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Physics

2000 - 2026

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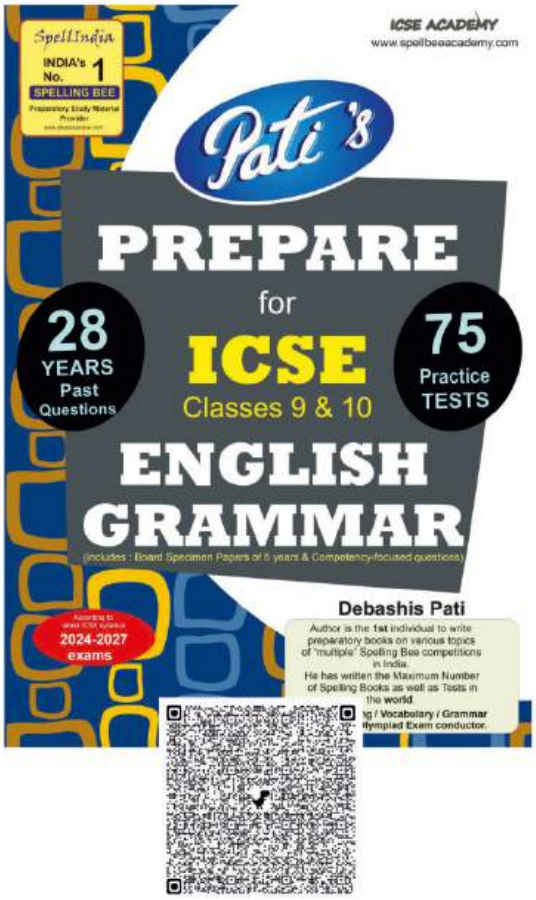

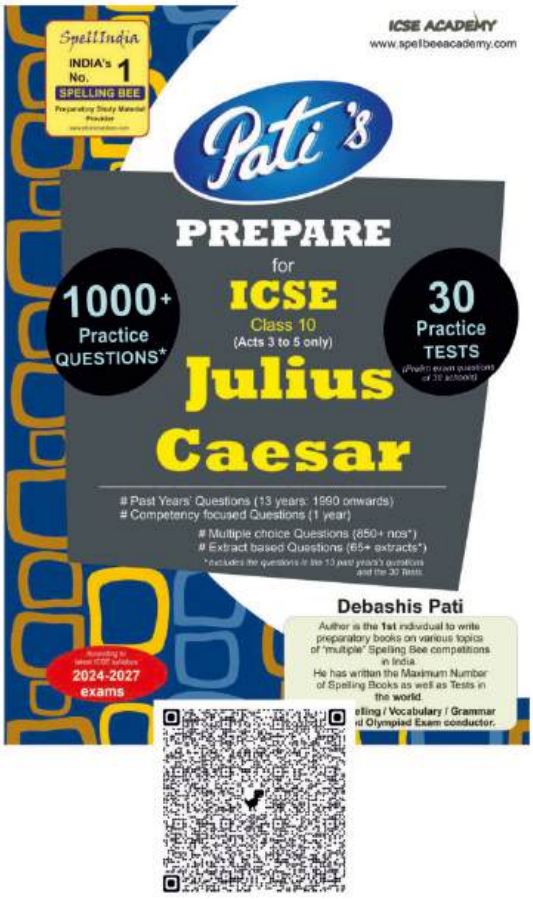

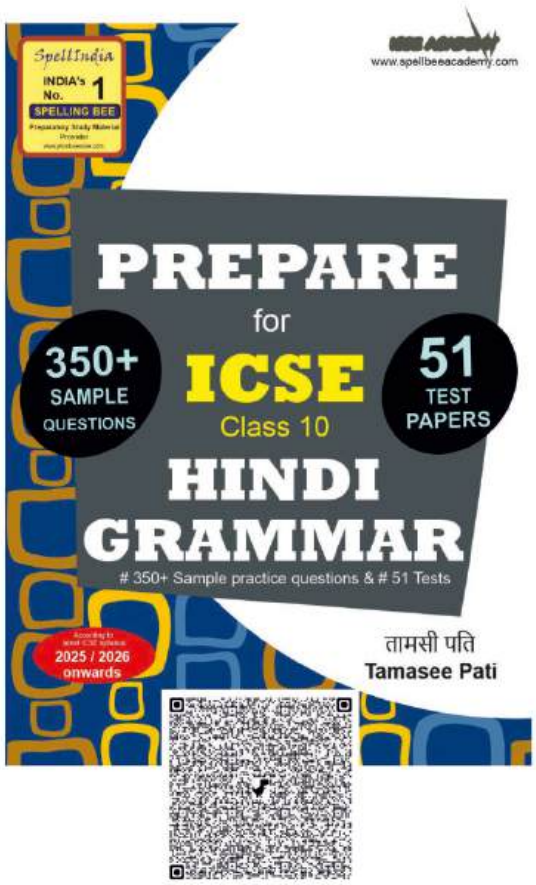

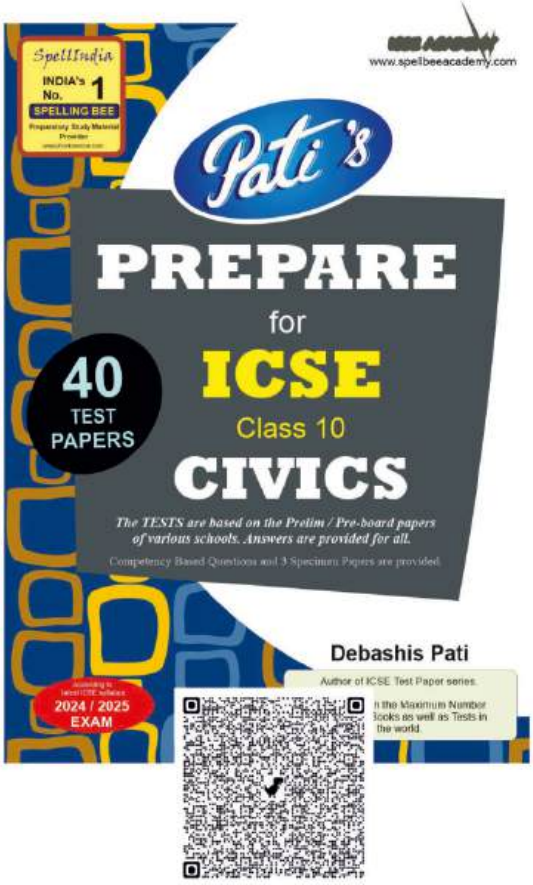

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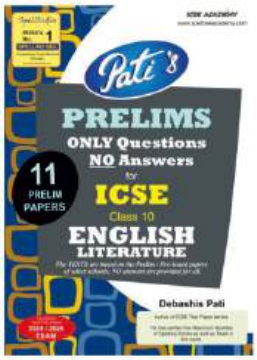

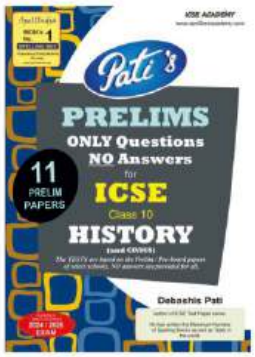

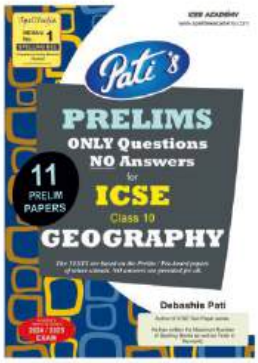

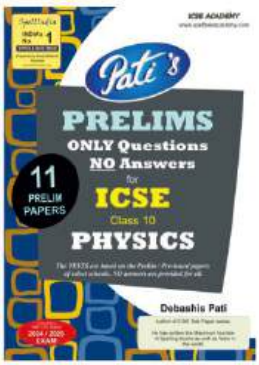

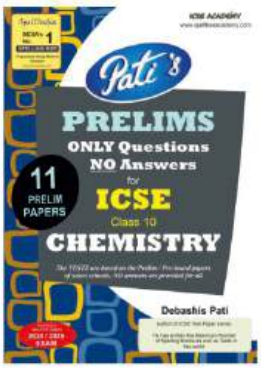

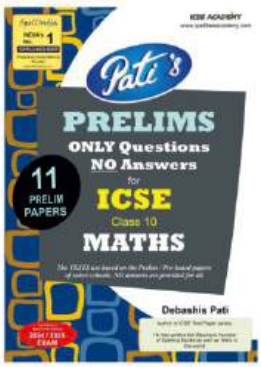

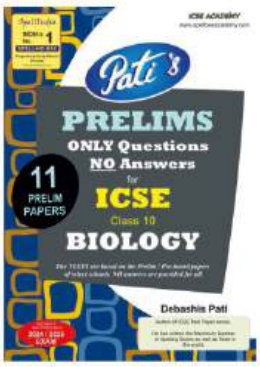

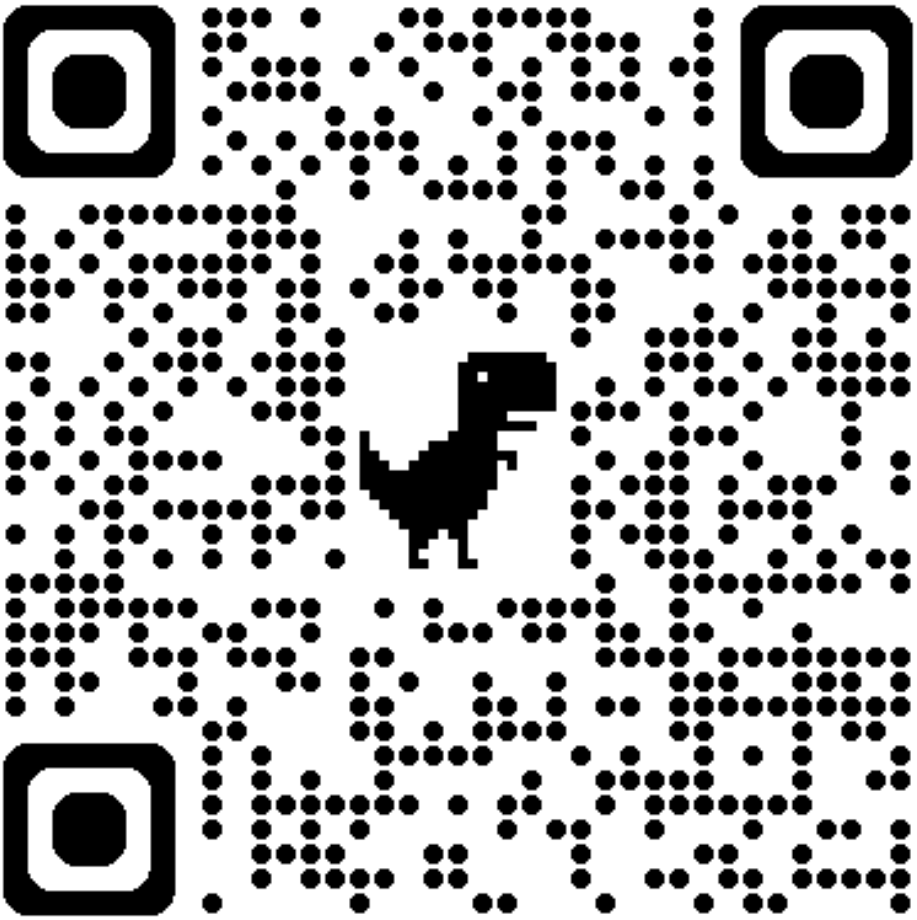

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Class 10

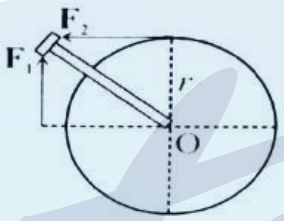
Physics

2000 - 2026

1. Force

2026:

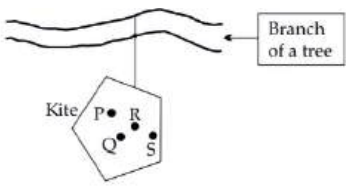
1. For a body to be in dynamic equilibrium, its:
    a. momentum should be zero
    b. acceleration should be zero
    c. kinetic energy should be zero
    d. velocity should be zero
2. A car is moving in uniform circular motion. The direction of friction between the tyres and the path is _____ [towards the centre / tangential to the path].
3. State two factors on which the position of the Center of Gravity of a body depends.
4. The diagram shows a wheel with a handle. Two forces, F1 and Fz of equal magnitudes are acting on



the handle as shown in the diagram.
    a. Which force produces a negative moment?
    b. Is the wheel in equilibrium? (Yes or No)
    c. Justify your answer stated in (b).

2025:

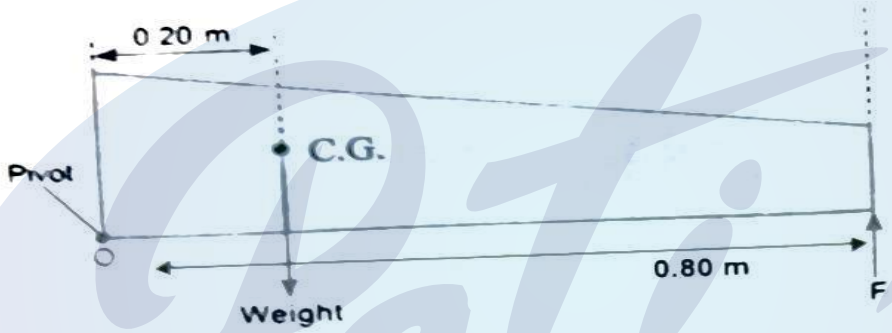
1. A body is acted upon by two equal and opposite forces that are NOT along the same straight line. The body will:
    a. remain stationary
    b. have only rectilinear motion
    c. have only rotational motion
    d. have both rectilinear and rotational motion
2. Which among the following is a vector quantity?
    a. Work. b. Power. c. Energy. d. Moment of couple
3. In uniform circular motion the centrifugal force acts _____ (towards the centre/away from the centre/along the tangential direction].
4. Akash takes a uniform metre scale and suspends a weight of 2 N at one end 'X', and a weight of 5 N on the other end 'Y". He then balances the ruler horizontally on a knife edge placed at 70 cm from X. Draw a diagram of the arrangement and calculate the weight of the ruler.
5. A non-uniform kite is hanging freely from the branch of a tree as shown. Study the figure and answer the following:



a. Fill in the blank. _____ (P, Q, R or S) is the most probable position of its centre of gravity.
b. Support your answer to (a) with a reason.

2024

1. A door lock is opened by turning the lever (handle) of length 0.2 m. If the moment of force produced is 1 Nm, then the minimum force required is:
   a. 5N
   b. 10N
   c. 20 N
   d. 0.2 N
2.
   a. When a stone tied to a string is rotated in a horizontal plane, the tension in the string provides _____ force necessary for circular motion.
   b. Work done by this force at any instant is_____
3. A non uniform beam of weight 120 N pivoted at one end is shown in the diagram below.

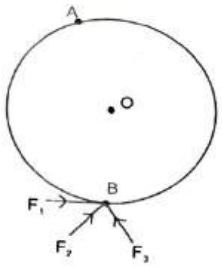


Calculate the value of F to keep the beam in equilibrium..
4. Define Centre of Gravity.
5. A hollow ice cream cone has a height of 6 cm.
   a. Where is the position of its center of gravity from the broad base?
   b. Will its position change when it is filled completely with honey? Write Yes or No.

2023

1. Clockwise moment produced by a force about a fulcrum is considered to be:
   a. Positive
   b. Negative
   c. Zero
   d. None of these
2. A meter scale of weight 50 gf can be balanced at 40 cm mark without any weight without any weight suspended on it.
   a. If this ruler is cut at its center then state which part [0 to 50 cm or 50 to 100 cm] ofthe ruler will weigh more than 25 gf.
   b. What minimum weight placed on this metre.~ler can balance this ruler when it is pivoted at its center?
3.
   i. What is the position of the center of gravity of a triangular lamina?
   ii. Where this triangular lamina is suspended freely from any one vertex, what is the moment of force produced by its own weight in its rest position?

iii. The diagram shows the wheel O pivoted at point A. Three equal forces F1, F2 and F3 act at point B on the wheel.

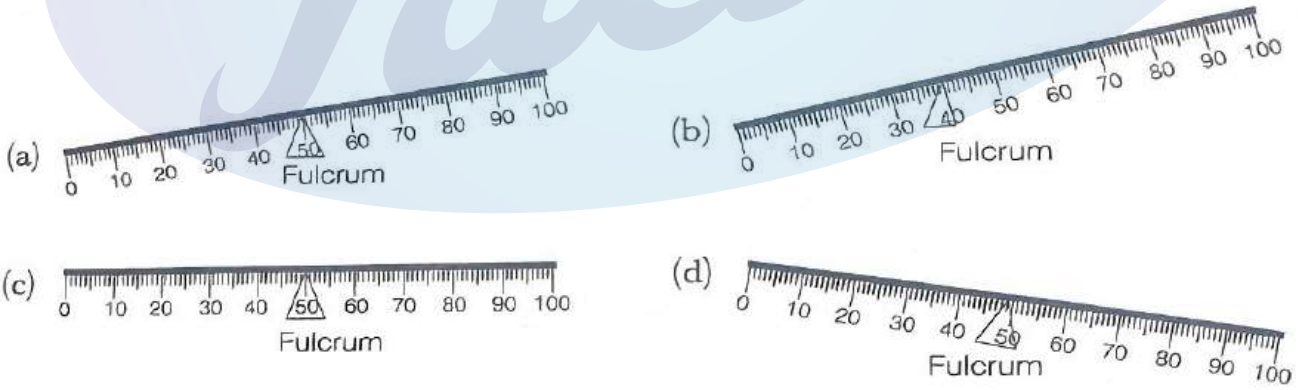


a. Which force will produce the maximum moment about A?
b. Give a reason for your answer in (a)

2021

1. The relation between CGS and SI unit of moment of force is
   a. 1 N-m =10^5 dyne-cm
   b. 1 N-m = 10^5 dyne
   c. 1 N-m = 10^7 dyne-cm
   d. 1 dyne-cm = 10^7 N-m
2. The diagram below shows the balanced position of a meter scale.

Which one of the following diagrams shows the correct position of the scale, when it is supported at the centre?

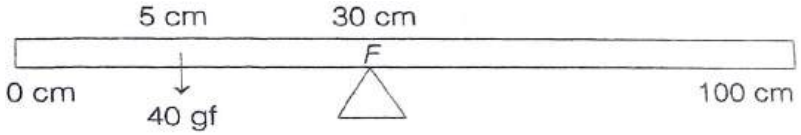


2020

1.
   i. Define moment of force.
   ii. Write the relationship between the SI and CGS unit of moment of force.

2019

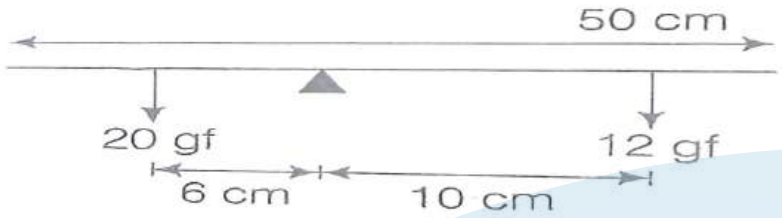
1.
   a. Define a couple.
   b. State the SI unit of moment of couple.
2. A uniform meter scale is in equilibrium as shown in the figure given below.



a. Calculate the weight of the meter scale
b. Which of the following options is correct to keep the ruler in equilibrium, when weight of 40 gf is shifted to 0 mark? F is shifted towards 0 cm or F is shifted towards 100 cm.

2018

1. A half-meter rod is pivoted at the center with two weights of 20 gf and 12 gf suspended at a perpendicular distance of 6 cm and 10 cm from the pivot respectively, as shown below.



a. Which of the two forces acting on the rigid rod causes a clockwise moment?
b. Is the rod in equilibrium?
c. The direction of the 20 kgf force is reversed. What is the magnitude of the resultant moment of the forces on the rod?

2017

1. A brass ball is hanging from a stiff cotton thread. Draw a neat labeled diagram showing the forces acting on the brass ball and cotton thread.
2. The distance between two bodies is doubled. How is the magnitude of gravitational force between them affected?
3. Why is a jack screw provided with a long arm?

2016

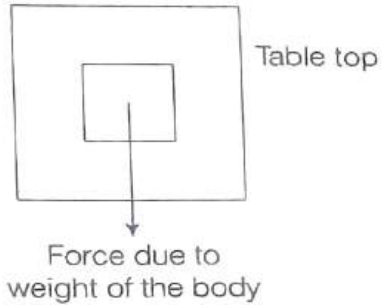
1.
a. Give an example of a non-contact force which is always of attractive nature.
b. How does the magnitude of this non-contact force on the two bodies depend on the distance of separation between them?

2015

1.
i. Define equilibrium.
ii. In a beam balance, when the beam is balanced in a horizontal position, it is in_____ equilibrium.

2.
i. On what factor does the position of the centre of gravity of a body depend?
ii. What is the SI unit of the moment of force?

3. Name the factors affecting the turning effect of a body.
4. A nut is opened by a wrench of length 20 cm. If the least force required is 2N, find the moment of force needed to loosen the nut.
5. When a body is placed on a table top, it exerts a force equal to its weight downwards on the table top but does not move or fall.



a. Name the force exerted by the table top.
b. What is the direction of the force?

2014

1. What is the weight of a body placed at the center of the earth?
2. A brass ball is hanging from a stiff cotton thread. Draw a neat labeled diagram showing the forces acting on the brass ball and cotton thread.
3. A force is applied on (i) a rigid body and (ii) a non-rigid body. How does the effect of the force differ in the above two cases?
4. Two forces each of 5 N act vertically upwards and downwards, respectively. On the two ends of a uniform meter rule which is placed at its mid-point as shown in the diagram. Determine the magnitude of the resultant moment of these forces about the mid-point.

2013

1.
   i. Where is the center of gravity of a uniform ring situated?
   ii. The position of the center of gravity of a body remains unchanged even when the body is deformed. State whether the statement is true or false.
2. Give any two effects of a force on a non-rigid body
3. One end of a spring is kept fixed while the other end is stretched by a force as shown in the diagram.

a. Copy the diagram and mark on it the direction of the restoring force
b. Name one instrument which works on the above principle.

2012

1. A boy of mass 30 kg is sitting at a distance of 2 m from the middle of a seesaw. Where should a boy of mass 40 kg sit, so as to balance the seesaw?
2. What is meant by the term moment of force?
3. If the moment of force is assigned a negative sign, then will the turning tendency of the force be clockwise or anticlockwise?

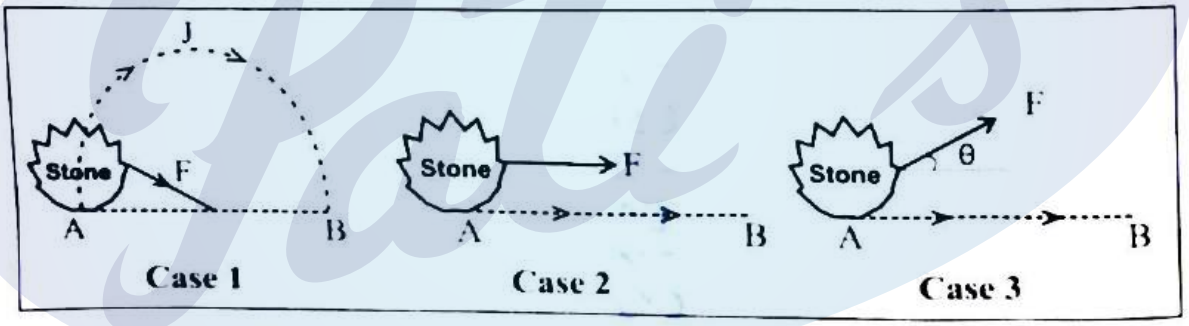
2011

1. A man can open a nut by applying a force of 150 N by using a liver handle of length 0.4 m. What should be the length of the handle, if he is able to open it by applying force of 60 N?
2. Where does the position of center of gravity lie for a circular laminar and triangular lamina?
3. A uniform meter scale can be balanced at the 70.0 cm mark when a mass of 0.05 kg is hung from the 94.0 cm mark.
    a. Draw a diagram of the arrangement.
    b. Find the mass of the meter scale.

2. Work, Energy and Power

2026:

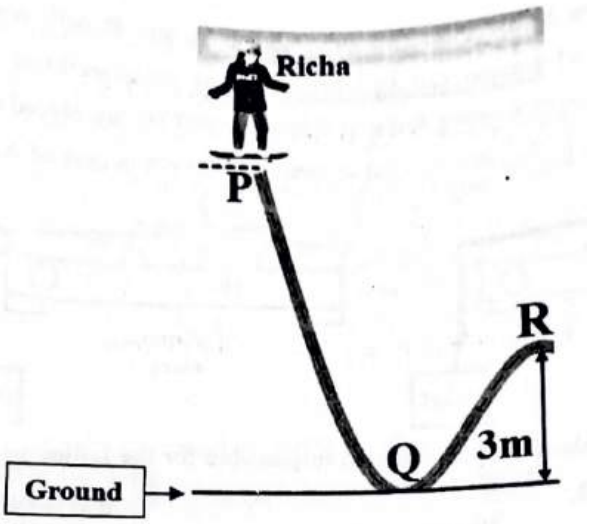
1. The energy transformation taking place during photosynthesis in plants is:
    a. heat to chemical
    b. chemical to light
    c. light to chemical
    d. chemical to heat
2. A fast-moving cyclist stops pedalling on reaching a hilly track. If he continues to move with the acquired energy, then assuming no loss of energy:
    a. His kinetic energy remains constant at all times.
    b. His potential energy remains constant at all times.
    c. His total mechanical energy continuously increases.
    d. His total mechanical energy remains constant.
3. Name the unit of work done, used in subatomic scale.
4. A stone is tied to a string and displaced from A to B by application of constant force F in three different ways as shown in the diagram below. Arrange the three cases in ascending order of the work done by the force. (Given AJB is a semi-circle, $0<90°$ and AB = 20 m)



5. A ball of mass 20 g falls from a height of 45 m. It rebounds from the ground to a height of 40 m. Calculate:
    a. the initial potential energy of the ball.
    b. the speed of the ball at which it hits the ground
    c. the loss in kinetic energy on striking the ground. [g = 10 m/s^2]

2025:

1. What is the correct energy transformation during burning of a candle?
    a. heat → kinetic + potential
    b. heat → chemical + light
    c. chemical → heat + light (d)
    d. mechanical → chemical + heat
2. Richa weighing 40 kgf leaves point P on her skateboard and reaches point Q on the ground with velocity 10 m/s. Calculate:

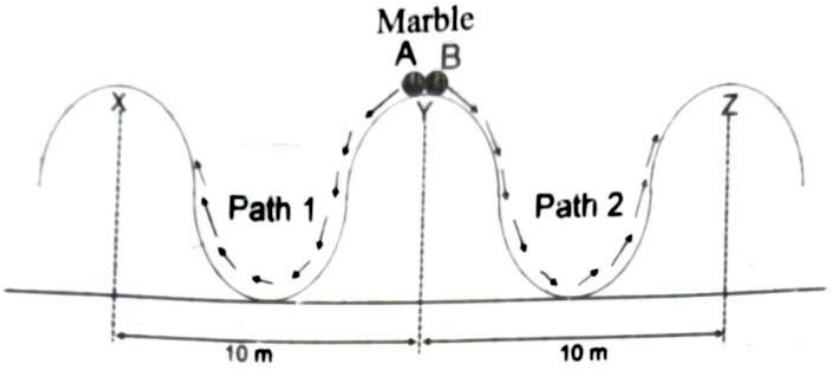


a. the kinetic energy of Richa at point Q.
b. the vertical height of point P above the ground. (Use g as 10 m/s and neglect friction)
c. the kinetic energy of Richa at point R. (While moving from @ to R, she loses 500 J of energy against friction.)

