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.

Section I is compulsory. Attempt 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) (i) Give an example of a *non contact force* which is always of attractive nature. [2]

    (ii) How does the magnitude of this *non contact force* on the two bodies depend on the distance of separation between them?

(b) A boy weighing 40kgf climbs up a stair of 30 steps each 20cm high in 4 minute [2]
and a girl weighing 30kgf does the same in 3 minutes. Compare:-

    (i) The work done by them.

    (ii) The power developed by them.

(c) With reference to the terms Mechanical Advantage, Velocity Ratio and [2]
efficiency of a machine, name and define the term that will not change for a
machine of a given design.

(d) Calculate the mass of ice required to lower the temperature of 300g of water at [2]
$40°C$ to water at $0°C$.

(Specific latent heat of ice=336 J/g, Specific heat capacity of water=4.2 J/g°C)

This Paper consists of 7 printed pages and 1 blank page.

(e) What do you understand by the following statements: [2]

    (i) The heat capacity of the body is 60 JK^{-1}.

   (ii) The specific heat capacity of lead is 130 $Jkg^{-1}K^{-1}$.

Question 2

(a) State *two* factors upon which the heat absorbed by a body depends. [2]

(b) A boy uses blue colour of light to find the refractive index of glass. He then repeats the experiment using red colour of light. Will the refractive index be the same or different in the two cases? Give a reason to support your answer. [2]

(c) Copy the diagram given below and complete the path of light ray till it emerges out of the prism. The critical angle of glass is 42°. In your diagram mark the angles wherever necessary. [2]
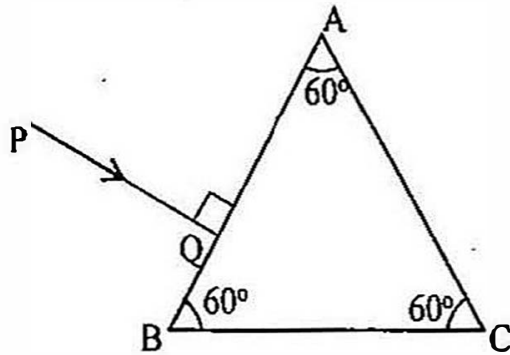
(d) State the dependence of angle of deviation: [2]

    (i) On the refractive index of the material of the prism.

    (ii) On the wavelength of light.

(e) The ratio of amplitude of two waves is 3 : 4. What is the ratio of their: [2]

    (i) loudness?

    (ii) frequencies?

Question 3

(a) State *two* ways by which the frequency of transverse vibrations of a stretched string can be increased. [2]

(b) What is meant by noise pollution? Name one source of sound causing noise pollution. [2]

(c) The V-I graph for a series combination and for a parallel combination of two resistors is shown in the figure below. Which of the two A or B, represents the parallel combination? Give a reason for your answer. [2]
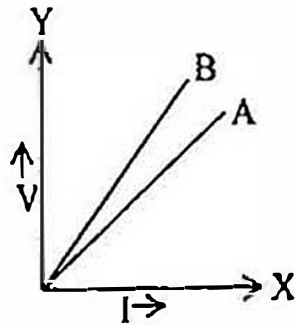
(d) A music system draws a current of 400 mA when connected to a 12 V battery. [2]

(i) What is the resistance of the music system?

(ii) The music system is left playing for several hours and finally the battery voltage drops and the music system stops playing when the current drops to 320 mA. At what battery voltage does the music system stop playing?

(e) Calculate the quantity of heat produced in a 20 Ω resistor carrying 2.5A current in 5 minutes. [2]

Question 4

(a) State the characteristics required of a good thermion emitter. [2]

(b) An element $_zS^A$ decays to $_{85}R^{222}$ after emitting 2 α particles and 1 β particle. Find the atomic number and atomic mass of the element S. [2]

(c) A radioactive substance is oxidized. Will there be any change in the nature of its radioactivity? Give a reason for your answer. [2]

(d) State the characteristics required in a material to be used as an effective fuse wire. [2]

(e) Which coil of a step up transformer is made thicker and why? [2]

Attempt any four questions from this Section

Question 5

(a) A stone of mass 'm' is rotated in a circular path with a uniform speed by tying a [3] strong string with the help of your hand. Answer the following questions:

(i) Is the stone moving with a uniform or variable speed?

