

PRELIMINARY ASSESSMENT

PHYSICS

Grade : 10
Date : 17.01.2025
Duration : 2 hours

Max. Marks : 80
No. of questions : 09
No of printed sides : 10

[Answers to this Paper must be written on the paper provided separately.]

You will not be allowed to write during the first 15 minutes.

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing answers.

*Attempt **all** questions from Section A and any **four** questions from Section B.*

The intended marks for questions or parts of questions are given in brackets [].

SECTION A

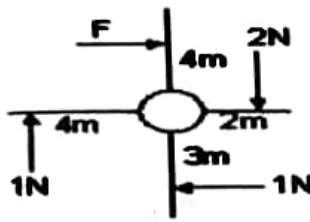
*(Attempt **all** questions from this section)*

Question 1

Choose the correct answers to the questions from the given options: [15]

- (i) Is it possible for a hydrogen (${}_1^1\text{H}$) nucleus to emit an alpha particle?
(a) Yes, always
(b) No, because alpha particles are too large
(c) Yes, under certain conditions
(d) No, because hydrogen has no protons.
- (ii) The Position of centre of gravity depend on
(a) shape (b) Weight (c) Volume (d) both a and b
- (iii) White light is dispersed by the prism. Inside the prism, compared to green light the red light
(a) Slows down less and refracts more
(b) Slows down more and refracts less
(c) Slows down more and refracts more
(d) Slows down less and refracts less
- (iv) As the water level in a pitcher kept under a water tap rises, the sound becomes shriller and shriller because:
(a) The frequency of sound increases
(b) The air column above the water decreases
(c) The level of water increases
(d) All the above

- (v) A wheel spanner is pushed by four external forces as shown in the figure alongside. Which of the options will bring the wheel spanner to a Standstill?



- (a) 2.75N (b) 0.75N (c) -6N (d) -2.75N

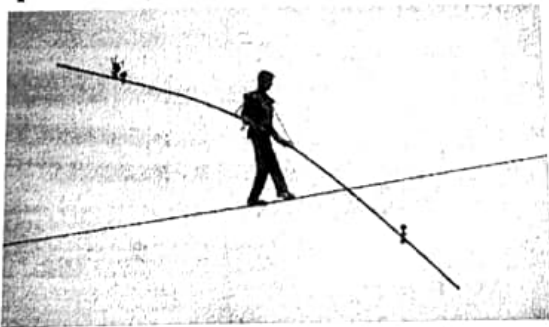
- (vi) When one resistor is removed from a series circuit,

- (a) The current decreases.
 (b) The current decreases by half.
 (c) The current increases.
 (d) The current increases by half.

- (vii) A ball is dropped from a height of 10 m.

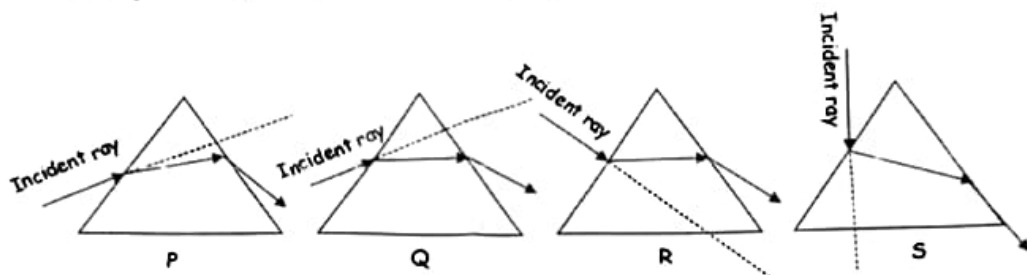
- (a) Its potential energy increases and kinetic energy decreases during the falls
 (b) Its potential energy is equal to the kinetic energy during the fall.
 (c) The potential energy decreases and the kinetic energy increases during the fall.
 (d) The potential energy is 0 and kinetic energy is maximum while it is falling.

- (viii) Observe the diagram given below and find the most suited answer from the options to explain why he needs a pole while doing this activity.



- (a) The pole increases his centre of gravity, increasing the stability of movement.
 (b) The pole helps in distracting him from the height.
 (c) The pole lowers his centre of gravity, increasing the stability of movement.
 (d) The pole decreases the stability hence he holds it with both hands.

- (ix) Given figure represent four different cases of a ray of light passing through an equilateral prism of refractive angle A . The case corresponding to the minimum deviation is:



- (a) P
(b) Q
(c) R
(d) Both Q and R

- (x) **Assertion (A)** : The resistivity of a substance does not depend on the nature of the substance and temperature.
Reason (R) : The resistivity of a substance is a characteristic property of the material.