2024:

1. When a bell fixed on a cycle rings, then the energy conversion that takes place is:
   a. gravitational potential energy to sound energy
   b. kinetic energy to sound energy
   c. sound energy to electrical energy
   d. sound energy to mechanical energy
2. A force 'F' moves a load from A to C as shown in the figure below. For the calculation of work done, which of this length would use as the displacement

   a. 3m
   b. 4m
   c. 5m
   d. 7m
3. Sumit does 600 J of work in 10 min and Amit does 300 J of work in 20 min. Calculate the ratio of the powers delivered by them.
4. Iwoidentical marbles A and B are rolled down along Path 1 and Path 2 respectively. Path 1 is frictionless and Path 2 is rough.



a. Which marble will surely reach the next peak?
b. Along which path/s is the law of conservation of energy obeyed? Given are two pulleys.
c. Along which path/s the mechanical energy will be conserved?

2023:

1. When the speed of a moving object is doubled, then its kinetic energy:
   a. remains the same
   b. decreases
   c. is double
   d. becomes four times
2. The energy conversion in a washing machine is from _ _ _ _
   a. Magnetic to electrical
   b. Electrical to mechanical
   c. Electrical to magnetic
   d. Magnetic to electrical
3. What should be the angle between the direction of force and the direction of displacement, for work to be negative?
4. Name the physical quantity obtained using the formula U/h where U is the potential energy and h is the height.
5. Calculate the power spent by crane while lifting a load of 1000 at velocity of 1.5 ms^{-1} ($g = 10\ ms^{-2}$)
6. A car of mass 120 kg is moving at a speed 18 km/h and it accelerates to attain a speed of54 km/h in 5 seconds. Calculate: the work done by the engine and the power of the engine.

2022

1. A coolie raises a load upwards against the force of gravity then the work done by the load is:
   a. zero.
   b. positive work.
   c. negative work.
   d. none of these.
2. The energy change during photosynthesis in plants is:
   a. heat to chemical.
   b. light to chemical.
   c. chemical to light.
   d. chemical to heat.
3. Body Of Mass 200g Falls Freely From a height 15m. [g= 10m/s]
   i. When the body reaches 10 m above the ground, its potential energy will be:
      a. 20000 J
      b. 10 J

c. 10000 J
d. 20 J

ii. The gain in kinetic energy of the body when it reaches 10 m above the ground is:
a. 20J
b. 10J
c. 30J
d. 25J

iii. The total mechanical energy it will possess, when it is just about to strike the ground is:
a. 30000J
b. 20000J
c. 30J
d. 20J

iv. Velocity in m/s with which the body will hit the ground
a. 30
b. 10
c. $10\sqrt{3}$
d. $10\sqrt{2}$

4. Which one of the following is the correct mathematical relation?
a. Power = Force/ Velocity
b. Power = Force x Acceleration
c. Power=Force/ Acceleration
d. Power= Force x Velocity
5. A light body A and a heavy body B have the same momentum.(Choose a correct statement from the given options.
a. Kinetic energy of body A and body B will be the same.
b. Kinetic energy of body A is greater than kinetic energy of body B
c. kinetic energy of body B is greater than kinetic energy of body A
d. Unless we know the velocity we cannot find which body has greater kinetic energy
6. A If the ratio of kinetic energies of A and B is 5: 2, then which one of the following gives the mass ratio of the bodies respectively? Choose the correct option
a. 5:2
b. 25: 4
c. 2: 5
d. 4: 24
7. 1 joule = ... erg
a. 10^9
b. 10^7
c. 10^5
d. 10^6

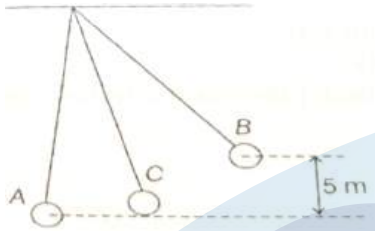
2021: No exam

2020

1. A light body A and a heavy body B have the same momentum.(Choose a correct statement from the given options.
a. Kinetic energy of body A and body B will be the same.
b. Kinetic energy of body A is greater than kinetic energy of body B
c. kinetic energy of body B is greater than kinetic energy of body A

d. Unless we know the velocity we cannot find which body has greater kinetic energy

2. A If the ratio of kinetic energies of A and B is 5: 2, then which one of the following gives the mass ratio of the bodies respectively? Choose the correct option
   a. 5:2
   b. 25: 4
   c. 2: 5
   d. 4: 24
3. Given one example of each, when
   a. chemical energy changes into electrical energy.
   b. electrical energy changes into sound energy.
4. The figure below shows a simple pendulum of mass 200 g. It is displaced from the mean position A to the extreme position B. The potential energy at the position A is zero. At position B, the pendulum bob is raised by 5 m.



   i. What is the potential energy of the pendulum at the position B?
   ii. What is the total mechanical energy at point C ?
   iii. What is the speed of the bob at the position A when released from B? (Take, g = 10 ms^{-2} and there is no loss of energy).

2019

5. Two bodies A and B have masses in the ratio 5:1 and their kinetic energies are in the ratio 125:9 Find the ratio of their velocities.
6. A body of mass 10 kg is kept at a height of 5 m. It is allowed to fall and reach the ground. What is the total mechanical energy possessed by the body at the height of 2 m assuming it is a frictionless medium?
7. What is the kinetic energy possessed by the body just before hitting the ground? (Take, g = 10 ms^{-2}).

2018

8. Derive a relationship between the SI and CGS unit of work.
9.
   a. State and define the SI unit of power.
   b. How is the unit horsepower related to the SI unit of power?
10. State the energy changes in the following cases while in use
    a. an electric iron.
    b. a ceiling fan.
11. Name the unit of physical quantity obtained by the formula $2K/V^2$ where K is kinetic energy and V is linear velocity.

2017

12. If the power of a motor is 100 kW, at what speed can it raise a load of 50000 N?

2016

13. a boy weighing 40 kg climbs up a stair of 30 steps each 20 cm high in 4 min and a girl weighing 30 kg does the same in 3 min. Compare

a. the work done by them.
b. the power developed by them

2015

14. Explain briefly, why the work done by a fielder, when he takes a catch in a cricket match is negative?
15. How is work done by a force measured, when the force
    a. is in the direction of displacement?
    b. is at an angle 0 to the direction of displacement?
16. State the energy changes in the following while in use
    a. burning of a candle.
    b. a steam engine.
17. Rajan exerts a force of 150 N in pulling a cart at a constant speed of 10 m/s. Calculate the power exerted.
18. Define joule, give the SI unit of work and establish a relationship between the SI and CGS unit of work.

2014

19.
    a. When does a force do work?
    b. What is the work done by the moon when it revolves around the earth?
20. Calculate the change in the kinetic energy of a moving body, if its velocity is reduced to 1/3rd of the initial velocity.
21. A man having a box on his head, climbs up a slope and another man having an identical box walks the same distance on a leveled road. Who does more work against the force of gravity and why?
22. The conversion of part of the energy into an undesirable form is called?
23. What is nuclear energy?
24. A body is thrown vertically upwards, its velocity keeps on decreasing. What happens to its KE as its velocity becomes zero?
25. Name the process used for producing electricity using nuclear energy.
26. State the energy changes in the following devices while in use:
    a. a loudspeaker.
    b. a glowing electric bulb.
27. State one important advantage and disadvantage of using nuclear energy for producing electricity.

2013

28. A force is applied on a body of mass 20 kg moving with a velocity of 40 ms^{-1}. The body attains a velocity of 50 ms^{-1} in 2 s. Calculate the work done by the body.
29. A girl of mass 35 kg climbs up from the first floor of a building at a height 4 m above the ground to the third floor at a height 12 m above the ground. What will be the increase in her gravitational potential energy? (Take, g = 10 ms^{-2})

2012

30. A ball is placed on a compressed spring. When the spring is released, the ball is observed to fly away.
    a. What form of energy does the compressed spring possess?
    b. Why does the ball fly away?
31. A body of mass 0.2 kg falls from a height of 10 m to a height of 6 m above the ground. Find the loss in potential energy taking place in the body. (Take, g = 10 ms^{-2})
32. A moving body weighing 400 N possesses 500 J of KE. Calculate the velocity with which the body is moving. (Take, g = 10 ms^{-2})
33. State the energy conversion taking place in a solar cell.
34. Give one disadvantage of using a solar cell.

2011

35. A coolie carrying a load on his head and moving on a frictionless horizontal platform does not work. Explain the reason, why?
36. A ball of mass 200 g falls from a height of 5 m. What will be its kinetic energy when it just reaches the ground? (Take, g = 9.8 ms^{-2})
37. Draw a diagram to show the energy changes in an oscillating simple pendulum. Indicate in your diagram how the total mechanical energy in it remains constant during the oscillation.

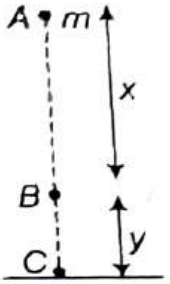
2010

38. A body is acted upon by a force. State two conditions under which the work done could be zero.
39. A body of mass 50 kg has a momentum of 3000 kg ms^{-1}, Calculate
    a. Kinetic energy of the body
    b. Velocity of the body.
40. A spring is kept compressed by a small trolley of mass 0.5 kg lying on a smooth horizontal surface as shown in the figure given below.

When the trolley is released, it is found to move at a speed of 2 ms^{-1}, what potential energy did the spring possess when compressed?

2009

41. A body of mass 5 kg is moving with a velocity of 10 ms^{-1}. What will be the ratio of its initial kinetic energy and final kinetic energy, if the mass of the body is doubled and its velocity is halved?
42. What is the SI unit of energy? How is the electron volt (eV) related to it?
43. 6.4 kJ of energy causes a displacement of 64 m in a body in the direction of force in 2.5 s. Calculate
    a. the force applied
    b. power in horsepower (HP).
44. State the energy changes that takes place in the following when they are in use all ad
    a. a photovoltaic cell.
    b. an electromagnet.



45. An object of mass m is allowed to fall freely from point A as shown in the figure.
    a. Calculate the total mechanical energy of the object at (i) Point A (ii) Point B (iii) Point C

2008

46. When an arrow is shot from a bow, it has a kinetic energy in it. Explain briefly from where it gets its kinetic energy?
47. What energy conversions take place in the following when they are working
    a. Electric toaster?
    b. Microphone?

48. A stone of mass 64.0 g is thrown vertically upward from the ground with an initial speed of 20.0 m/s. The gravitational potential energy at the ground level is considered to be zero. Apply the principle of conservation of energy and calculate the potential energy at the maximum height attained by the stone. (Take, g = 10 ms^{-2})
49. Using the same principle, state what will be the total energy of the body at its half-waypoint?

2007

50. Two bodies A and B of equal mass are kept at heights 20 m and 30 m, respectively. Calculate the ratio of their potential energies.
51. Define one kilowatt hour. How is it related to the joule?
52. How can the work done be measured when force is applied at an angle to the direction of displacement?
53. What is the main energy transformation that occurs in
    a. photosynthesis in a greenhouse?
    b. charging a battery?
54.

2006

55. State the amount of work done by an object, when it moves in a circular path for one complete rotation. Give your reason to justify your answer.

2005

56. What should the angle between force and displacement be to get the
    a. minimum work?
    b. maximum work?
57. A force acts on a body and displaces it by a distance in a direction at an angle 0 with the direction of force. What should be the value of 0 to get the maximum positive work?
58. What is the SI unit of energy? How is the electron volt (eV) related to it?
59. The work done by the heart is 1 joule per beat. Calculate the power of the heart, if it beats 72 times in one minute.
60. State the law of conservation of energy.

2004

61. A ball of mass 0.20 kg is thrown vertically upwards with an initial velocity of 20 m/s. Calculate the maximum potential energy it gains as it goes up.

2003

62. If the power of a motor is 40 kW, at what speed does it raise a load of 20000 N?

2002

63. By what factor, does the kinetic energy of a moving body change when its speed is reduced to half?
64. State the energy conversion taking place in a solar cell.
65. Give one disadvantage of using a solar cell.
66. A machine raises a load of 750 N through a height of 16 m in 5 s. Calculate the power at which the machine works.
67. How is work done related to the applied force?
68. Define work
69. What does kilowatt hour measure?
70. Define power and energy.

2001

71. A truck driver starts off with his loaded truck. What are the major energy changes that take place in setting the truck into motion?

2000

72. A body P has a mass of 20 kg and is moving with a velocity of 5 m/s. Another body O has a mass of 5 kg and is moving with a velocity of 20 m/s. Calculate
    a. the ratio of the momentum of P and Q.
    b. the kinetic energy of P in SI unit.
73. An engine can pump 30000 L of water to a vertical height of 45 m in 10 min. Calculate the work done by the machine and its power. (Take, g = 9.8 ms^{-2} density of water = 10^3 kgm^{-3}, 1000 L= 1 m^3).

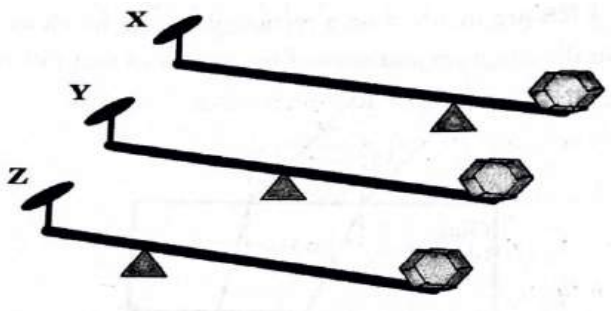
3. Machines

2026:

1. The Velocity Ratio (VR) of a block and tackle system of two pulleys with the effort in the upward direction is:
    a. 1
    b. 2
    c. 3
    d. 4
2. Case 1: Lata cuts a potato into two halves, using a cutter which belongs to a Class II lever. She needed effort E1.
3. Case 2: Then she cuts one half of this potato again, but this time she needed effort E2. If E1 > E2 then:
    a. In which case (1st or 2nd) was the potato closer to her hand applying the effort? (Assume normal reaction of the surface of the potato is same in both cases)
    b. Give a reason for your answer in (a) above.
4. To which class of lever does a pair of scissors belong?
5. To lift a load of 30 kgf, Suhas uses a single fixed pulley, while Radha uses a single movable pulley. The displacement of efforts in both the cases are equal. In an ideal situation calculate the ratio of:
    a. the efforts in the two cases.
    b. the potential energy gained by the loads in the two cases
    c. the efficiencies in the two cases.

2025:

1. For a lever, a graph is plotted with load on Y-axis and effort on X-axis. Which of the following represents the slope of the graph?
    a. Mechanical advantage
    b. Velocity ratio
    c. 1 / Velocity ratio
    d. 1 / Mechanical advantage
2. Three levers X, Y, Z of equal lengths are shown in the diagram.



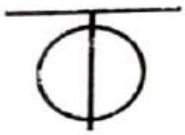
    a. Which class of lever do these belong to?
    b. Among these (X, Y or Z) which one will give the maximum mechanical advantage? Justify your answer.
3. Draw a block and tackle system of pulleys with velocity ratio equal to 3.

2024:

1. Which of the following is class III lever?

a. Pair of scissors
b. Wheelbarrow
c. Crowbar
d. Human forearm

2. Meera chose to use a block and tackle system of "9' pulleys instead of a single movable pulley to lift a heavy load.
    a. What is the advantage of using a block and tackle system over a single movable pulley?
    b. Why should she connect more pulleys in the upper fixed block?
3. Given are two pulleys



    a. Copy and complete the labeled diagram connecting the two pulleys with a tackle to obtain Velocity Ratio = 2.
    b. If Load = 48 kgf and efficiency is 80% then calculate:
        i. Mechanical Advantage.
        ii. Effort needed to lift the load.

4. Name the class of the lever shown in the picture below:

2023

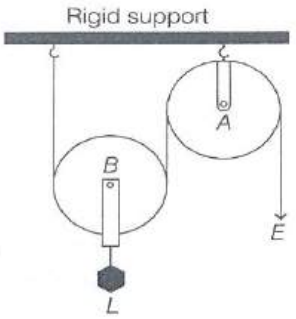
1.
    a. Name a single pulley in which displacement of load and effort is not the same.
    b. State one advantage of this pulley.
2. A block and tackle system of pulleys has velocity ratio 4.
    a. Draw a labeled diagram of the system indicating clearly, the direction of the load and the effort.
    b. What is the value of the mechanical advantage of the given pulley system if it is an ideal pulley system?

2022

3. A single fixed pulley is used because
    a. it changes the direction of applied effort conveniently
    b. it multiplies speed
    c it multiplies effort

d. its efficiency is 100%

4. In the diagram shown below, the velocity ratio of the arrangement is



a. 1
b. 2
c. 3
d. 0

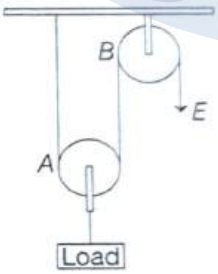
5. A woman draws water from a well using a fixed pulley. The mass of the bucket and the water together is 10 kg. The force applied by the woman is 200 N. The mechanical advantage is (Take, g = 10 ms^{-2})
   a. 2
   b. 20
   c. 0.5
   d. 0.05

2020

6. Crane A lifts a heavy load in 5 s, whereas another crane B does the same work in 2 s. Compare the power of crane A to that of crane B.
7. A block and tackle system of police has velocity ratio 4
   i. Draw a neat labeled diagram of the system, indicating clearly the points of application and direction of effort and load
   ii. What will be its velocity ratio, if the weight of the movable block is doubled?

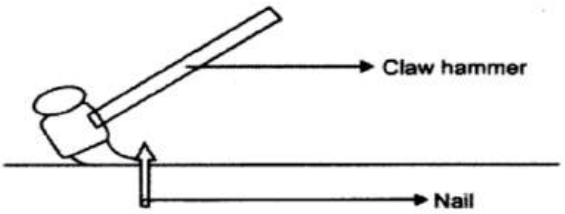
2019

8. The figure below shows a pulley arrangement.



a. Copy the figure and mark the direction of tension on each strand of the string.
b. What is the velocity ratio of the arrangement?
c. If the tension acting on the string is I, then what is the relationship between T And effort E?
d. If the free end of the string moves through a distance x, then find the distance by which the load is raised.

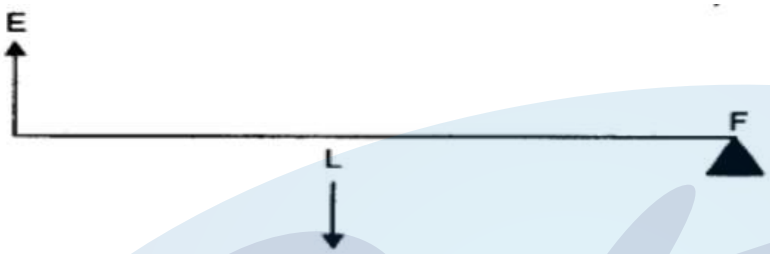
9. The diagram below shows a claw hammer used to remove a nail:



   i. To which class of lever does it belong ?
   ii. Give one more example of the same class of lever mentioned by you in (i) for which the mechanical advantage is greater than one

2018

10. The diagram below shows a lever in use:



   a. To which class of levers does it belong?
   b. Without changing the dimensions of the lever, if the load is shifted towards the fulcrum what happens to the mechanical advantage of the lever?

11.
   a. Draw a diagram to show a block and tackle pulley system having a velocity ratio of 3 marking the direction of load (L), effort (E and tension (I).
   b. The pulley system draws a load of 150 N. When an effort of 60 N is applied, find its mechanical advantage.
   c. Is the above pulley system an ideal machine or not?

2017

12. A boy uses a single fixed pulley to lift a load of 50 kg to some height. Another boy uses a single movable pulley to lift the same load to the same height. Compare the effort applied by them. Give a reason to support your answer.

2016

13. With reference to the terms mechanical advantage, velocity ratio and efficiency of a machine, name and define the term that will not change for a machine of a given design.

2015

14. A scissor is a_____multiplier.
15. A block and tackle system has V.R. = 5
   a. Draw a neat labeled diagram of a system indicating the direction of its load and effort
   b. Rohan exerts a pull of 150 kgf. What is the maximum load he can raise with this pulley system if its efficiency = 75%?

2014

16. Draw a diagram to show how a single pulley can be used, so as to have its ideal MA = 2.
17. Derive a relationship between MA, VR and n of a machine.
18. What is the principle of an ideal machine?

2013

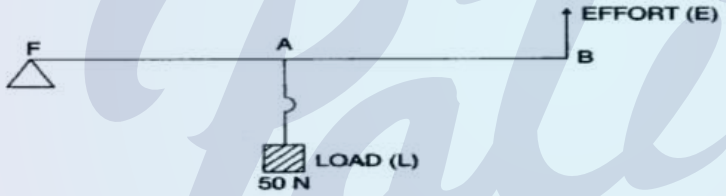
19. A type of single pulley is very often used as a machine even though it does not give any gain in mechanical advantage
    a. Name the type of pulley used.
    b. For what purpose is such a pulley used?
20. In what way does an 'Ideal machine' differ from a 'Practical machine' ?
21. Can a simple machine act as a force multiplier and a speed multiplier at the same time ?
22. Which class of lever found in the human body is being used by a boy :
    a. When he holds a load on the palm of his hand.
    b. When he raises the weight of his body on his toes ?

2012

23. State the class of levers and the relative positions of load (L), effort (E) and fulcrum (F) in each of the following cases :
    a. A bottle opener.
    b. Sugar tongs.
24. Why is less effort needed to lift a load over an inclined plane as compared to lifting the load directly ?

2011

25. What is meant by an ideal machine?
26. A man can open a nut by applying a force of 150 N by using a lever handle of length 0.4 m. What should be the length of the handle if he is able to open it by applying a force of 60 N ?
27.
    a. To which class of lever does it belong ?
    b. If FA = 40 cm, AB = 60 cm, then find the mechanical advantage of the lever.



28. Write a relationship between the mechanical advantage (MA) and velocity ratio (VR) of an ideal machine?
29. Name a machine which can be used to
    a. multiply force.
    b. change the direction of force applied.

2010

30. Why is the mechanical advantage of a lever of the second order always greater than one ?
31. Name the type of single pulley that has a mechanical advantage greater than one.
32. Write a relation expressing the mechanical advantage of a lever.
33. Give two reasons as to why the efficiency of a single movable pulley system is always less than 100%

2009

34. With reference to the terms mechanical advantage, velocity ratio and efficiency of a machine,
    a. name the term that will not change for a machine of a given design.
    b. Define the term stated by you in part (a).
35. A pulley system comprises two pulleys, one fixed and the other movable.
    a. Draw a labeled diagram of the arrangement and show clearly the directions of all the forces acting on it.
    b. What change can be made in the movable pulley of this system to increase the mechanical advantage of the system?

2008

36. Copy the diagram of the forearm given below, indicate the positions of Load, Effort and Fulcrum

2007

37. Write an expression to show the relationship between mechanical advantage, velocity ratio and efficiency for a simple machine.
38. Which class of levers has a mechanical advantage always greater than one ? What change can be brought about in this lever to increase its mechanical advantage ?
39. A block and tackle pulley system has a velocity ratio 3.
    a. Draw a labelled diagram of this system. In your diagram, indicate clearly the points of application and the directions of the load and effort.
    b. Why should the lower block of this pulley system be of negligible weight ?

2006

40. pulley system has a velocity ratio of 4 and an efficiency of 90%. Calculate
    a. the mechanical advantage of the system.
    b. the effort required to raise a load of 300 N by the system.

2004

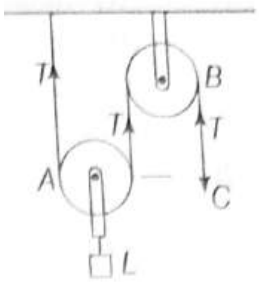
41. A woman draws water from a well using a fixed pulley. The mass of the bucket and water together is 6.0 kg. The force applied by the woman is 70 N. Calculate the mechanical advantage. (Take, g = 10 ms^{-2})

2006

42. A pulley system has a velocity ratio of 4 and an efficiency of 90%. Calculate
    a. the mechanical advantage of the system.
    b. the effort required to raise a load of 300 N by the system.

2005

43. From the given diagram answer the questions that follow:



    a. What kind of pulleys are A and B?
    b. State the purpose of pulley B.
    c. What effort has to be applied at C to just raise the load L = 20 kgf? (Neglect the weight of pulley A and friction)

2004

44. A woman draws water from a well using a fixed pulley. The mass of the bucket and water together is 6.0 kg. The force applied by the woman is 70 N. Calculate the mechanical advantage. (Take, g = 10 ms^{-2})
45. Explain why scissors for cutting cloth may have blades much longer than the handles; but shears for cutting metals have short blades and long handles.

2003

46. Give two reasons why the efficiency of a single movable pulley system is not 100%.
47. What is the relationship between the mechanical advantage and the velocity ratio for
    i. Ideal machine
    ii. Practical machine
48. A cook uses a fire tong of length 28 cm to lift a piece of burning coal of mass 250 g. If he applies his effort at a distance of 7 cm from the fulcrum, what is the effort in the SI unit? (Take, g= 10 ms^{-2})

2002

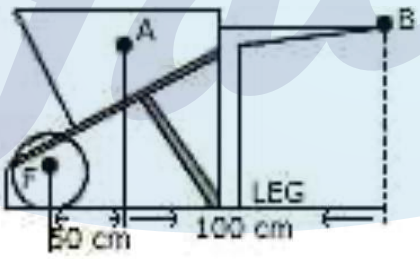
49. A cook uses a 'fire tong' of length 28 cm to lift a piece of burning coal of mass 250 g. If he applies his effort at a distance of 7 cm from the fulcrum, what is the effort in S.I. unit? Take g = 10 m/s^2.

2001

50. To use a machine as a force multiplier, what type (class) of lever should preferably be used? Draw a sketch of such a lever
51. A pair of scissors and a pair of pliers belong to the same class of levers.
    a. Which one has a mechanical advantage less than one?
    b. State the usefulness of a machine whose mechanical advantage is less than one.

2000

52. Why is the mechanical advantage of a lever of the third order always less than l? Give one example of this class of lever.
53. In the diagram of a stationary wheel barrow, the center of gravity is at A. The wheel and the leg are in contact with the ground. The horizontal distance between A and F is 50 cm and that between B and F is 150 cm.