(ii) Is the stone moving with a uniform acceleration? In which direction does the acceleration act?

(iii) What kind of force acts on the hand and state its direction?

(b) From the diagram given below, answer the questions that follow: [3]
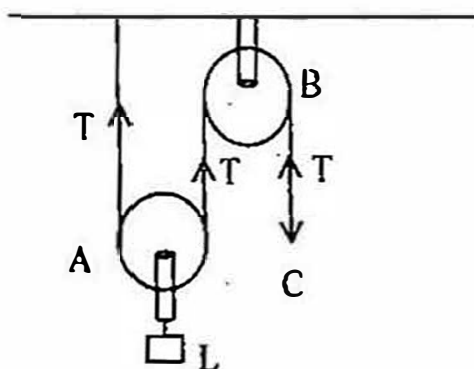
(i) What kind of pulleys are A and B?

(ii) State the purpose of pulley B.

(iii) What effort has to be applied at C to just raise the load L=20kgf?

(Neglect the weight of pulley A and friction).

(c) (i) An effort is applied on the bigger wheel of a gear having 32 teeth. It is used [4] to turn a wheel of 8 teeth. Where is it used?

(ii) A pulley system has three pulleys. A load of 120N is overcome by applying an effort of 50N. Calculate the Mechanical Advantage and Efficiency of this system.
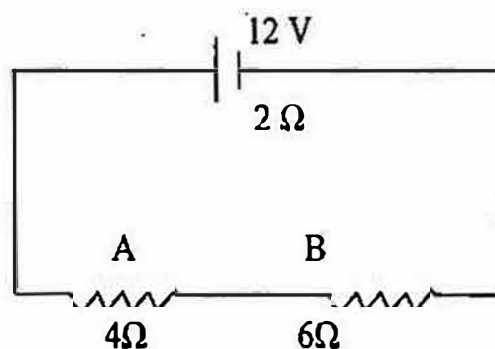
Question 6

(a) (i) What is the principle of method of mixtures? [3]

(ii) What is the other name given to it?

(iii) Name the law on which the principle is based.

(c), (i) Name the phenomenon involved in tuning a radio set to a particular station. [4]

(ii) Define the phenomenon named by you in part (i) above.

(iii) What do you understand by loudness of sound?

(iv) In which units is the loudness of sound measured?

Question 9

(a) (i) Which particles are responsible for current in conductors? [3]

(ii) To which wire of a cable in a power circuit should the metal case of a geyser be connected?

(iii) To which wire should the fuse be connected?

(b) (i) Name the transformer used in the power transmitting station of a power plant. [3]

(ii) What type of current is transmitted from the power station?

(iii) At what voltage is this current available to our household?

(c) A battery of emf 12V and internal resistance 2 Ω is connected with two resistors [4] A and B of resistance 4 Ω and 6 Ω respectively joined in series.

Find:

(i) Current in the circuit.

(ii) The terminal voltage of the cell.

(iii) The potential difference across 6Ω Resistor.

(iv) Electrical energy spent per minute in 4Ω Resistor.

Question 10

(a) Arrange α, β and γ rays in ascending order with respect to their   [3]

   (i)   Penetrating power.

   (ii) Ionising power.

   (iii) Biological effect.

(b) (i)   In a cathode ray tube what is the function of anode?   [3]

   (ii) State the energy conversion taking place in a cathode ray tube.

   (iii) Write one use of cathode ray tube.

(c) (i)   Represent the change in the nucleus of a radioactive element when a β   [4]
         particle is emitted.

   (ii) What is the name given to elements with same mass number and
         different atomic number?

   (iii) Under which conditions does the nucleus of an atom tend to be
         radioactive?