

**GREENLAWNS SCHOOL, WORLI**  
**PHYSICS PRELIM EXAM - 2024**

**STD: X**  
**Date: 11/01/2024**

**Marks: 80**  
**Time: 2hrs**

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**General Instructions:**

1. Answer to this Paper must be written on the paper provided separately.
  2. You will not be allowed to write during first 15 minutes.
  3. This time is to be spent in reading the question paper.
  4. The time given at the head of this Paper is the time allowed for writing the answers.
  5. Section A is compulsory. Attempt any four questions from Section B.
  6. The intended marks for questions or parts of questions are given in brackets [ ].
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**Section A**  
**(Attempt all questions from this Section.)**

**QUESTION 1.** Choose the correct answers to the questions from the given options. **[15]**

(Do not copy the questions, write the correct answer only.)

- (i) The radiation suffering the maximum deflection in a magnetic field is:  
(a)  $\alpha$  particles (b)  $\beta$  particles  
(c) X-rays (d)  $\gamma$  radiations
- (ii) When ice melts, its volume  
(a) increases (b) decreases  
(c) remains same (d) None of these
- (iii) The weight of an object lies at the .....  
(a) Geometric center (b) always Centre of gravity  
(c) Centre of buoyancy (d) Centre of mass
- (iv) Work done = force  $\times$  .....  
(a) Displacement (b) distance  
(c) Time (d) velocity
- (v) Kilo-calorie is the amount of heat required to raise the temperature of :  
(a) 1 kg of water through  $10^{\circ}\text{C}$  (b) one kg of water through  $1^{\circ}\text{C}$   
(c) one gram of water through  $1^{\circ}\text{C}$  (d) 1 kg of water through  $100^{\circ}\text{C}$
- (vi) **Assertion :** The connecting wires are made of copper.  
**Reason :** The electrical conductivity of copper is high.  
(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.

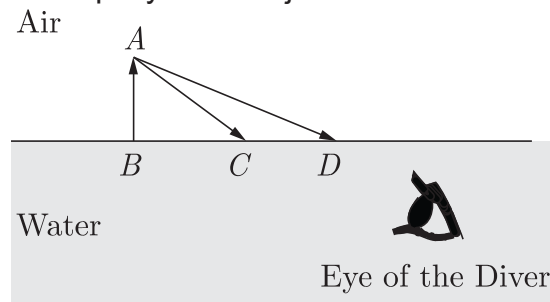
- (vii)** When white light is dispersed by a prism, compared with blue light, the red light is
- (a) slowed down less and refracted more
  - (b) slowed down more and refracted less
  - (c) slowed down less and refracted less
  - (d) slowed down more and refracted more
- (viii)** The graph between current and voltage for a conductor is a straight line. The slope of the graph represents :
- (a) electric potential
  - (b) resistance
  - (c) resistivity
  - (d) conductance
- (ix)** In which of the following cases emf is not induced ?
- (a) A magnet is moved through a loop of wire
  - (b) A loop of wire is held near a magnet
  - (c) A current is started in a wire held near a loop of wire
  - (d) The current is switched off in a wire held near a loop of wire
- (x)** Two sounds A and B are of same amplitudes, same wave forms but of frequencies  $f$  and  $2f$  respectively then.
- (a) B is differ in quality from A
  - (b) B is grave, A is shrill
  - (c) B is shrill A is grave
  - (d) B is louder than A
- (xi)** Class III levers are designed to have.
- (a)  $MA = VR$
  - (b)  $MA > VR$
  - (c)  $MA > 1$
  - (d)  $MA < 1$
- (xii)** Reducing the focal length of a lens, its power.
- (a) decreases
  - (b) increases
  - (c) does not change
  - (d) first increases then decreases
- (xiii)** A coconut tree appears to be ..... when viewed by a sea diver from below the water surface.
- (a) same size
  - (b) distorted
  - (c) taller
  - (d) shorter
- (xiv)** A conductor at 4.2 K is found to offer no resistance. Such a conductor is called.
- (a) zero conductor
  - (b) absolute conductor
  - (c) superconductor
  - (d) none of these
- (xv)** When a ray of light travelling in an optically denser medium, emerges into an optically less dense medium it
- (a) deviates towards the normal
  - (b) gets reflected
  - (c) deviates away from normal
  - (d) does not deviate