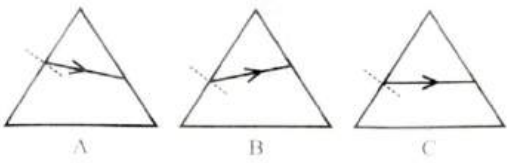


    a. What is the direction of the force acting at A? Name the force.
    b. What is the direction of the minimum force at B to keep the leg off the ground? What is this force called?
    c. The weight of the wheel barrow is 15 kgf and it holds sand of weight 60 kgf. Calculate the minimum force required to keep the leg off the ground.

4. Refraction of Light at plane surface

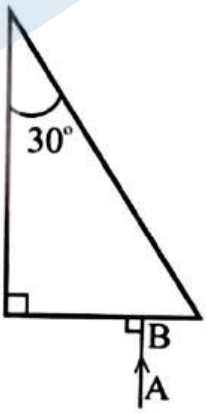
2026:

1. A monochromatic ray strikes the surface of identical prisms (A, B and C) at different angles of incidence. The diagram below shows their refracted rays. Study the path of these refracted rays and identify in which of the diagrams:

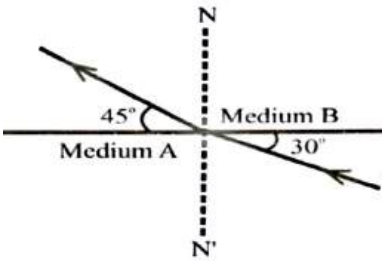


   a. The angle of incidence is maximum.
   b. The angle of incidence is minimum.
   c. The angle of incidence is equal to the angle of emergence.

2. When a ray of light passes from a denser to a rarer medium, its wavelength (decreases / increases].
3. A type of glass block has a refractive index of 1.8.
   a. Calculate the speed of light in this glass. (Given speed of light in air 3 x 10° ms)
   b. If the width of this block is doubled, then what will be the speed of light in the block?
4. A ray of light enters a glass block from air and comes out from the opposite surface. If the angle of refraction at the first surface is not the same as the angle of incidence at the second surface, then:
   a. What is the product of the ratio of Sin i/sin r at the first surface and at the second surface?
   b. State whether the opposite surfaces are parallel or not parallel.
   c. How did you reach the conclusion in (b) above?
5. Redraw the diagram given below and complete the path of the light ray AB through the glass prism

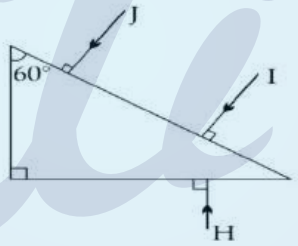


   till it emerges out of the prism. The critical angle of the glass is 42°.
6. From the figure given below, the refractive index of medium B with respect to medium A is:

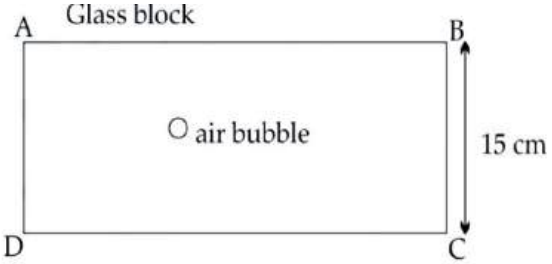


a. Sin 45°/sin 30°
b. Sin 30°/sin 45°
c. Sin 45°/sin 60°
d. Sin 60°/sin 45°

2025:

1. When a ray of light passes from one optical medium to another, which of the following physical quantities does NOT change?
   a. Amplitude of the wave
   b. Frequency of the wave
   c. Wavelength of the wave
   d. Speed of the wave
2. A ray of light is incident normally on a face of an equilateral prism. The ray gets totally reflected at the second refracting surface. The total deviation produced in the path of the ray is: (a) 30° (b) 60° (c) 90° (d) 120°
3. Refractive index of a medium is independent of _____ [temperature/angle of incidence/wavelength of light).
4. A ray of light enters a rectangular glass slab submerged in water at an angle of incidence 55°. Does this ray undergo total internal reflection when it moves from water to glass? Justify your answer. (The critical angle for glass–water interface is 54°)
5. 

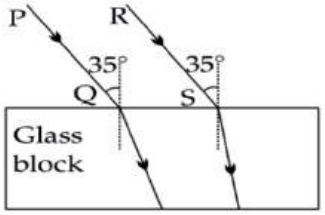
   a. Out of the three rays (I, J, H) shown in the diagram, which ray will suffer Total Internal Reflection while inside the prism? (The critical angle of the prism is 42°.)
   b. Copy the diagram to complete the path of the ray which you have named in (a) till it comes out of the prism
6. A rectangular glass block of refractive index 1.5 has an air bubble trapped inside it as shown in the diagram. When seen from the surface AB, it appears to be 4 cm deep.



   a. Calculate the actual depth of the air bubble from the surface AB.
   b. For which colour of light, blue or yellow, the apparent depth will be greater?

c. Turning the glass block upside down, DOES NOT change the apparent depth of the air bubble. State True or False.

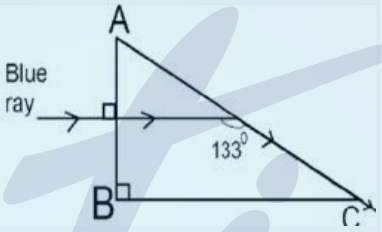
7. Two rays PQ and RS are incident on a rectangular glass block as shown in the diagram. Observe the diagram and answer the questions that follow. Which of these two rays will:



a. have greater lateral displacement on emerging out of the block?
b. travel with greater speed in the block?
c. scatter more in the atmosphere?

2024

1. The diagram below shows the path of a blue ray through the prism :



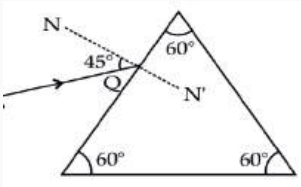
a. Calculate the critical angle of the material of the prism for blue colour.
b. What is the measure of the angle of this prism (A)?
c. Which colour should replace the blue ray, for the ray to undergo Total Internal Reflection?

2.

a. The refractive index of glass with respect to water is 9/8. Find the refractive index of water with respect to glass.
b. Name the principle used to find the value in part (a).
c. If we change the temperature of water,then will the ratio 9/8. remain the same? Write yes or no.

3. Light travels a distance of '10x' units in time 't1' in vacuum and it travels a distance of 'x' units in time 't2' in a denser medium. Using this information answer the question that follows:
   a. 'Light covers a distance of '20x' units in time 't1' in diamond. 'State true or false.
   b. Calculate the refractive index of the medium in terms of 't1' and 't2'.

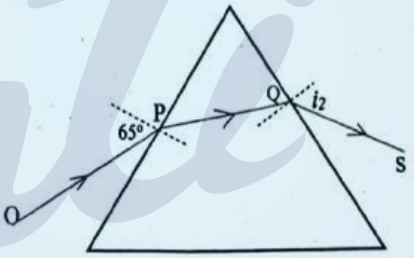
4. A monochromatic ray of light is incident on an equilateral prism placed at minimum deviation position with an angle of incidence 45° as shown in the diagram.



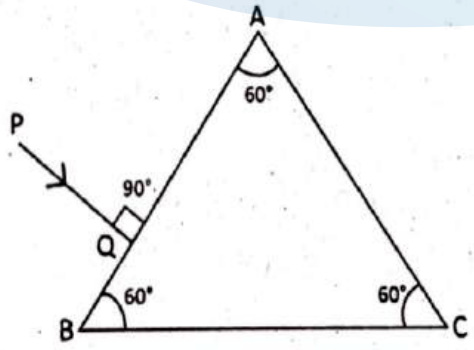
a. Copy the diagram and complete the path of the ray PQ.
b. State two factors on which the angle of deviation depends.

2023

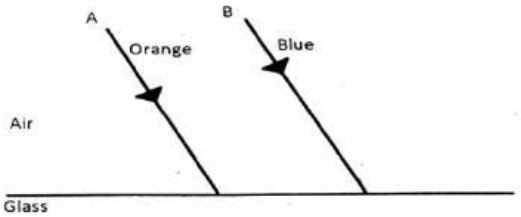
1. Speed of blue light in water is:
   a. more than green light
   b. more than orange light
   c. more than violet light
   d. more than red light
2. When a ray of light travel normal to a surface, then angle of refraction is
   a. 180°
   b. 90°
   c. 0°
   d. 45°
3. Small air bubbles rising up a fish tank appear silvery when viewed from some particular angle is due to the:
   a. Reflection of light
   b. Refraction of light
   c. Dispersion of light
   d. Total internal reflection of light
4. The diagram below shows the ray OP traveling through an equilateral prism of a certain material.
   a. Calculate the value of i_2, if the angle of deviation is 43°.



   b. What is the ray QS called?
5. Copy the diagram given below and complete the path of the light ray PQ, as it emerges out of the prism by marking necessary angles. The critical angle of glass i



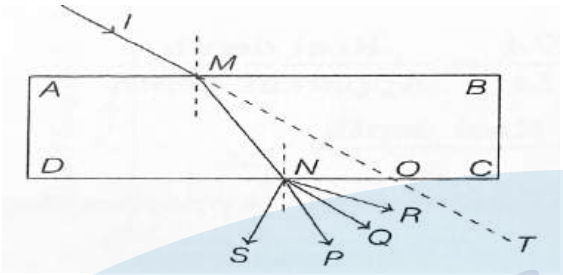
6. The diagram below shows two parallel rays A (Orange) & B (Blue) incident from air, on the air-glass boundary.



a. Copy and complete the path of A and B
b. How do the speeds of these rays differ in glass?
c. Are the two refracted rays in glass parallel? Give a reason.

2022

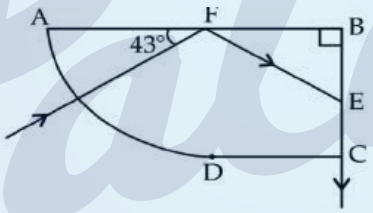
1. A ray of light IM is incident on a glass slab ABCD as shown in the figure. The emergent ray for this incident ray is



a. NQ b. NR c. NP d. NS

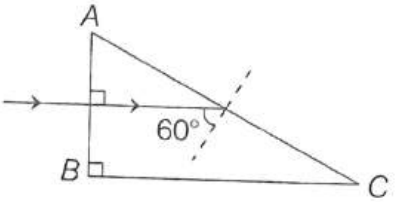
2. The ratio of velocities of light of wavelength 400 nm and 800 nm in a vacuum is
a. 1:1 b. 1:2. c. 2:1. d 1:3

3. The diagram below shows a ray of light travelling from air into a glass material as shown below. Answer the questions that follow:



i. The angle of incidence at the surface AB is (a) 43° (b) 47° (c) 90° (d) 0°
ii. Select a correct statement from the following. (a) The speed of light at the curved surface AD does not change while entering the block. (b) The ray at the surface AD is not travelling along the radius of the curved part. (c) The ray at the surface AD is travelling along the radius of the curved part. (d) Light never refracts when it enters a curved surface.
iii. The angle of incidence on the surface BC is (a) 43° (b) 47° (c) 90° (d) 0°

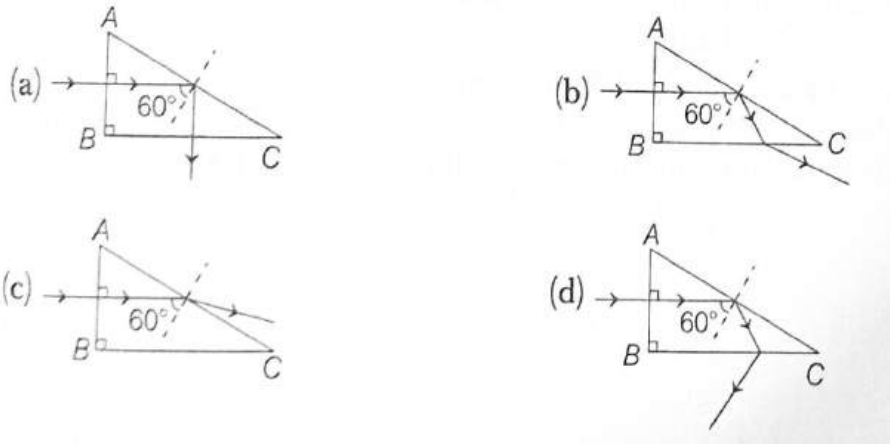
4. The diagram below shows the path of light passing through a right-angled prism of critical angle 42°.



Answer the following questions

i. The angle C of the prism is: a) 45° b) 60° c) 90° d) 30°

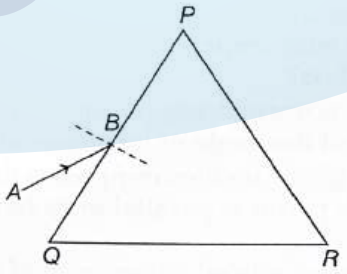
ii. Which one of the following diagrams show the correct path of this ray till it emerges out of the prism?



5. The refractive index of a diamond is 2.4. It means that,
   d. the speed of light in vacuum is equal to 2.4 times the speed of light in diamond
   e. the speed of light in diamond is 2.4 times the speed of light in vacuum
   f. the speed of light in vacuum is 2.4 times the speed of light in diamond
   g. the wavelength of light in diamond is 2.4 times the wavelength of light in vacuum

2000 - 2020

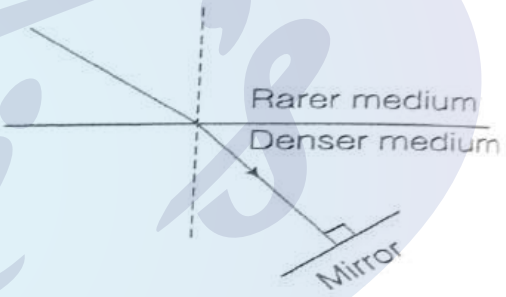
1. Name one factor that affects the lateral displacement of light as it passes through a rectangular glass slab.
2. Does the depth of a tank of water appear to change or remain the same when viewed normally from above?
3. How does the speed of light in glass change on increasing the wavelength of light?
4. A pond appears to be 2.7 m deep. If the refractive index of water is , find the actual depth of the pond. Complete the path of the monochromatic light ray AB incident on the surface PO of the equilateral glass prism POR till it emerges out of the prism due to refraction.



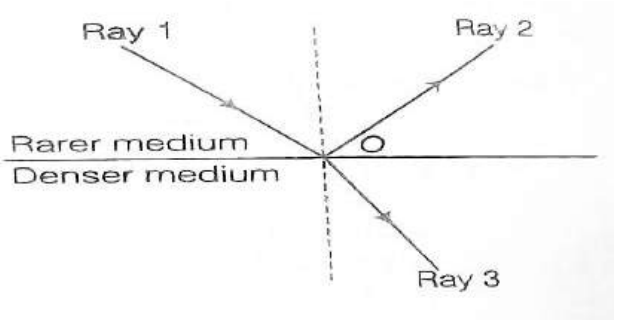
5. A ray of light falls normally on a rectangular glass slab. Draw a ray diagram showing the path of the ray till it emerges out of the slab.
6. What is the relation between the refractive index of water with respect to air and the refractive index of air with respect to water?
7. If the refractive index of water with respect to air is 5/3 Calculate the refractive index of air with respect to water.
8. Why is the ratio of the velocities of light of wavelengths 4000 A° and 8000 A° in vacuum 1:1?
9. Which of the above wavelengths has a higher frequency?
10. How is the refractive index of a material related to
    a. real and apparent depth?
    b. velocity of light in vacuum or air and the velocity of light in a given medium?

11. Draw a ray diagram to show the refraction of a monochromatic ray through a prism when it suffers minimum deviation.
12. State the dependence of angle of deviation (i) on the refractive index of the material of the prism. (ii) on the wavelength of light.
13. The speed of light in glass is 2×10^5 km/s. What is the refractive index of glass?
14. Draw the diagram given below and clearly show the path taken by the emergent ray.

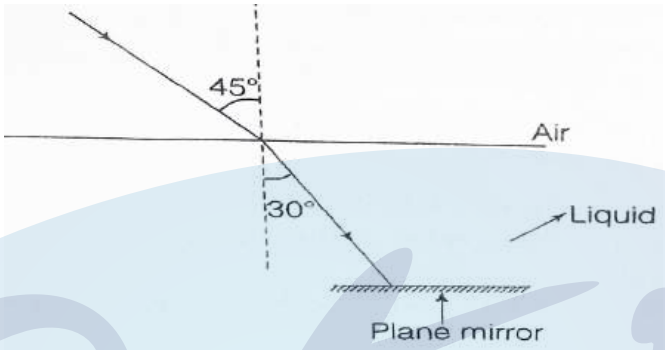
15.
    a. A ray of light passes from water to air How does the speed of light change?
    b. Which color of light travels fastest in any medium except air?
16. Light passes through a rectangular glass slab and through a triangular glass prism. In what way, does the direction of the two emergent beams differ and why?
17. A ray of light is moving from a rarer medium to a denser medium and strikes a plane mirror placed at



90° to the direction of the ray as shown in the diagram.
    a. Copy the diagram and mark arrows to show the path of the ray of light after it is reflected from the mirror.
    b. Name the principle you have used to mark the arrow to show the direction of the ray.
18.
    a. The refractive index of glass with respect to air is 1.5. What is the value of the refractive index of air with respect to glass?
    b. A ray of light is incident as a normal ray on the surface of separation of two different mediums. What is the value of the angle of incidence in this case?
19. A ray of light incident at an angle of incidence i passes through an equilateral glass prism such that the refracted ray inside the prism is parallel to its base and emerges from the prism at an angle of emergence e.
    a. How is the angle of emergence e related to the angle of incidence i?
    b. What can you say about the value of the angle of deviation in such a situation?
20. Define the term refractive index of a medium in terms of velocity of light.
21. A ray of light moves from a rarer medium to a denser medium as shown in the diagram alongside. Write down the number of the ray which represents the partially reflected ray.

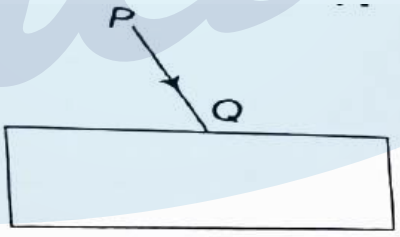


22. A ray of monochromatic light enters a liquid from air as shown in the diagram given below.



23.
    a. Copy the diagram and show in the diagram the path of the ray of light after it strikes the mirror and re-enters the medium of air.
    b. Mark in your diagram, the two angles on the surface of separation, when the ray of light moves out from the liquid to air.

24. In the given diagram, PQ is a ray of light incident on a rectangular glass block.



    a. Copy the diagram and complete the path of the ray of light through the glass block. In your diagram, mark the angle of incidence by letter i and the angle of emergence by the letter e.
    b. How are the angles i and e related to each other?

25. The refractive index of diamond is 2.42. What is meant by this statement?

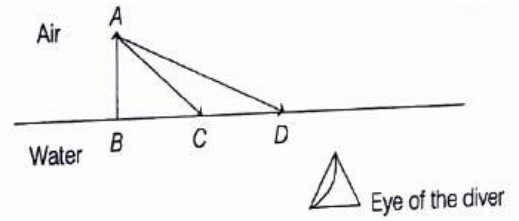
26.
    a. What is meant by refraction of light?
    b. What is the cause of refraction of light?

27. A ray of light strikes the surface of a rectangular glass block such that the angle of incidence is (i) 0° and (ii) 42°. Sketch a diagram to show the approximate path taken by the ray in each case as it passes through the glass block and emerges.

28.
    a. A monochromatic beam of light of wavelength & passes from air into a glass block. Write an expression to show the relation between the speed of light in air and the speed of light in glass.

b. As the ray of light passes from air to glass, state how the wavelength of light changes. Does it increase, decrease or remain constant?

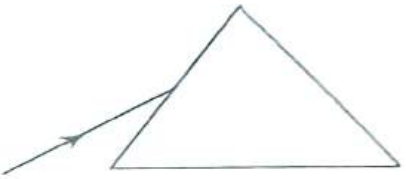
29. The velocity of light in diamond is 121000 km/s. What is its refractive index? (Take, velocity of light in air is 3×10^8 m/s)



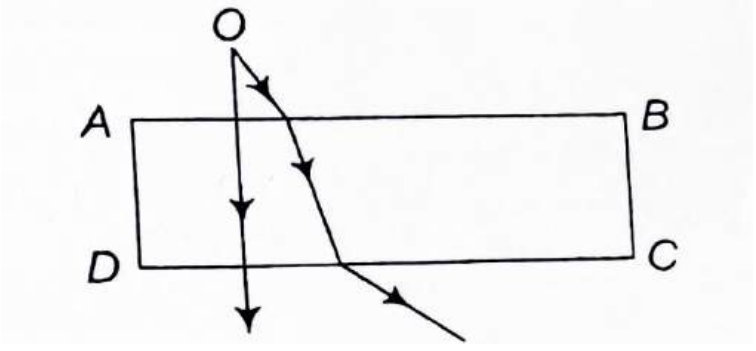
30. A diver in water looks obliquely at an object AB in air.
    a. Does the object appear taller, shorter or of the same size to the diver?
    b. Show the path of two rays AC and AD starting from the tip of the object as it travels towards the diver in water and hence obtain the image of the object.
31. How does the angle of deviation formed by a prism change with the increase in the angle of incidence?
32. Draw a graph showing the variation in the angle of deviation with the angle of incidence at a prism surface.
33.
    a. Write a relationship between angle of incidence and angle of refraction for a given pair of media
    b. When a ray of light enters from one medium to another having different optical densities it bends. Why does this phenomenon occur?
    c. Write one condition, where a ray of light does not bend when entering a medium of different optical density.
34.
    a. Can the absolute refractive index of a medium be less than one?
    b. A coin placed at the bottom of a beaker appears to be raised by 4.0 cm. If the refractive index of water is 4/3, then find the depth of the water in the beaker.
35.
    a. State the laws of refraction of light.
    b. Write a relation between the angle of incidence (i), angle of emergence (e), angle of prism (A) and angle of deviation (δ) for a ray of light passing through an equilateral prism.
36. A stick partly immersed in water appears to be bent. Draw a ray diagram to show the bending of the stick when placed in water and viewed obliquely from above.
37. A ray of monochromatic light is incident from air on a glass slab.
    a. Draw a labeled ray diagram showing the change in the path of the ray till it emerges from the glass slab.
    b. Name the two rays that are parallel to each other.
    c. Mark the lateral displacement in your diagram.
38. How does the value of angle of deviation produced by a prism change with an increase in the
    a. value of angle of incidence?
    b. wavelength of incident light?
39. A prism deviates a monochromatic ray of light through an angle δ, where the angle of incidence at the surface of the prism is i.
    a. Draw a graph showing the variation of δ with i. On your graph, show the angle of minimum deviation.

b. What is the relation between the angle of incidence and the angle of emergence when the ray suffers minimum deviation.

40. Jatin puts a pencil into a glass container having water and is surprised to see the pencil in a different state.
    a. What change is observed in the appearance of the pencil?
    b. Name the phenomenon responsible for the change.
    c. Draw a ray diagram showing how the eye sees the pencil.
41. The diagram given alongside shows a ray of light incident on an equilateral glass prism placed in minimum deviation position.

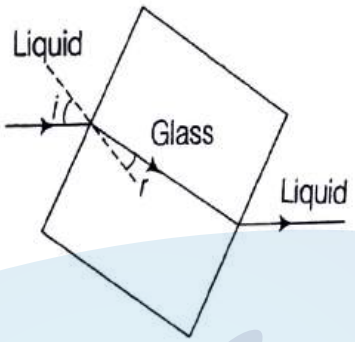


    a. Copy the diagram and complete it to show the path of the refracted ray and the emergent ray.
    b. How are angle of incidence and angle of emergence related to each other in this position of the prism?
42.
    a. With the help of a well-labeled diagram, show that the apparent depth of an object such as a coin in water is less than its real depth.
    b. How is the refractive index of water related to the real depth and the apparent depth of a column of water?
43.
    a. State Snell's laws.
    b. Calculate the velocity of light in a glass block of refractive index 1.5 (Take velocity of light in air = 3×10^8 m/s)
44.
    a. What is meant by refraction?
    b. Express the refractive index u of a medium
        i. in terms of the velocity of light.
        ii. in terms of the angle of incidence i in air and the angle of refraction r in a denser medium.
    c. If a ray of light passes from one medium to another medium without any change of direction. What can be said about the refractive indices of these media (angle i is not zero)?
45. A postage stamp appears raised by 7.0 mm, when placed under a rectangular glass block of refractive index 1.5. Find the thickness of the glass block.
46. A monochromatic point source of light O is seen through a rectangular glass block ABCD. Paths of two rays, in and outside the block, are shown in the figure below.



i. Does the source at point O appear to be nearer or farther with respect to the surface AB?
ii. How does the shift depend on the thickness (AD or BC) of the block?
iii. Justify your answer with the help of an appropriate ray diagram as shown in part (ii)
iv. For the same rectangular glass block, which color from the visible spectra will produce the maximum shift?

47. The given diagram shows the path of a ray of light through a rectangular glass block placed in a liquid of a uniform density.

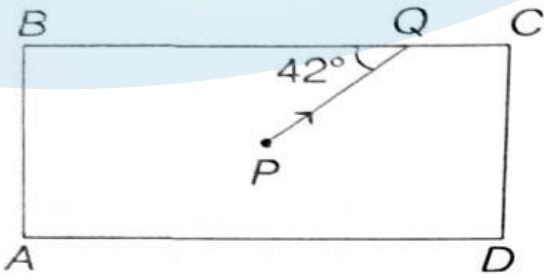


i. (a) Does the light speed up or slow down in glass? (b) Give reasons for your answer.
ii. What is the angular deviation of the emergent ray from the glass block with respect to the incident ray?
iii. What should be the ratio of the speed of light through the liquid to the speed through glass, so that there is no refraction of light at the boundaries of the glass block when the system is illuminated by light of one color?

48.

i. Define critical angle.
ii. State one important factor which affects the critical angle of a given medium.

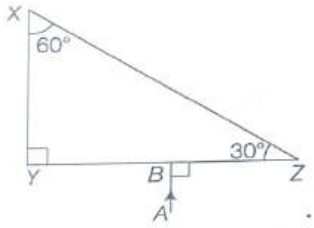
49. The diagram below shows a light source embedded in a rectangular glass block ABCD of critical angle 42°. Complete the path of the ray P till it emerges out of the block. [Write necessary angles).



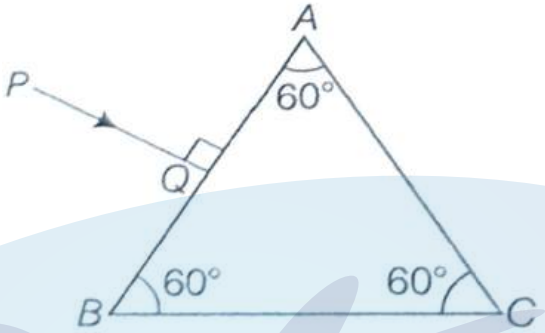
50.

i. State the relation between the critical angle and the absolute refractive index of a medium.
ii. Which color of light has a higher critical angle? Red light or Green light.

