Estd. 1861

BOYS' HIGH SCHOOL AND COLLEGE
PRELIMINARY EXAMINATION (2024-25)
CLASS – X
PHYSICS

Maximum Marks: 80 **Time allowed: Two hours.**

Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during 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 the answers.

Section A is compulsory. Attempt **any four** questions from **Section B.**
The intended marks for the questions are given in brackets [ ]

SECTION – A

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. S.I unit of moment is
   a) kgf.m
   b) Nm
   c) gf.m
   d) Ncm

II. Which of the following is the correct expression for gain in kinetic energy, if initial velocity is not zero?
   a) $K = 1/2\ mv^2$
   b) $K = m/4\ v^2$
   c) $K = mv^2/2t$
   d) $K = 1/2m\ (v^2 - u^2)$

III. When seven spectral colours passes through a glass block from air, then which one of the following statements is correct:
   a) In the glass block, speed of blue light > speed of yellow light
   b) In the glass block, speed of green light > speed of orange light
   c) In the glass block, speed of violet light > speed of red light
   d) In the glass block, speed of orange light > speed of indigo light

IV. The characteristics of sound which enables to differentiate between two sounds of different intensity is:
   a) Quality
   b) Amplitude
   c) Pitch
   d) Loudness

V. When a conductor carrying current is placed in a magnetic field, perpendicular to it then the direction of the force experienced can be found out using:
   a) Lenz's law
   b) Fleming's left-hand rule
   c) Fleming's right-hand rule
   d) Right hand thumb rule

(a) $\angle i < \angle r$

(b) $\angle i = \angle r$

(c) $\angle i > \angle r$

(d) $\angle i \leq \angle r$

VI. While entering from medium A to medium B if light entering from slows down then

VII. The phenomenon of light that causes diamond to glitter is:
   a) Refraction
   b) Total internal reflection
   c) Reflection
   d) Absorption

VIII. Which of the following statement is not the characteristic of the magnetic field set up by a straight conductor carrying current?
   a) Any conductor in which current flows behaves like a magnet.
   b) The direction of magnetic field is in the direction of the flow of the current.
   c) The direction of magnetic field is at right angle to the direction of flow of current.
   d) The magnetic intensity increases with the increase in magnitude current in the conductor.

IX. The thermal capacity of a solid is is 400 J/K. The amount of heat supplied to it will be _____ if its temperature rises by 40K.

a) 16000 J
b) 1600 J
c) 1000 J
d) None of these

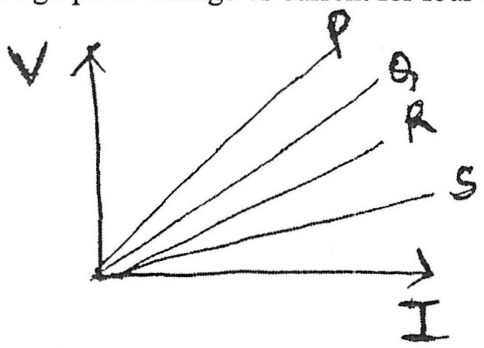
X. 3.75×10^5 calories of heat is given out by 5.0 kg of water at 100 °C. If the specific heat capacity of water is 1000 cal kg^{-1} $°C^{-1}$, the temperature of cold water is:

a) 25 °C
b) 25.5 °C
c) 24.5 °C
d) 24 °C

XI. A moment of a couple has a tendency to rotate the body direction in an anticlockwise direction. Then the moment of couple is taken as:

a) Positive
b) Negative
c) Maximum
d) Zero

XII. The graph of voltage vs current for four different materials is, given below:



Which of these four materials would be used for making filament of bulb?

a) Q
b) S
c) P
d) R

XIII. According to the new convention, the colour of live wire is:

a) Black
b) Brown
c) Yellow
d) Red

XIV. The amount of heat energy required to melt a given mass of a substance at its melting point without any rise in its temperature is called:

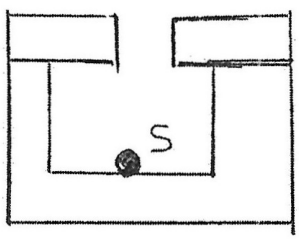
a) Specific heat capacity
b) Specific latent heat of fusion
c) Latent heat of fusion
d) Specific latent heat of freezing

XV. Two copper wires can have different _____ but will have same _____

a) resistivity, resistance
b) resistance, resistivity

Question 2

I. The figure shows a radioactive source 'S' in a thick lead walled container having a narrow opening. The radiations pass through an electric field between the plates A and B. [3]



a) Complete the diagram to show the paths of α, β and γ radiations.
b) Why is the source 'S' kept in a thick-walled container with a narrow opening?
c) Which radiation is deflected the most? Give reason.

