ICSE Board
Class X Physics
Gold Series
Sample Paper - 4

Time: 1½ hrs **Total Marks: 80**

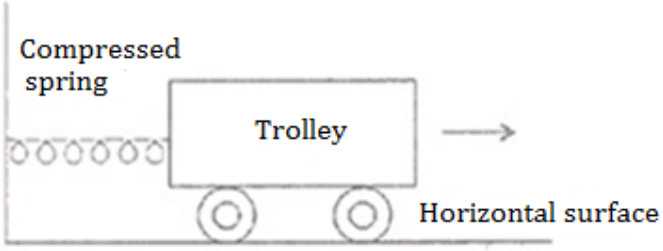
General Instructions:

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

Section 1 (40 Marks)
Attempt *all* questions from this section

Question 1 **[10]**

(a) A spring is kept compressed by a small trolley of mass 0.5 kg lying on a smooth horizontal surface as shown in the figure given below:



When the trolley is released, it is found to move at a speed of 2 ms^{-1}.

i. What type of potential energy did the spring possess when compressed?
ii. Find its value.

(b) State the energy changes which occur in the following when they are in use:

i. A photovoltaic cell
ii. An electromagnet

(c) Draw a ray diagram to illustrate the determination of the focal length of a convex lens using an auxiliary plane mirror.

(d)

i. Sketch a graph to show the change in potential difference across the ends of an ohmic resistor and the current flowing in it. Label the axes of your graph.
ii. What does the slope of the graph represent?

(e)

i. Which radiation produces maximum biological damage?
ii. What happens to the atomic number of an element when the radiation named by you in part (i) above is emitted?

Question 2 **[10]**

(a)

i. Why is the mechanical advantage of a lever of the second order always greater than one?

ii. Name the type of single pulley which can have a mechanical advantage greater than one.

(b) We can burn a piece of paper by focusing the sun rays on it using a particular type of lens.

i. Name the type of lens used for the above purpose.

ii. Draw a ray diagram to support your answer.

(c) Name the SI unit of

i. Linear momentum

ii. Rate of change of momentum

(d) Why do pieces of ice added to a drink cool it much faster than icy cold water added to it?

(e) How many alpha and beta particles are emitted when the uranium nucleus $^{238}_{92}U$ decays to lead $^{206}_{82}Pb$?

Question 3 **[10]**

(a) In a three pin plug, why is the earth pin made longer and thicker than the other two pins?

(b) State the condition for each of the following:

i. A symmetrical biconvex lens has both its focal lengths equal.

ii. A ray passes undeviated through the lens.

(c) Where is the fuse placed in an electrical circuit? Name a material suitable for making fuse wire.

(d) Two balls of mass ratio 1:2 are dropped from the same height.

i. What is the ratio of their velocities when they strike the ground?

ii. Find the ratio of the forces acting on them during motion.

(e)

i. A flag is made using three strips of cloth of colours yellow, white and cyan. Name the colour of a particular light in which this flag will appear to be of a single colour.

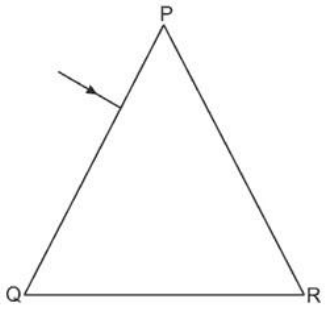
ii. Explain why radium paint consisting of zinc sulphide and a trace of radium salt glows in the dark.

Question 4 **[10]**

(a) Why is the efficiency of a single movable pulley system not 100%? Give two reasons.

(b) The ratio of the amplitudes of two waves is 5:7. What is the ratio of their intensity?

(c) Complete the ray diagram showing its emergence into air after passing through an equilateral prism.



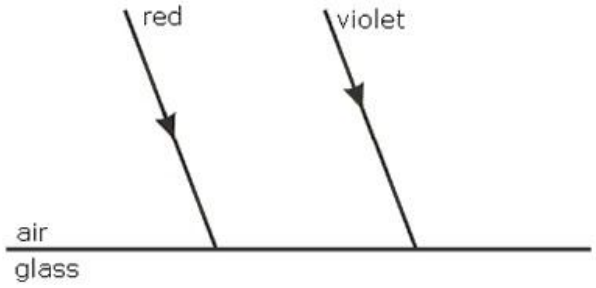
(d) A family uses a light bulb of 100 W, a fan of 100 W and a heater of 1000 W, each for 8 hours a day. If the cost of electricity is Rs 2 per unit, what is the expenditure for the family per month of 30 days on electricity?

(e) Radio waves of speed 3×10^8 m/s are reflected off the moon and received back on the earth. The time elapsed between the sending of the signal and receiving it back on the earth station is 2.5 seconds. What is the distance of the moon from the earth?

Section 2 (40 Marks)
Attempt *any four* questions from this section

Question 5 **[10]**

(a)



Two parallel rays of red and violet travelling through air meet the air–glass boundary as shown in the above figure.

i. Will their paths inside the glass also be parallel? Give a reason for your answer.
ii. Compare the speeds of the two rays inside the glass. What is their speed ratio in air?

(b)

i. A certain radioactive nucleus emits a particle which leaves its mass unchanged, but increases its atomic number by one. Identify this particle and write its symbol.
ii. Name the process, nuclear fission or nuclear fusion, in which the energy released per unit mass is more.
iii. State two uses of nuclear fission.