## QUESTION 2.

- (i) (a) What is a pulley?  
(b) State one safety precaution in the disposal of nuclear waste.  
(c) What is radioactivity? [3]
- (ii) Give one example of each when:  
(a) Chemical energy changes into electrical energy.  
(b) Electrical energy changes into sound energy. [2]
- (b) (a) State the relationship between mechanical advantage, velocity ratio and efficiency.  
(b) Name the term that will not change for a machine of a given design. [2]
- (iii) State two factors on which the magnitude of induced e.m.f. in a coil depend [2]
- (iv) Differentiate between radioactive decay and nuclear fission. [2]
- (v) If a wire of resistance  $2\ \Omega$  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? [2]
- (vi) (a) Name the system which enables us to locate underwater objects by transmitting ultrasonic waves and detecting the reflecting impulse.  
(b) What are acoustically measurable quantities related to pitch and loudness? [2]

## QUESTION 3.

- (i) A diver in water looks obliquely at an object  $AB$  in air. [2]



- (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.
- (ii) How does an increase in the temperature affect the specific resistance of a: [2]  
(a) Metal and  
(b) Semiconductor?
- (iii) Two waves of the same pitch have amplitudes in the ratio 1:3. What will be the ratio of their loudness and frequencies? [2]
- (iv) Water falls from a height of 50 m. Calculate the rise in the temperature of water when it strikes the bottom. (Take  $g = 10\text{ms}^{-2}$ ; C of water =  $4200\text{J kg}^{-1}\text{K}^{-1}$ ). [2]
- (v) In  $\beta$ -emission from a radioactive substance an electron is ejected. Where does this electron come from? [2]

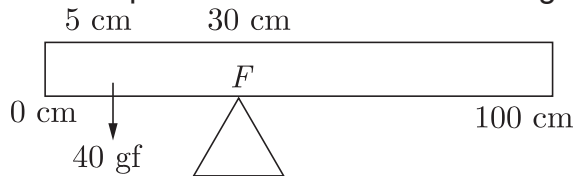
## SECTION - B

(Attempt any four questions.)

### QUESTION 4.

- (i) Calculate the power of an engine required to lift  $10^5$  kg of coal per hour from a mine 360 m deep (take  $g = 10 \text{ m/s}^2$ ) [3]

- (ii) A uniform meter scale is in equilibrium as shown in the diagram: [3]

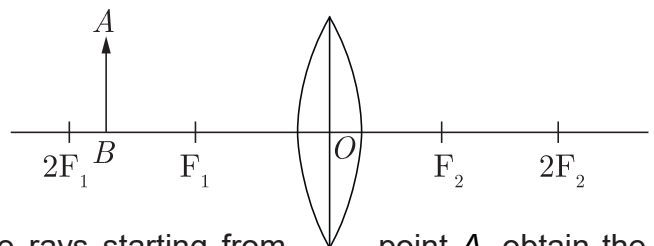


- (a) Calculate the weight of the metre scale.  
 (b) Which of the following options is correct to keep the ruler in equilibrium, when 40 gf wt is shifted to 0 cm mark?  
 $F$  is shifted towards 0 cm or  $F$  is shifted towards 100 cm.

- (iii) (a) Name the radiations: [4]

1. Used for photography at night.
2. Whose wavelength range is from  $100\text{\AA}$  to  $4000\text{\AA}$  (or 10 nm to 400 nm).

- (b) An object  $AB$  is placed between  $2F_1$  and  $F_1$  on the principal axis of a convex lens as shown in the diagram:



Copy the diagram and using three rays starting from point  $A$ , obtain the image of the object formed by the lens.

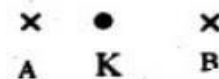
### QUESTION 5.

- (i) (a) Can the absolute refractive index of a medium be less than one? [3]

- (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  $4/3$ , find the depth of the water in the beaker.

- (ii) What do you understand by the term “quality” of a musical note? Illustrate your answer with a diagram. [3]

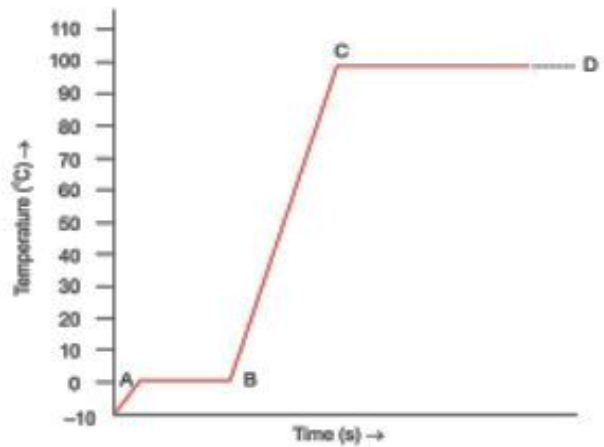
- (iii) In the given figure, A and B represent two straight wires carrying equal currents in a direction normal to the plane of paper inwards.