II. In an electric circuit two resistors of 12 Ω each are joined in parallel to a 6 V battery. Find the current drawn from the battery. [2]

III. If four identical resistors of resistance 8 ohm are first connected in series so as to give an effective resistance Rs and then connected in parallel so as to given an effective resistance Rp, then find the ratio of Rs/ Rp. [2]

IV. What kind of energy is possessed by a body in the following cases: [2]

a) A shooting arrow.
b) A stone lying on the top of a hill.

V. State two properties of a material which makes it suitable for an electric fuse. [2]

VI. State the nature of the lens and find the focal length if its power is +4D. [2]

VII. How is the loudness of sound related to: [2]

a) Amplitude of the vibrating body
b) Distance of the observer from the vibrating body

Question 3

I. By drawing a neat diagram, explain how a totally reflecting prism can be used to turn rays through 180°. [2]

II. With reference to magnitude of force and its direction, how does centripetal force differ from centrifugal force. [2]

III. State two factors which determine lateral displacement. [2]

IV. How is the refractive index of a medium related to its: [2]

a) Real and apparent depth
b) Velocity of light in vacuum and velocity of light in a given medium.

V. The stem of a vibrating fork is pressed against the table top. [2]

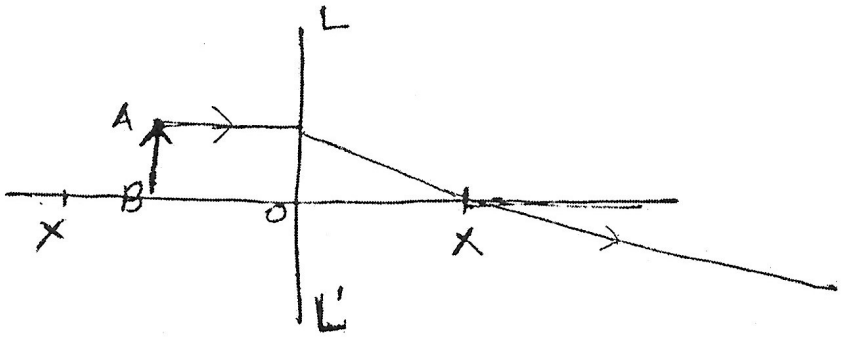
a) Does the above action cause the table to be set into vibration? What kind of Vibrations are they?
b) Under what conditions, the above action leads to resonance?

SECTION - B

(Attempt any four questions)

Question 4

a) Refer to the diagram: [3]



i. Copy and complete the ray diagram to show the formation of the image of the object AB.
ii. Name the lens LL'
iii. Name a device in which this principle is used.

b) State: [3]

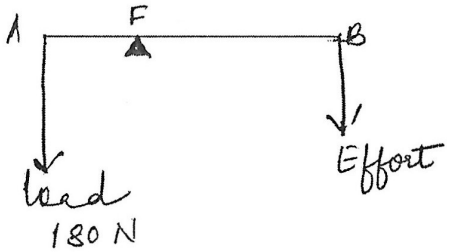
i. The critical angle for glass-air interface is 45° for the light of yellow colour. State whether it will be less than, equal to, more than 45° for i) red light ii) blue light.
ii. A ray of light incident at an angle 48° on a prism of refracting angle 60° suffers minimum deviation. Calculate the angle of minimum deviation.

c) A block and tackle system of pulleys has a velocity ratio 4. [4]

i. Draw a labelled diagram of the system indicating clearly the points of application and direction of load and effort.
ii. What is the value of the mechanical advantage of the given pulley system if it's an ideal one?