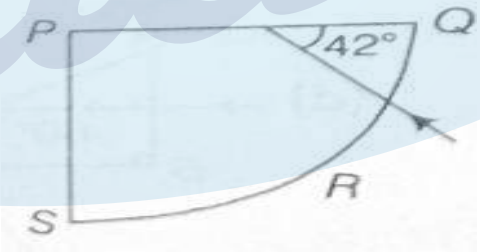
51. The following diagram shows a 60°, 30°, 90° glass prism of critical angle 42°. Copy the diagram and complete the path of incident ray AB emerging out of the prism marking the angle of incidence on each surface.



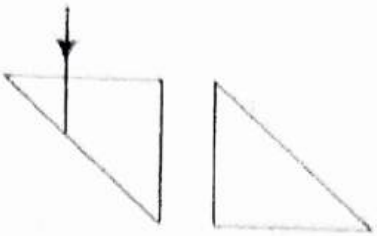
52. State the conditions required for total internal reflection of the light to take place.
53. Copy the diagram given below and complete the path of the light ray till it emerges out of the prism. The critical angle of the glass is 42°. In your diagram, mark the angles wherever necessary.



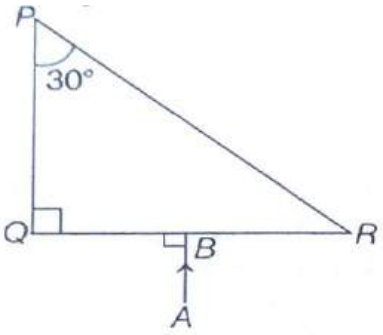
54. Name the factors affecting the critical angle for the pair of media.
55.
    a. What is meant by the term critical angle?
    b. How is it related to the refractive index of the medium?
56. A ray of light enters a glass slab PQRS, as shown in the diagram. The critical angle of the glass is 42°. Copy this diagram and complete the path of the ray till it emerges from the glass slab. Mark the necessary angles.



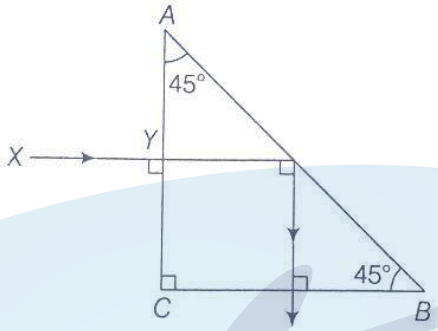
57. Two isosceles right-angled glass prisms are placed near each other as shown in the figure. Complete the path of the light ray entering the first isosceles right-angled glass prism till it emerges from the second identical prism.



58. Complete the path of the ray AB through the glass prism in POR till it emerges out of the prism. Given the critical angle of the glass as 42°



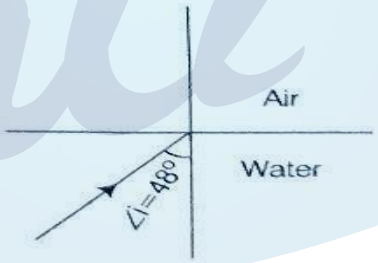
59. A ray of light XY passes through a right angled isosceles prism as shown below



a. What is the angle through which the incident ray deviates and emerges out of the prism?
b. Name the instrument, where this action of prism is put into use.
c. Which prism's surface will behave as a mirror?

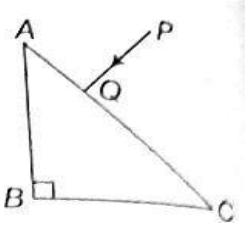
60. Draw the diagram of a right angled isosceles prism which is used to make an inverted image erect.

61. A ray of light travels from water to air as shown in the diagram given alongside



a. Copy the diagram and complete the path of the ray. Given, the critical angle for water is 48°
b. State the condition, so that total internal reflection occurs in the above diagram.

62. A ray of light PQ is incident normally on the hypotenuse of a right angled prism ABC as shown in the diagram given alongside.



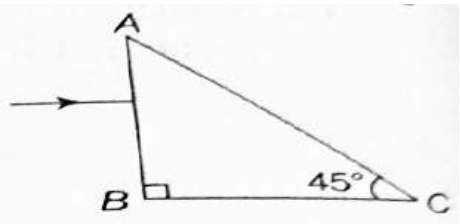
a. Copy the diagram and complete the path of the ray PQ till it emerges from the prism.
b. What is the value of the angle of deviation of the ray?
c. Name an instrument, where this action of the prism is used.

63.

i. Draw a labeled ray diagram to illustrate (a) critical angle (b) total internal reflection for a ray of light moving from one medium to another.

ii. Write a formula to express the relationship between refractive index of the denser medium with respect to rarer medium and its critical angle for that pair of media

64. The diagram given alongside shows a right-angled prism with a ray of light incident on the side AB.(The critical angle for glass is 42°).

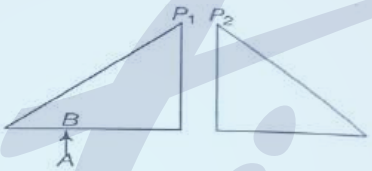


i. Copy the diagram and complete the path of the ray of light in and out of the glass prism.

ii. What is the value of the angle of deviation shown by the ray?

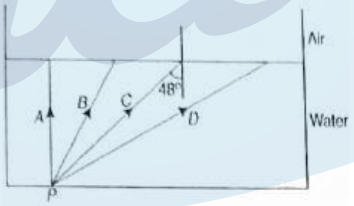
65.

a. Two isosceles right-angled prisms are arranged as shown in the figure. Copy the diagram and complete the path of the ray AB along which it passes through the prisms and comes out.

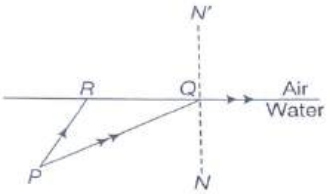


b. Name the phenomenon being displayed by the path of the ray in the diagram.

66. The diagram below shows a point source P inside a water container. Four rays A, B, C and D starting from the source P are shown up to the water surface.



67. PQ and PR are two light rays emerging from the object P as shown in the figure.



a. What is the special name given to the angle of incidence (PQN) of ray PQ?

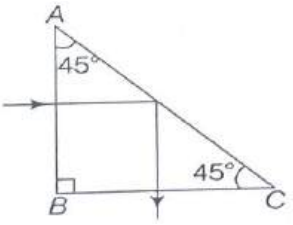
b. Copy the ray diagram and complete it to show the position of the image of the object P, when seen obliquely from above.

c. Name the phenomenon that occurs, if the angle of incidence PQN is increased still further.

68.

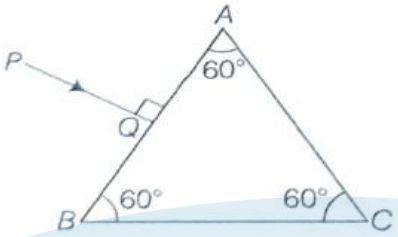
a. Define critical angle.

b. A ray of light passess through a right angled prism as shown in the figure. State the angles of incidence at the faces of AC and BC



69.

a. In the given diagram, a ray of light PQ is incident normally on one face AB of an equilateral glass prism. What are the angles of incidence at the faces AB and AC?

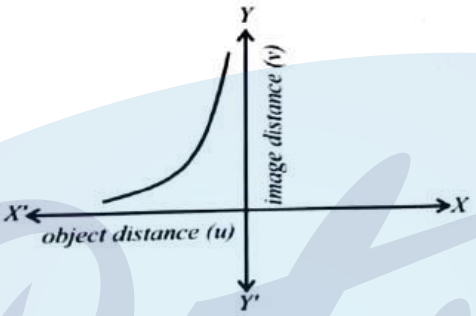


b. Complete the ray diagram showing its emergence into air after passing through the prism..

5. Refraction of Light through lens

2026:

1. The distance (V) of a virtual image formed by a lens of focal length 15 cm never exceeds a certain finite value, then this value will be:
    a. less than 15 cm
    b. between 15 cm to 30 cm
    c. less than or equal to 30 cm
    d. less than or equal to 15 cm
2. The graph below shows the variation of image distance (v) with the object distance (u) when an object



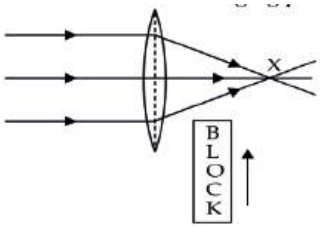
is kept in front of a lens.
    a. Identify the type of lens used.
    b. What would be the magnification (more than /less than 1 / equal to 1)if the object is placed between F and 2F of the above lens?

2025:

1. For a real image formed by a convex lens, the ratio of I : O = 2 : 5, then the object is: (I is the height of the image and O is the height of the object)
    a. between O and F b. beyond 2F c. at F d. between F and 2F
2.
    a. An object is placed at the 2F position of a convex lens. Draw a ray diagram showing the formation of the image.
    b. How will the size of the image change if we ONLY replace the lens in the above arrangement with another lens of a greater focal length?
3. An object is placed in front of a concave lens at a distance of 45 cm from it. If its image is formed at a distance of 30 cm from the lens, calculate the focal length of the lens.

2024:

1. Linear magnification(m) produced by a concave lens is
    a. $m < 1$ b. $m > 1$ c. $m = 1$ d. $m = 2$
2. A block of glass is pushed into the path of the light as shown below. Then the converging point X will



a. Move away from the slab
b. Move towards the slab
c. Not shift
d. Move towards the left side of the lens

3.
a. In a reading glass what is the position of the object with respect to the convex lens used?
b. Why can we not use concave lens for the same purpose?

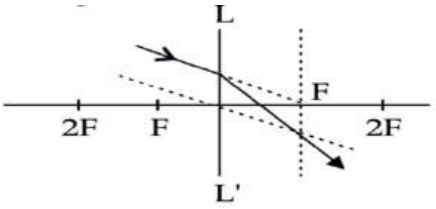
4. The image of a candle flame placed at a distance of 36 cm from a spherical lens, is formed on a screen placed at a distance of 72 cm from the lens. Calculate the focal length of the lens and its power.

2023

1. A concave lens produces only - - - - - image.
   a. real, enlarged
   b. virtual, enlarged
   c. virtual, diminished
   d. real, diminished
2.
   a. Is it possible for a concave lens to form an image of size two times that of the object? Write Yes or No.
   b. What will happen to the focal length of the lens if a part of the lens is covered with an opaque paper?
3. A convex Lens of focal length 10 cm is placed at a distance of 60 cm from a screen. How far from the lens should an object be placed so as to obtain a real image on the screen?

2022

1. An object of height 10 cm is placed in front of a concave lens of focal length 20 cm, at a distance of 25 cm from the lens. Is it possible to capture this image on a screen? Select the correct option from the following.
   a. Yes, as the image formed will be real.
   b. Yes, as the image formed will be erect.
   c. No, as the image formed will be virtual.
   d. No, as the image formed will be inverted.
2. Observe the diagram which shows the path of an incident ray through an optical plane LL′ of a lens. The focal length of the lens is 20 cm.



i. If an object is placed at a distance of 30 cm in front of this lens, then (a) the image will be virtual. (b) the image will be diminished and inverted. (c) the image will be diminished. (d) the image will be real and magnified.

ii. This type of lens can be used (a) to correct hypermetropia. (b) to correct myopia. (c) to diverge light. (d) in the front door peepholes.

iii. An object is placed in front of this lens at a distance of 60 cm. Then the image distance from the lens with proper sign convention is (a) +60 cm (b) +30 cm. (c) –30 cm (d) +15 cm

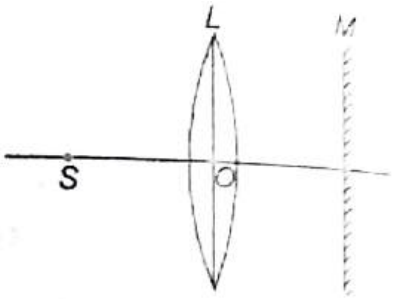
iv. An object is placed in front of this lens at a distance of 60 cm. Then the magnification of the image is (a) 0.25 (b) 1.25 (c) –0.5 (d) 1

2020 - 2025

1. Ranbir claims to have obtained an image twice the size of the object with a concave lens. Is he correct? Give reason for your answer.
2. You are provided with a printed piece of paper. Using this paper, how will you differentiate between a convex lens and concave lens?
3.
   a. When does a ray of light falling on a lens pass through it undeviated?
   b. Which lens can produce a real and inverted image of an object?
4. We can burn a piece of paper by focussing the sun rays by using a particular type of lens.
5.
   a. Name the type of lens used for the above purpose.
   b. Draw a ray diagram to support your answer.
6. Copy and complete the following table.

Type of Lens	Position of Object	Nature of Image	Size of Image
Convex	At F		
Concave	At infinity		

7. An object is placed in front of a converging lens at a distance greater than twice the focal length of the lens. Draw a ray diagram to the formation of the image.
8. An object is placed in front of a convex lens such that the image formed has the same size as that of the object. Draw a ray diagram to illustrate this.
9. A ray of light, after refraction through a concave lens, emerges parallel to the principal axis. Draw a ray diagram to show the incident ray and its corresponding emergent ray.
10. The diagram shows a point source of light S, a convex lens L and a plane mirror M. These are placed such that rays of light from S return to it after reflection from M.

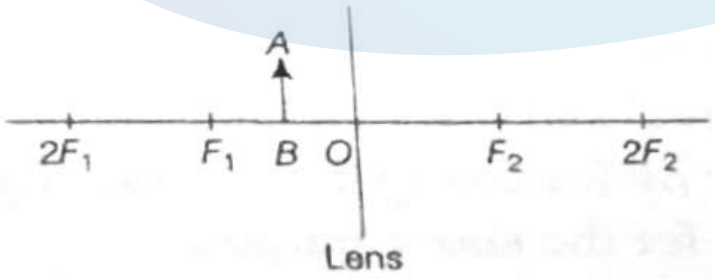


a. What is the distance OS called?
b. To which point (left of S or right of S) will the rays return, if M is moved to the left and brought in contact with L?

11.

a. If the lens is placed in water instead of air, how does its focal length change?
b. Which lens, thick or thin, has greater focal length?

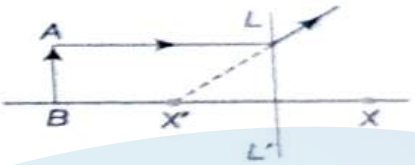
12. The power of a lens is - 5 D.
    a. Find its focal length.
    b. Name the type of lens.
13. State the position of the object in front of a converging lens, if
    a. it produces a real and same size image of the object.
    b. It is used as a magnifying lens.
14. In an optical camera,
    a. state the nature of the lens used.
    b. state two characteristics of the image formed by the lens.
15. A virtual, diminished image is formed when an object is placed between the optical center and the principal focus of a lens.
    a. Name the type of lens which forms the above image.
    b. Draw a ray diagram to show the formation of the image with the above stated characteristics.
16. An object AB is placed between 0 and F, on the principal axis of a converging lens as shown in the diagram.Copy the diagram and by using three standard rays starting from point A, obtain an image of the object AB.



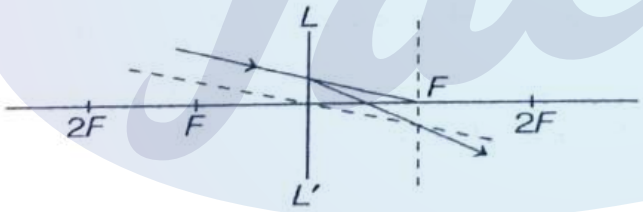
17. A lens forms an upright and diminished image of an object when the object is placed at the focal point of the given lens.
    a. Name the lens.
    b. Draw a ray diagram to show the image formation.
18. A lens produces a virtual image between the object and the lens.
    a. Name the lens.
    b. Draw a ray diagram to show the formation of this image.
19.

a. Where should an object be placed, so that a real and inverted image of the same size as the object is obtained using a convex lens?
b. Draw a ray diagram to show the formation of the image as specified in the part (a)

20. A lens forms an erect, magnified and virtual image of an object.
    a. Name the lens.
    b. Draw a labeled ray diagram to show the image formation.
21.
    a. Define the power of a lens.
    b. The lens is of focal length 25 cm. Calculate the power of the lens.
22.
    a. Copy and complete the diagram to show the formation of the image of an object AB.



    b. What is the name given to X?
23. A linear object is placed on the axis of a lens. An image is formed by refraction in the lens. For all positions of the object on the axis of the lens, the positions of the image are always between the lens and the object.
    a. Name the lens.
    b. Draw a ray diagram to show the formation of the image of an object placed in front of the lens at any position of your choice except infinity.
24. State three characteristics of the image of an extended source, formed by a concave lens.
25. Observe the diagram which shows the path of an incident ray through an optical plane L of a lens. The focal length of the lens is 20 cm. Answer the following questions



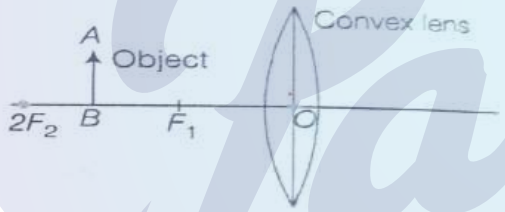
    i. If an object is placed at a distance of 30 cm in front of this lens, then the image will be
        a. virtual
        b. diminished and inverted
        c. diminished
        d. real and magnified
    ii. This type of lens can be used
        a. to correct hypermetropia
        b. to diverge light
        c. to correct myopia
        d. in the front door peepholes
    iii. An object is placed in front of this lens at a distance of 60 cm, then the image distance from the lens with proper sign convention is
        a. +60 cm
        b. -30 cm

c. +30 cm
d. +15 cm

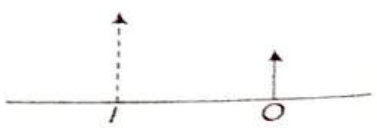
iv. An object is placed in front of this lens at a distance of 60 cm, then the magnification of the image is

a. 0.25
b. 1.25
c. 0.5
d. 1

26. A lens of focal length 20 cm forms an inverted image at a distance of 60 cm from the lens.
    a. Identify the lens.
    b. How far is the lens present in front of the object?
    c. Calculate the magnification of the image.
27. An object is placed at a distance 24 cm in front of a convex lens of focal length 8 cm.
    a. What is the nature of the image so formed?
    b. Calculate the distance of the image from the lens.
    c. Calculate the magnification of the image.
28. An object is placed at a distance of 12 cm from a convex lens of focal length 8 cm. Find
    a. the position of the image.
    b. nature of the image.
29. An object AB is placed between 2F and F, on the principal axis of a convex lens as shown in the diagram.Copy the diagram and using these rays starting from point A, obtain the image of the object formed by the lens.



30. A converging lens is used to obtain an image of an object placed in front of it. The inverted image is formed between F, and 2F, of the lens.
    a. Where is the object placed?
    b. Draw a ray diagram to illustrate the formation of the image obtained.
31. An object is placed in front of a lens between its optical center and the focus and forms a virtual, erect and diminished image.
    a. Name the lens which forms this image.
    b. Draw a ray diagram to show the formation of the image with the above stated characteristics.
32. An erect, magnified and virtual image is formed when an object is placed between the optical center and principal focus of a lens.
    a. Name the lens.
    b. Draw a ray diagram to show the formation of the image with the above stated characteristics.
33. The diagram given alongside shows an object O and its image I. Copy the diagram and draw suitable rays to locate the lens and its focus. Name the type of lens in this case



34. An erect, diminished and virtual image is formed when an object is placed between the optical center and principal focus of a lens.
    a. Name the type of lens, which forms the above image.
    b. Draw a ray diagram to show the formation of the image with the above characteristics.
35. Draw a ray diagram to illustrate the action of a convergent lens as a reading lens of a magnifying glass.
36. A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.
37. An object 5 cm in length is placed 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram and find position, size and nature of the image formed.
38. At what distance should an object be placed from a convex lens of focal length 18 cm to obtain an image at 36 cm from it? What will be the magnification produced in this case?
39. The image of an object formed by a lens is of magnification -1. If the distance between the object and its image is 60 cm, what is the focal length of the lens? If the object is moved 20 cm towards the lens, where would the image be formed? State reason and also draw a ray diagram in support of your answer.
40. A 6 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 25 cm. The distance of the object from the lens is 40 cm.By calculation determine
    a. the position and
    b. the size of the image formed.
41. A thin converging lens forms a real magnified image and virtual magnified image of an object in front of it.
    a. Write the positions of the objects in each case.
    b. Draw ray diagrams to show the image formation in each part.
    c. How will the following be affected by cutting this lens into two halves along the principal axis?
        i. Focal length
        ii. Intensity of the image formed by half lens.
42. One-half of a convex lens of focal length 10 cm is covered with a black paper. Can such a lens produce an image of a complete object placed at a distance of 30 cm from the lens? Draw a ray diagram to justify your answer.
43. A 4 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 15 cm. Find the nature, position and the size of the image.

6. Spectrum

2026:

1. When a blackened bulb thermometer is moved beyond the red region of the visible spectrum, there is a rapid rise in the temperature. This is due to the presence of:
    a. Infrared radiations
    b. Ultraviolet radiations
    c. X-rays
    d. Radio waves
2. Assertion: air molecules scatter blue light more than red light. Reason (R): The refractive index of a medium is greater for blue light than red light.
    a. (A) is true but (R) is false.
    b. (A) is false but (R) is true.
    c. Both (A) and (R) are true and (R) is the correct explanation of (A).
    d. Both (A) and (R) are true but (R) is not the correct explanation of (A).
3. Name the electromagnetic radiation used to detect fake currency.

2025

1. Which one of the following combinations is the correct ascending order of electromagnetic waves in terms of wavelength?
    a. Gamma-rays, visible light, microwaves
    b. Microwaves, visible light, gamma-rays
    c. Gamma-rays, microwaves, visible light
    d. Microwaves, gamma-rays, visible light
2.
    a. Name the radiations:
        i. for which a quartz prism is used to study the spectrum.
        ii. which are used in remote sensing devices.
        iii. which are used in traffic signals in India.
    b. Name one property common to all electromagnetic radiations.

2024

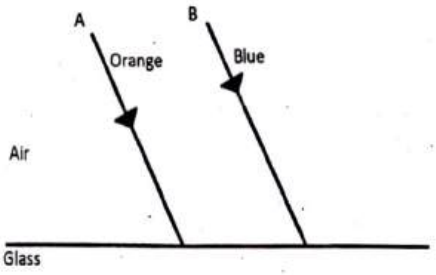
1. Below is an incomplete table showing the arrangement of electromagnetic spectrum in the increasing order of their wavelength. Complete the table.

Gamma ray	X - ray	U V ray	Visible rays	Infrared waves	A	Radiowaves

    a. Identify the radiation A.
    b. Name the radiation used to detect fracture in bones.
    c. Name one property common to both A and Radiowaves.
2. Why do we use red colour as a danger signal on the top of a skyscraper?

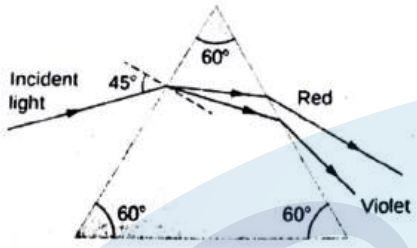
2023

1. The diagram below shows two parallel rays A (Orange) & B (Blue) incident from air, on the air-glass boundary.



a. Copy and complete the path of the rays A and B.
b. How do the speeds of these rays differ in glass?
c. Are the two refracted rays in glass parallel? Give a reason.

2. Infrared radiations are used in warfare. Explain the reason why.
3. A ray of light is incident at 45° on an equilateral prism in the diagram below.



a. Name the phenomenon exhibited by the ray of light when it enters and emerges out of the prism.
b. State the cause of the above phenomenon mentioned by you.

2022

1. The wavelength range of visible light is
   a. 40 nm to 80 nm
   b. 4000 mm to 8000 nm
   c. 4 nm to 8 nm
   d. 400 nm to 800 nm
2. The deviation produced by an equilateral prism does not depend on the
   a. angle of incidence
   b. size of the prism
   c. material of the prism
   d. color of light used
3. The color of white light which is deviated least by a prism is
   a. green
   b. yellow
   c. red
   d. violet

2000-2020

1. Name the subjective property of light related to its wavelength.
2. Fill in the blanks. A piece of red cloth appears red in white light, because it .... only red color. .... blue and green colors
3. The wavelengths for the light of red and blue colors are nearly 7.8 x 10^{-7} m and 4.8 x 10^{-7} m, respectively.
   a. Which color has the greater speed in a vacuum?

b. Which color has a greater speed in glass?

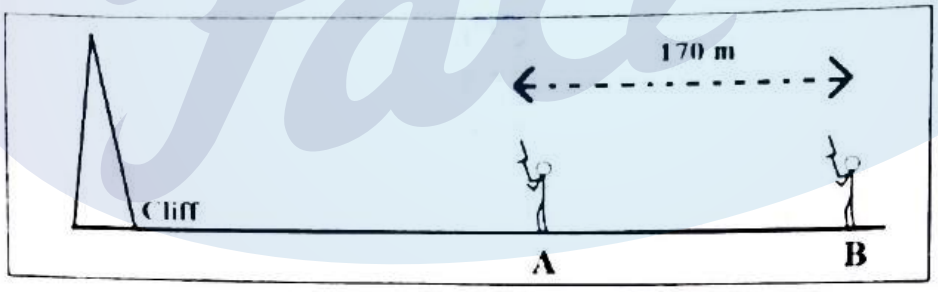
4. Electromagnetic radiation is used for photography in fog.
   a. Identify the radiation.
   b. Why is this radiation mentioned by you, ideal for this purpose?
5. A boy uses the blue color of light to find the refractive index of glass. He then repeats the experiment using the red color of light. Will the refractive index be the same or different in the two cases? Give a reason to support your answer.
6.
   a. Name a prism required for obtaining a spectrum of ultraviolet light.
   b. Name the radiations which can be detected by a thermopile.
7.
   a. Why is white light considered to be polychromatic in nature?
   b. Give the range of the wavelength of those electromagnetic waves which are visible to us.
8. Suggest one way in each case by which we can detect the presence of
   a. infrared radiations
   b. ultraviolet radiation.
9. Give one use of infrared radiations.
10. Two parallel rays of red and violet light traveling through air, meet the air glass boundary as shown in the given figure.

   a. Will their paths inside the glass be parallel? Give a reason for your answer.
   b. Compare the speeds of the two rays inside the glass.
11. A glass slab is placed over a page on which the word VIBGYOR is printed with each letter in its corresponding color.
   a.
      i. Will the image of all the letters be in the same place?
      ii. If not, state which letter will be raised to the maximum. Give a reason for your answer.
   b. What will be the color of an object which appears green in white light and black in red light?
12.
   a. If a monochromatic beam of light undergoes minimum deviation through a triangular prism, how does the beam pass through the prism, with respect to its base?
   b. If white light is used in the same way as in (a) above, what change is expected in the emergent beam?
13. Name any four regions of the electromagnetic spectrum (other than visible light) in increasing order of their wavelength.
14. Name the extreme colors in the pure spectrum of light.

