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**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.*

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*Section I is compulsory. Attempt any four questions from Section II.*

*The intended marks for questions or parts of questions are given in brackets [ ].*

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**SECTION I (40 Marks)**

*Attempt all questions from this Section.*

**Question 1**

- (a) (i) Define moment of force. [2]  
(ii) Write the relationship between the SI and CGS unit of moment of force.
- (b) Define a kilowatt hour. How is it related to joule? [2]
- (c) A satellite revolves around a planet in a circular orbit. What is the work done by the satellite at any instant? Give a reason. [2]
- (d) (i) Identify the class of the lever shown in the diagram below: [2]

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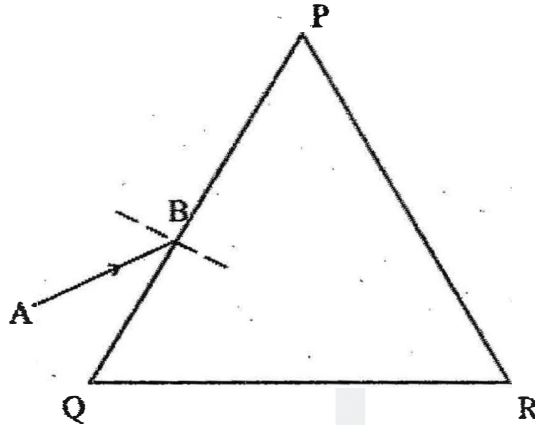
- (ii) How is it possible to increase the M.A. of the above lever without increasing its length?
- (c) Give one example of each when: [2]  
(i) Chemical energy changes into electrical energy.  
(ii) Electrical energy changes into sound energy.
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**This Paper consists of 8 printed pages.**

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**Question 2**

- (a) A crane 'A' lifts a heavy load in 5 seconds, whereas another crane 'B' does the same work in 2 seconds. Compare the power of crane 'A' to that of crane 'B'. [2]
- (b) A ray of light falls normally on a rectangular glass slab. [2]  
Draw a ray diagram showing the path of the ray till it emerges out of the slab.
- (c) Complete the path of the monochromatic light ray AB incident on the surface PQ of the equilateral glass prism PQR till it emerges out of the prism due to refraction. [2]



- (d) Where should an object be placed in front of a convex lens in order to get: [2]
- an enlarged real image
  - enlarged virtual image?
- (e) A pond appears to be 2.7 m deep. If the refractive index of water is  $\frac{4}{3}$ , find the actual depth of the pond. [2]

**Question 3**

- (a) The wave lengths for the light of red and blue colours are nearly  $7.8 \times 10^{-7}$  m and  $4.8 \times 10^{-7}$  m respectively. [2]
- Which colour has the greater speed in a vacuum?
  - Which colour has a greater speed in glass?

- (b) Draw a graph between displacement from mean position and time for a body executing free vibration in a vacuum. [2]
- (c) A sound wave travelling in water has wavelength 0.4 m. [2]  
Is this wave audible in air? (The speed of sound in water =  $1400 \text{ ms}^{-1}$ )
- (d) Why does stone lying in the sun get heated up much more than water lying for the same duration of time? [2]
- (e) Why is it not advisable to use a piece of copper wire as fuse wire in an electric circuit? [2]

**Question 4**

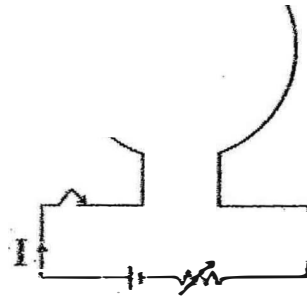
- (a) Calculate the total resistance across AB: [2]



- (b) Two metallic blocks P and Q having masses in ratio 2:1 are supplied with the same amount of heat. If their temperatures rise by same degree, compare their specific heat capacities. [2]
- (c) When a current carrying conductor is placed in a magnetic field, it experiences a mechanical force. What should be the angle between the magnetic field and the length of the conductor so that the force experienced is: [2]
- (i) Zero
- (ii) Maximum?
- (d) A nucleus  ${}_{84}\text{X}^{202}$  of an element emits an alpha particle followed by a beta particle. The final nucleus is  ${}_{a}\text{Y}^b$ . Find a and b. [2]

