PHYSICS

SCIENCE Paper – 1

(Two hours)

Answers to this paper must be written on the paper provided separately.

*You will **not** be allowed to write during the 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.

*Attempt all questions from **Section I** and any **four** questions from **Section II.***

The intended marks for questions or parts of questions are given in brackets [ ].

SECTION I (40 marks)

*Attempt **all** questions from this section.*

Question 1
(a) Obtain the difference between ideal and actual mechanical advantage.   [2]
(b) Give two examples of couple.   [2]
(c) From the ground floor, a man comes up the fourth floor of a building, using a staircase. Another person comes up to the same floor using an elevator. Neglecting work done, compare the work done in the two cases.   [2]
(d) Why are railway wagons not loaded beyond a certain limit?   [2]
(e) In the diagram of a stationary wheel barrow, the centre of gravity is at *A*. The wheel and the leg are in contact with the ground. The horizontal distance between *A* and *F* is 50 cm and that between *B* and *F* is 150 cm.
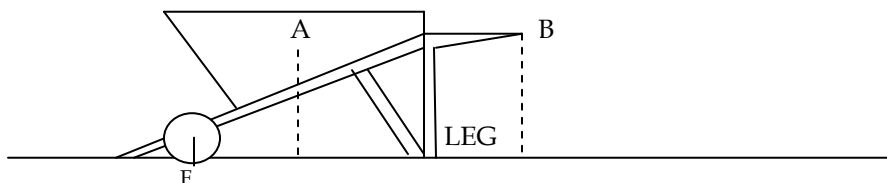

(i) What is the direction of the force acting at *A*? Name the force.
(ii) What is the direction of the minimum force at *B* to keep the leg off the ground? What is this force called?   [2]

Question 2
(a) What is meant by: (i) critical angle; (ii) total internal reflection?   [2]

(b) State two advantages of using a right-angled prism as a reflector rather than a plane mirror. [2]
(c) Rock-salt prism is used instead of glass prism to obtain infra-red spectrum. Why? [2]
(d) A harpoon used to kill a fish is aimed at a point below the apparent position of the fish. Why? [2]
(e) Copy the figure below and complete it to show the formation of image of the object AB. Name the lens used in the figure. [2]

F_1 F_2 A B
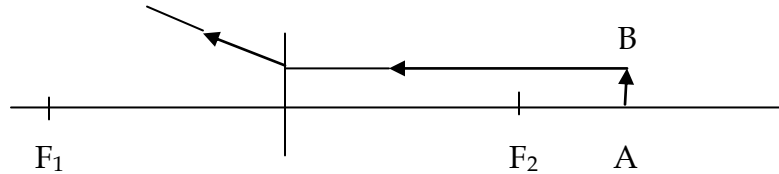
Question 3
(a) A bucket is placed below a water-tap. We can estimate the height of the water level in the bucket from a distance simply by listening to the sound. Why? [2]
(b) List the activities responsible for increase of methane in the earth's atmosphere. [2]
(c) What is wrong in the statement: Body at higher temperature contains more heat? [2]
(d) Mention two common properties of visible light and gamma radiations. [2]
(e) How are β – rays emitted from a nucleus while it does not contain electrons? [2]

Question 4
(a) What is the purpose of a fuse in an electric circuit? [2]
(b) What is the function of earth wire? [2]
(c) State two ways of increasing the speed of rotation of a d.c. motor. [2]
(d) Why are switches and fuse always placed in the live wire? [2]
(e) Why do we transmit alternating current at high voltage? [2]

SECTION II (40 marks)

*Attempt any **four** questions from this Section.*

Question 5

(a) In the given figure pendulum (A) is set into vibrations, which of the other three will vibrate with maximum amplitude and why? [3]