7. Sound

2026:

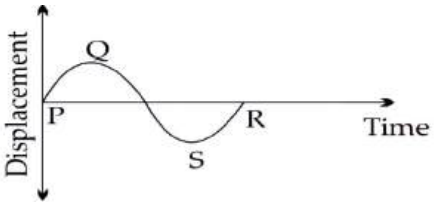
1. Equal volumes of water are added to three cylindrical jars A, B and C of same height and radii rA, rB and rC respectively with rB < rA < rC. If you blow air into the mouth of these jars, which tube will produce the shrillest note?
    a. A
    b. B
    c. C
    d. All will produce the notes of same shrillness
2. Quality of sound depends on its [amplitude / waveform].
3.
    a. Define natural vibrations.
    b. How is this vibration different from damped vibrations in terms of the amplitudes?
4.
    a. One end of a plastic foot ruler is held tightly at the edge of a table and the other end is plucked. Name the vibrations produced in the ruler.
    b. Now the ruler is pushed inside partially and plucked again from its free end. State with a reason whether the frequency of vibration increases or decreases.
5. Two persons A and B are standing in front of a cliff in the same line 170 m apart as shown in the diagram. Person B fires the gun and hears the echo in 3 s. Then person A standing in front of person B fires the gun. (The speed of sound in air is 340m/s.) Calculate



    a. the distance of person B from the cliff.
    b. the minimum time in which B hears the gunshot fired by A
    c. Fill in the blank. The echo is softer (less loud) than the original sound due to the decrease in of the wave. (amplitude / frequency)

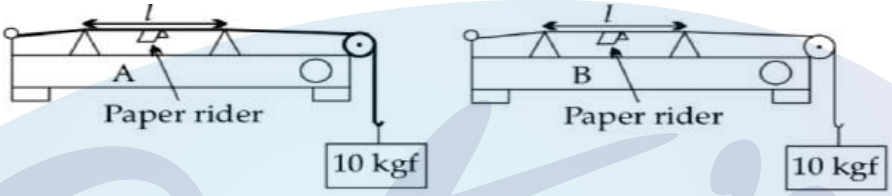
2025

1. Assertion (A): As the level of water in a tall measuring cylinder kept under a running tap rises, the pitch of sound gradually increases. Reason (R): Frequency of sound is inversely proportional to the length of the water column.
    a. Both (A) and (R) are true and (R) is the correct explanation of (A).
    b. Both (A) and (R) are true and (R) is not the correct explanation of (A).
    c. (A) is true but (R) is false.
    d. (A) is false but (R) is true.
2. The displacement-time graph of a sound wave produced by a vibrating wire is shown below.



a. How will you adjust the tension in the wire, to reduce the length of PR?
b. Which characteristic of sound is affected by the reduction in the length of PR?

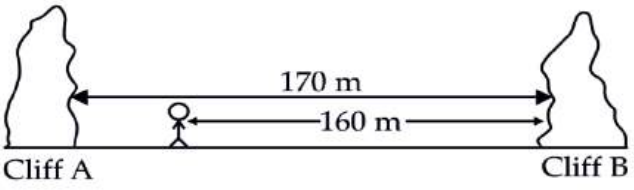
3. A submarine in the sea, sends ultrasonic ping and a stopwatch is started. simultaneously. The stopwatch stops on receiving the reflected wave from an obstacle and reads 1 minute 40 seconds. Calculate the distance of the obstacle from the submarine (Speed of sound in water 1500 m/s)
4. The diagrams given below show two sound boxes A and B with wires of same length (I) and tension (10 kg/ but different cross-sectional areas. Simultaneously, vibrating tuning forks of frequency 300 Hz are placed on the boxes A and B. The paper rider falls off in case of B but not in case of A.



a. Name and explain the phenomenon responsible for the falling off of the paper rider in B
b. The wire A resonates with a tuning fork of frequency f. Is f greater than, less than or equal to 300 Hz? Justify your answer:

2024

1. When the stem of the vibrating tuning fork is pressed on a table, the tabletop starts vibrating. These vibrations are definitely an example of
   a. resonance
   b. natural vibrations
   c. forced vibrations
   d. damped vibrations
2.
   a. Name the waves used in SONAR.
   b. In the above diagram Lata stands between two cliffs and claps her hands. Determine the time taken by her to hear the first echo. Speed of sound in air 320 m/s



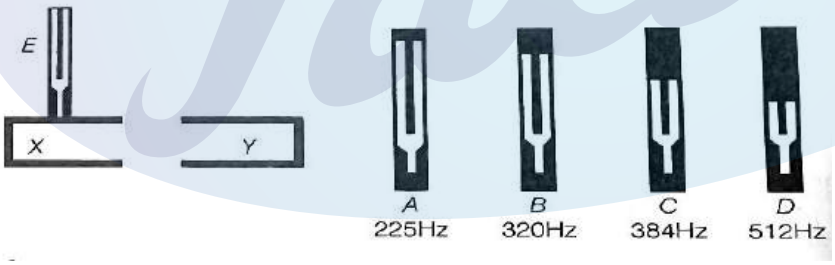
2023

1. When a body vibrates under a periodic force, the vibrations of the body are always:
   a. natural vibrations
   b. damped vibrations
   c. forced vibrations
   d. resonant vibrations

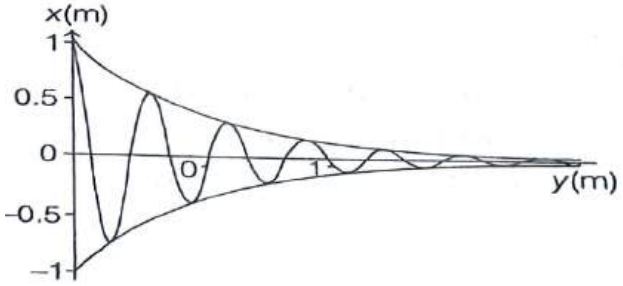
2. Two notes are produced from two different musical instruments, such that they have the same loudness and same pitch. The produced notes differ in their
    a. Waveform
    b. Frequency
    c. Wavelength
    d. Speed
3. A metal foot ruler is held at the edge of a table. It is pressed at its free end and then released. It vibrates.
    a. Name the vibrations produced.
    b. State one way to increase the frequency of these vibrations.
4. Which characteristic of sound is affected due to the larger surface of a school bell?
5. Calculate the distance covered by the Ultrasonic wave having a velocity of 1.5 kms^{-1} in 14 s, when it is received after reflection by the receiver of the SONAR.
6. We are able to see the T.V. channels clearly when we set T.V on auto-tuning.
    a. Which phenomenon led to the clear visibility of the channels, due to auto tuning?
    b. Define the above phenomenon mentioned by you.
    c. Give any one more example of this phenomenon.

2022

7. Free vibrations are
    a. the vibrations under the influence of a periodic force
    b. the vibrations with larger amplitude
    c. the vibrations when the frequency continuously decreases
    d. the vibrations with a constant frequency and constant amplitude
8. The diagram below shows a vibrating tuning fork E mounted on a sound box X. When the vibrating tuning forks A, B, C and D are placed on the sound box Y one by one, it is observed that a louder sound is produced when the tuning fork B is placed on Y



    a. What is the frequency of tuning fork E?
    b. Why does B produce a louder sound?
9. Study the above figure and answer the following



    a. What type of vibration does the above figure represent?
    b. State one reason for which the amplitude of the vibration decreases with time.

c. Write an example of natural vibrations.

2021

10. Select the correct option with respect to echo depth sounding.
    a. Infrasonic waves are used
    b. The frequency of the waves used is between 20 Hz and 20000 Hz
    c. Ultrasonic waves are used
    d. Supersonic waves are used
11. Which one of the following diagnostic methods use reflection of sound?
    a. CT scan
    b. Electrocardiogram
    c. Echocardiogram
    d. MRI
12. A boy standing in front of a wall produces two whistles per second. He notices that the sound of his whistling coincides with the echo. The echo is heard only once when whistling is stopped. Calculate the distance between the boy and the wall.(The speed of sound in air = 320 m/s)
    i. The time in which the boy hears the echo is
        a. 1 s
        b. 0.5 s
        c. 1.5 s
        d. 2 s
    ii. The distance at which the boy is standing from the wall
        a. 160 m
        b. 240 m
        c. 320 m
        d. 80 m
    iii. If the speed of sound is increased by 16 ms I and the boy moves 4 m away from the wall, then in how much time will he hear the echo of the first whistle?
        a. 0.525 s
        b. 0.5 s
        c. 0.48 s
        d. 0.3 s
    iv. In which of the following timings of reflection of the whistle, the echo cannot be heard?
        a. 0.05 s
        b. 0.12 s
        c. 0.2 s
        d. 0.11 s

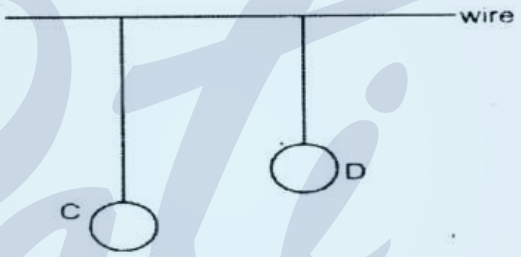
2020

13. Draw a graph between displacement from mean position and time for a body executing free vibration in a vacuum.
14. A sound wave traveling in water has a wavelength 0.4 m. Is this wave audible in the air? (The speed of sound in water = 1400 ms^{-1})
15.
    a. When a tuning fork (vibrating) is held close to ear, one hears a faint hum. The same (vibrating tuning fork) is held such that its stem is in contact with the table surface, then one hears a loud sound. Explain.

b. A man standing in front of a vertical cliff fires a gun. He hears the echo after 3.5 s. On moving closer to the clift by 81 m, he hears the echo after 3 s. Calculate the distance of the cliff from the initial position of the man.

2019

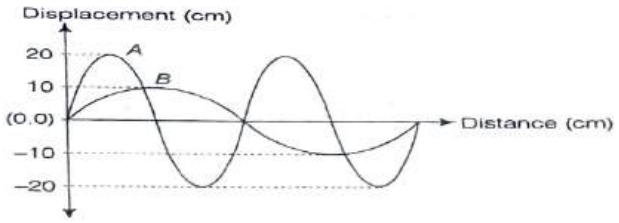
16. A man playing a flute is able to produce notes of different frequencies. If he closes the holes near his mouth, will the pitch of the note produced, increase or decrease? Give a reason.
17.
    a. Define resonant vibrations.
    b. Which characteristic of sound makes it possible to recognize a person by his voice without seeing him ?
18. It is observed that during march-past we hear a base drum distinctly from a distance compared to the side drums.
    a. Name the characteristic of sound associated with the above observation.
    b. Give a reason for the above observation.
19. A pendulum has a frequency of 4 vibrations per second. An observer starts the pendulum and fires a gun simultaneously. He hears the echo from the cliff after 6 vibrations of the pendulum. If the velocity of sound in air is 340 m/s, find the distance between the cliff and the observer.
20. Two pendulums C and D are suspended from a wire as shown in the given figure. Pendulum C is made to oscillate by displacing it from its mean position. It is seen that D also starts oscillating.



    a. Name the type of oscillation, C will execute.
    b. Name the type of oscillation, D will execute.
    c. If the length of D is made equal to C, then what difference will you notice in the oscillations of D?
    d. WHat is the name of the phenomenon when the length of D is made equal to C?

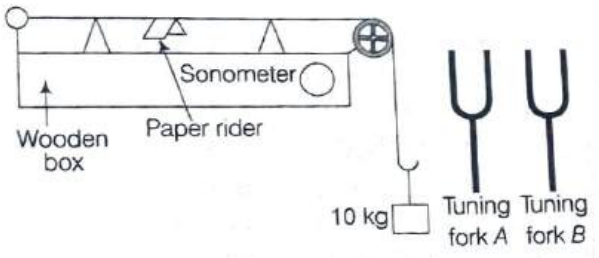
2018

21. Why does the amplitude of a vibrating body continuously decrease during damped vibrations?
22. What do you understand by the free vibrations of a body?
23. Displacement-distance graph of two sound waves A and B, traveling in a medium are as shown in the diagram below. Study the two sound waves and compare their
    a. amplitudes
    b. wavelengths



24. The diagram below shows a wire stretcheer a sonometer. Stems of two vibrating tuning forks A and B are touched to the wooden box of the sonometer. It is observed that the paper rider (a small piece of

paper folded at the centre) present on the wire flies off when the stem of vibrating tuning fork B is touched to the wooden box but the paper just vibrates when the stem of vibrating tuning fork A is touched to the wooden box.



a. Name the phenomenon when the paper rider just vibrates.
b. Name the phenomenon when the paper rider flies off.

25. Why does the paper rider fly off when the stem of tuning fork B is touched to the boxd ov?
26. A person is standing at the sea shore. An observer on the ship which is anchored in between a vertical cliff and the person on the shore fires a gun. The person on the shore hears two sounds, 2s and 3 s after seeing the smoke of the fired gun. If the speed of sound in the air is 320 m/s then calculate
    a. the distance between the observer on the ship and the person on the shore.
    b. the distance between the cliff and the observer on the ship.

2017

27. A wire of length 80 cm has a frequency of 256 Hz. Calculate the length of a similar wire under similar tension, which will have frequency of 1024 Hz.
28. The human ear can detect continuous sounds in the frequency range from 20 to Hz to 20000 Hz. Assuming the speed of sound 330 m/s, for all frequencies, calculate the wavelengths corresponding to the given extreme frequencies of the audible range.
29. An enemy plane is at a distance of 300 km from a radar. In how much time, the radar will be able to detect the plane? (Take, velocity of radio waves as 3×10^8 m/s)
30. A certain sound has a frequency of 256 Hz and a wavelength of 1.3 m.
    a. Calculate the speed with which this sound travels.
    b. What difference would be felt by a listener between the above sound and another sound traveling at the same speed, but of wavelength 2.6 m?
31. How is the frequency of a stretched string related to
    a. its length?
    b. its tension?
32.
    a. What are damped vibrations?
    b. Give one example of damped vibration.
    c. Name the phenomenon that causes a loud sound when the stem of a vibrating tuning fork is kept pressed on the surface of a table.

2016

33. State two ways by which the frequency of transverse vibrations of a stretched string can be increased
34.
    a. Name the waves used for echo depth sounding.
    b. Give one reason for their use for the above purpose.
    c. Why are the waves mentioned by you not audible to us?
35.
    a. What is an echo?

b. State two conditions for an echo to take place.

36.

a. Name the phenomenon involved in tuning a radio set to a particular station.
b. Define the phenomenon named by you in part above.
c. What do you understand by loudness of sound?
d. In which units is the loudness of sound measured?

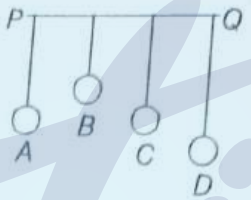
2015

37.

a. Draw a graph between displacement and the time for a body executing free vibrations.
b. Where can a body execute free vibrations?

38. A person standing between two vertical cliffs and 480 m from the nearest cliff shouts. He hears the first echo after 3s and the second echo 2s later. Calculate
    a. the speed of sound.
    b. the distance of the other cliff from the person.

39. In the diagram below, A, B, C and D are four pendulums suspended from the same elastic sting PQ. The length of A and C are equal to each other while the length of pendulum B is smaller than that of D. Pendulum A is set into a mode of vibrations.



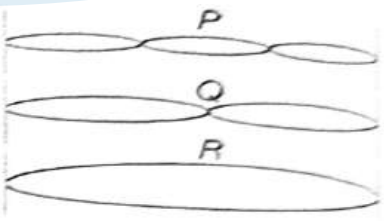
a. Name the type of vibrations taking place in pendulums Band D.
b. What is the state of pendulum C?
c. State the reason for the type of vibrations in pendulums Band C.

2014

40.

a. What are mechanical waves?
b. Name one property of waves that do not change when the wave passes from one medium to another.

41. The adjacent diagram shows three different modes of vibrations P, and R of the same string.



a. Which vibrations will produce a louder sound and why?
b. The sound of which string will have maximum shrillness?
c. State the ratio of wavelengths of P and R.

42.

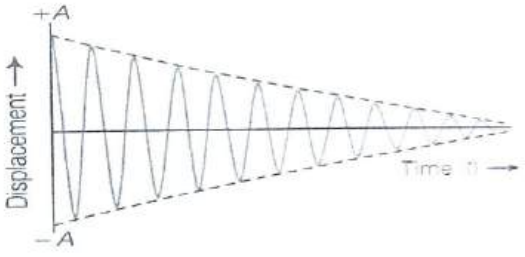
a. State one important property of waves used for echo depth sounding.
b. A radar sends a signal to an aircraft at a distance of 30 km away and receives it back after 2 x 10^{-4} second. What is the speed of the signal?

2013

43. A bucket kept under a running tap is getting filled with water. A person sitting at a distance is able to get an idea when the bucket is about to be filled.
    a. What change takes place in the sound to give this idea?
    b. What causes the change in the sound?
44. A sound made on the surface of a lake takes 3s to reach a boatman. How much time will it take to reach a diver inside the water at the same depth? (Take, velocity of sound in air = 300 m/s and velocity of sound in water = 1440 m/s)
45.
    a. What is the principle on which SONAR is based?
    b. An observer stands at a certain distance away from a cliff and produces a loud sound. He hears the echo of the sound after 1.8s. Calculate the distance between the cliff and the observer, if the velocity of sound in air is 340 m/s
46. A vibrating tuning fork is placed over the mouth of a burette filled with water. The tap of the burette is opened and the water level gradually starts falling. It is found that the sound from the tuning fork becomes very loud for a particular length of the water column.
    a. Name the phenomenon taking place when this happens.
    b. Why does the sound become very loud for this length of the water column?
47.
    a. What is meant by the terms (i) amplitude (ii) frequency of a wave?
    b. Explain why stringed musical instruments, like the guitar, are provided with a hollow box?

2012

48. Name one factor which affects the frequency of sound emitted due to vibrations in an air column.
49.
    a. What is meant by resonance?
    b. State two ways in which resonance differs from forced vibrations.
50.
    a. A man standing between two cliffs produces a sound and hears two successive echoes at intervals of 3s and 4 s, respectively. Calculate the distance between the two cliffs. The speed of sound in the air is 330 m/s
    b. Why will an echo not be heard, when the distance between the source of sound and the reflecting surface is 10 m?
51. The diagram alongside shows the displacement-time graph for a vibrating body.



    a. Name the type of vibrations produced by the vibrating body.
    b. Give one example of a body producing such vibrations.
    c. Why is the amplitude of the wave gradually decreasing?
    d. What will happen to the vibrations of the body after some time?

2011

52.

a. Three musical instruments give out notes at the frequencies listed below. Flute: 400 Hz, Guitar: 200 Hz, Trumpet: 500 Hz. Which one of these has the highest pitch?
b. With which of the following frequencies does a tuning fork of 256 Hz resonate? 288 Hz, 341 Hz, 333 Hz, 512 Hz

53.

a. Name the type of waves which are used for sound ranging.
b. Why are these waves mentioned in (a) above, not audible to us?
c. Give one use of sound ranging.

54.

a. A man standing 25 m away from a wall produces a sound and receives the reflected sound.
b. Calculate the time after which he receives the reflected sound, if the speed of sound in air is 350 m/s.
c. Will the man be able to hear a distinct echo? Give a reason for your answer.

2010

55. State two differences between light waves and sound waves.
56.

a. A man stands at a distance of 68 m from a cliff and fires a gun. After what time interval will he hear the echo, if the speed of sound in air is 340 ms
b. If the man had been standing at a distance of 12 m from the cliff would he have heard a clear echo?

2009

57. An ultrasonic wave is sent from a ship towards the bottom of the sea. It is found that the time interval between the sending and the receiving of the wave is 1.5 s. Calculate the depth of the sea, if the velocity of sound in seawater is 1400 m/s.
58.

a. What is the principle on which SONAR is based?
b. Calculate the minimum distance at which a person should stand in front of a reflecting surface, so that he can hear a distinct echo. (Take, speed of sound in air = 350 m/s)

59.

a. A person is tuning his radio set to a particular station. What is the person trying to do to tune it?
b. Name the phenomenon involved in tuning the radio set.
c. Define the phenomenon named by you in part (b).

2008

60. A radar sends a signal to an aeroplane at a distance 45 km away with a speed of 3 x10^8 m/s. After how long is the signal received back from the aeroplane?
61.

a. What is meant by an echo? Mention one important condition that is necessary for an echo to be heard distinctly.
b. Mention one important use of echo

62.

a. Sometimes when a vehicle is driven at a particular speed, a rattling sound is heard. Explain briefly, why this happens and give the name of the phenomenon taking place?
b. Suggest one way by which the rattling sound could be stopped.

2007

63. A man standing in front of a vertical cliff fires a gun. He hears the echo after 3s. On moving closer to the cliff by 82.5 m, he fires again. This time, he hears the echo after 2.5 s. Calculate

a. the distance of the cliff from the initial position of the man
b. the velocity of sound

64. Define the term amplitude and frequency of sound waves

2006

65. When a tuning fork, struck by a rubber pad, is held over a length of air column in a tube, it produces a loud sound for a fixed length of the air column.
    a. Name the above phenomenon.
    b. How does the frequency of the loud sound compare with that of the tuning fork?
    c. State the unit for measuring loudness.
66.
    a. What is meant by the terms (i) amplitude (ii) frequency of a wave?
    b. Explain why stringed musical instruments, like the guitar, are provided with a hollow box?

2005

67. State two ways by which the frequency of transverse vibrations of a stretched string can be decreased.
68. A radar is able to detect the reflected waves from an enemy aeroplane, after a time interval of 0.02 ms. If the velocity of the waves is 3×10^8 m/s, calculate the distance of the plane from the radar.

2004

69. What is SONAR? State the principle in which it is based.
70.
    a. Differentiate between resonance and forced vibrations.
    b. The wavelength of waves produced on the surface of water is 20 cm. If the wave velocity
        i. the number of waves produced in one second and
        ii. the time required to produce a wave.

2003

71.
    a. Sound made in front of a tall building 18 m away, is repeated. Name the phenomenon and briefly explain it.
    b. A tuning fork, held over an air column of a given length, produces a distinct audible sound. What do you call this phenomenon? How does it occur?
72. A pendulum has a frequency of 5 vibrations per second. An observer starts the pendulum and fires a gun simultaneously. He hears the echo from a cliff after 8 vibrations of the pendulum. If the velocity of sound in air is 340 m/s, what is the distance between the cliff and the observer?

2002

73. An observer stands at a distance of 850 m from a cliff and fires a gun. After what time gap will he hear the echo, if sound travels at a speed of 350 ms ′ in air?
74. A vibrating tuning fork is placed over the mouth of a burette filled with water. The tap is opened and the water level gradually falls. It is observed that the sound becomes the loudest for a particular length of air column.
    a. What is the name of the phenomenon taking place when this happens?
    b. Why does the sound become the loudest?
    c. What is the name of the phenomenon taking place when sound is produced for another length of air column and is not the loudest?
75. What change, if any, would you expect in the characteristics of a musical sound when we increase:
    a. Its frequency
    b. Its amplitude.

2001

76. Radio waves of speed 3 × 10 m/s are reflected from the moon and received back on the earth, the time elapsed between the sending of the signal and receiving it back at the earth's surface is 2.5 s, what is the distance of the moon from the earth?
77.
    a. Give one example each of natural vibration, forced vibration and resonance.
    b. Mention one practical use of echoes.
78.
    a. How does a stretched string on being set into vibration, produce the audible sound?
    b. Will the sound be audible, if the string is set into vibration on the surface of the moon? Give reason for your answer.

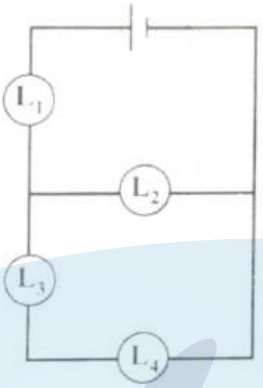
2000

79. A sound wave of wavelength 0.332 m has a time period of 10^{-3} s. If the time period is decreased to 10^{-4} s, calculate the wavelength and frequency of the new wave.
80. Two friends were playing on their identical guitars whose strings were adjusted to give notes of the same pitch. Will the quality of the two notes be the same? Give a reason for your
81. Give the relation wavelength, time-period and wave-velocity of a wave motion.
82. The rear view mirror of a motor bike starts vibrating violently at some particular speed of the motor bike.
    a. Why does this happen?
    b. What is the name of the phenomenon taking place?
    c. What could be done to stop the violent vibrations?
83.
    a. Define the terms: Amplitude and frequency for sound waves.
    b. Name the subjective property of sound related to its frequency and of light related to its w

8. Current Electricity

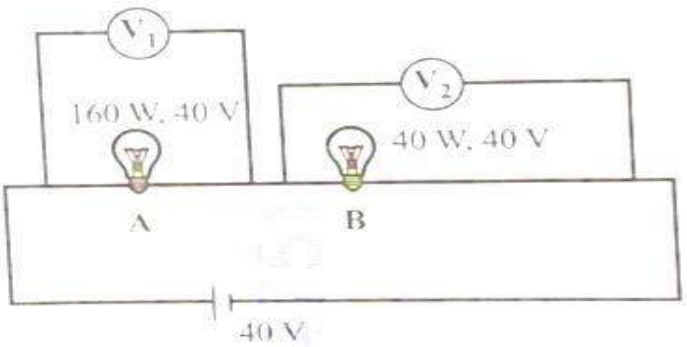
2026:

1. In the circuit given below, identify the lamp (L1, L2, L3 or L4) whose failure would not interrupt the power supply to the other lamps.



   a. L1
   b. L2
   c. L3
   d. L4

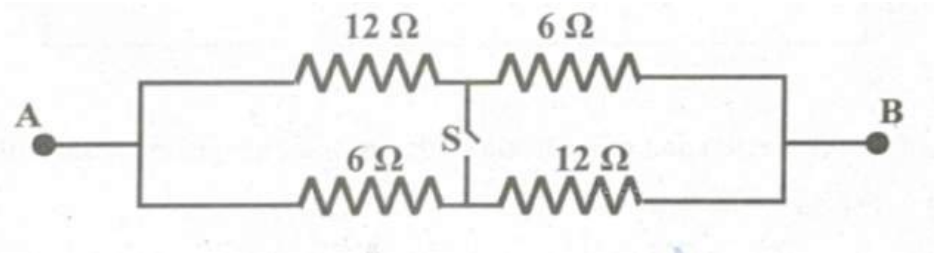
1. The correct formula to calculate the equivalent resistance of two resistors R1 and R2 when connected in parallel, is:
   a. R1+R2/R1xR2
   b. R1xR2/R1+R2
   c. R1-R2/R1xR2
   d. R1xR2/R1-R2
2. A substance whose resistance becomes almost negligible at a temperature near absolute zero is called a _____ (semiconductor / superconductor].
3. A resistance R is connected across a cell with a switch and a rheostat in series A voltmeter is connected parallel across the cell. Current in the circuit increased using the rheostat.
   a. How will the voltmeter reading change? (increase / decrease / remain t same)
   b. Justify your answer stated in (a) above.
4. Bulb A rated 160 W, 40 V and Bulb B rated 40 W, 40 V are connected as shown in the diagram.



   a. Calculate the ratio V1: V2

b. If the bulb A fuses, the current in the circuit remains the same. state True or False.