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

- (xi) Match the following:

Electromagnetic Radiation	Source
1. Gamma rays	P. Crystal oscillator
2. Ultraviolet radiation	Q. Red hot bodies
3. Infrared Radiation	R. Mercury vapour lamp
4. Microwaves	S. Cosmic radiations

- (a) 1 - S, 2 - R, 3 - P, 4 - Q
(b) 1 - R, 2 - S, 3 - Q, 4 - P
(c) 1 - S, 2 - R, 3 - Q, 4 - P
(d) 1 - S, 2 - P, 3 - R, 4 - Q

- (xii) **Assertion (A)** : The specific heat capacity of a given solid can be determined by using the principle of calorimetry

Reason (R) : Heat gained is equal to the heat lost.

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

- (xiii) Which is incorrect about alpha particles ?
 (a) These are positively charged
 (b) They have large kinetic energy
 (c) The speed of alpha particles is 10^8 m/s
 (d) alpha particles affect a photographic plate
- (xiv) **Assertion (A)** : The sound produced by the flute is more shrill than the sound produced by a table.
Reason (R) : Frequency produced by the flute will be greater than the frequency produced by the table.
- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
 (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
 (c) Assertion (A) is true but reason (R) is false.
 (d) Assertion (A) is false but reason (R) is true.
- (xv) To detect the obstacle in their path, bats produce:
 (a) Infrasonic waves
 (b) Ultrasonic waves
 (c) Sonic waves
 (d) Radio waves

Question 2

- (i) Complete the following by choosing the correct answer from the bracket: [6]
- (a) Use a good quality machine oil to lubricate the moving parts of a machine in order to reduce _____ (velocity ratio / efficiency / friction).
- (b) When mass and velocity of a body are doubled then its kinetic energy will _____ (increase by 8 times, increase by 2 times, increase by 4 times).
- (c) Two devices are connected between two points, say A and B, in parallel. The physical quantity that will remain the same between the two points is _____ (Current/ Voltage/ Resistance).
- (d) A water droplet acts as a _____ (convex lens/ concave lens /prism)
- (e) The source of energy of the sun and stars is obtained from the nuclear fusion of _____ (uranium/thorium/hydrogen)
- (f) A charge moving in a magnetic field in a direction other than the direction of the magnetic field experiences a force called _____ (Electromagnetic force/Lorentz force/Nuclear force)

- (ii) Alex the gardener pushes a lawn roller through a distance of 20m. If he applies a force of 20kg weight in a direction inclined at an angle of 60° to the ground, then what will be the work done by him? [2]
- (iii) If the power of a motor be 100 kW, at what speed can it raise a load of 50,000 N? [2]

Question 3

(i) A solid of mass 50 g at 150°C is placed in 100 g of water at 11°C , if the final temperature recorded is 20°C . Find the specific heat capacity of the solid. (Specific heat capacity of water = $4.2 \text{ J/g}^\circ\text{C}$). [2]

(ii) Draw a graph showing the variation in the angle of deviation with the angle of incidence at a prism surface. [2]

(iii) Chief Engineer of TATA Power observed that there is a large loss of energy from his transformers. State two causes of energy loss in a transformer. [2]

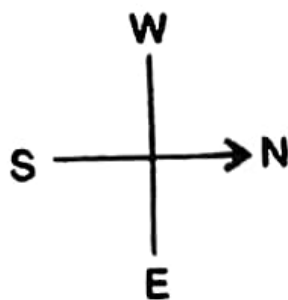
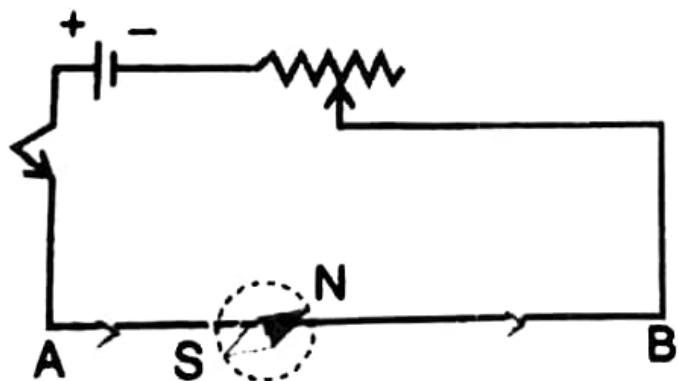
(iv) Can all elements of the periodic table become radioactive? When does the nucleus of an atom tend to be radioactive? [2]

(v) (a) How does uniform circular motion differ from uniform linear motion?