Question 5

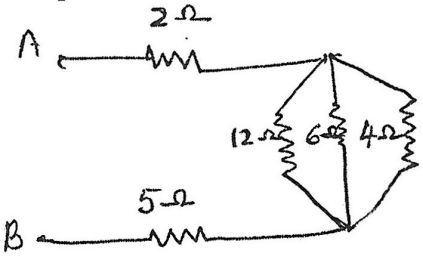
a) The diagram below shows a lever in use. [3]



i. To which class of lever does it belong?
ii. If AB= 1.2m, AF= 0.2 m, find its mechanical advantage.
iii. Calculate the value of E.

b) State: [3]
i. What is an ohmic resistor?
ii. Two copper wires are of same length, but one is thicker than the other.
1. Which wire will have more resistance?
2. Which wire will have more specific resistance?

c) Find the equivalent resistance between points A and B. [4]



Question 6

a) Answer the following: [3]
i. A fuse is rated 8 A. Can it be used with an electrical appliance rated 5kW, 200V? Give a reason.
ii. An electric iron is rated 220 V, 2kW. If the iron is used for 2 hours daily, find the cost of running it for one week, if its costs ₹ 4.25 per kWh.

b) Answer the following: [3]
i. A cell is sending current in an external circuit. How does the terminal voltage compares with the emf of the cell?
ii. What is the purpose of using a fuse in an electric circuit?
iii. What are the characteristic properties of a fuse wire used?

c) Draw a representative labelled diagram of a D.C electric motor and write the function of any three of the labelled parts. [4]

Question 7

a) A radioactive nucleus ${}_{84}X^{202}$ of an element emits a beta particle followed by 2 alpha particles such that final nucleus is ${}_{a}Y^{b}$. Find the value of 'a' and 'b'. [3]

b) 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 as 4.2 J g^{-1} $°C^{-1}$) [3]

c) Give reasons: - [4]
i. The temperature of the surroundings starts falling, when the ice of a frozen lake start melting.
ii. Stringed musical instrument such as a sitar is provided with a number of wires of different thickness.

Question 8

a) How is the magnetic field due to a straight conductor carrying current affected if the current in the wire is? [3]
i. Decreased ii. Reversed.

b) Choose the correct answer: [3]
i. One megawatt is equivalent to _____
A. 10^3 W
B. 10^6 W
C. 10^9 W
D. 10^{12} W

ii. The direction of induced current in an AC generator changes once in each _____

A. Two revolutions
B. One revolution
C. Half revolution
D. One – fourth revolution

iii. A galvanometer is used to

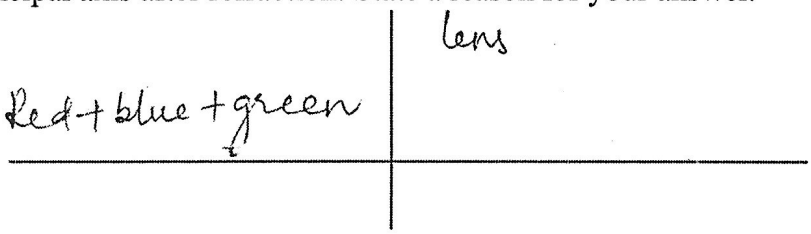
A. Measure potential difference
B. Measure electric power of the circuit
C. Detect direction of the current
D. Measure amount of current flowing

c) Answer the following questions on transformers: - [4]

i. Why is the core of a transformer made of soft iron or silicon steel?
ii. Why are the sheets of the core laminated?
iii. Name two kinds of energy losses in a transformer.
iv. How are they minimized?

Question 9

a) A mixture of red+ blue+ green colours are passed through a convex lens as shown in the diagram. State whether the ray passes through a single point or through different points on the principal axis after refraction. State a reason for your answer. [3]



b) As per the following scenarios, state whether the work done by gravity is positive, negative or zero. [3]

i. A car in neutral gear is coming down a slope.
ii. A person climbs a ladder.
iii. A person walks on a levelled road.

c) A person standing in front of a cliff fires a gun and hears its echo after 3 seconds. If the speed of sound in air is 336 ms^{-1} [4]

i. Calculate the distance of the person from the cliff.
ii. After moving a certain distance from the cliff, he fires the gun again and this time the echo is heard 1.5 seconds later than the first. Calculate the distance that the person moved.

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