(c)

i. A person is tuning his radio set to a particular station. What is the person trying to do to tune it?
ii. Name the phenomenon involved in tuning the radio set.
iii. Define the phenomenon named by you in part (ii).

Question 6 **[10]**

(a) A piece of ice of mass 40 g is dropped into 200 g of water at 50°C. Calculate the final temperature of water after all the ice has melted. (Specific heat capacity of water = 4200 J/kg°C, specific latent heat of fusion of ice = 336×10^3 J/kg)

(b) Explain the following:

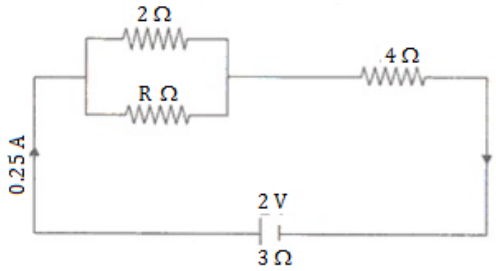
i. Why does the weather become pleasant when it starts freezing in cold countries?
ii. Why is it advisable to pour cold water over burns caused on the human body by hot solids?

(c) Complete the following reaction using the appropriate values in place of A.

$${}^{A}_{92}U + {}^{1}_{0}n \rightarrow {}^{148}_{z}Ba + {}^{A}_{36}Kr + 3{}^{1}_{0}n$$

Question 7 **[10]**

(a) The circuit shows three resistors of 2 ohm, 4 ohm and R ohm connected to a battery of e.m.f. 2 V and internal resistance $3\,\Omega$. A main current of 0.25 A flows through the circuit.

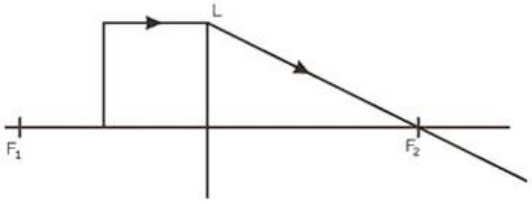


Find:

i. The potential difference across the $4\,\Omega$ resistor.
ii. The potential difference across the internal resistance of the cell.
iii. Value of R.
iv. The potential difference across RΩ and $2\,\Omega$ resistors.

(b) Study the given diagram and answer the questions:

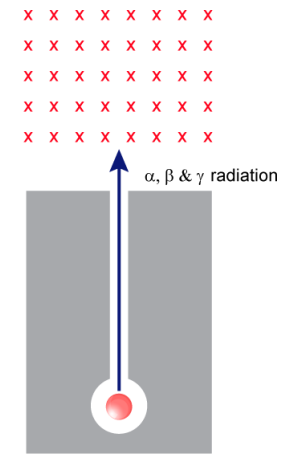
i. Name lens L.
ii. Name points F_1 and F_2.
iii. Draw a ray diagram to show the position and the nature of the image formed.



Question 8

[10]

(a) A mixed source of α and β particles along with γ rays are coming from the radioactive source placed in a lead container. All these radiations pass through the magnetic field as shown in the figure. Show how each radiation is deflected in the magnetic field.



(b) How does the value of the angle of deviation produced by a prism change with an increase in the

i. Value of angle of incidence (represent graphically as well)

ii. Wavelength of incident light

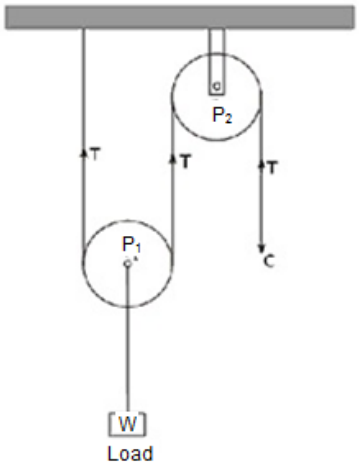
(c)

i. If a monochromatic beam of light undergoes minimum deviation through an equiangular prism, how does the beam pass through the prism, w.r.t. its base?

ii. If white light is used in the same way as in (i) above, what change is expected in the emergent beam?

Question 9 **[10]**

(a) The figure below shows the combination of a movable pulley P_1 with a fixed pulley P_2 used for lifting a load W.



i. State the function of the fixed pulley P_2.

ii. If the free end of the string moves through a distance x, find the distance by which the load W is raised.

iii. Calculate the force to be applied at C to just raise the load W = 20 kg, neglecting the weight of the pulley P_1 and friction.

(b) A stamp placed under a glass slab of refractive index 1.5 appears raised by 0.6 cm. Find the real thickness of the glass slab.

(c) A body of mass 10 kg is moving with a velocity of 15 m/s. When a force is applied on it, its velocity becomes 35 m/s after 10 s. Calculate the applied force.

Question 10 **[10]**

(a) What is meant by total reflection? What are the two conditions which must be fulfilled for total internal reflection to occur?

(b)

i. What is meant by an echo?

ii. Mention one important condition necessary for an echo to be heard distinctly.

iii. Mention one important use of an echo.

(c) A bullet of mass 5 g travelling at a speed of 100 m/s penetrates a fixed target and is brought to rest in 0.015 s.

Calculate:

i. Distance of penetration

ii. Average force exerted by the bullet