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Physics ICSE 2014

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2014

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) A force is applied on (i) a non-rigid body and (ii) a rigid body. How does the effect of the force differ in the above two cases? [2]
- (b) A metallic ball is hanging by a string from a fixed support. Draw a neat labelled diagram showing the forces acting on the ball and the string. [2]
- (c) (i) What is the weight of a body placed at the centre of the earth?
(ii) What is the principle of an ideal machine? [2]
- (d) Is it possible to have an accelerated motion with a constant speed? Explain. [2]
- (e) (i) When does a force do work?
(ii) What is the work done by the moon when it revolves around the earth? [2]

Question 2

- (a) Calculate the change in the Kinetic energy of a moving body if its velocity is reduced to $1/3^{\text{rd}}$ of the initial velocity. [2]
- (b) State the energy changes in the following devices while in use:
(i) A loud speaker.
(ii) A glowing electric bulb. [2]

This Paper consists of 6 printed pages.

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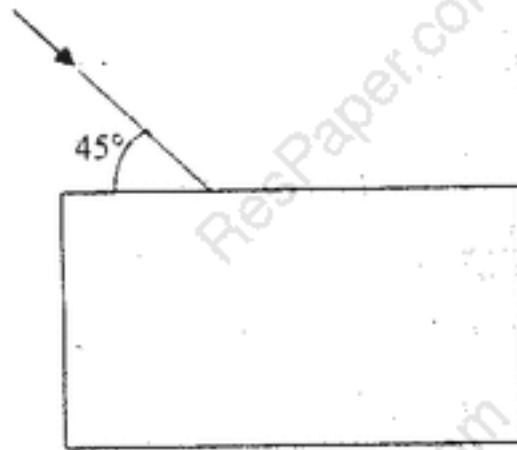
Turn over

- (c) (i) What is nuclear energy? [2]
 (ii) Name the process used for producing electricity using nuclear energy. [2]
- (d) State one important advantage and disadvantage each of using nuclear energy for producing electricity. [2]
- (e) (i) The conversion of part of the energy into an undesirable form is called _____ [2]
 (ii) For a given height h , _____ the length l of the inclined plane, lesser will be the effort required.

$$MA = \frac{W}{E} = \frac{1}{\sin \theta} = \frac{l}{h}$$

Question 3

- (a) Draw the diagram given below and clearly show the path taken by the emergent ray.



$$n_2 = \frac{n_2}{n_1} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$$

$\lambda \propto v$

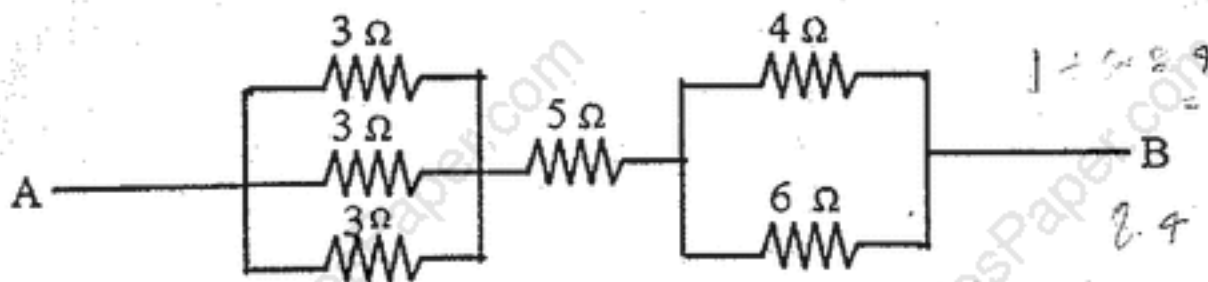
- (b) (i) What is consumed using different electrical appliances, for which electricity bills are paid? [2]
 (ii) Name a common device that uses electromagnets. [2]
- (c) (i) A ray of light passes from water to air. How does the speed of light change? [2]
 (ii) Which colour of light travels fastest in any medium except air? [2]
- (d) Name the factors affecting the critical angle for the pair of media. [2]
- (e) (i) Name a prism required for obtaining a spectrum of Ultraviolet light. [2]
 (ii) Name the radiations which can be detected by a thermopile. [2]

Question 4

- (a) Why is the colour red used as a sign of danger? [2]
 (b) (i) What are mechanical waves?

