SECOND PRELIMINARY EXAMINATION (2015-2016)

SUBJECT: SCIENCE PAPER I - PHYSICS

Std : X Marks: 80

Date : 18/01/2016 Time : 2 Hrs.

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 question are given in the brackets [ ].

Section – I (40 marks)

[Attempt all questions from this Section.]

Question 1

A] Name the commercial unit of electrical energy.
How is it related to the SI unit of energy. [2]

B] A spring is compressed against a rigid wall.
Draw a neat and labelled diagram showing the forces acting on the spring. [2]

C] Can the moment of force of a given force be zero? Justify your answer. [2]

D] (i) Which of the gears A and B is suitable for gain in speed, if gear ratio of A < 1 and that of B > 1?

(ii) Give one example of a class I lever whose mechanical advantage is equal to 1. [2]

E] State the energy changes in the following cases:

(i) drawing electric current from a dry cell.

(ii) rubbing of palms.

Question 2

A] Calculate the power of an engine required to lift 10^5 kg of coal per hour from a mine 360m deep. (Take g = 10ms^{-2}) [2]

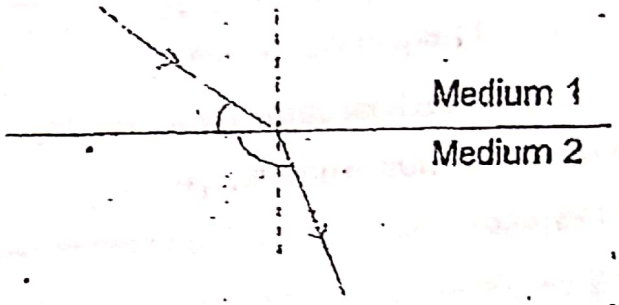
B] (i) The centre of gravity of a uniform ball is at _____

(ii) The mechanical advantage of an ideal single movable pulley is _____. [2]

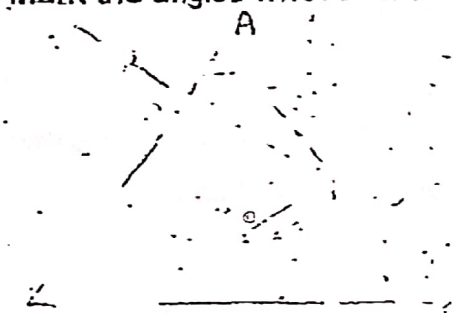
C] Two electromagnetic waves P and Q are of wavelength 9000 Å and 0.001 Å respectively. Identify the waves P and Q. [2]

D] (i) What is the minimum value of absolute refractive index of a transparent medium?

(ii) Write an expression for the refractive index (μ) of medium 2 with respect to medium 1 in the following case. [2]



E] Copy and complete the ray diagram showing the emergence of the ray PQ into air after passing through the prism. Mark the angles wherever necessary. [2]



Question 3

A] (i) When does a ray of light falling on a lens pass through it undeviated?

(ii) Which lens can produce an erect and magnified image of an object? [2]

B] 'A fuse wire is rated 15 A. Why it cannot be used for an electrical appliance of rating. 3kW, 250V? [2]

C] Two waves of the same pitch have their amplitudes in the ratio 3:2.

(i) What will be the ratio of their loudness?

(ii) What will be the ratio of their frequencies? [2]

D] The time period of a certain vibrating body is 0.08 s. Does this body produce sound audible to the human ear? Justify your answer. [2]

E] A current of 2A passes through a conductor and produces 80J of heat in 10s. Find the resistance of the conductor. [2]

Question 4

A] Four wires of resistance 2Ω each are joined end to end to form a square ABCD. Calculate the effective resistance of the combination between any two adjacent corners. [2]

B] A copper calorimeter of thermal capacity 20 JK^{-1} at 20°C is heated. Find :

(i) The amount of heat energy required to increase its temperature to 50°C.

(ii) Its mass if specific heat capacity of copper is 400 $Jkg^{-1}K^{-1}$. [2]

C] (i) Name two green house gases.

(ii) Name the radiations for which the green house gases are transparent. [2]

D] (i) In a step-up transformer the thickness of the wire in the primary coil should be _____ than that of secondary coil.

(ii) A d.c motor is rotating in a clockwise direction. How can the direction of rotation be reversed? [2]

E] (i) Write the difference between β particles and cathode rays based on their origin.

