Grade: 10
Date . 10.01.20
Time : 2 hrs

MM : 80
No. of Qs : 10
No. of Pgs: 4

General Instructions:

Answers to this paper must be written on the paper provided separately. Do not write anything on the question paper. You will **not** be allowed to write during the first **15** minutes. This time is to be spent on the reading of the question paper. The time given at the head of this paper is the time allowed to write the answers.

This paper comprises **two** sections: **Section A** and **Section B.** Attempt all questions from **Section A** and **any four** questions from **Section B.** The intended marks for questions or parts of questions are given in brackets [ ].

SECTION A
(Attempt **all** questions from this section)

Question 1

a) In case of a wireless receiver, a clear sound is not heard unless we adjust the frequencies. Explain why? [2]

b) Name any two radioactive substances present in our own body. [2]

c) State any two ways of increasing the boiling point of a liquid. [2]

d) For the same kinetic energy of a body, what should be the change in its mass if its velocity is increased four times? [2]

e) Name the process responsible for the energy generation in the sun. Define it. [2]

Question 2

a) A refrigerator is marked 80W and 220V. [2]
   (i)   How much energy does it consume in one day if on an average it is used for 20 hours a day?
   (ii) What is the resistance?

b) The diagram shows the use of a lever. State the principle of moments as applied to the given lever. Give an example of this type of lever. [2]
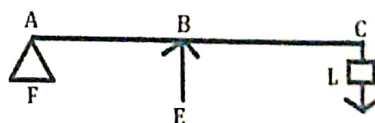
c) Will light travelling from glass to air reach the air in the following diagram? Give reasons. (Critical angle for glass-air interface is 42°) [2]

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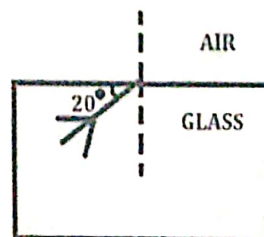
d) The base of an electric iron is made thick and heavy. Why? [2]

e) A coin placed at the bottom of a beaker appears to be raised by 4cm. If the refractive index of water is $\frac{4}{3}$, find the depth of water in the beaker. [2]

Question 3

a) Give two examples when work done by a force acting on a body is zero but displacement is not zero. [2]

b) What will be the effect on the focal length of the lens if:
i) the lens is under water.   ii) a part of the lens is covered. [2]

c) Smoke from a fire appears white. Give reasons. [2]

d) Why are thick wires used in high power instruments like an electric heater? [2]

e) Name the colour code of the wire which is connected to:
(i) the metallic body of an appliance.   (ii) the switch of the appliance. [2]

Question 4

a) A straight wire lying in the horizontal plane carries current from south to north. [2]
   (i)   What will be the direction of the magnetic field at a point just underneath it?
   (ii)   Name the law used to arrive at the answer in i.

b) Calculate the resultant torque from the following diagram. [2]
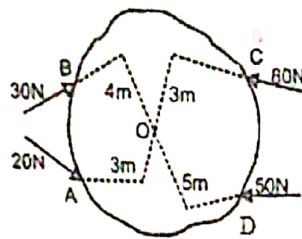

c) Two waves of the same pitch have their amplitudes in the ratio 2:3. [2]
   (i)   What will be the ratio of their loudness?
   (ii)   What will be the ratio of their frequencies?

d) Write two similarities between a d.c motor and an a.c generator. [2]

e) Arrange the radiations of the electromagnetic spectrum in decreasing order of their frequencies. [2]

SECTION B
(Attempt **any four** questions from this section)

Question 5

a) Draw a diagram to show the energy changes in an oscillating simple pendulum. Indicate in your diagram how the total mechanical energy in it remains constant during oscillation. [3]

b) The following diagram shows two parallel and opposite forces F_1 and F_2 each of magnitude 5N, with their lines of action separated by a distance of 2m. A point X is pivoted midway between F_1 and F_2, while a point Y is pivoted on F_2. [3]
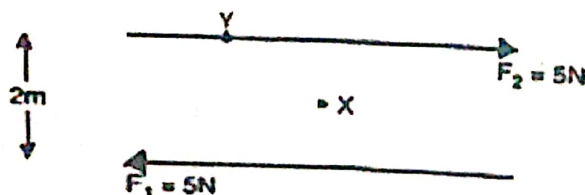

   (i)   Calculate the total moment of the two forces about the points: (i) X and (ii) Y.
   (ii)   State the effect produced by the two forces about the points X.