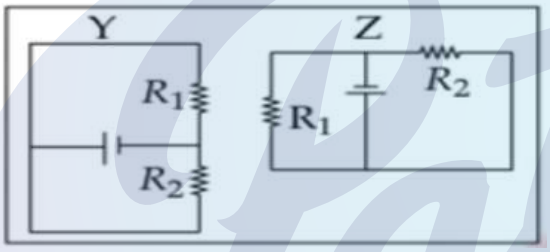
5. In the combinations of resistors shown below, calculate:



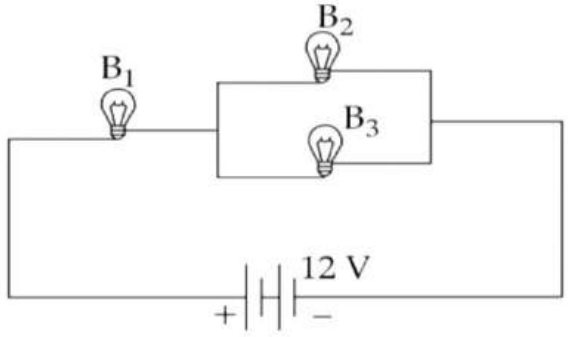
   a. the resistance across AB when the switch S is open.
   b. the resistance across AB when the switch S is closed.
6. An electric iron rated 1100 W, 220 V is operated for 5 hours. Calculate:
   a. the minimum rating of the fuse required.
   b. the energy consumed in kWh.
   c. the cost of the energy consumed, if the rate is ₹10 per unit.

2025

1. In a closed circuit containing a bulb and a cell, the electromotive force (ε) and the terminal voltage (V) is related as. (Given I is current and r is internal resistance.)
   a. (a) V = ε + Ir (b) V = ε – Ir (c) V = ε ÷ Ir (d) V = ε × Ir
2. In the given circuits Y and Z, the resistors, R, and Ry, are connected in:



   a. series in both the circuits
   b. parallel in both the circuits
   c. parallel in Y and series in 2
   d. series in Y and parallel in 2
3. Emf of a cell is [greater than / less than / equal to] the terminal voltage when the cell is in open circuit.
4. A current flows through a metallic conductor for a long period of time. State the change you would expect in its:
   a. Resistance
   b. Resistivity
5. Three identical bulbs B,, B, and B, each of power rating 18 W, 12 V are connected to a battery of 12 V.

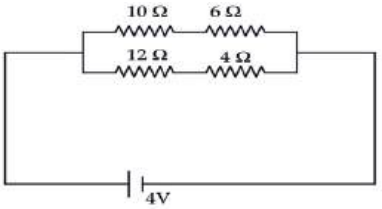


Calculate:

a. the resistance of each bulb .
b. the current drawn from the cell
c. lf the bulb B, is removed from the circuit, then will the brightness of the bulb B, increase, decrease or remains the same

2024

1. Study the diagram:



   a. Calculate the total resistance of the circuit.
   b. Calculate the current drawn from the cell.
   c. State whether the current through 10 W resistor is greater than, less than or equal to the current through the 12 W resistor.
2. The specific resistance of a conductor depends on its
   a. length
   b. material
   c. area of cross section
   d. radius
3. The potential difference between terminals of a cell in a closed electric circuit is
   a. terminal voltage
   b. electro motive force
   c. voltage drop
   d. none of these
4. 5 bulbs are connected in series in a room. One bulb is fused. It is removed and remaining 4 bulbs are again connected in series to the same circuit. What will be the effect on the following physical quantities? (Increases, Decreases, Remain Same
   a. Resistance
   b. Intensity of light
5. The voltage - current readings of a certain material are shown in the table given below: Study the table and answer the following questions

Voltage (V)	10 V	20V	30V
Current (I)	2A	3A	4A

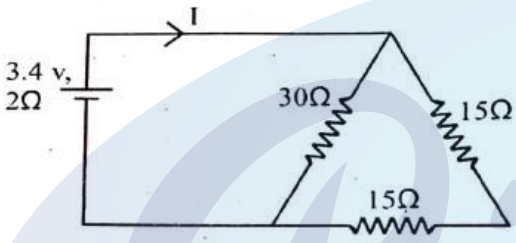
   a. State whether the conductor used is ohmic or non-ohmic.
   b. Justify your answer.
   c. State Ohm's law.

2023

1. When a current I flows through a wire of resistance R for time t then the electrical energy produced is given by:

a. I^2Rt
b. IR^2t
c. IRt
d. IRt^2

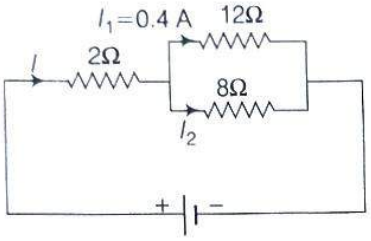
2. Choose the correct relation for e.m.f. (ε) and terminal voltage V:
   a. ε = V (always)
   b. V > ε (always)
   c. V< ε (when the cell is in use)
   d. None of these
3. A geyser is rated 240 W - 220 V. Explain the meaning of this statement.
4.
   a. Define specific resistance.
   b. What happens to the specific resistance when length is doubled?
   c. Name a substance whose specific resistance remains almost unchanged with increase in its temperature.
5. Find the value of current I drawn from the cell.



   a. Calculate the current I.
   b. Calculate the terminal Voltage.

2022

6. The graph plotted for potential difference (V) against current (I) for ohmic resistors is
   a. a curve passing through the origin
   b. a straight line not passing through origin
   c. a straight line passing through origin
   d. a circle centered at the origin
7. An appliance rated 440 W, 220 V is connected across 220 V supply. Calculate
   a. the maximum current that the appliance can draw.
   b. Calculate the resistance of the appliance.
8. If a wire of resistance 2 ohm gets stretched to thrice its original length
   a. Calculate the new resistance of the wire.
   b. What happens to the specific resistance of the wire?



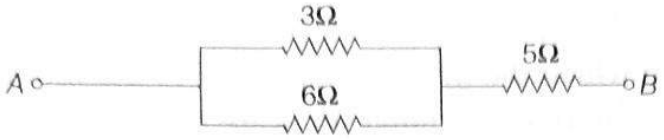
In the above circuit diagram,

a. calculate the external resistance of the circuit

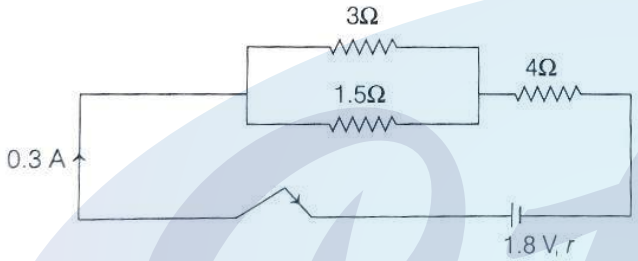
b. the current 1_2
c. the current I

2020

9. Calculate the total resistance across AB



10. Define a kilowatt hour. How is it related to joule?
11.
    a. What are superconductors?
    b. Calculate the current drawn by an appliance rated 110 W, 220 V when connected across 220 V supply.
    c. Name a substance whose resistance decreases with the increase in temperature.
12.

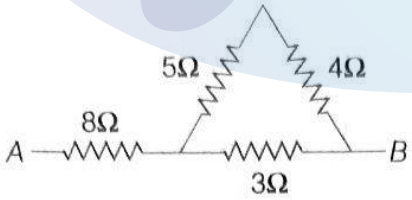


The diagram above shows three resistors connected across a cell of emf 1.8 V and internal resistance r. Calculate

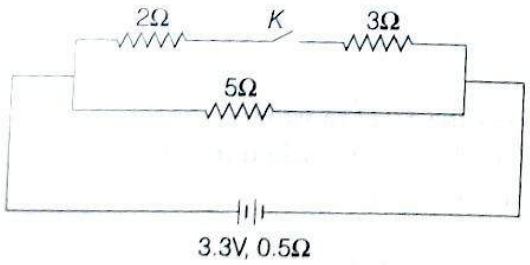
a. current through 3 ohm resistor
b. the internal resistance r.

2019

13. Calculate the effective resistance across AB.



14. How does an increase in the temperature affect the specific resistance of a
    a. metal?
    b. semiconductor?
15.

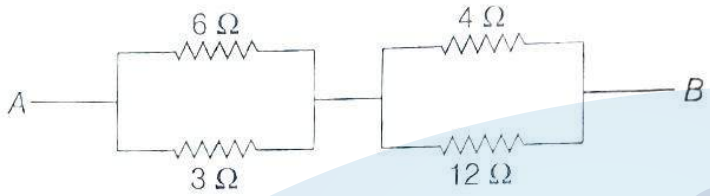


The above figure shows a circuit with the key K open, Calculate

a. the resistance of the circuit when the key K is open.
b. the current drawn from the cell when the key K is open.
c. the resistance of the circuit when the key K is closed.
d. the current drawn from the cell when the key K is closed.

2018

16. You have three resistors of values 2 ohm, 3 ohm and 5 ohm. How will you join them, so that the total resistance is more than 7 ohm?
    a. Draw a diagram for the arrangement.
    b. Calculate the equivalent resistance.
17. Find the equivalent resistance between A and B.



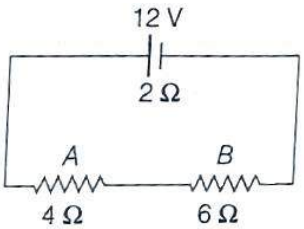
18. State whether the resistivity of a wire changes with the change in the thickness of the wire.

2017

19. Which particles are responsible for current in conductors?
20. Define specific resistance and state its SI unit.
21. An electric bulb of resistance 500 , draws a current of 0.4A. Calculate the power of the bulb and the potential difference at its end.

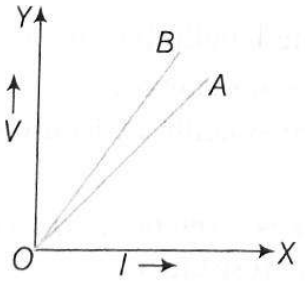
2016

22. Which particles are responsible for current in conductors?
23. A music system draws a current of 400 mA, when connected to a 12 V battery.
    a. What is the resistance of the music system?
    b. The music system is left playing for several hours and finally the battery voltage drops and the music system stops playing when the current drops to 320 mA. At what battery voltage does the music system stop playing?
24. Calculate the quantity of heat produced in a 20 ohm resistor carrying 2.5 A current in 5 min.
25. A battery of emf 12V and internal resistance 2 ohm is connected with two resistors A and B of resistance 4 ohm and 6 ohm respectively, joined in series.



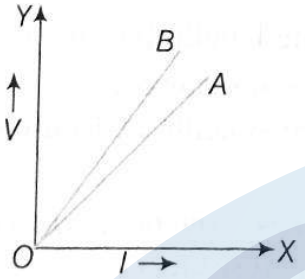
    a. current in the circuit.
    b. the terminal voltage of the cell.
    c. the potential difference across 6 ohm resistor.
    d. electrical energy spent per minute in a 4 ohm resistor.

26. The VI graph for a series combination and for a parallel combination of two resistors is shown in the figure below. Which of the two A or B, represents the parallel combination? Give a reason for your answer.

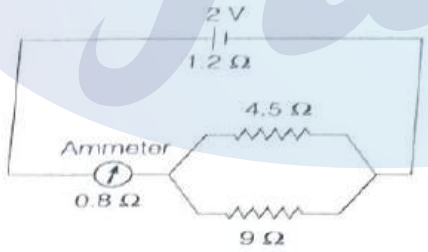


2015

27. What happens to the resistivity of semiconductors with the increase in temperature?



28. The relationship between the potential difference and the current in a conductor is stated in the form of a law.
    a. Name the law.
    b. What does the slope of the VI graph for a conductor represent?
    c. Name the material used for making the connecting wire.
29. A cell of emf 2V and internal resistance 1.2 ohm is connected with an ammeter of resistance 0.8 ohm and two resistors of 4.5 ohm and 9 ohm as shown in the diagram below:



    a. What would be the reading on the ammeter?
    b. What is the potential difference across the terminals of the cell?
30. Name the physical quantity measured in terms of horse power.
31. 1 kWh = ——– J

2014

32.
    a. What is an ohmic resistor?
    b. Two copper wires are of the same length, but one is thicker than the other.
        i. Which wire will have more resistance?
        ii. Which wire will have more specific resistance?
33. Two resistors of 4 ohm and 6 ohm are connected in parallel to a cell to draw 0.5 A current from the cell.

a. Draw a labeled circuit diagram showing the above arrangement.
b. Calculate the current in each resistor.

34. What is consumed using different electrical appliances, for which electricity bills are paid?

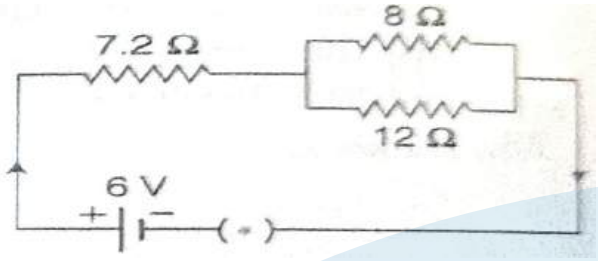
2013

35.

a. State Ohm's law.
b. A metal wire of resistance 6 ohm is stretched, so that its length is increased to twice its original length. Calculate its new resistance.

2012

36. Three resistors are connected to a 6 V battery as shown in the figure:



Calculate

a. the equivalent resistance of the circuit.
b. total current in the circuit.
c. potential difference across the 7.2 ohm resistor.

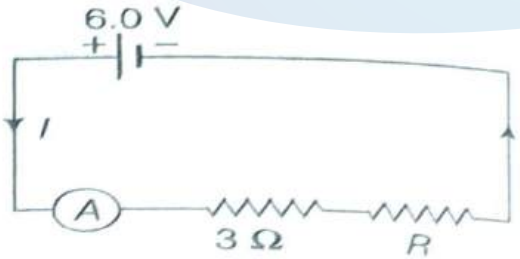
37. An electrical appliance is rated at 1000 kW, 220 V. If the appliance is operated for 2 h, calculate the energy consumed by the appliance in

a. kWh
b. joule

38.

a. Write an expression for the electrical energy spent in the flow of current through an electrical appliance in terms of I, Rand t.
b. At what voltage is the alternating current supplied to our houses?
c. How should the electric lamps in a building be connected?

39. The figure shows a circuit, when the circuit is switched on, the ammeter reads 0.5 A.



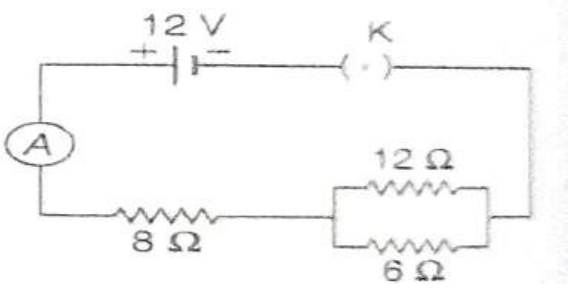
a. Calculate the value of the unknown resistor R.
b. Calculate the charge passing through the 3 ohm resistor in 120 s.
c. Calculate the power dissipated in the 3 ohm resistor

2011

40.

a. Draw a graph of potential difference (V) versus current (I) for an ohmic resistor.
b. How can you find the resistance of the resistor from this graph?
c. What is a non-ohmic resistor?

41. Three resistors are connected to a 12 V battery as shown in the figure given here.



a. What is the current through the 8 ohm resistors?
b. What is the potential difference across the parallel combination of 6 ohm and 12 ohm resistors?
c. What is the current through the 6 ohm resistor?

42. Two bulbs are marked 100 W, 220 V and 60 W, 110 V. Calculate the ratio of their resistances.

43.

a. An electric bulb is marked 100 W, 250 V. What information does this convey?
b. How much current will the bulb draw, if connected to a 250 V supply?

2010

44.

a. A substance has nearly zero resistance at a temperature of IK. What is such a substance called?
b. State any two factors which affect the resistance of a metallic wire.

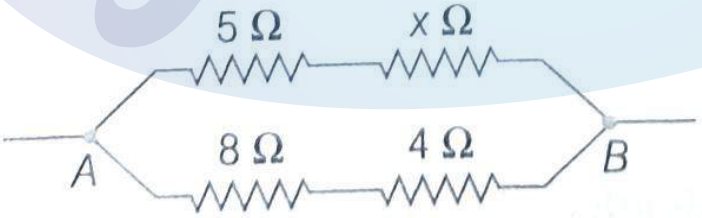
45.

a. Write an expression for calculating electrical power in terms of current and resistance.
b. State a relation between electrical power, resistance and potential difference in an electrical circuit.

46. Calculate the quantity of heat that will be produced in a coil of resistance 75 Q, if a current of 2 A is passed through it for 2 min.

2009

47. The equivalent resistance of the following circuit diagram is 4 ohm. Calculate the value of x.



48.

a. State Ohm's law.
b. Diagrammatically illustrate how you would connect a key, a battery, a voltmeter, an ammeter, an unknown resistance R and a rheostat, so that it can be used to verify the above law.

49. An electric heater is rated 1000 W - 200 V. Calculate

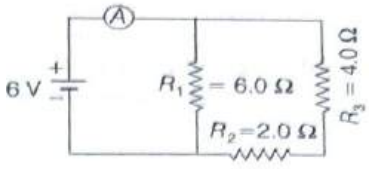
a. the resistance of the heating element.
b. the current flowing through it.

2008

50.

a. Sketch a graph to show the change in potential difference across the ends of an ohmic resistor and the current flowing in it. Label the axes of your graph
b. What does the slope of the graph represent?

51. Three resistors of 6.0 ohm, 2.0 ohm and 4.0 ohm respectively are joined together as shown in the figure. The resistors are connected to an ammeter and to a cell of emf 6.0 V. Calculate

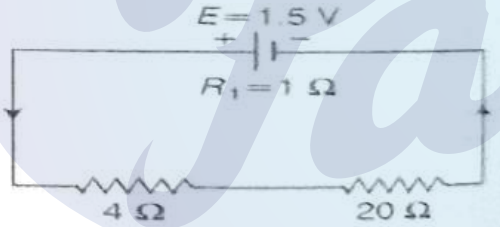


a. the effective resistance of the circuit.
b. the current drawn from the cell.

52. An electrical heater is rated 4 kW, 220 V. Find the cost of using this heater for 12 h, if one kWh of electrical energy costs ₹3.25.
53. How does the heat produced in a wire or a conductor depend upon the
a. current passing through the conductor?
b. resistance of the conductor?

2007

54. The VI graph for a series combination and for a parallel combination of two resistors is shown in the figure below. Which of the two A or B, represents the parallel combination? Give a reason for your answer.
55. Mention two factors on which the resistance of a wire depends.
56. A cell of emf 1.5 V and internal resistance 1.0 are connected to two resistors of 4 ohm and 20.ohm in series as shown in the figure.

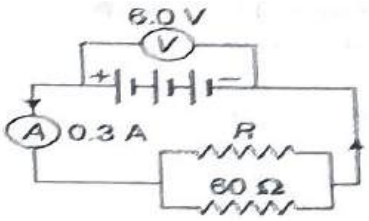


Calculate

a. the current in the circuit.
b. potential difference across the 4 ohm resistor.
c. voltage drops across internal resistance when the current is flowing.
d. potential difference across the cell.

2006

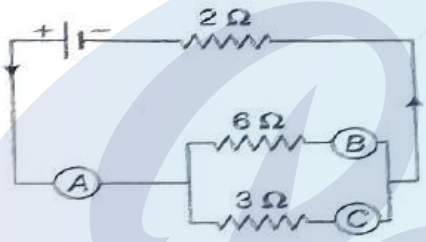
57. A wire of a uniform thickness with a resistance of 27 ohm is cut into three equal pieces and they are joined in parallel. Find the resistance of the parallel combination.
58. Find the cost of operating an electric toaster for two hours, if it draws 8 A current on a 110 V circuit. The cost of electrical energy is ₹2.50 per kWh.
59. In the figure given alongside, the ammeter A reads 0.3 A. Calculate



a. the total resistance of the circuit.
b. the value of R.
c. the current flowing through R

2005

60. Four resistances of 2 ohm each are joined end to end, to form a square ABCD. Calculate the equivalent resistance of the combination between any two adjacent corners.
61. An electrical appliance is rated 1500 W, 250 V. This appliance is connected to 250 V mains.Calculate
    a. the current drawn.
    b. the electrical energy consumed in 60 h.
    c. the cost of electrical energy consumed at ₹2.50 per kWh.
62. In the figure given alongside A, B and Care three ammeters. The ammeter B reads 0.5 A. (All the ammeters have negligible resistance).



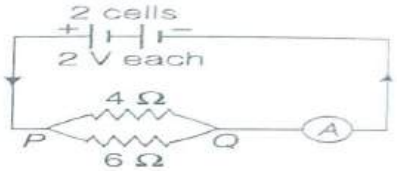
Calculate
    a. the readings in the ammeters A and C.
    b. the total resistance of the circuit.

2004

63. Mention two factors on which the internal resistance of a cell depends.
64. An electric bulb rated 220 V, 60 W is working on its full efficiency. Calculate the electric resistance of the bulb.

2003

65. A cell of emf 1.5 V and internal resistance 10 ohm are connected to a resistor of 5 ohm with an ammeter in series. What is the reading of the ammeter?
66.
    a. Which of the two wires of similar dimensions, copper or nichrome, would you use for the electric heater element? Give reasons to justify your answer.
    b. Two fuse wires of the same length are rated 5 A and 20 A. Which of the two fuse wires is thicker and why?
67. An electric kettle is rated 2.5 kW, 250 V. Find the cost of running the kettle for two hours at 60 paise per unit.
68. With reference to the diagram given below, calculate



a. the equivalent resistance between P and O.
b. the reading of an ammeter.
c. the electrical power between P and O

69. Electrical power P is given by an expression P = QV/time
    a. What do the symbols and V represent?
    b. Express power in terms of current and resistance explaining the symbols used there in.

2002

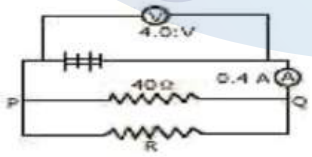
70. Four cells, each of emf 1.5 V and internal resistance 2 ohm are connected in a parallel. The battery of the cells is connected to an external resistance of 2.5 ohm. Calculate
    a. the total resistance of the circuit.
    b. the current flowing in the external circuit.
    c. the drop in potential across the terminals of the cells.
71. A geyser has a label 2 kW, 240 V. What is the cost of using it for 30 min, if the cost of electricity is ₹ 3 per commercial unit?

2001

72. Define the emf (E) of a cell and the potential difference (V) across a resistor (R) in terms of the work done in moving a unit charge. State the relation between these two works and the work done in moving a unit charge through a cell connected across the resistor. Take the internal resistance of the cell as r. Hence, obtain an expression for the current i in the circuit
73. A family uses a light bulb of 100 W, a fan of 100 W and a heater of 1000 W, each for 8 h a day. If the cost of electricity is ₹ 2 per unit, what is the expenditure for the family per day on electricity?

2000

74. Calculate the electrical energy in SI units consumed by a 100 W bulb and a 60 W fan connected in parallel for 5 min.
75. In the figure shown calculate:



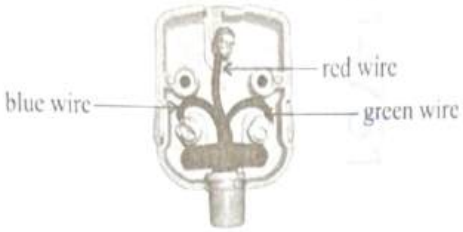
a. The value of the combined resistance of 40 ohm and R, using the readings of the two meters.
b. The value of R

The current flowing through R

9. Household Circuits

2026

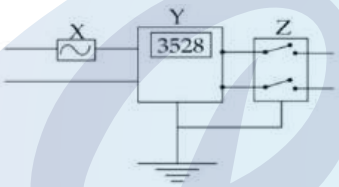
1. The reverse side of a three-pin plug with incorrect connèction of wires is shown in the diagram below.



   a. Identify the fault in the above connection.
   b. Mention a risk factor involved, if the user operates the appliance without correcting it.
   c. Will the appliance function in the present situation? (Yes or No)

2025

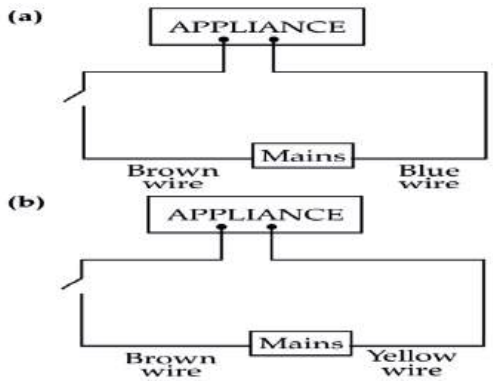
1. The diagram shows wiring in a meter room of a building.



   a. What is the current rating of device X?
   b. What is the difference between the switch Z shown in the diagram and the switches you use to operate different appliances at home?
   c. What is the unit of the physical quantity displayed in Y?
2. According to the NEW colour convention which colour of wire is connected to:
   a. the metal body of the appliance
   b. the switch of the appliance?

2024

1. Identify the option that displays the correct wiring with correct colour code



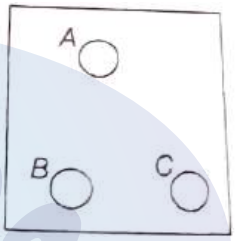
2. A fuse is rated 5 A. Can it be used with a geyser rated 1540 W, 220 V. Write Yes or No. Give supporting calculations to justify your answer.
3.

2023:

1. Which electrical component protects the electric circuit in case of excess current and which can also be used as a switch?
2. Name the wire to which this electrical component is connected in an electric circuit.

2022:

1. A main switch in the main distribution board is present in
   a. a live wire
   b. a neutral wire
   c. a live as well as neutral wire
   d. an earth wire
2. Three wires with proper color coding are connected to the three terminals of a three pin socket.



Match the color of the wire with the proper terminals A, B and C of the socket.

i. Brown
ii. Green
iii. Light blue

2020:

1. Why is it not advisable to use a piece of copper wire as fuse wire in an electric circuit?

2019:

1.
   a. Write one advantage of connecting electrical appliances in parallel combination.
   b. What characteristics should a fuse wire have?
   c. Which wire in a power circuit is connected to the metallic body of the appliance?