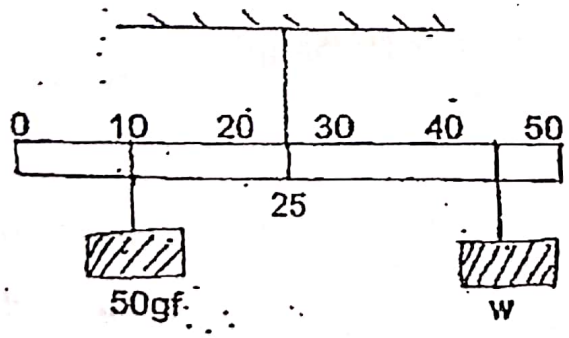
(ii) What do you mean by back ground radiations? [2]

Section – II (40 marks)

[Attempt any 4 questions from this Section.]

Question 5

A] A half metre ruler is suspended by a thread from the mid-point of the ruler as shown in the figure. It balances horizontally when a 50gf and an unknown weight 'w' are suspended respectively from 10 cm and the 45 cm mark. Calculate the magnitude of weight 'w'. [3]



B] (i) A body is acted upon by a force. State two conditions when the work done is zero.

(ii) What is degradation of energy? [3]

C] (i) Draw a labelled diagram of a block and tackle system of pulleys with two pulleys in each block. Indicate the directions of the load, effort and tension in the string. [4]

(ii) Name the class of lever in the following cases:

a long handle oar used for rowing a boat by a single person.

a short handle oar used in a boat race.

Question 6

A] How does the angle of deviation change if :

(i) The angle of prism is increased

(ii). The refractive index of the material of the prism is increased

(iii) The wave length of light is increased? [3]

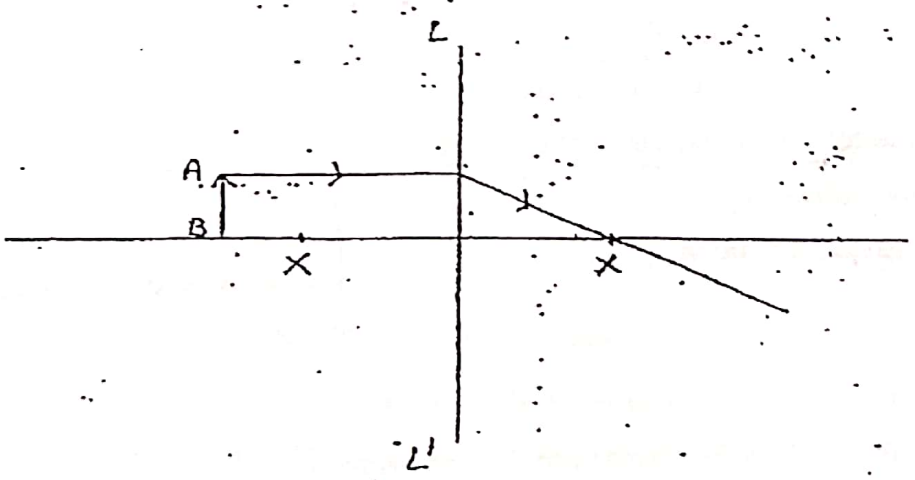
B] (i) Define critical angle.

(ii) The critical angle for glass-air is 45° for the light of yellow colour. State whether it will be less than, equal to or more than 45° for (1) red light (2) blue light [3]

C] (i) Copy and complete the diagram to show the formation of the image of the object AB.

(ii) Name the type of lens.

(iii) What is the name given to X. [4]



Question 7

A] A man standing in a gorge between two cliffs gives a short sharp shout. He hears two echoes, the 1st after 1s and the next after 1.5s after his shout. The speed of sound is 340 ms^{-1}. Calculate the distance between two cliffs. [3]

B] A vibrating tuning fork is placed over the mouth of a burette filled with water. When the tap is opened, the water level gradually falls. A loud sound is heard when the water reaches a particular level.

(i) Name the phenomenon responsible for the loud sound.

(ii) Give reason for the above observation.

(iii) If the water level in the burette falls further, is it possible to notice the same observation again? [3]

C] (i) Name the type of electromagnetic radiations which are obtained by stopping highly energetic cathode rays by a heavy metal target. Give one use of these radiations.

(ii) The clouds are seen white. Explain. [4]

Question 8

A] (i) Define 1 ohm

(ii) Name the quantity obtained from the slope of current Vs voltage graph and write its S.I. unit. [3]

B] (i) Of the three connecting wires in a household circuit, which two wires are at the same potential?