- (ii) Name one property of waves that do not change when the wave passes from one medium to another. [2]

- (c) Find the equivalent resistance between points A and B



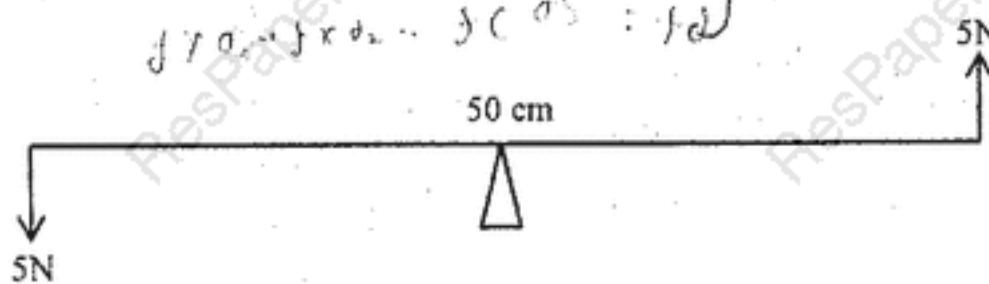
- (d) 50 g of metal piece at 27°C requires 2400 J of heat energy so as to attain a temperature of 327°C . Calculate the specific heat capacity of the metal. [2]
- (e) An electron emitter must have _____ work function and _____ melting point. [2]

SECTION II (40 Marks)

Attempt any four questions from this Section

Question 5

- (a) (i) A man having a box on his head, climbs up a slope and another man having an identical box walks the same distance on a levelled road. Who does more work against the force of gravity and why?
- (ii) Two forces each of 5N act vertically upwards and downwards respectively on the two ends of a uniform metre rule which is placed at its mid-point as shown in the diagram. Determine the magnitude of the resultant moment of these forces about the midpoint. [4]



- (b) (i) A body is thrown vertically upwards. Its velocity keeps on decreasing. What happens to its kinetic energy as its velocity becomes zero?

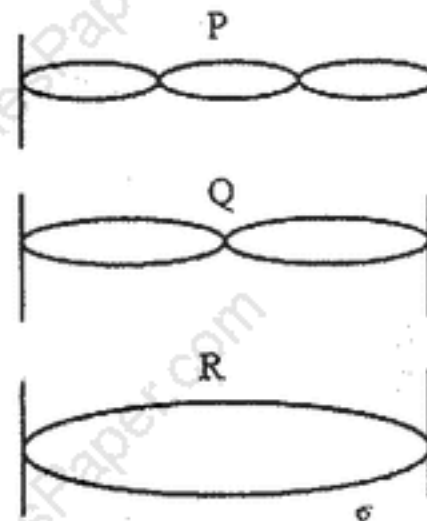
- (ii) Draw a diagram to show how a single pulley can be used so as to have its ideal $M.A=2$. [3]
- (c) Derive a relationship between mechanical advantage, velocity ratio and efficiency of a machine. [3]

Question 6

- (a) (i) Light passes through a rectangular glass slab and through a triangular glass prism. In what way does the direction of the two emergent beams differ and why? [4]
- (ii) Ranbir claims to have obtained an image twice the size of the object with a concave lens. Is he correct? Give a reason for your answer. [4]
- (b) A lens forms an erect, magnified and virtual image of an object.
- (i) Name the lens. [3]
- (ii) Draw a labelled ray diagram to show the image formation. [3]
- (c) (i) Define the power of a lens. [3]
- (ii) The lens mentioned in 6(b) above is of focal length 25cm. Calculate the power of the lens. [3]

Question 7

- (a) The adjacent diagram shows three different modes of vibrations P, Q and R of the same string.