2018:

1. Identify the following wires used in a household circuit.
   a. The wire is also called the phase wire.
   b. The wire is connected to the top terminal of a three-pin socket.
2.
   a. A fuse is rated 8 A. Can it be used with an electrical appliance rated 5 kW, 200 V? Give a reason.
   b. An electric iron is rated 220 V, 2 kW. If the iron is used for 2 h daily, find the cost of running it for one week, if it costs ₹ 4.25 per kWh.
3.
   a. Name the safety devices which are connected to the live wire of a household electric circuit.
   b. An electric iron is rated 220 V, 2 kW. Why is the fuse absolutely necessary in a power circuit?

2017:

1. Explain the meaning of the statement 'current rating of a fuse is 5A.
2.
   a. To which wire of a cable in a power circuit, should the metal case of a geyser be connected?
   b. To which wire, should the fuse be connected?

2016:

1. To which wire, should the fuse be connected?
2. State the characteristics required in a material to be used as an effective fuse wire.

2015:

1. For a fuse, higher the current rating ———— is the fuse wire.

2014:

1.
    a. Two sets A and B of three bulbs each, are glowing in two separate rooms. When one of the bulbs in set A is fused, the other two bulbs also cease to glow. But in set B, when one bulb fuses, the other two bulbs continue to glow. Explain why this phenomenon occurs?
    b. Why do we prefer arrangements of set B for house circuits?

2013:

1.
    a. Name the device used to protect the electric circuits from overloading and short circuits.
    b. On what effect of electricity does the above device work?
2.
    a. An electrical gadget can give an electric shock to its user under certain circumstances. Mention any two of these circumstances.
    b. What preventive measure provided in a gadget can protect a person from an electric shock?

2012:

1.
    a. A cell is sending current in an external circuit. How does the terminal voltage compare with the emf of the cell?
    b. What is the purpose of using a fuse in an electrical circuit? (ir) What are the characteristic properties of fuse wire?

2011:

1.
    a. What is the color code for the insulation on the earth wire?
    b. Which part of an electrical appliance is earthed?
2.
    a. Name two safety devices which are connected to the live wire of a household electrical circuit.
    b. Give one important function of each of these two devices.

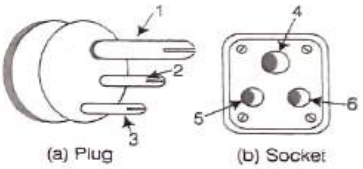
2010:

1. What is the color code for the insulation on the earth wire?
2. Which part of an electrical appliance is earthed?
3.
    a. In what unit, does the domestic electric meter measure the electrical energy consumed? State the value of this unit in SI unit.
    b. Why should switches always be connected to the live wire?
    c. Give one precaution that should be taken while handling switches.

2009:

1.
    a. Give two characteristic properties of copper wire which make it unsuitable for use as fuse wire.
    b. Name the material which is used as a fuse wire.
2.

a. The diagram (a) and (b) given alongside are of a plug and a socket with an arrow marked as 1, 2, 3 and 4, 5, 6 respectively on them. Identify and write live (L), neutral (N) and the earth (E) against the correct number.



b. Calculate the electrical energy consumed when a bulb of 40 W is used for 12.5 h everyday for 30 days.

2008:

1. The electrical gadgets used in a house such as bulbs, fans, heater, etc., are always connected in parallel, not in series. Give two reasons for connecting them in parallel.

2007:

1. Of the three connecting wires in a household circuit
   a. Which two of the three wires are at the same potential?
   b. In which of the three wires should the switch be connected?
2. What is meant by earthing an electrical appliance? Why is it essential?

2006:

1. Draw a labeled diagram of a three-pin socket.

2004:

1. State the purpose of a fuse in an electric circuit. Name the material used for making a fuse wire.

2002:

1. Explain briefly the function of the following in the household wiring
   a. a three-pin plug.
   b. main switch.

2001:

1. How does earthing prevent electrical shock?

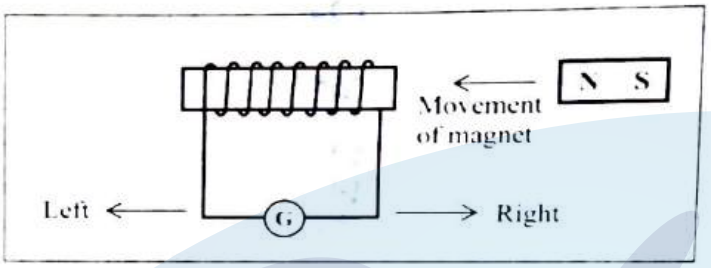
2000:

1. Give two characteristic properties of copper wire which make it unsuitable for use as fuse wire.
2. Name the material which is used as a fuse wire.
3. In a three-pin plug, why is the earth pin made longer and thicker than the other two pins?
4.
   a. Under what circumstances does one get an electric shock from an electric gadget?
   b. What is meant by earthing an electrical appliance?
   c. How does earthing offer protection?

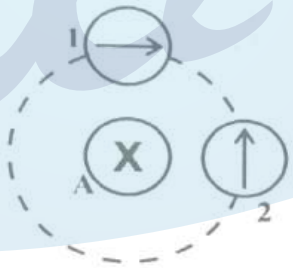
10. Electromagnetism

2026:

1. In an AC generator, name the part which has the following functions:
   a. intensifies the magnetic field
   b. maintains electrical contact between the rotating parts and the external circuit.
2. When the magnet, as shown in the diagram, is moved towards the coil at a speed of 5 ms^{-1} the galvanometer shows a certain deflection to the right.



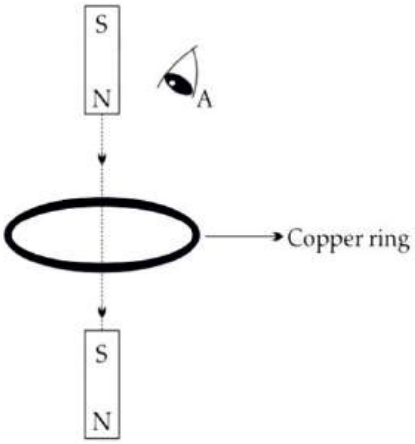
   a. How will the direction and magnitude of deflection change when the coil also moves with a speed of 5 ms^{-1} in the direction of the motion of the magnet?
   b. in the opposite direction of the motion of the magnet?
3. The diagram below shows the top view of the Wire A shown by a cross (X). carrying current into the plane of the paper, Which of the compasses is correctly aligned with the magnetic field, produced by the current carrying wire?



   a. Only 1 is aligned
   b. Only 2 is aligned
   c. Both 1 and 2 are aligned
   d. Both 1 and 2 are not aligned

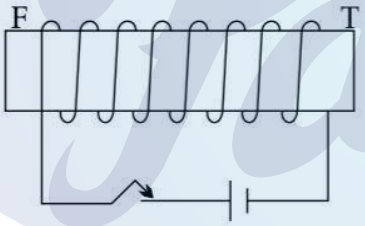
2025

1. The following figure shows a small bar magnet falling freely through a copper ring. For the observer at A, the direction of the induced current will be:



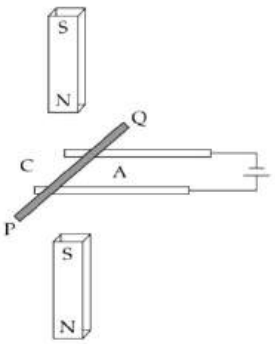
a. clockwise when magnet is above and below the ring
b. anticlockwise when magnet is above and below the ring (c)
c. anticlockwise when magnet is above the ring and clockwise when the magnet is below the ring
d. clockwise when magnet is above the ring and anticlockwise when the magnet is below the ring

2. In a step up transformer, turn ratio is(more than 1/ less than 1/ equal to 1)
3. Which of the two, alternating current or direct current, produces a varying magnetic field when it flows through a conductor?
4. State the frequency of the alternating current supply in India.
5. Copper wire is wound around a steel bar FT. Current is allowed to pass through the coil for some tim nd then the bar is removed



a. Draw only the magnetised bar FT and mark its poles.
b. Trace two magnetic lines of force around FT clearly indicating the direction.

6. A copper rod PQ carrying current is kept in a magnetic field as shown in the diagram.

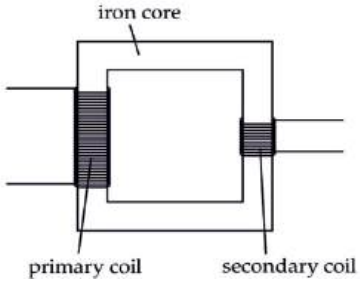


a. The copper rod PQ will move towards C. State True or False.
b. Name the law used to determine the direction of motion of PQ

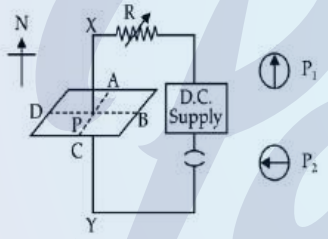
c. What will be the effect on the force experienced, if the rod PQ is replaced by another copper rod of same length but of greater cross-sectional area?
d. Justify your answer in (c).

2024

1. State two factors affecting the speed of rotation of the coil in a D.C. motor.
2. Below is the diagram of a transformer:



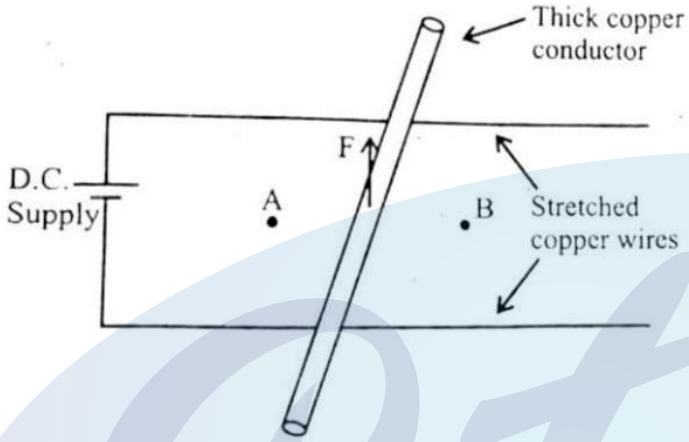
   a. Identify the type of transformer:
   b. In this type of transformer which of the wire is thicker, the primary or the secondary? Give a reason.
3. State one factor that affects the magnitude of induced current in an AC generator:
4. Given below is a circuit to study the magnetic effect of electric current. ABCD is a cardboard kept perpendicular to the conductor XY. A magnetic compass is placed at the point P of the cardboard. P_1 and P_2 are the positions of the magnetic compass, before and after passing a current through XY respectively.



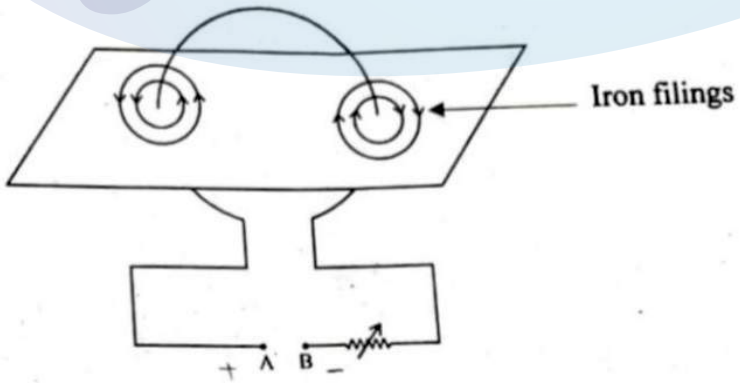
   a. Name the rule that is used to predict the direction of deflection of the magnetic compass.
   b. State the direction of current in the conductor (X to Y or Y to X) when the circuit is complete.
   c. If resistance R is increased, then what will be the effect on the magnetic lines of force around the conductor?

2023:

1. If the strength of the current flowing through a wire is increased, the strength of the magnetic field produced by it:
   a. decreases
   b. increases
   c. remains the same
   d. first increases then decreases
2. A copper conductor is placed over two stretched copper wires whose ends are connected to a D.C. supply as shown in the diagram.



   a. What should be the magnetic poles at the points A and B lying on either side of the conductor to experience the force in the upward direction?
   b. Name the law used to find these polarities.
3. The diagram below shows a cardboard on which iron filings are kept. A wire bent in the form of a loop is seen passing through the cardboard. When current flows through it the iron filings arrange themselves as shown below.

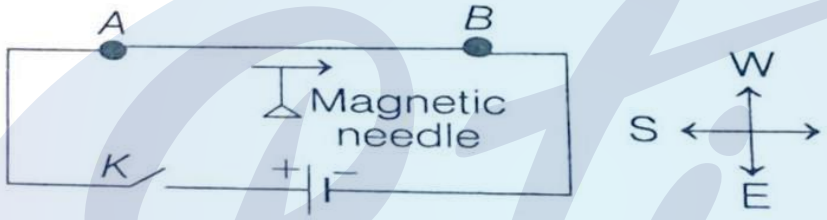


   a. State the polarities of the battery at A and B.
   b. State the effect on the magnetic field if an iron rod is held along the axis of the coil.
   c. State one way to:

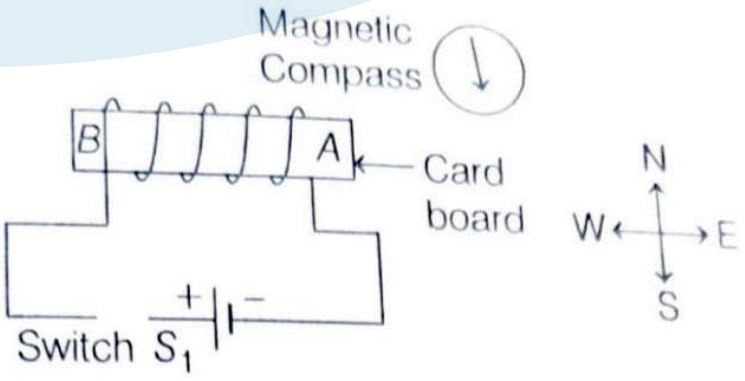
i. Change the polarity of the coil. .
ii. Decrease the strength of the magnetic field around the coil.

2022:

1. A coil wound around a piece of soft iron can become an electromagnet only when
   a. the circuit is open
   b. a magnetic compass is present in the vicinity
   c. a galvanometer is connected to the circuit
   d. a current flows in the circuit
2.
   a. Name two factors on which the force experienced by a conductor carrying current, placed in a magnetic field, depends. Also state how these factors affect the force.
   b. With the help of which rule you can determine the direction of force acting on a current carrying conductor placed in a magnetic field?
3. A conductor AB is kept along the North-South direction of the earth above a magnetic needle as shown below. When the key K is closed, then



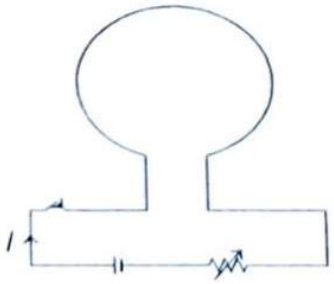
   a. the needle will not show any deflection
   b. the needle will deflect towards East
   c. the needle will turn in the opposite direction i.e. towards South
   d. the needle will deflect towards the West.
4. The diagram below shows a magnetic compass kept closer to a coil AB wound around a hollow cylindrical cardboard.



   a. After studying the circuit and the magnetic compass carefully, state whether the switch S, is open or closed.
   b. How did you arrive at the conclusion in (a)?
   c. What is the purpose of placing the magnetic compass in the above setup?

2020:

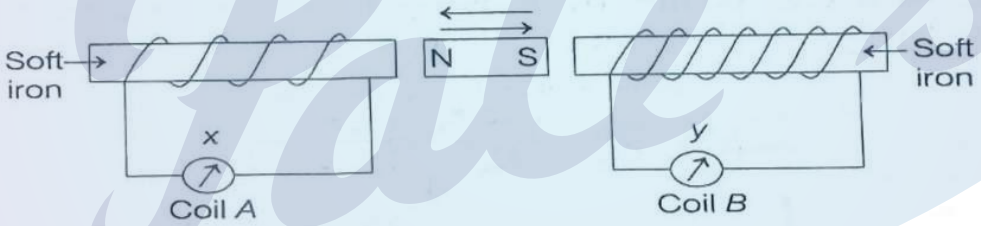
1. When a current carrying conductor is placed in a magnetic field, it experiences a mechanical force. What should be the angle between the magnetic field and the length of the conductor, so that the force experienced is zero and maximum?
2. The diagram below shows a loop of wire carrying current I.



   a. What is the magnetic polarity of the loop that faces us?
   b. (i) With respect to the diagram, how can we increase the strength of the magnetic field produced by this loop?

2019:

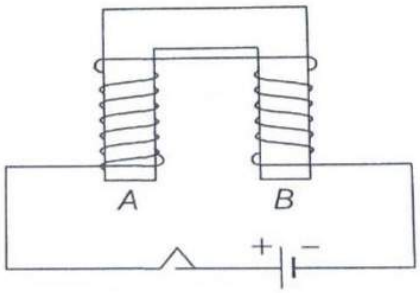
1. A magnet kept at the center of two coils A and Bis moved to and fro as shown in the figure given below. The two galvanometers show deflection.



   State with a reason whether x > y or x < y, where x and y are magnitudes of deflection.

2018:

1. State any two advantages of an electromagnet over a permanent magnet.
2. The diagram shows a coil wound around a U-shape soft iron bar AB.



   a. What is the polarity induced at the ends A and B when the switch is pressed? (ti) Suggest one way to strengthen the magnetic field in the electromagnet.

b. What will be the polarities at A and B, if the direction of current is reversed in the circuit?

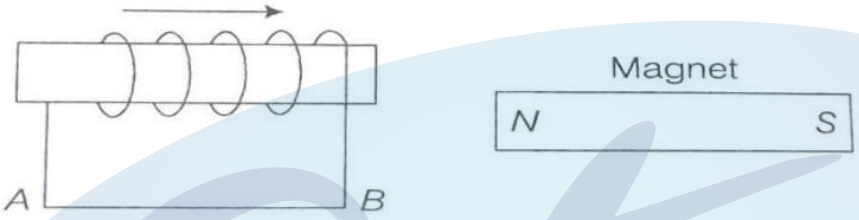
2015:

1.

a. Why does a current carrying, freely suspended solenoid rest along a particular direction?
b. State the direction in which it rests.

2014

1. Name two factors on which the magnitude of an induced emf in the secondary coil depends.
2. In the following diagram an arrow shows the motion of the coil towards the bar magnet



a. State in which direction the current flows, A to B or B to A?
b. Name the law used to come in the conclusion.

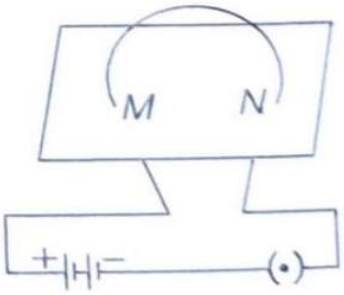
2013

1. You have been provided with a solenoid AB.

c. What is the polarity at end A?
d. Give one advantage of an electromagnet over a permanent magnet.

2012:

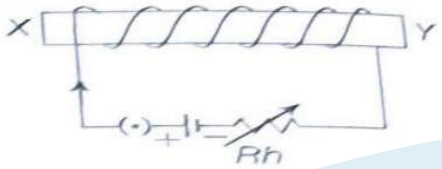
1. The diagram given shows a current carrying loop or a circular coil passing through a sheet of cardboard at the points M and N. The sheet of cardboard is sprinkled uniformly with iron filings.



a. Copy the diagram and draw an arrow on the circular coil to show the direction of current flowing through it.
b. Draw the pattern of arrangement of the iron fillings when current is passed through the loop.

2009:

1. The figure given alongside shows an electromagnet.



a. What will be the polarity at the end X?
b. Suggest a way by which the strength of the electromagnet referred to in the question, may be increased.

2006:

1. State two advantages of an electromagnet over a permanent magnet.
2. What will happen to a compass needle when the compass is placed below a wire and a current is made to flow through the wire? Give a reason to justify your answer.

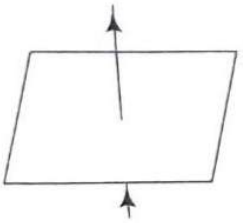
2002:

1. State two advantages of an electromagnet over a permanent magnet.

2010

1.

a. A straight wire conductor passes vertically through a piece of cardboard sprinkled with iron fillings as shown in the figure below. Copy the diagram and show the setting of iron fillings when a current is passed through the wire in the upward direction and the cardboard is tapped gently. Draw arrows to represent the direction of the magnetic field lines.



b. Name the law which helped you to find the direction of the magnetic field lines.

2008:

1.

a. Why does a magnetic needle shows a deflection when brought close to a current carrying conductor?

b. A wire bent into a circle carries current in an anti-clockwise direction. What polarity does this face of the coil exhibit?

2.

a. What is the name given to a cylindrical coil, whose diameter is less in comparison to its length?
b. A piece of soft iron is placed inside the current carrying coil, what is the name given to the device?
c. Give one use of the device named by you in part (b) above.

2007:

1.

a. State two factors on which the strength of an induced current depends.
b. When a solenoid that is carrying current is freely suspended, it rests along a particular direction. Why does this happen?

2005:

1. State the energy change which takes place when a magnet is moved inside a coil having a galvanometer at its ends. Name this phenomenon.
2. Mention two reasons, why a soft iron core is used within the coil of a moving coil galvanometer?

2004:

1. State two dissimilarities between a DC motor and an AC generator.

2003:

1. The diagram shows a coil connected to a galvanometer G. The galvanometer shows a deflection to the right when the N-pole of a powerful magnet is moved to the right as

shown.

a. Explain why the deflection occurs in the galvanometer?'
b. Does the direction of the current in the coil appear clockwise or anti-clockwise, when viewed from the end A?
c. State the observation in G when the coil is moved away from N.
d. State the observation in G when both the coil and the magnet are moved to the right at the same speed.

2002:

1. State two advantages of an electromagnet over a bar magnet.
2. Draw a sketch of an electric bell with electrical connections and label the main parts. Why is the armature made of soft iron and not of steel?
3. State two dissimilarities between a DC motor and an AC generator.

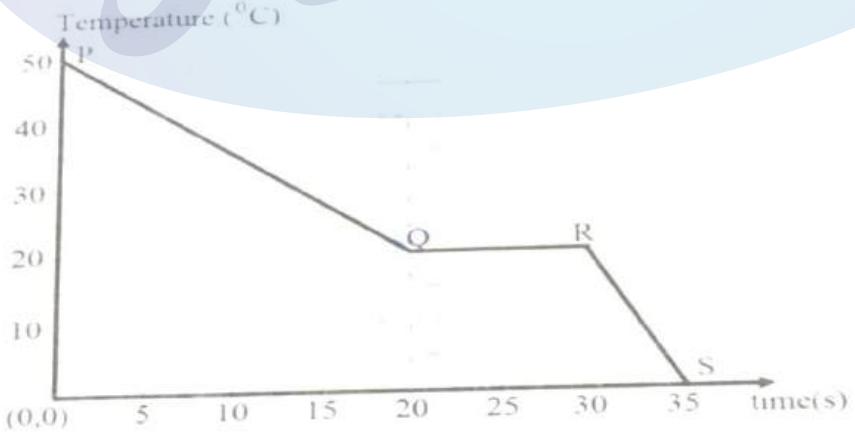
2000:

1. With about a D.C. motor, state:
   a. The energy change that takes place.
   b. The principle on which it operates.
2. State two characteristics of a primary coil of a step-up transformer when compared to the secondary coil.

11. Calorimetry

2026:

1. A metallic wire is stretched in such a way that its new length becomes twice the original length. How does its specific heat capacity change?
    a. becomes double
    b. becomes 4 times
    c. becomes ¼
    d. remains the same
2. Three substances A, B and C of same mass are present at their respective melting points. On heating, if they melt completely in 5 minutes, 7 minutes and 3 minutes respectively, then which substance has the highest specific latent heat? (Assume heat is absorbed at the same rate)
    a. Substance A
    b. Substance B
    c. Substance C
    d. All the substances have same specific latent heat
3. The lid of a calorimeter minimises heat loss by _____ [convection / radiation).
4. A metal piece of thermal capacity 40 JK^{-1} absorbs 800 J of heat.Calculate the rise in the temperature of this metal piece.
5.
    a. Atmospheric temperature after a hailstorm is greater than the temperature during the hailstorm. State True or False.
    b. Which thermal physical quantity of a frying pan changes by making its base heavier?
    c. State the principle of Calorimetry
6. The given graph represents the cooling curve of a liquid.



    a. State the freezing temperature of the liquid
    b. Name the phase change happening at the region QR.
    c. In which state (solid / liquid) does the above substance liberate heat at a faster rate? Justify.

2025

1. A metal piece of mass 5 g has thermal capacity 2.5 JK~'. If the mass of the metal is tripled, then its specific heat capacity will be:
    a. 7.5 J/K
    b. 2.5 J/K
    c. 1.5 Jg/K
    d. 0.5 Jg/K
2. Calculate the amount of heat absorbed by 200 g of paraffin wax to melt completely at its melting point. (Specific latent heat of fusion of paraffin wax = 146 J/g)
3. 30 g of ice at 0°C is used to bring down the temperature of a certain mass of water at 70°C to 20°C. Find the mass of water (Specific heat capacity of water = 4.2 J/gK and specific latent heat of ice = 336 J/g)
4.
    a. A certain amount of heat will warm 1 g of material X by 10°C and 1 g of material Y by 40°C. Which material has higher specific heat capacity?
    b. Which material, X or Y, would you select to make a calorimeter?
    c. The specific heat capacity of a substance remains the same when it changes its state from solid to liquid. State True or False
5. Each of the substances given below is supplied with the same amount of heat. Which one will attain the highest temperature?

Substance	Lead	Aluminium	Copper	Iron
Specific heat capacity (cal/g°C)	0.031	0.21	0.095	0.115

    a. Lead
    b. Aluminium
    c. Copper
    d. Iron

2024

1. The graph given below shows heat energy supplied against change in temperature when no energy is lost to the surrounding. The slope of this graph will give
    a. Specific heat capacity
    b. Latent heat of fusion
    c. Latent heat of vaporisation
    d. Heat capacity
2. How much heat is required to convert 500 g of ice at 0°C to water at 0°C? The latent heat of fusion of ice is 330 Jg^{-1}
3. 85 g of water at 30°C is cooled to 5°C by adding a certain mass of ice. Find the mass of ice required. [Specific heat capacity of water = 4.2 Jg-1°C-l, Specific latent heat of fusion = 336 Jg^{-1}]
4. Why does it become pleasantly warm when the lakes start freezing?
5. Water freezes to form ice. What change would you expect in the average kinetic energy of the molecules?

2023

1. Specific Latent heat of substance
    a. is directly proportional to the mass
    b. is directly proportional to the change in the temperature
    c. depends on the material

d. is inversely proportional to the mass

2. Specific heat capacity of a substance X Is 1900 J/kgK means:
   a. Substance X absorbs 1900 J for 1 °C rise in temperature
   b. 1 kg substance absorbs 1900 J of heat for 1°C rise in temperature
   c. 1 kg of substance X absorbs 1900 J heat to increase the temperature
   d. 1 kg of substance X absorbs I900 J heat to cool down by 1°C
3. Thermal capacities of substances A and B are the same. If Mass of A is more than mass of B then:
   a. Which substance will have more specific heat capacity?
   b. Which substance will show greater rise in temperature if the same amount of heat is supplied to both?
4. Calculate the total amount of heat energy required to melt 200 g of ice at 0°C to water at 100°C. (Specific latent heat of ice= 336 J g-1, specific heat capacity of water= 4.2 J g-.1 °C-1)
5.
   a. State the principle of calorimetry.
   b. Name the material used for making a calorimeter.
   c. Write one characteristic property of the material chosen for making a calorimeter.

