Subject: Physics

Std: X

Date: 07/12/2018

Time: 2hrs

Marks: 30

Answers to this paper must be written on the paper provided separately.
Candidates are allowed additional **15 minutes** for only reading the paper.
They must **NOT** start writing during this time.
Section A is compulsory. Attempt any four questions from section B
The intended marks for questions or parts of questions are given in brackets [ ].
This paper consists of 3 printed pages and 1 blank page.

Section A (40 Marks)

Question 1

a) Where does the position of centre of gravity lie for

   (i) a circular lamina   (ii) a triangular lamina?   [2]

b) A man can open a nut by applying a force of 200 N by using a lever handle of length 0.5 m. What should be the length of the handle if he is able to open it by applying a force of 50 N?   [2]

c) What physical quantity does the electron volt (eV) measure? How is it related to the S.I. unit of that quantity?   [2]

d) Name the chief energy transformation that occur in the following:

   (i)   Photosynthesis   (ii) loudspeaker   [2]

e) A body is moving in a circular path. When will it experience only a centripetal force? Justify your answer.   [2]
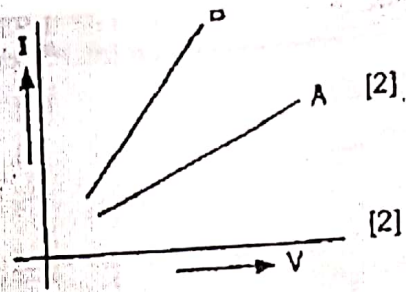
Question 2

a) What is the principle of the lever? To which class of lever does the beam balance belong?   [2]

b) A ray of light falls normally on one face of a prism of angle 45^0. If critical angle for the material of the prism is 45^0, trace the path of light.   [2]

c) A convex lens forms a real image of a point object placed on its principal axis. If the upper half of the lens is painted black, will the image be shifted? Will the intensity of the image increase or decrease?   [2]

d) (i) Which lens can produce a diminished and erect image of an object?

   (ii) When does a ray of light falling on a lens pass through it undeviated ?   [2]

e) Draw a graph showing the variation of angle of deviation with angle of incidence. On your graph show the angle of minimum deviation.   [2]

Question 3

a) Differentiate between light wave and sound wave. (Two points)   [2]

b) An observer stands at a certain distance away from a cliff and produce a loud sound. He hears the echo of the sound after 1.8 s. Calculate the distance between the cliff and the observer if the velocity of sound in air is 340rns⁻¹.   [2]

c) Which wave property determines: (i) loudness, (ii) pitch?   [2]

d) A cell of e.m.f. 2 V and internal resistance 1 ohm is connected to an external resistance of 4 ohm. Calculate the current through the circuit.   [2]

e) Observe the graph between I and V for two conductors. Which of the two is a better conductor? Give reason. [2]

Question 4

a) Which of the cables, one marked 5A and other marked 15 A will be thicker? Give reason. [2]

b) Differentiate between specific heat capacity and thermal capacity. Two points [2]

c) How much heat energy is required to melt 8 kg of ice? Specific latent heat of ice = 336 Jg^{-1}. [2]

d) What are the conditions necessary for nuclear fusion reaction? [2]

e) What are tracers? Write one use of tracers. [2]

Section B (40 Marks)

Question 5

a) Diagram below shows a right angled prism of refractive index 1.5. An object PQ is placed in front of its base BC.
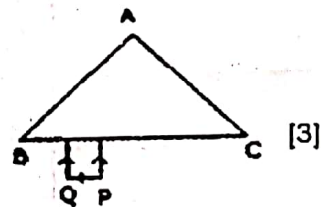
i) Copy and complete the diagram showing the image produced by the prism.

ii) Name an instrument in which such prism is used. [3]

b) Suggest one way, in each case by, which we can detect the presence of:

i) Infrared radiations   ii) ultraviolet radiations

iii) Give one use of ultraviolet radiations. [3]

c) The image obtained with a convex lens is erect and its length is four times the length of the object. If the focal length of the lens is 20 cm, calculate the object and image distances. [4]