FLEXIBLE SUPPORT

B

A   D

C
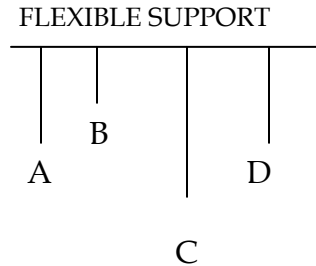
(b) Materials X, Y and Z are solids that are at their melting temperatures. Material X requires 200 J to melt 4 kg, Y requires 300 J to melt 5 kg and Z requires 300 J to melt 6 kg. Rank the materials according to their heats of fusion in descending order. Appropriate explanations are required. [3]

(c) (i) A boy weighing 350 N runs up a flight of 30 steps, each 20 cm high, in 5 seconds. Calculate the power expanded.

(ii) In a meter rod half of it is made up of copper and rest half of steel. Weights of copper and steel are 9 N and 8 N respectively. Is the centre of gravity of the rod at its geometric centre? If not, calculate where it is. [4]

Question 6

(a) What is meant by resonance? Describe and explain a simple experiment to illustrate the phenomenon of resonance. [3]

(b) (i) Give one difference between a chemical change and a nuclear change.

(ii) How is a cathode ray tube used to convert an electrical signal into a visual one? [3]

(c) A ray of red light is incident on a glass prism as shown in the figure below.

30°
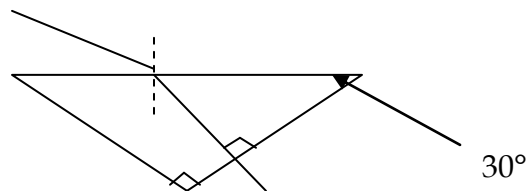
(i) Write the value of the angle of refraction.

(ii) Calculate the value of the angle of incidence, i of the light on the glass prism. Given that refractive index of glass for red light is 1.5. [4]

Question 7
(a) The diagram below shows a system of 5 pulleys.

Rigid Support
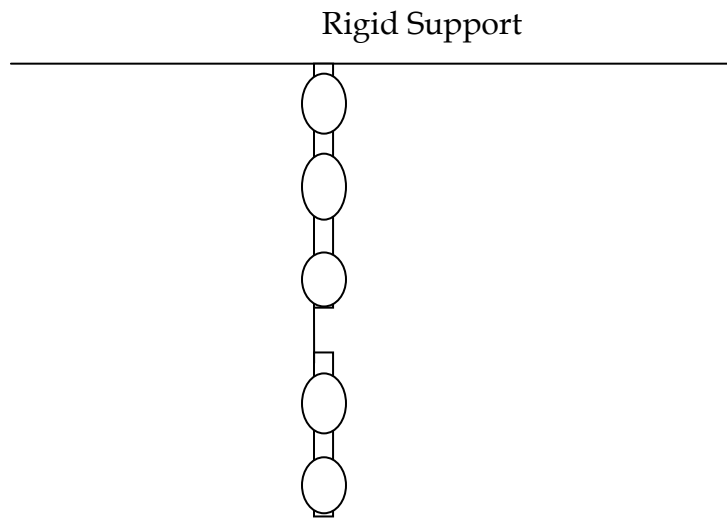
(i) Copy the diagram and complete it by drawing strings around the pulleys. Mark the position of load and effort.
(ii) If the load is raised by 1 m, through what distance will the effort move?   [3]
(b) A ray of monochromatic light enters a liquid. Angle of incidence is 45° and the angle of refraction is 30°. The refracted ray is incident on a plane mirror.
(i) Show by drawing a ray diagram the path of the ray after it strikes the mirror and goes into air.
(ii) Calculate the refractive index of the liquid.   [3]
(c) (i) An observer standing at the sea-coast observes 54 waves reaching the coast per minute. If the wavelength of the waves is 1000 cm, find the velocity of the waves.
(ii) A man standing in a gorge between two cliffs gives a short sharp shout. He hears two echoes, the first after 1 s and the next 1.5 s after his shout. The speed of sound is 340 m/s. Calculate the distance between the two cliffs.   [4]