(b) Name the process used for producing electricity using nuclear energy. [2]

(vi) (a) What name is given to a cylindrical coil of diameter less than its Length? [2]

(b) In the figure given below, when the key is pressed, a current passes in the wire in the direction from A to B (i.e., from south to north). The north pole of the compass needle will deflect towards which direction?



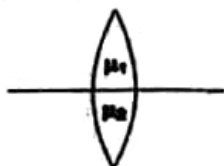
- (vii) A pump is used to lift 600 kg of water from a depth of 75 m in 10 s. Calculate the power rating of the pump if its efficiency is 40%. (Take $g = 10 \text{ m s}^{-2}$). [3]

Question 4

- (i) A body of mass 60 kg has the momentum of 3000 kg m/s. Calculate:
(a) the kinetic energy and
(b) the speed of the body. [3]
- (ii) (a) Which particles are responsible for current in conductors?
(b) Which wire of the cable in a power circuit should the metal case of a geyser be connected to?
(c) Which wire should the fuse be connected to? [3]
- (iii) (a) What do you understand by the following statements :
1. The heat capacity of the body is 60 J K^{-1} .
2. The specific heat capacity of lead is $130 \text{ J kg}^{-1} \text{ K}^{-1}$
(b) What do you understand by the term 'Scattering of light'? Which colour of white light is scattered the least and why? [4]

Question 5

- (i) (a) Refer to the diagram given below. A single lens with two different refractive indices as shown. If the rays are coming from an object placed at its focal length then how many images are formed?

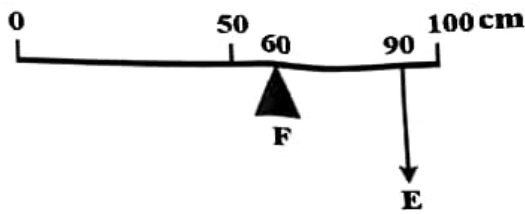


- (b) A body is acted upon by two forces each of magnitude F , but in opposite directions. If both forces act at the same point on the body, what would be the effect of the forces? Give a real life example of the above effect. [3]

- (ii) Amanda has a convex lens of focal length of 15 cm.

- (a) Calculate at what distance from the lens, should an object be placed so that it forms an image at a distance of 40cm on the other side of the lens.
(b) State the nature of the image so formed. [3]

(iii) A uniform metre scale is kept in equilibrium when supported at the 60cm mark and a mass M is suspended from the 90 cm mark as shown in the figure.



- (a) Compare the weights of the scale and the mass at the 90cm mark.
 (b) If the metre scale is changed to a scale of 180cm, with all other specifications same, find whether the weight of the scale is greater than, less than or equal to the weight of the mass M .

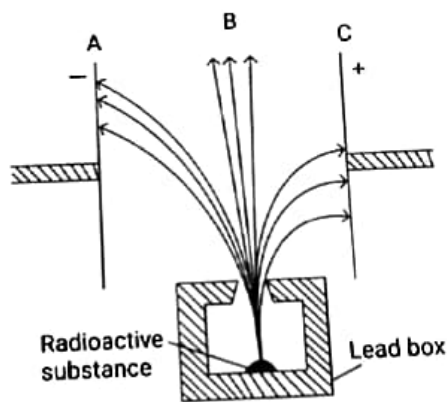
[4]

Question 6

(i) Radiations given out from a source when subjected to an electric field in a direction perpendicular to their path are shown in the diagram. The arrows show the path of the radiation A, B and C.

Answer the following question in terms of A, B and C.

[3]

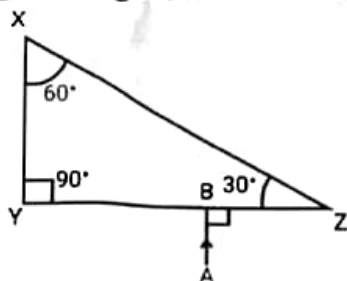


- (a) Identify and Name the radiation which is unaffected by the electrostatic field.
 (b) Why does the radiation C deflect more than A?
 (c) Name the radiation which is used in carbon dating.
- (ii) (a) What is the ratio of the velocities of light of wavelengths 4000 \AA and 8000 \AA in vacuum? Justify your answer.
 (b) Which of the above wavelengths has a higher frequency?

[3]

(iii) (a) Derive and Name the unit of physical quantity obtained by the formula $2K/V^2$ Where K: kinetic energy, V: Linear Velocity.

