BOYS' HIGH SCHOOL AND COLLEGE
PRELIMINARY EXAMINATION (2023-24)
CLASS - X
PHYSICS

TIME 2:00 Hours   **MM: 80**

Note : Attempt All Questions from Section A and any Four Questions from Section B.
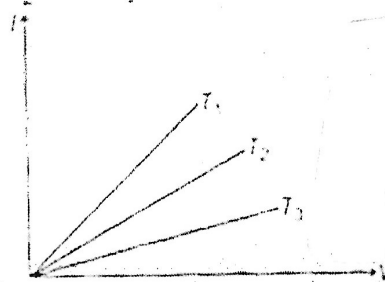
Section (A) (40 Marks)

(Attempt All Questions from this section)

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

(i) The graph shows I versus V relation for a conductor at three temperatures T_1, T_2 and T_3. Choose the correct relation for T_1, T_2 and T_3.

a) $T_2 > T_1 > T_3$

b) $T_3 > T_2 > T_1$

c) $T_1 > T_2 > T_3$

d) $T_1 < T_3 < T_2$

(ii) If the velocity of a moving body is increased to double, then its kinetic energy will be.
a) increased to double   c) decreased to half
b) increased to four times   d) decreased to one-fourth

(iii) Which of the following liquid will take longer time to cool?
a) Substance with specific heat capacity $4000 Jkg^{-1}K^{-1}$
b) Substance with specific heat capacity $8000 Jkg^{-1}K^{-1}$
c) Substance with specific heat capacity $2000 Jkg^{-1}K^{-1}$
d) Substance with specific heat capacity $3000 Jkg^{-1}K^{-1}$

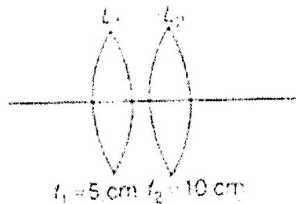(iv) The physical quantity that remains unchanged when a sound wave goes from one medium to another is
a) Amplitude   c) Wavelength
b) Speed   d) Frequency

(v) What will be the power of the combination of lenses given below?
a) 10D   c) 30D
b) 20D   d) 40D

(vi) The radiation with maximum energy is
a) Gamma-rays

b) beta-rays

c) X-rays

d) Alpha-rays

(vii) **Assertion (A)** : Light travels faster in glass than in air
Reason (R) : Glass is denser than air
a) Both A and R are true.   c) A is false and R is true.
b) Both A and R are false.   d) A is true and R is false.

(viii) Which of the following is true for rays coming from infinity?

a) Two images are formed

b) One image is formed

c) No image is formed

d) More than two images are formed between focal points of upper and lower lens.
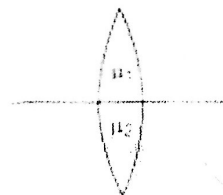
(ix) Apparent depth is due to
a) Reflection of light   c) Refraction of light
b) Scattering of light   d) Diffuse reflection of light

(x) A battery of 10V carries 20000C of charge through a resistance of 20Ω. The work done in 10 sec is
a) $2 \times 10^3 J$ c) $2 \times 10^4 J$
b) $2 \times 10^5 J$ d) $2 \times 10^2 J$

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(xi) A submarine produces an ultrasonic wave of velocity 1500m/s in water. The officer receives signal after 50s of emission of the wave. Find the distance of object which is present in the bottom of the sea.

a) 25.7km

c) 37.5km

c) 37.5m

d) 50 km

(xii) A body of mass 'm' is accelerated with acceleration 'a'. The kinetic energy in time 't' as it starts from rest is given by.

a) $\frac{mat}{2}$

b) $\frac{m}{2}a^2t^2$

c) mat^2

d) $\frac{ma^2t}{2}$

(xiii) A student arranged the circuit components as shown in the figure but he did not succeed to find the equivalent resistance of two resistors connected in series. Which of the following mistakes has been committed by him in setting up the circuit?

a) Position of ammeter is incorrect.

b) Position of voltmeter is incorrect.

c) Terminals of ammeter is wrongly connected.