(e) The diagram below shows a loop of wire carrying current I:

[2]



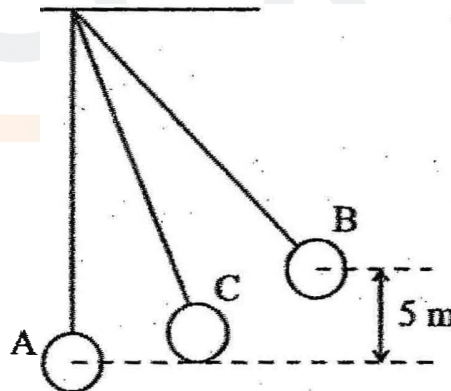
- (i) What is the magnetic polarity of the loop that faces us?
- (ii) With respect to the diagram how can we increase the strength of the magnetic field produced by this loop?

**SECTION II (40 Marks)**

*Attempt any four questions from this Section*

**Question 5**

- (a) The figure below shows a simple pendulum of mass 200 g. It is displaced from the mean position A to the extreme position B. The potential energy at the position A is zero. At the position B the pendulum bob is raised by 5 m. [3]

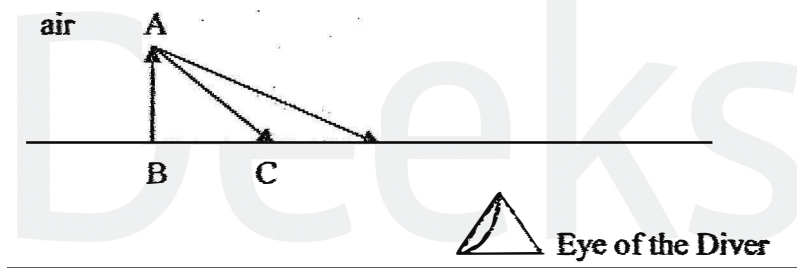


- (i) What is the potential energy of the pendulum at the position B?
  - (ii) What is the total mechanical energy at point C?
  - (iii) What is the speed of the bob at the position A when released from B?
- (Take  $g = 10 \text{ ms}^{-2}$  and there is no loss of energy.)

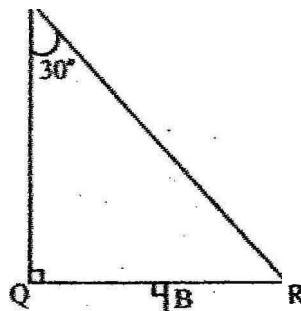
- (b) (i) With reference to the direction of action, how does a centripetal force differ from a centrifugal force during uniform circular motion? [3]
- (ii) Is centrifugal force the force of reaction of centripetal force?
- (iii) Compare the magnitudes of centripetal and centrifugal force.
- (c) A block and tackle system of pulleys has velocity ratio 4. [4]
- (i) Draw a neat labelled diagram of the system indicating clearly the points of application and direction of load and effort.
- (ii) What will be its V.R. if the weight of the movable block is doubled?

Question 6

- (a) A diver in water looks obliquely at an object AB in air. [3]



- (i) Does the object appear taller, shorter or of the same size to the diver?
- (ii) Show the path of two rays AC & AD starting from the tip of the object as it travels towards the diver in water and hence obtain the image of the object.
- (b) Complete the path of the ray AB through the glass prism in PQR till it emerges out of the prism. Given the critical angle of the glass as  $42^\circ$ . [3]



A



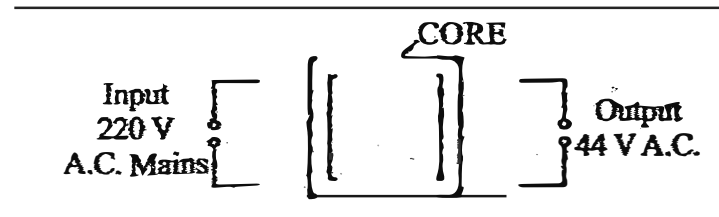
- (c) A lens of focal length 20 cm forms an inverted image at a distance 60 cm from the lens. [4]
- Identify the lens.
  - How far is the lens present in front of the object?
  - Calculate the magnification of the image.