- (a) Sketch separately the magnetic field lines produced by each current
- (b) What will be the magnetic field at the midpoint  $K$  of the line joining  $A$  and  $B$ ? Give reason.
- (c) How will the magnetic needle of compass rest if it is placed at point  $K$  ?
- (d) What will be the effect on the magnetic field at point  $K$  if the current in wire  $B$  is reversed? [4]

### QUESTION 6.

- (i) A piece of ice is heated at a constant rate. The variation in temperature with time of heating is shown in the graph.



- (a) What is represented by part AB?  
(b) What does the part CD represent?  
(c) What conclusion do you draw regarding the nature of ice from the graph? [3]

- (ii) (a) What is the purpose of a switch in a circuit?  
(b) Why is the switch put in the live wire?  
(c) What precaution do you take while handling a switch? [3]

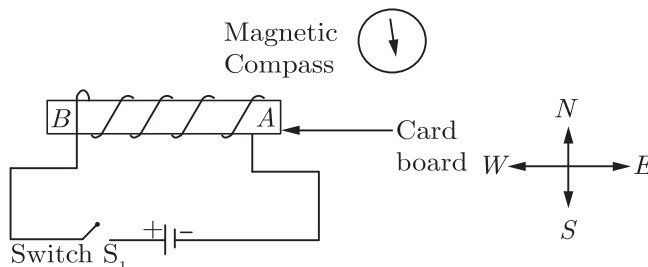
- (iii) A block and tackle of 5 pulleys is used to raise a load of 50 kgf steadily through a height of 20 m. The work done against friction is 2000 J. Calculate:  
(a) the work done by the effort.  
(b) the efficiency of the system [4]  
(c) mechanical advantage.

### QUESTION 7.

- (i) A convex lens forms an erect and three times magnified image of an object placed at a distance 10 cm in front of it. find:  
(a) The position of the image.  
(b) The focal length of the lens. [3]
- (ii) Draw a ray diagram to show the image formation by a convex lens when the object is placed between  $F_1$  and Optical Centre. Write the characteristic of the image. [3]
- (iii) An atomic nucleus  $A$  is composed of 84 protons and 128 neutrons. Nucleus  $A$  emits an alpha particle and is transformed into nucleus  $B$ . [4]  
(a) What is the composition of  $B$ ?  
(b) The nucleus  $B$  emits a beta particle and is transformed into a nucleus  $C$ . What is the composition of  $C$ ?  
(c) What is the mass number of the nucleus  $A$ ?  
(d) Does the composition of  $C$  change if it emits gamma radiation?

**QUESTION 8.**

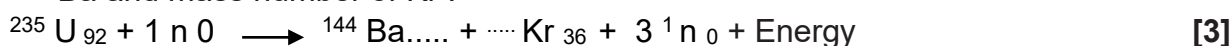
- (i) The diagram below shows a magnetic compass kept closer to a coil AB wound around a hollow cylindrical cardboard.



- (a) After studying the circuit and the magnetic compass carefully, state whether the switch S<sub>1</sub> 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?

- (ii) (a) Define nuclear fusion.

- (b) Rewrite and complete the following nuclear reaction by filling in the atomic number of Ba and mass number of Kr :

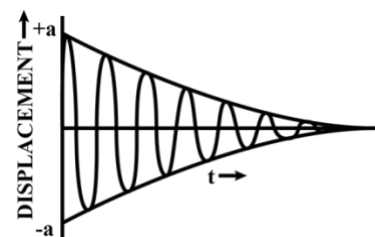


- (iii) Four lamps of 200 watt, 100 watt, 60 watt and 40 watt are connected to a power supply of 200 volts; calculate: [4]

- (a) total current consumed.  
 (b) total resistance of this arrangement and  
 (c) the cost of keeping them lit for 7 hours daily for 30 days, the cost of electricity being 30 paise per unit.

**QUESTION 9.**

- (i) The diagram in the figure shows the displacement time graph of a vibrating body



- (a) Name the kind of vibrations.  
 (b) Why is the amplitude of vibrations gradually decreasing?  
 (c) What happens to the vibration of the body after some time? [3]

- (ii) Specific heat capacity of substance A is 38. J g<sup>-1</sup>K<sup>-1</sup> whereas the specific heat capacity of substance B is 0.4. Jg<sup>-1</sup> K<sup>-1</sup>. [3]

- (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 B are liquids, then which one would be more useful in car radiators?

- (iii) A refrigerator converts 100 g of water at 20 °C into ice at -10 °C in one hour. Determine the quantity of heat extracted per second. [4]

[Given: specific latent heat of ice = 336 J/g and specific heat capacity of ice = 2.1 J/g °C, specific heat capacity of water = 4.2 J/g °C.]

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