- (i) Which vibration will produce a louder sound and why? [4]
- (ii) The sound of which string will have maximum shrillness? [4]
- (iii) State the ratio of wavelengths of P and R. [4]
- (b) A type of electromagnetic wave has wavelength 50 \AA .
- (i) Name the wave. [3]
- (ii) What is the speed of the wave in vacuum? [3]
- (iii) State one use of this type of wave. [3]

- (c) (i) State one important property of waves used for echo depth sounding.
- (ii) A radar sends a signal to an aircraft at a distance of 30 km away and receives it back after 2×10^{-4} second. What is the speed of the signal? [3]

Question 8

- (a) Two resistors of 4Ω and 6Ω are connected in parallel to a cell to draw 0.5A current from the cell.
- (i) Draw a labelled circuit diagram showing the above arrangement.
- (ii) Calculate the current in each resistor. [4]
- (b) (i) What is an Ohmic resistor?
- (ii) Two copper wires are of the same length, but one is thicker than the other.
- (1) Which wire will have more resistance?
- (2) Which wire will have more specific resistance? [3]
- (c) (i) Two sets A and B, of three bulbs each, are glowing in two separate rooms. When one of the bulbs in set A is fused, the other two bulbs also cease to glow. But in set B, when one bulb fuses, the other two bulbs continue to glow. Explain why this phenomenon occurs.
- (ii) Why do we prefer arrangements of Set B for house circuiting? [3]

Question 9

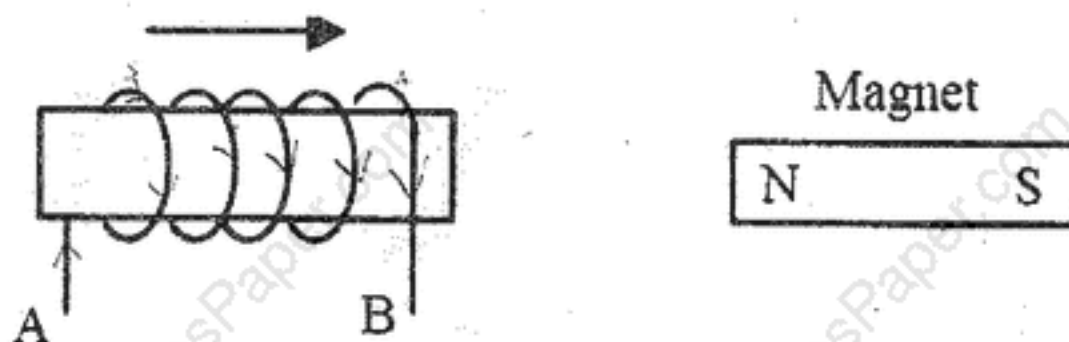
- (a) Heat energy is supplied at a constant rate to 100g of ice at 0°C . The ice is converted into water at 0°C in 2 minutes. How much time will be required to raise the temperature of water from 0°C to 20°C ? [Given: sp. heat capacity of water = $4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$, sp. latent heat of ice = 336 J g^{-1}]. [4]
- (b) Specific heat capacity of substance A is $3.8 \text{ J g}^{-1} \text{ K}^{-1}$ whereas the Specific heat capacity of Substance B is $0.4 \text{ J g}^{-1} \text{ K}^{-1}$.
- (i) Which of the two is a good conductor of heat?
- (ii) How is one led to the above conclusion?
- (iii) If substances A and B are liquids then which one would be more useful in car radiators? [3]

- (c) (i) State any two measures to minimize the impact of global warming.
 (ii) What is the Greenhouse effect?

[3]

Question 10

- (a) (i) Name two factors on which the magnitude of an induced e.m.f. in the secondary coil depends.
 (ii) In the following diagram an arrow shows the motion of the coil towards the bar magnet.
 (1) State in which direction the current flows, A to B or B to A?
 (2) Name the law used to come to the conclusion.



[4]

- (b) A nucleus ${}_{11}\text{Na}^{24}$ emits a beta particle to change into Magnesium (Mg)

- (i) Write the symbolic equation for the process.
 (ii) What are numbers 24 and 11 called?
 (iii) What is the general name of ${}_{12}^{24}\text{Mg}$ with respect to ${}_{11}^{24}\text{Na}$?

[3]

- (c) In a cathode ray tube state:

- (i) the purpose of covering cathode by thorium and carbon.
 (ii) the purpose of the fluorescent screen.
 (iii) how is it possible to increase the rate of emission of electrons.

[3]