d) Terminals of voltmeter is wrongly connected.
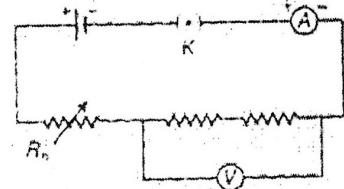
(xiv) According to the new convention, the colour of live wire in a cable is

a) Brown

b) Green

c) Black

d) Light Blue

(xv) The optical phenomena, twinkling of stars is due to

a) Atmospheric reflection

b) Total internal reflection

c) Atmospheric refraction

d) Scattering

Q.2 (i)

a) Why is it easier to draw water from a well when the rope passes over a pulley?

b) Following equations reflect the nuclear reactions described incompletely. Fill the gaps in these equations

$$^{210}_{93}Bi \rightarrow \text{.........} Po + ^{-1}_{0}\beta \text{-particle}$$

$$^{39}_{19}K + ... \rightarrow ^{42}_{20}Ca + ^{1}_{1}H$$ [3]
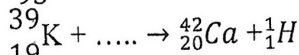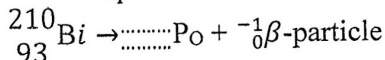
(ii) What are the factors affecting turning of a body? [2]

(iii) Where is the centre of gravity of the following object situated?

a) Scalene triangle

b) Rhombus

c) Solid cone

d) Hollow sphere [2]

(iv) a) Derive the relation between CGS and SI unit of power.

b) A man is holding a suitcase in his hand at rest. What is the work done by him. [2]

(v) a) A baby recognizes her mother by her voice. Name the characteristic of sound involved.

b) A human heart beats 72 times in 1 min. Calculate its frequency. [2]

(vi) a) A torch blub when cold has 1Ω resistance. It draws a current 0.3A when glowing from a source of 3V. Calculate the resistance of the bulb when glowing.

b) Explain the reason for the difference in resistance. [2]

(vii) A straight conductor passes vertically through a cardboard having some iron fillings sprinkled on it. What changes occur if.

a) the strength of current is increased?

b) the single conductor is replaced by several parallel conductors each carrying same current flowing in the same direction? [2]

Q.3 (i) A convex lens forms an image of an object equal to the size of the object? Draw a diagram to illustrate this situation. [2]

(ii) If a current of 0.15 A flows through a wire for 60s across two points having potential difference 15V, then calculate the amount of charge that flows through the circuit and amount of work done required to transfer this charge. [2]

(iii) Name the material used for

I. heating element for heater and

I. conducting wire. [2]

(iv) a) write the SI unit of heat capacity.

b) Name the liquid that has the highest specific heat capacity. [2]

(v) A radioactive element $_Z^A X$ first emits a β-particle and then an α-particle and the resulting nucleus can be represented by $_Q^P \gamma$. What are the values of P and Q in terms of A and Z? [2]

Section - B (40 marks)
(Attempt any FOUR Questions)

Q.4 (i) a) Two circular coils P and Q are kept close to each other of which coil P carries a current. If coil P is moved towards Q, will some current be induced in coil Q? Give reason for your answer and name the phenomenon involved.
a) What happens, if coil P is moved away from Q?
b) State one way to increase the induced current in the coil Q. [3]
(ii) a) Mention two possible sources of background radiation.
b) Draw the labelled diagrams of deflection of radioactive radiations in electric and magnetic fields. [3]

(iii) Show, how would you connect three resistors each of 6Ω, so that the combination has a resistance of
a) 9Ω   b) 4Ω
Also draw simple diagrams to support your answer. [4]

Q.5 (i) a) A solid mass 200g at $100^0 c$ is dropped into 80g of water at 10^0C. If the final temperature is 40^0C. Calculate the heat capacity of the solid.
b) Which has more heat, 1g of ice at 0^0C or 1g of water at 0^0C? [3]
(ii) a) Why ice is used to cool the soft drinks?
b) Differentiate between heat capacity and specific heat capacity. [3]
(iii) The diagram shows below, a current carrying loop passing through a sheet of stiff cardboard at the points P and Q.
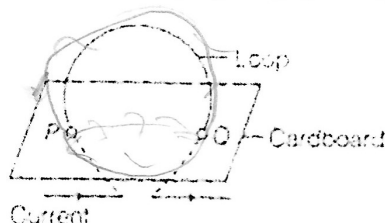
a) Draw three magnetic field lines on the cardboard, one each at points P and Q and one at the centre of loop. Draw arrows to show the direction of magnetic field lines.
b) State and factor on which the magnitude of magnetic field at the centre of loop depends.
c) State two ways through which the strength of an electromagnet can be
increased. [4]