Question 8
(a) How does a desert cooler lower the temperature? Why is it not effective after the monsoon sets in?   [3]
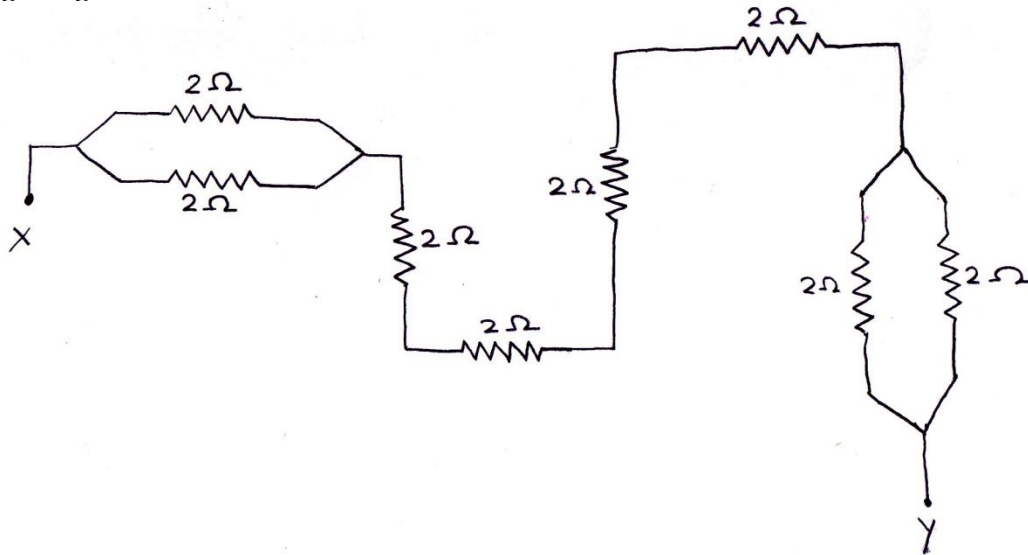
(b)

radioactive substance
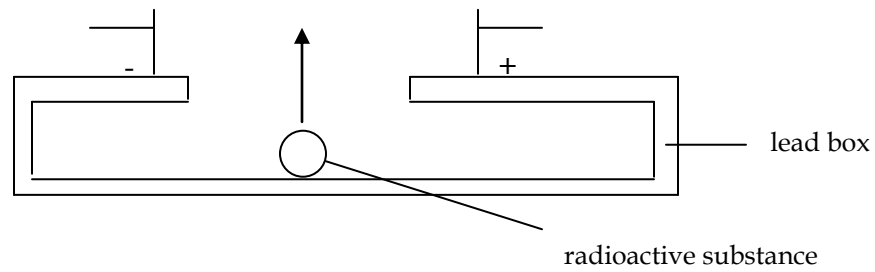
(i) Copy and complete the abve diagram by showing and labelling the paths of alpha, beta and gamma radiations in an electric field.

(ii) Name the radiations which have the least penetrating power. [3]

(c) (i) Calculate the resistance between the points X and Y in the network shown in the figure given below.

(ii) A battery of emf 15 V is connected to two coils of 4 Ω and 6 Ω joined in series. Find the electrical energy spent per minute in 6 Ω coil. [4]

