ST. JOSEPH'S COLLEGE, PRAYAGRAJ
PRE-BOARD EXAMINATION 2024
PHYSICS
CLASS – X

TIME: 3 Hours **MM: 80**

Instructions to be followed

Fill in your credentials (Name, Roll No., Class & Section, Subject, Admission No. and Date) in the Answer Scripts carefully.

The first 15 minutes are provided to read the question paper thoroughly and not to write anything on the answer scripts.

The marks entitled to the respective questions are mentioned in brackets [ ]

Section A is compulsory. Attempt any four questions from Section B.

DO NOT TRY TO USE UNFAIR MEANS DU0RING THE EXAMS. It may lead to cancellation of the whole examination.

Section – A [40 Marks]

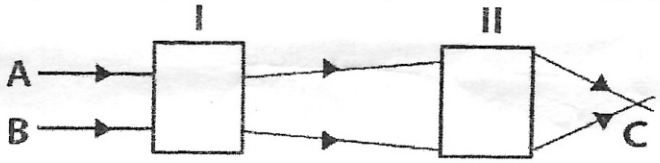
(Attempt all the questions from this section)

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

1) When white light is dispersed by a prism, compared with blue light, the red light is
   a) slowed down less and refracted less
   b) slowed down less and refracted more
   c) slowed down more and refracted less
   d) slowed down more and refracted more

2) Which of the following statement is true?
   a) Two equal forces form a couple
   b) Two equal forces acting in the same direction form a couple
   c) Two equal but opposite parallel forces not acting along the same line of action form a couple
   d) A force acting at the centre of gravity is called a couple.

3) Two parallel rays of light A and B as shown in the figure pass through two boxes. The possible combination of devices used in boxes I and II are…
   a) convex lens and concave lens
   b) concave lens and convex lens
   c) concave mirror and convex mirror
   d) convex mirror and concave mirror



4) If m is mass, K is kinetic energy and p is momentum, then the correct relation amongst them is…
   a) $p = \sqrt{2mK}$
   b) $m = p^2/2K$
   c) $K = p^2/2m$
   d) all of these

5) When a satellite revolves in a circular orbit around a planet then work done is zero, because:
   a) the centrifugal force on the body and the displacement are normal to each other
   b) the centripetal force on the body and the displacement are normal to each other.
   c) the displacement of the body is zero
   d) the displacement is in the same direction of the force.

6) The critical angle for glass is 42°. The corresponding angle of refraction is:
   a) 0°
   b) 90°
   c) lesser than 90° but more than 42°
   d) no angle of refraction.

7) 1 GJ = _____ erg.
   a) 10^{12}
   b) 10^{14}
   c) 10^{16}
   d) 10^{18}

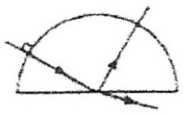
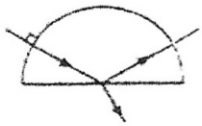
8) Following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

Assertion(A): Light travels from one medium to another, the frequency of light does not change.

Reason (R): The energy of the light wave is directly proportional to its frequency and since energy cannot be created or destroyed; the frequency of the wave cannot change as it moves from one medium to another.

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

9)A ray of red light enters a semi-circular glass block normal to the curved surface. Which diagram shows the partial reflection and refraction of the ray in the most appropriate manner?

(a)  (b)  (c)  (d) 

10) ~~Which diagram shows the partial reflection and refraction of the ray in the most appropriate manner ?~~9The sound produced by two tuning forks A and B have same amplitude and same waveform, but the frequency of A is three times more than B. In such a case:

a) quality of sound of A differs from B
b) the note produced by A is shriller than B
c) the note produced by B is shriller than A
d) the note produced by A has more speed than B.

11) 1 hertz is equal to

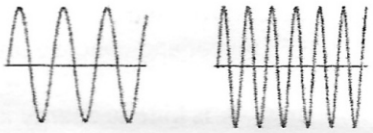
a) 1 vibration per minute
b) 100 vibrations per minute
c) 60 vibrations per second
d) 60 vibrations per minute

12) The picture shows the soldiers crossing the bridge. It is always advised the troops not to march on the suspension bridge, because…

a) the vibrations of the bridge will be stopped
b) the amplitude of the bridge vibrations will gradually decrease.
c) the bridge may vibrate with large amplitude due to resonance.
d) the bridge will be overloaded.