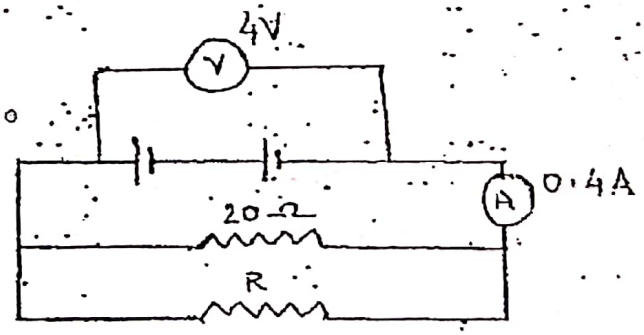
(ii) Why are electrical gadgets always connected in parallel and not in series in household wiring? [3]

C] Observe the diagram and calculate:

(i) the total resistance of the circuit

(ii) the value of R

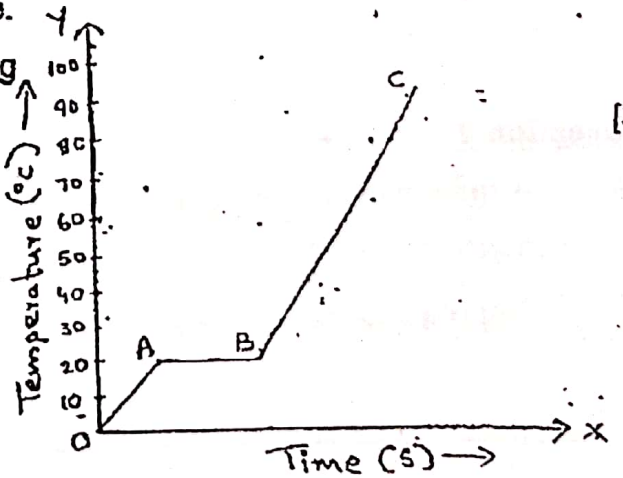
(iii) the current flowing in R



[4]

Question 9

A] A solid of unit mass is heated at a constant rate. The variation in temperature with time of heating is shown in the graph below. [3]



(i) What is represented by AB?

(ii) Explain why the graph in part AB is parallel to X-axis.

(iii) Find the melting point of the substance from the graph.

Over

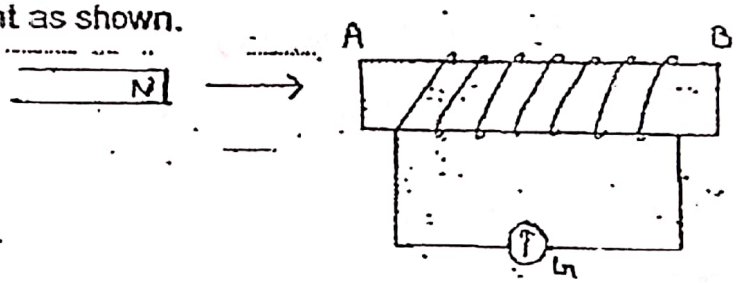
B] (i) 5g of ice each is put in equal quantity of two liquids A and B of specific heat capacity 'c' and '2c' respectively. In which of the liquids will the change in temperature be more?

(ii) Which has more heat : 1g of ice at 0°C or 1g of water at 0°C? Justify your answer. [3]

C] Calculate the amount of ice which is required to cool 150g of water contained in a copper vessel of mass 100g at 30°C, such that the final temperature of the mixture is 5°C. (specific heat capacity of copper = 0.4 J /g°C, specific heat capacity of water = 4.2 J/g°C, specific latent heat of fusion of ice = 336 J/g) [4]

Question 10

A] The diagram below shows a coil connected to a centre zero galvanometer G. The galvanometer shows a deflection to the right when the N-pole of a powerful magnet is moved to the right as shown. [3]



(i) Name the phenomenon responsible for the deflection in the galvanometer.

(ii) Does the direction of the current in the coil appear clockwise or anticlockwise when viewed from the end A?

(iii) Name the law which helps you to arrive at the conclusion in part (ii).

B] In a cathode ray tube, why is the : [3]

(i) filament made of tungsten?

(ii) cathode plate coated with oxide of barium or strontium?

(iii) thick glass screen coated with barium platinocyanide?

C] (i) A nucleus ${}^{A}_{Z}X$ emits an α - particle copy and complete the equation. [4]

$${}^{A}_{Z}X \xrightarrow{-\alpha} \_\_ X_1$$

(ii) What changes will take place in the mass number and atomic number of nucleus X_1 if it emits a gamma radiation?

(iii) Mention one use and one harmful effect of radioactivity.

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