Question 9

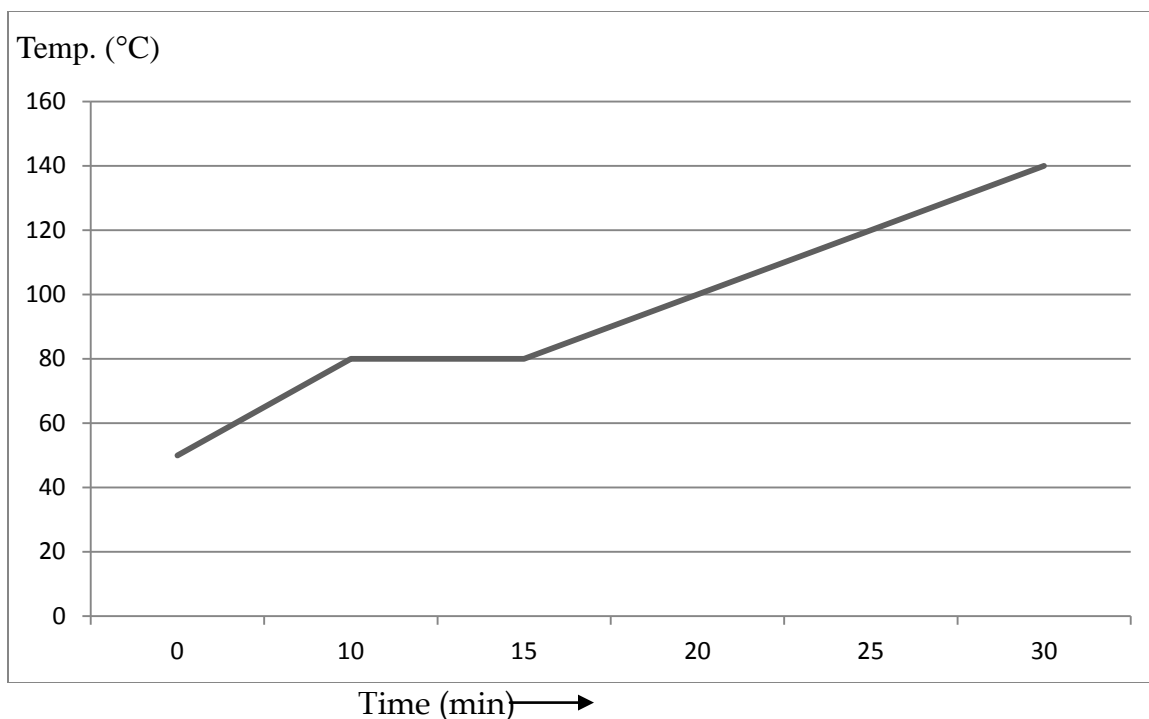(a) Name the chief energy transformations that occur in the following:

(i) A filament lamp

(ii) A photovoltaic cell

(iii) A washing machine [3]

(b) How are Fleming's left hand rule and right hand rule different from each other? [3]

(c) (i) A 20 g solid at 50°C is heated with a burner which supplies heat at a rate of 2 J/s. The figure given shows its temperature-time graph.

Temp. (°C) vs Time (min)

Calculate the specific heat capacity of the solid and the latent heat of fusion of the substance.

(ii) 5 g ice at - 20°C is mixed into 5 g water at 30°C. What will be the temperature of the mixture? [4]

Question 10
(a) What do you mean by an optical fibre? Draw a labelled diagram to illustrate its working. [3]
(b) (i) How are the electromotive force in the primary and secondary coils of a transformer related with the number of turns in both the coils and the current induced in both the coils?
(ii) Make a comparision between the primary coil and the secondary coil of a step-up transformer. [3]
(c) (i) Copy and complete the following nuclear equations by filling the correct values in the blanks:

$$^{238}_{92}P \xrightarrow{-\alpha} {}^{...}_{...}Q \xrightarrow{-\beta} {}^{...}_{...}R \xrightarrow{-\beta} {}^{...}_{...}T$$
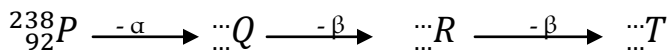
(ii) State whether the following nuclear disintegrations are allowed or not: (* indicates excited state)
A) $^*_zX^a \longrightarrow {}_zX^a + \gamma$ - rays
B) $_zX^a \longrightarrow {}_{z-2}{}^*X^a + {}_2He^4$. [4]