2022

1. If water absorbs 4000 J heat to increase the temperature of 1 kg of water through 1°C, then the specific heat capacity of water is
   a. 4 J/kgk
   b. 400 J/gk
   c. 4 J/gk
   d. 4.2 J/gk
2. Water is used in car radiators because
   a. it is a good conductor of heat
   b. it conducts heat faster as compared to the other substances and cools the engine quickly
   c. its specific heat capacity is very low
   d. its specific heat capacity is very high, so it can cool the engine without a greater increase in its own temperature
3.
   a. Give an important reason for copper to be used as a material for a calorimeter
   b. Calculate the thermal capacity of 40 g of water. [Specific heat capacity of water = 4200 J/kgK]
4.
   a. Why does it become colder after a hailstorm than during or before the hailstorm?
   b. If two bodies have the same specific heat capacities, then they will always absorb the same amount of heat if their temperature increases by the same amount. State whether the given statement is true or false.
5. A metal piece of mass 420g present at 80°C is dropped in 80g of water present at 20°C in a calorimeter of mass 84g. If the final temperature of the mixture is 30°C, then calculate the specific heat capacity of the metal piece. [Specific heat capacity of water = 4.2J/gK Specific heat capacity of the calorimeter = 200 J/kgK]

2020

1. Two metallic blocks P and l having masses in ratio 2: 1 are supplied with the same amount of heat. If their temperatures rise by same degree, compare their specific heat capacities
2. Why does stone lying in the sun get heated up much more than water lying for the same duration of time?
3

a. Define the heat capacity of a substance.
b. Write the SI unit of heat capacity.
c. What is the relationship between heat capacity and specific heat capacity of a substance?

2019

1.
   a. Name the physical quantity which is measured in calories.
   b. How is calorie related to the SI unit of that quantity?
2. The specific heat capacity of a substance A is 3800 J/kgK and that of a substance B is 400 J/kgK Which of the two substances is a good conductor of heat? Give a reason for your answer.
3.
   a. Define calorimetry.
   b. Name the material used for making a calorimeter.
   c. Why is a calorimeter made up of thin sheets of the above material answered in (b)?

2018

1. How can a temperature in degree celsius be converted into SI unit of temperature?
2. A liquid X has the maximum specific heat capacity and is used as a coolant in car radiators. Name the liquid X.
3. The temperature of 170 g of water at 50°C is lowered to 5°C by adding a certain amount of ice to it. Find the mass of ice added. (Take, specific heat capacity of water = 4200J kg °C- and specific latent heat of ice = 336000 J/ kg)
4.
   a. State two differences between "heat capacity" and "specific heat capacity"
   b. Give a mathematical relation between heat capacity and specific heat capacity.

2017

1. Define heat capacity and state its SI unit.
2. Why is the base of a cooking pan generally made thick?
3. A solid of mass 50 g at 150°C is placed in 100 g of water at 11°C, when the final temperature recorded is 20°C. Find the specific heat capacity of the solid. (Take, specific heat capacity of water = 4.2J/g°C)
4.
   a. How is the transference of heat energy by radiation prevented in a calorimeter?
   b. You have choices of three metals A, B and C of specific heat capacities 900J/kgK, 380 J/kgK and 460 J/kgK respectively. To make a calorimeter, which material will you select? Justify your answer.

2016

1. What do you understand by the following statements?
   a. The heat capacity of the body is 60 J/K
   b. The specific heat capacity of lead is 130 J/kgK
2. State two factors upon which the heat absorbed by a body depends.
3.
   a. What is the principle of the method of mixtures?
   b. What is the other name given to it?
   c. Name the law on which the principle is based.
4. A copper vessel of mass 100 g contains 150 g of water at 50°C. How much ice is needed to cool it to 5°C? Take, specific heat capacity of copper = 0.4 J/gK Specific heat capacity of water = 4.2 J/gK Specific latent heat of fusion of ice = 336 J/g

2015

1.
    a. Which property of water makes it an effective coolant?
    b. What is the principle of calorimetry?
    c. Name the law on which principle of calorimetry is based.
    d. State the effect of an increase of impurities on the melting point of ice.
2. A refrigerator converts 100 g of water at 20°C to ice at -10°C in 35 min. Calculate the average rate of heat extraction in terms of watts. Take, specific heat capacity of ice = 2.1 J/gK Specific heat capacity of water = 4.2 J/gK Specific latent heat of fusion of ice = 336 J/g

2014

1. 50 g of metal piece at 27°C requires 2400 J of heat energy so as to attain a temperature of 327°C, calculate the specific heat capacity of the metal.
2. Specific heat capacity of substance A is 3.8 J/gK, whereas the specific heat capacity of substance B is 0.4 J/gK.
    a. Which of the two is a good conductor of heat?
    b. How is one led to the above conclusion?
    c. If substances A and Bare liquid, then which one would be more useful in car radiators?

2013

1. Define heat capacity and state its SI unit.
2. How is the heat capacity of the body related to its specific heat capacity?
3. A certain amount of heat l will warm 1 g of material X by 3°C and 1 g of material Y by 4°C. Which material has a higher specific heat capacity?
4. A calorimeter of mass 50 g and specific heat capacity 0.42 J/gK contains some mass of water at 20°C. A metal piece of mass 20 g at 100°C is dropped into the calorimeter. After stirring, the final temperature of the mixture is found to be 22°C. Find the mass of water used in the calorimeter. (Take, specific heat capacity of the metal piece = 0.3 J/gK and water = 4.2 J/gK)

2012

1. Differentiate between heat capacity and specific heat capacity.
2. A hot solid of mass 60 g at 100°C is placed in 150 g of water at 20°C. The final steady temperature recorded is 25°C. Calculate the specific heat capacity of the solid. (Take, specific heat capacity of water = 4200J/kgK)

2011

1. Differentiate between heat and temperature.
2. 200 g of hot water at 80°C is added to 300 g of cold water at 10°C. Calculate the final temperature of the mixture of water. Consider the heat taken by the container to be negligible. Take, specific heat capacity of water is 4200 J/kgK)
3.
    a. Give one example, where high specific heat capacity of water is used as a heat reservoir.
    b. Give one example, where high specific heat capacity of water is used for cooling purposes.

2010

1.
    a. Name the liquid which has the highest specific heat capacity.
    b. Name two factors on which the heat absorbed or given out by a body depends.
    c. An equal quantity of heat is supplied to two substances A and B. The substance A shows a greater rise in temperature. What can you say about the heat capacity of A as compared to that of B?

2009

1. 40 g of water at 60°C is poured into a vessel containing 50 g of water at 20°C. The final temperature recorded is 30°C. Calculate the thermal capacity of the vessel. (Take, specific heat capacity of water is 4.2 J/gK).
2.
    a. What is the principle of method of mixture?
    b. Name the law on which this principle is based.

2008

1.
    a. Define the heat capacity of a given body. What is its SI unit?
    b. What is the relation between heat capacity and specific heat capacity of a substance?
2. A certain quantity of ice at 0°C is heated till it changes into steam at 100°C. Draw a time-temperature heating curve to represent it. Label the two phase changes in your graph.
3. A piece of ice of mass 40 g is dropped into 200 g of water at 50°C.Calculate the final temperature of water after all the ice has melted. (specific heat capacity of water = 4200 J kg^{-1} °C, specific latent heat of fusion of ice = 336 x 103 J kg^{-1})

2007

1. Some hot water was added to three times its mass of cold water at 10°C and the resulting temperature was found to be 20°C. What was the temperature of the hot water?
2. In a laboratory experiment to measure specific heat capacity of copper, 0.02 kg of water at 70°C was poured into a copper calorimeter with a stirrer of mass 0.16 kg initially at 15°C. J/kg°C. After stirring, the final temperature reached 45°C. Specific heat of water is taken as 4200 J/kgK
    a. What is the quantity of heat released per kg of water per 1°C fall in temperature?
    b. Calculate the heat energy released by water in the experiment in cooling from 70°C to 45°C.
    c. Assuming that the heat released by water is entirely used to raise the temperature of the calorimeter from 15°C to 45°C, calculate the specific heat capacity of copper.

2006

1. Give two reasons, why copper is preferred over other metals for making calorimeters?
2.
    a. What is the *principle of calorimetry*?
    b. Why is water used in hot water bottles for fomentation and also as a universal coolant ?
3. A piece of iron of mass 2.0 kg has a thermal capacity of 996J/°C.
    a. How much heat is needed to warm it by 15°C?
    b. What is its specific heat capacity in SI unit ?
4. Calculate the amount of heat released when 5.0 g of water at 20°C is changed into ice at 0°C. (Specific heat capacity of water = 4.2 J/g°C Specific latent heat of fusion of ice = 336 J/g).

2005

1. Water falls from a height of 50 m. Calculate the rise in temperature of water, when it strikes the bottom. (Take, g = 10 ms -2 specific heat capacity of water = 4200J/kg°C)

2004

1.
    a. In winter, the weather forecast for a certain day was 'severe frost'. A wise farmer watered his yields the night before to prevent frost damage to his crops. Why did he water his fields?
    b. 10125 J of heat energy boils off 4.5 g of water at 100°C to steam at 100°C. Find the specific latent heat of steam.
2. A thermos flask of negligible heat capacity contains 100 g of ice and 30g of water. Calculate
    a. The mass of steam at l00°C needed to condense in the flask to just melt the ice;

b. The amount of water in the flask after condensation. (Specific latent heat of vaporization of steam = 2260 J/g Specific latent heat of fusion of ice = 336 J/g Specific heat capacity of water = 4.2 J/g°C.)
c. Is it possible to condense the water formed back to ice by adding ice at 0°C? Explain, giving a suitable reason to justify your answer.

3.

a. State the principle of calorimetry.
b. Which of the two, 1 g of ice at 0°C or 1 g of water at 0°C contains more heat? Give a reason for your answer.

2003

1.

a. Does land cool at a slower or faster rate than water? Give one reason.
b. Explain why steam pipes warm a building more effectively than hot water pipes in cold countries?

2. In a laboratory experiment for finding specific latent heat of ice, l00 g of water at 30°C was taken in a calorimeter made of copper and of mass 10 g. When 10 g of ice at 0°C was added to the mixture and kept within the liquid till the ice melted completely, the final temperature of the mixture was found to be 20°C.
   a. What is the total quantity of water in the calorimeter at 20°C?
   b. Specific heat capacities of water and copper being 4.2 J/g°C and 0.4 J/g°C respectively, what quantity of heat would each release in cooling down to 20°C from the initial stage?
   c. Write an expression for the heat gained by ice on melting
   d. At Calculate the value of the latent heat of fusion of ice from the data discussed above.

2002

1.

a. Define specific heat capacity of a substance. State its SI unit.
b. Give one example of each, where high specific heat capacity of water is used
   i. in cooling
   ii. as a heat resistor.

2. A vessel of negligible heat capacity contains 40 g of ice in it at 0°C. 8 g of steam at 100°C is passed into the ice to melt it. Find the final temperature of the contents of the vessel. (Specific latent heat of vaporization of steam, = 2268 J/g; Specific latent heat of fusion of ice = 336 J/g and Specific heat capacity of water = 4.2 J/g°C)

2001

1. Explain why one feels ice-cream at 0°C colder than water at 0°C?
2. In a laboratory experiment to measure specific heat capacity of copper, 0.02 kg. of water at 70°C was poured into a copper calorimeter with a stirrer of mass 0.l6 kg, initially at 15 °C. After stirring, the final temperature reached to 45°C. Specific heat of water is taken as 4200 J/kg°C.
   a. What is the quantity of heat released per kg of water per 1°C fall in temperature?
   b. Calculate the heat energy released by water in the experiment in cooling from 70° to 45° C.
   c. Assuming that the heat released by water is entirely used to raise the temperature of the calorimeter from 15 °C to 45 °C, Calculate the specific heat capacity of copper.

2000

1. It takes a much longer time to boil off (change to steam) a certain quantity of water, rather than to bring it to its boiling point from room temperature, say 25°C. Explain the reason for this.
2. A hot solid of mass 60 g at 100°C. Is placed in 100g of water at 18°C. The final steady temperature recorded is 20°C. Find the specific heat capacity of the solid.

3. Calculate the mass of steam at 100°C that must be passed into 8.4 kg. of water at 30°C to raise the temperature of water to 80°C. [Sp. heat capacity of water Q = 4.2 J/g°C, Sp. latent heat of vaporisation of steam = 2268 J/g.]
4. Why do the surroundings become pleasantly warm when freezing starts in cold countries?

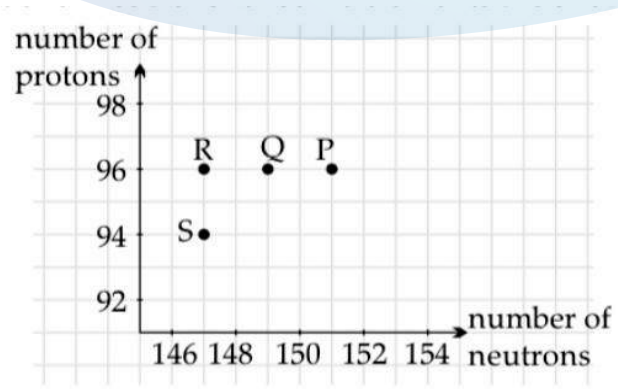
12. Radioactivity and Nuclear energy

2026:

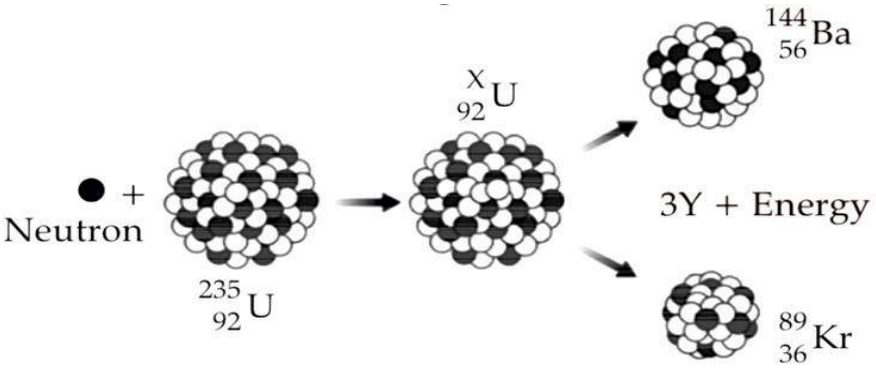
1. An atom of lithium contains 3 electrons, 3 protons and 4 neutrons. Its mass number is:
    a. 3
    b. 4
    c. 7
    d. 10
2. _____ radiation deviates minimum in a magnetic field. [Alpha / Beta]
3. Give two differences between nuclear fission and nuclear fusion.
4.
    a. Which element is used in the lining of the special aprons worn by workers in nuclear power plants?
    b. Why is this element preferred?
5. $_{11}Na^{24}$ emits a nuclear radiation which does not alter the mass number but is deflected by a magnetic field
    a. Name the type of nuclear radiation emitted by $_{11}Na^{24}$
    b. Write the equation for this radioactive decay.

2025

1. A radioactive element P emits one alpha particle and transforms to a new element Q. What will be the position of the element Q in the periodic table?
    a. One group to the left of P
    b. One group to the right of P
    c. Two groups to the right of P
    d. Two groups to the left of P
2. The nuclear radiation with lowest ionisation power is (Alpha/Beta/Gamma)
3. Curium is a radioactive element with the symbol $_{96}Cm^{247}$ named after madam curie. The graph of the number of protons versus the number of neutrons for some elements are shown below



    a. Which point on the graph indicates the element Cm?
    b. Which point on the graph indicates the daughter nucleus after Cm undergoes radioactive decay of 1 alpha followed by 2 beta?
    c. State the mass number of the daughter nucleus.
4. Study the diagram given below and answer the questions that follow



a. Name the process depicted in the diagram.
b. What is the value of X?
c. Identify Y, the missing product of the reaction.

2024

1. A radioactive nucleus containing 128 nucleons emits a B-particle. After B-emission the number of nucleons present in the nucleus will be
   a. 128
   b. 129
   c. 124
   d. 127
2. Copy and complete the nuclear reaction by filling in the blanks.

$$_{92}U^{235} + {}_{0}n^{1} \longrightarrow {}_{56}Ba^{\cdots} + \ldots Kr^{92} + 3\,{}_{0}n^{1}$$

3. A radioactive element is placed in an evacuated chamber. Then the rate of radioactive decay will
   a. Decrease
   b. Increase
   c. Remain unchanged
   d. Depend on the surrounding temperature
4. In the following atoms, which one is a radioisotope? Give one use of this isotope. 0^{16}, C^{14}, N^{14}, He^{4}
5. Uranium is available in two forms U-235 and U-238. Which of the two isotopes of Uranium is more fissionable?
6. Complete the following radioactive reaction:

$$X \rightarrow Y + {}^{4}_{2}He \rightarrow {}^{234}_{91}Z + {}^{0}_{-1}e$$

2023

1. Which of the following radiations suffer maximum deflection in a magnetic field?
   a. Alpha radiation
   b. Beta radiation
   c. Gamma radiation
   d. X - radiation
2. When does the nucleus of an atom tend to become radioactive?
3. How is the radioactivity of a radioisotope affected if it undergoes a chemical change? Give reason for your answer
4. Complete the following nuclear charges

$$^{238}_{92}P \rightarrow \_\_Q + {}^{4}_{2}He \rightarrow \_\_R + {}^{0}_{-1}e$$

5. Name the nuclear radiation which has the highest ionizing power.
6.
    a. Which nuclear radiation will travel undeviated in an electric field?
    b. How can one stop the radiation escaping from nuclear reactors in a nuclear power plant?
    c. Name one internal source o f background radiation.

2022:

1. The heaviest nuclear radiation is
    a. X radiation
    b. Gamma radiation
    c. Alpha radiation
    d. Beta radiation
2. To study the age of excavated material of archaeological significance we study the rate of decay of an isotope of
    a. Uranium
    b. Cobalt
    c. Carbon
    d. Chlorine
3. Complete and rewrite the following nuclear reaction by filling the blanks. $^{235}U \rightarrow {}_{90}Th^{?} + {}^{4}He_{2}$
4.
    i. What is nuclear energy?
    ii. After emission of nuclear radiation, the atomic number of the daughter nucleus increases by 1. Identify the nuclear radiation.
    iii. Write a nuclear reaction indicating the nuclear change mentioned in (ii).
    iv. What is the special name given to the parent and daughter nucleus when this radiation is emitted?

2020

1. State one safety precaution in the disposal of nuclear waste.
2. A nucleus $^{84}X_{202}$ of an element emits an alpha particle followed by a ß-particle. The final nucleus is ${}_{a}Y^{b}$. Find the values of a and b.
3. An atomic nucleus A is composed of 84 protons and 128 neutrons. The nucleus A emits an a-particle and is transformed into a nucleus B.
    i. What is the composition of B?
    ii. The nucleus B emits beta particle and is transformed into a nucleus C. What is the composition of C ?
    iii. What is the mass number of the nucleus A?
    iv. Does the composition of C change, if it emits gamma radiations?

2019

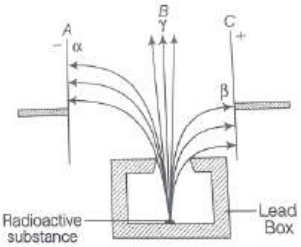
1. Complete the reaction. $^{3}He_{2} + {}^{2}H_{1}$ ——> $^{4}He_{2}$ + ... + energy
2. Is it possible for a hydrogen ($^{1}_{1}H$) nucleus to emit an alpha particle? Give a reason for your answer.
3. Rewrite and complete the following nuclear reaction by filling in the atomic number of Ba and mass number of Kr. $^{235}U_{92} + {}_{0}{}^{1}n \rightarrow {}^{144}Ba_{?} + {}_{36}{}^{?}Kr + 3{}_{0}{}^{1}n$ + Energy

2018

1.

a. What are isobars?
b. Give one example of isobar

2. Radiations given out from a source when subjected to an electric field in a direction perpendicular to their path are shown below in the diagram. The arrows show the path of the radiation A, B and C. Answer the following questions in terms A, Band C.



i. Name the radiation B which is unaffected by the electrostatic field.
ii. Why does the radiation C deflect more than A?
iii. Which among the three causes the least biological damage externally?
iv. Name the radiation which is used in carbon dating.

2017

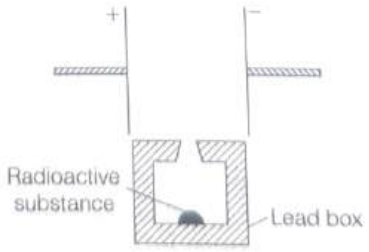
1. When does the nucleus of an atom tend to be radioactive?

2016

1. A radioactive substance is oxidized. Will there be any change in the nature of its radioactivity? Give a reason for your answer.
2. An element ${}_{z}S^{A}$ decays to ${}_{85}R^{222}$ after emitting 2 alpha-particles and
3. 1 beta-particle. Find the atomic number and atomic mass of the element S.
4. Arrange alpha, beta and gamma rays in ascending order with respect to their
   i. penetrating power
   ii. ionizing power
   iii. biological effect
5.
   i. Represent the change in the nucleus of a radioactive element when a B-particle is emitted.
   ii. What is the name given to elements with the same mass number and different atomic numbers?
   iii. Under which conditions does the nucleus of an atom tend to be radioactive?

2015

1. An atomic nucleus A is composed of 84 protons and 128 neutrons.
   i. The nucleus A emits an alpha particle and is transformed into nucleus B. What is the composition of nucleus B?
   ii. The nucleus B emits beta particle and is transformed into a nucleus C. What is the composition of nucleus C?
   iii. Does the composition of nucleus C change, if it emits gamma radiations?
2.
   i. Complete the diagram as given below by drawing the deflection of radioactive radiations in an electric field.



ii. State any two precautions to be taken while handling radioactive substances.

2014

1. A nucleus $_{11}Na^{24}$ emits a beta particle to change into magnesium (Mg)
   i. Write the symbolic equation for the process.
   ii. What are numbers 24 and 11 called?
   iii. What is the general name of $_{12}Mg^{24}$ with respect to $_{11}Na^{24}$?

2013

1. Which of the radioactive radiations occurs in the following cases
   i. can cause severe genetic disorder?
   ii. are deflected by an electric field?
2.
   i. What is meant by radioactivity?
   ii. What is meant by nuclear waste?
   iii. Suggest one effective process for the safe disposal of nuclear waste.

2012

1. A radioactive nucleus undergoes a series of decays according to the sequence.

$$X \xrightarrow{\beta} X_1 \xrightarrow{\alpha} X_2 \xrightarrow{\alpha} X_3$$

2. If the mass number and atomic number of X_3 are 132 and 69 respectively, what is the mass number and atomic number of X.
3. A certain nucleus X has a mass number 14 and atomic number 6. The nucleus X changes to $_7y^{14}$ after the loss of a particle.
   i. Name the particle emitted.
   ii. Represent this change in the form of an equation.
   iii. A radioactive substance is oxidised. What change would you expect to take place in the nature of its radioactivity? Give a reason for your answer.

2011

1. Fill in the blanks in the following sentences with appropriate word. During the emission of a B-particle, the ..... number remains the same.
2. A mixture of radioactive substances gives off three types of radiations.
   i. Name the radiation which travels with the speed of light.
   ii. Name the radiation which has the highest ionizing power.
3. The nucleus $_{84}X^{202}$ emits an alpha -particle and forms the nucleus Y. Represent this change in the form of an equation.
4.
   i. Define radioactivity.
   ii. What happens inside the nucleus that causes the emission of beta particles?
   iii. Express the above change in the form of an equation.

2010

1. Complete the following reaction
   a. $_{11}Na^{24} \rightarrow {}_{?}Mg^{?} + {}_{-1}beta^{0}$
   b. $_{92}U^{238} \rightarrow {}_{90}Th^{234}$ + ... + energy
2.
   i. Which radiation produces maximum biological damage?
   ii. What happens to the atomic number of an element, when the radiation named by you in part (i) above are emitted?

2009

1.
   i. Name the radioactive radiations which have the least penetrating power.
   ii. Give one use of radioisotopes.
   iii. What is meant by background radiation?
2. A nucleus $_{z}X^{A}$ emits an alpha particle followed by gamma emission, thereafter, it emits two beta particles to form X_3.
   i. Copy and complete the values of A and Z for X_3

$$\underset{X}{\overset{A}{}}X \xrightarrow{-\alpha} X_1 \xrightarrow{-\gamma} X_2 \xrightarrow{-2\beta} X_3$$

   ii. Out of a, B and y-radiation,
      1. Which radiation is the most penetrating?
      2. Which radiation is negatively charged?

2008

1.
   i. When does the nucleus of an atom become radioactive?
   ii. How is the radioactivity of an element affected, when it undergoes a chemical change to form a chemical compound?
   iii. Mention one use and one harmful effect of radioactivity.

2007

1.
   i. Mention two important precautions that should be taken while handling radioactive.
   ii. State one use of radioisotopes.
2. What happen to the atomic number of an element, when it emits
   i. an alpha particle
   ii. a beta particle.
3. Explain why alpha and beta particles are deflected in an electric or a magnetic field but gamma rays are not deflected in such a field.
4.
   i. Name the particles given out during radioactive decay.
   ii. Show by equation, the effect on the proton number Z and mass number A of the parent nucleus brought about by the two types of radioactive decay.
   iii. What is carbon-14 dating?

2006

1. A certain radioactive nucleus emits a particle that leaves its mass unchanged but increases its atomic number by one. Identity the particle and write its symbol.
2. How many a and B-particles are emitted when uranium nucleus $_{92}U^{238}$ decays to lead $_{82}Pb^{206}$?

2003

1. The isotope of $_{92}U^{238}$ decays by alpha emission to an isotope of thorium (Th). The thorium isotopes decay by beta emission to an isotope of protactinium (Pa). Write down the equations to represent these two nuclear changes.

2002

1. Mention two possible sources of background radiations.
2. An element X changes to another element Y with the emission of B-particles. Write down the equation showing changes in the nucleus. Take the proton number and mass nuclear of X as Z and A, respectively.
3. Describe briefly, two properties of each of alpha and beta particles.

2001

1. In the above nuclear reaction, $$^{24}_{12}\mathrm{Mg} \xrightarrow{-\alpha,\ -\beta} \mathrm{Al} + \gamma$$
    a. $_{12}Mg^{24}$ emits alpha and beta particles and is transformed to aluminum. What is the mass number and the atomic number of aluminium?
    b. aluminum emits gamma rays. What is the resulting nucleus?
    c. Which radiation or particle from radioactivity produces maximum biological damage?
    d. state three precautions that must be taken while handling a radioactive source.

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