13) The number of vibrations made by two waves M and N in a similar given time interval is shown alongside. What can be concluded about M and N ?

a)M is louder than N
b)N is louder than M
c)M is shriller than N
d)N is shriller than M



M N

14) Commercial unit of electrical energy is…

a) kWh b) kW/h c) kWh^{-2} d) kWAh

15) α, β and γ are the three radioactive radiations. The correct way to arrange them in the ascending order of their penetrating power is

a) $\alpha < \beta < \gamma$
b) $\gamma < \beta < \alpha$
c) $\beta < \alpha < \gamma$
d) $\beta < \gamma < \alpha$

Q 2) Answer the following as instructed:

1) An object placed in front of a spherical lens at a distance of 20 cm produces a magnification of $-\frac{2}{3}$. Where and how much the object be shifted so as to obtain a magnification of $-\frac{3}{2}$. Also mention the nature of the lens. [3]
2) Mention the two essential conditions for a light ray to undergo total internal reflection. [2]
3) Draw a simple diagram of a fire tongs and mark on it the fulcrum F and the point of application of effort E. [2]
4) Calculate the kinetic energy of a body of mass 0.2 kg and momentum 40 kg ms^{-1}. [2]

5) Mention the differences between heat capacity and specific heat capacity. [2]
6) A sound wave travelling in water has a wavelength 0.4 m. Is this wave audible in the air? (The speed of sound in water = 1400 ms^{-1}) [2]
7) Draw a graph to show the variation of angle of deviation (δ) with angle of incidence (i). [2]

Q 3) Answer the following questions:

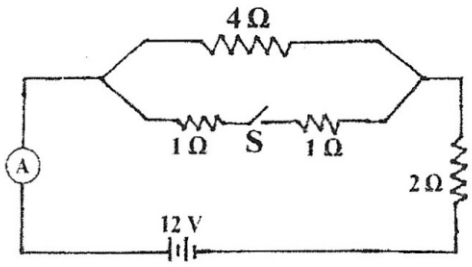
1) A uniform metre scale can be balanced at the 70.0 cm mark when a mass of 0.05 kg is hung from the 94.0 cm mark. [2]
   a) Draw a diagram of the arrangement.
   b) Find the mass of the metre scale.

2) Mention any 2 uses of UV radiations. [2]

3) A wire is stretched to 3 times its original length. Find the ratio between their... [2]
   a) Initial and final resistances.
   b) Initial and final resistivities.

4) Draw an Energy vs Height graph representing the conservation of energy (showing KE + PE = Total conserved energy) [2]

5) The figure alongside shows a circuit diagram. Find the reading of the ammeter A when... [2]
   a) the switch S is ON
   b) the switch S is OFF

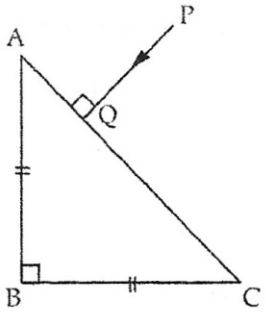


SECTION – B [40 Marks]

(Attempt any four questions from this section)

Q 4) 1) 10 g of ice at 0°C absorbed 5460 J of heat to melt and change to water at 50°C. Calculate the specific latent heat of fusion of ice. *Specific heat capacity of water is 4200 J/Kg^{0}C.* [3]

2) A ray of light PQ is incident normally on the hypotenuse of a right-angled prism ABC as shown in the diagram. [3]
   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.

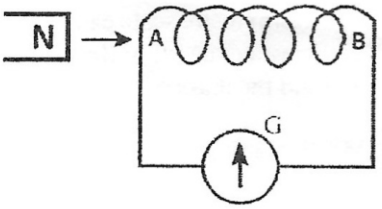


3) Two resistors of 8 Ω and 6 Ω are connected in parallel to a cell to draw 0.8A current from a cell. [4]
   a) What is the emf of the cell ?
   b) Calculate the current in each resistor.