Q.6 (i) A block and tackle system has the velocity ratio 4.
a) Draw a labelled diagram showing point of application and direction of load and effort.
b) A man can exert a pull of 500N. What is the maximum load he can raise with the pulley system, if its efficiency is 80%? [3]
(ii) a) A body is acted upon by two forces each of magnitude F, but in opposite directions. State the effect of the forces, if both forces act at the same point of the body.
b) A uniform meter scale rests horizontally with a hard massless string at the 60cm mark when a mass of 10g is suspended from one end. From which end, this mass be suspended? What is the mass of the meter scale? [3]

(iii) a) Mohan drops a hammer, which falls to the ground. The hammer has a mass of 4.0kg and is dropped from a height of 6.0m above the ground. Calculate the change in gravitational potential energy of the hammer when it is dropped.
b) Describe the energy changes from the time, the hammer leaves the hand of (Mohan) until it is at rest on the ground.
c) Rahul picks up the hammer from the ground and takes it back up the ladder to Mohan. He climbs the first 13.5m in 8.0s. His total weight including the hammer is 600N.
Calculate the useful power which his legs are producing. [4]

Q.7 (i) a) State the conditions required for total internal reflection of light to take place.
b) The diagram shows the refraction of a ray of light from air to a liquid. Write the values of angle of incidence and refraction. [3]
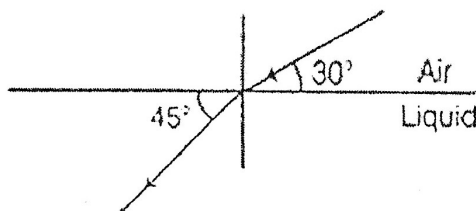
(ii) A 6 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 25cm. The distance of the object from the lens is 40cm. By calculation, determine
a) the position and
b) the size of the image formed. [3]
(iii) a) When does a ray of light falling on a lens pass through it undeviated?
b) Copy and complete the ray diagram to show the formation of the image of the object PQ.
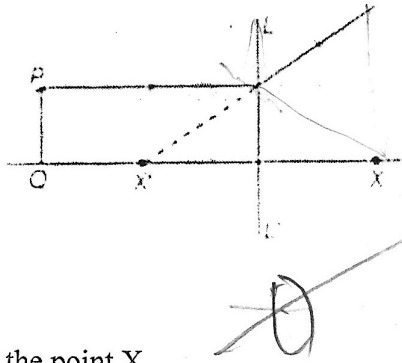
I. Name the lens LL'
II. What is the name given to the point X. [4]
Q.8 (i) a) Draw the schematic diagram of two-way switch circuit. (with bulb in ON position).

b) Write one advantage for using ring system in house-wiring. [3]
(ii) A person standing between two vertical cliffs and 480m 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. [3]
(iii) A string is vibrating between two fixed points. Three different modes of vibration of the string is shown in the diagram.
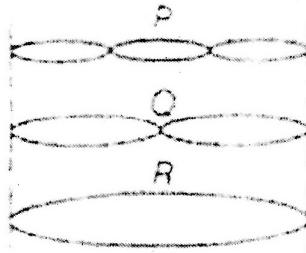
a) Which vibrations will produce a louder sound and way?
b) The sound of which string will have maximum shrillness?
c) State the ratio of wavelength of P and R. [4]
Q.9 (i) An aluminum vessel of mass 200g contains 500g of water at 25^0C. Calculate the amount of heat required to raise water temperature upto 75^0C, Given specific heat capacity of aluminum = 0.21 cal/g^0C, specific heat capacity of water = 1cal/g^0C, density of water = 1g/cm^3. [3]
(ii) a) Water in lakes and ponds does not freeze at once in cold countries. Give a reason in support of your answer.
b) What is the principle of calorimetry?
c) Name the law on which this principle is based. [3]
(iii) A flat rectangular coil is rotated between the pole pieces of a horse-shoe magnet.
a) In which position of coil with respect to the magnetic field, will the emf be.
I. maximum   II. zero
b) When does the emf change its direction?
c) What is the name of the rule used to find direction of induced current? [4]

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