Question 6

a) An engine can pump 30000 litre of water to a vertical height of 45 m in 10 minutes. Calculate the work done by the machine and its power. (density of water = 1000kgm^{-3} and 1000 litre = 1 m^3). [3]

b) A uniform metre scale of weight 50 gf, is balanced at 60 cm mark, when a weight of 15 gf is suspended at the 10 cm mark. Where a weight of 100 gf must be suspended to Balance the metre scale? [3]

c) A block and tackle system of pulleys has a velocity ratio 4,

i) Draw a labelled diagram of the system indicating clearly, the points of application and directions of load and effort.

ii) What is the value of the mechanical advantage of the given pulley system if it is an ideal pulley system? [4]

Question 7

a) The diagram below shows the displacement – time graph for a vibrating body.
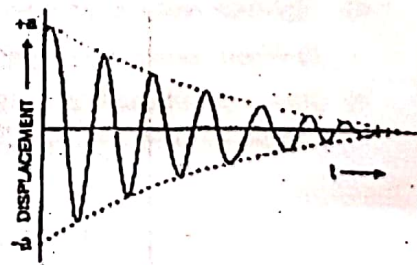
i) Name the type of vibrations produced by the vibrating body.

ii) Give one example of a body producing such vibrations.

iii) Why is the amplitude of the wave gradually decreasing? [3]

b) How is the frequency of a stretched string related to its:

i) tension   ii) mass   iii) length [3]

c) A 30 g ice cube at 0 °C is dropped into 200 g of water at 30 °C Calculate the final temperature of water when the entire ice cube has melted. Given: Latent heat of ice = 80 cal g^{-1}; specific heat capacity of water = 1 cal g^{-1} °C^{-1}. [4]

Question 8

a) i) If current is flowing in a straight wire from south to north, what will be the direction of lines of magnetic force?

ii) Draw a simple sketch of a step-down transformer. Label the different parts in the diagram. [3]

b) i) When we rotate the tuning knob of our radio, we are able to get the station of our choice at a particular position of the knob. Explain why?

ii) State the necessary condition for the phenomenon involved in the above case. [3]

c) An electric heater is rated 4 kW , 220 V. Calculate :

i) the current   ii) resistance of the heater   iii) Energy consumed in 2 hrs.

iv) total cost if 1kWh is charged at ₹ 0.50 [4]

Question 9

a) There are three pins in an electric plug. Answer the following:

i) How would you identify the earth pin?

ii) In which of the three connecting wires should the electric switch be connected?

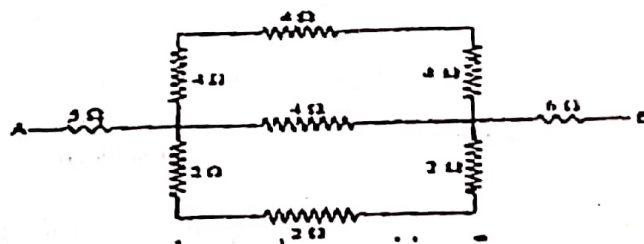iii) Explain why a switch should not be touched with wet hands. [3]

b) i) Explain why the weather becomes very cold when melting of ice starts.

ii) What happens to the heat supplied to a substance when the heat supplied causes no change in the temperature of the substance? [3]

c) Calculate the equivalent resistance between the points A and B for the combination of resistors: [4]

Question 10

a) A nucleus $^{24}_{11}Na$ emits a β particle to change into magnesium (Mg)

i) Write the symbolic equation for the process.

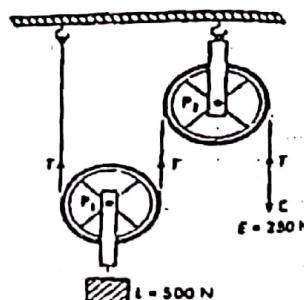ii) What is the general name of $^{24}_{12}Mg$ with respect to $^{24}_{11}Na$?

iii) Write one property of β particle. [3]

b) Observe the figure and calculate its velocity ratio , mechanical advantage and efficiency. [3]

c) i) Give two important sources of background radiations.

ii) Name the technique used to estimate the age of very old trees, wood and other such specimens. Name the isotope that forms the basis of this technique. [4]