(b) The following diagram shows a $60^\circ, 30^\circ, 90^\circ$ 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. [4]



Question 7

(i) The picture below shows a boy climbing a rope ladder hanging from the branch of a tree. The boy in the picture finds it difficult to climb the ladder as it turns about the axis where he is holding. The instructor tells the boy to stretch the body with the hands stretched up and make the body parallel to the ladder and climb. [3]



(a) Which force caused the ladder to turn? What does it do?

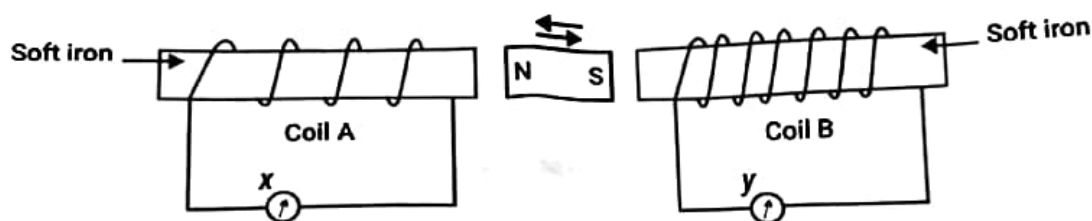
(b) How does keeping the body parallel to the ladder make climbing easier?

i) What is a superconductor? Give two examples of it. [3]

i) A person standing at a distance 'x' m in front of a cliff fires a gun. Another person B standing behind the person A at a distance 'y' m from the cliff hears two sounds of the fired shot after 2 s and 3 s respectively. Calculate x and y. (take speed of sound 320 ms^{-1}) [4]

Question 8

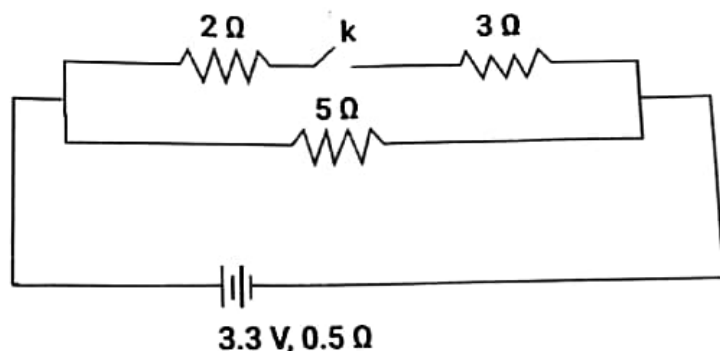
- (i) (a) A magnet kept between two coils A and B is moved to and fro as shown in the diagram. The two galvanometers show deflection. [3]



State with a reason whether :

$x > y$ or $x < y$ [x and y are magnitudes of deflection]

- (b) How is the frequency of a stretched string of a violin related to its tension?
- (ii) The diagram shows a circuit with the key k open. Calculate: [3]



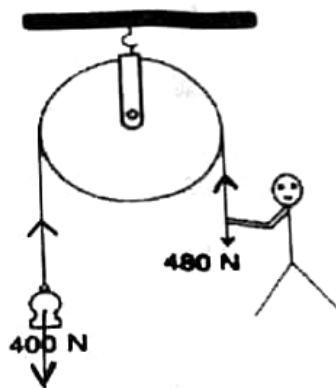
- (a) the resistance of the circuit when the key k is open.
 (b) the current drawn from the cell when the key k is open.
 (c) the resistance of the circuit when the key k is closed.
- (iii) An element ${}_Z P^A$ emits one α -particle and then two β -particles consecutively to form an element Q . [4]
- (a) Show all the transformations by means of equations only.
 (b) What are P and Q called? [3]

Question 9

- (i) (a) Name the transformer used in the power transmitting station of a power plant.
 (b) What type of current is transmitted from the power station?
 (c) At what voltage is this current available to our household? [3]

(ii) 200 g of hot water at 80°C is added to 400 g of cold water at 10°C . Neglecting the heat taken by the container, calculate the final temperature of the mixture of water. Specific heat capacity of water = $4200 \text{ J kg}^{-1} \text{ K}^{-1}$. [3]

(iii) The adjacent Figure shows a fixed pulley used by a boy to lift a load of 400 N through a vertical height of 5 m in 10 s. The effort applied by the boy on the other end of the rope is 480 N. [4]



- What is the velocity ratio of the pulley?
- What is the mechanical advantage?
- Calculate the efficiency of the pulley.
- Comment on the efficiency of the pulley.