Q 5) 1) Calculate the quantity of heat (in calories) that will be produced in a coil of resistance 75 Ω if a current of 2A is passed through it for 2 min. [3]

2) a) Mention the position of centre of gravity for a triangular lamina. [3]
b) The bottom of a ship is made heavy. Why?
c) Define Centre of Gravity.

3) The diagram shows a coil connected to a galvanometer G. It shows a deflection to the right when the North pole of a powerful magnet is moved to the right as shown : [4]



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.

Q 6) 1) A lens produces a virtual image between the object and the lens. [3]
a) Name the lens.
b) Draw a ray diagram to show the formation of this image.

2) 2.5 kg of ice at 0°C is heated uniformly by an electric heater rated 2KW. If all heat is absorbed by ice, calculate the time intervals in seconds for : [3]
a) Ice to completely melt to form water at 10°C.
b) Water at 10°C to attain a temperature of 100°C.
c) Water to change to steam at 100°C.
Given: Sp. latent heat of ice = 336,000 J Kg^{-1}
Sp. latent heat of steam = 2260,000 J Kg^{-1}
Sp. heat capacity of water = 4200 J Kg^{-1} $°C^{-1}$

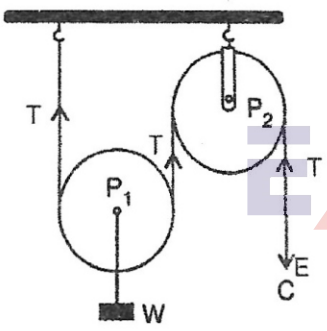
3) a) What do you understand by the subscript and superscript in $_{92}U^{235}$? [2]
b) What values does A,B,C and D hold in the following nuclear reaction ? [2]

$$_{92}U^{A} + {}_{0}n^{1} \longrightarrow {}_{36}Kr^{B} + {}_{C}Ba^{141} + D{}_{0}n^{1} + \triangle$$

Q 7) 1) Give reasons for the following: [3]
a) Ultraviolet bulbs have a quartz envelope instead of glass.
b) Infrared radiations are used for photography in fog.
c) Why does the sky appear blue in colour?

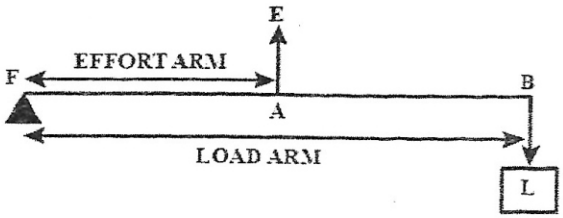
2) a) Can the absolute refractive index of a medium be less than 1? Explain. [1]
b) A coin placed at the bottom of a beaker appears to be raised by 4.0 cm. If the refractive index of water is 4/3, find the depth of the water in the beaker. [2]
3) a) List the factors on which the magnetic field strength by a current carrying straight conductor depends.
b) State the rule which gives the direction of its magnetic field.
c) Mention the pattern of magnetic field lines due to a straight current carrying conductor. [4]

Q 8) 1) The diagram in figure shows the combination of two pulleys P_1 and P_2 used to lift up a load W. [3]
a) State the kind of pulleys P_1 and P_2.
b) State the function of the pulley P_2.
c) What effort E has to be applied at C to just raise the load W of 20 kgf ?
(Neglect both the weight of the pulley P_1 and the friction)



[4]

2) a) Identify the class of the lever shown in the diagram. [3]
b) How is it possible to increase the M.A. of this lever without increasing its length?
c) How is this lever different from class 2 lever?



3) The diagram below shows the displacement-time graph for a vibrating body. [4]
a) Name the type of vibrations exhibited in this case.
b) Why the amplitude of this wave gradually deceasing?
c) What happens to the vibrations after some time?
d) What is the distance travelled by the wave in 1 time-period called?