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c) A pulley has a velocity ratio 5. [4]
  (i) Draw a neat labelled diagram of the pulley system to lift a load by applying the effort in a convenient direction.
  (ii) If the efficiency of the system is 80%, find it's mechanical advantage.
  (iii) If a load of 10kgf is pulled up by a distance of 2m in 10s, calculate the power developed by the effort. (Take $g = 9.8ms^{-2}$)
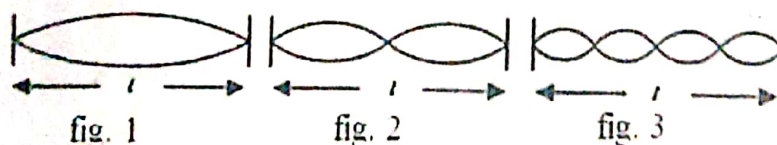
Question 6

a) The figure shows two isosceles right angled prisms A and B and the light rays incident on the prism A. Redraw completing the diagram to show the rays emerging out of the prism B. [3] Mark the necessary angles.
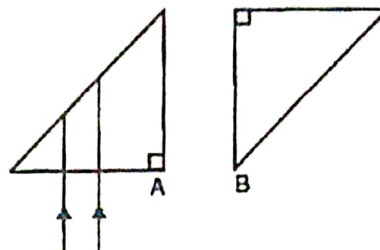
b) (i) Name the radiation that is absorbed by the green house gases in the earth's atmosphere. [3]
  (ii) Name the material of the prism required for obtaining it.
  (iii) Write one harmful effect of the radiation mentioned by you in (i).

c) (i) Draw a ray diagram to show how a lens forms a virtual and diminished image of an object. [2]
  (ii) An object is placed at a distance of 15cm in the front of a concave lens of focal length 10cm. Find the position of the image and the size of the image in relation to the object. [2]

Question 7

a) John fires a gun towards a hill and hears it's echo after 5s. He then moves 320m towards the hill and fires his gun again. This time he hears the echo after 3s. Calculate the velocity of sound. [3]

b) The rear view mirror of a car starts vibrating violently at some particular speed of the car. Explain why this happens? What is the name of this phenomenon and what could be done to stop this violent vibration? [3]

c) The diagram shows three ways in which the string of length l in an instrument can vibrate. [4]


fig. 1   fig. 2   fig. 3

  (i) Which figure shows the principal note?
  (ii) Which vibration has a frequency four times that of fig. 1?
  (iii) Which vibration has the longest wavelength?
  (iv) What is the ratio of frequency of vibrations in fig. 3 and fig. 2?

Question 8

a) Draw a labelled diagram of a dc motor. What energy change takes place in a dc motor? Name the principle of its working. [3]

b) Write three circumstances when one may get an electric shock from an electric gadget. [3]

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c)   In the given circuit diagram (i) Name the instruments X and Y. (ii) What will be the reading on Y when (1) S is open (2) S is closed?
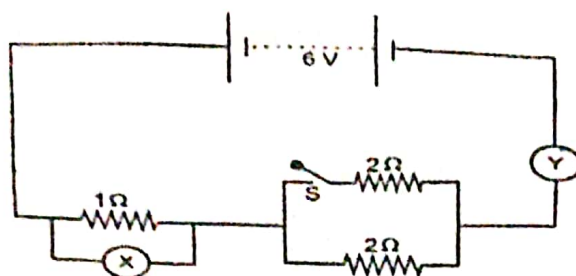

[4]

Question 9

a)   (i)   Define specific latent heat of a substance.   [3]
      (ii)   Give one example each when high specific heat capacity of water is used
             (1) in cooling (2) as a heat reservoir.

b)   A piece of ice at $0°C$ is heated at a constant rate and its temperature recorded at regular intervals till steam is formed at $100°C$. Draw a temperature-time graph to represent the change in phase. Label the different parts of your graph.   [3]

c)   Calculate the amount of heat given out while 400 g of water at $30°C$ is cooled and converted into ice at - $2°C$. Specific heat capacity of water = 4200 $Jkg^{-1}°C^{-1}$.
      Specific heat capacity of ice = 2100 $Jkg^{-1}°C^{-1}$.
      Specific latent heat of fusion of ice = 336000 Jkg^{-1} [4]

Question 10

a)   (i)   Why is nuclear fusion not possible to generate electricity?   [3]
      (ii)   An alpha particle captures:
             1) two electrons   2) one electron. In each case what does it change to?

b)   (i)   Define radioactivity.   [3]
      (ii)   What happens inside the nucleus that causes the emission of a beta particle?
      (iii) Express the above change in the form of an equation.

c)   (i)   Name two radioisotopes that are used to detect brain tumors.   [4]
      (ii)   A radioactive nucleus undergoes a series of decays according to the sequence:

$$X \xrightarrow{\beta} X_1 \xrightarrow{\alpha} X_2 \xrightarrow{\alpha} X_3.$$
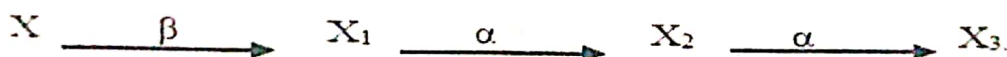
             If the mass number and atomic number of X_3 are 172 and 69 respectively, what is the mass number and atomic number of X?

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