### Question 7

- (a) Give reasons for the following: [3]
- During the day:
- Clouds appear white.
  - Sky appears blue.
- (b) (i) Name the system which enables us to locate underwater objects by transmitting ultrasonic waves and detecting the reflecting impulse. [3]
- (ii) What are acoustically measurable quantities related to pitch and loudness?
- (c) (i) When a tuning fork [vibrating] is held close to ear, one hears a faint hum. [4]  
The same [vibrating tuning fork] is held such that its stem is in contact with the table surface, then one hears a loud sound. Explain.
- (ii) A man standing in front of a vertical cliff fires a gun. He hears the echo after 3.5 seconds. On moving closer to the cliff by 84 m, he hears the echo after 3 seconds. Calculate the distance of the cliff from the initial position of the man.

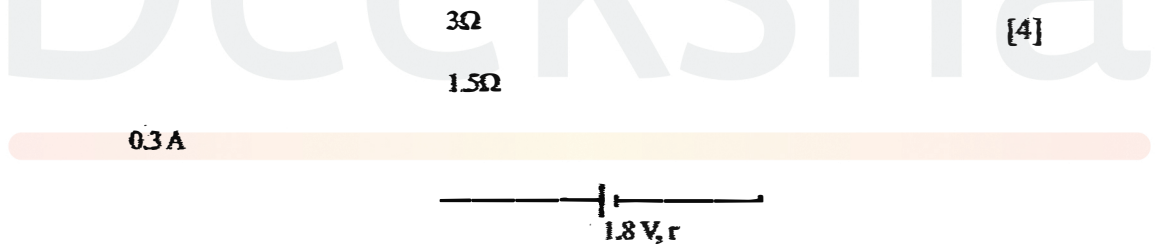
✓ Question 8

- (a) The diagram below shows the core of a transformer and its input and output connections [3]



- (i) State the material used for the core.
- (ii) Copy and complete the diagram of the transformer by drawing input and output coils.
- (b) (i) What are superconductors? [3]
- (ii) Calculate the current drawn by an appliance rated 110 W, 220 V when connected across 220 V supply.
- (iii) Name a substance whose resistance decreases with the increase in temperature.

- (c) [4]



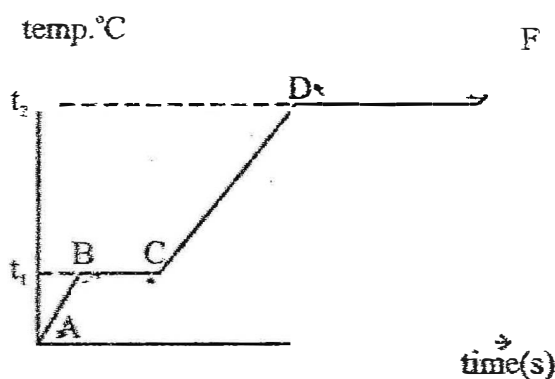
The diagram above shows three resistors connected across a cell of e.m.f. 1.8 V and internal resistance  $r$ . Calculate:

- (i) Current through  $3\Omega$  resistor.
- (ii) The internal resistance  $r$ .

✓ Question 9

- (a) (i) Define heat capacity of a substance. [3]
- (ii) Write the SI unit of heat capacity.
- (iii) What is the relationship between heat capacity and specific heat capacity of a substance?

- (b) The diagram below shows the change of phases of a substance on a temperature vs time graph on heating the substance at a constant rate. [3]



- (i) Why is the slope of CD less than slope of AB?
- (ii) What is the boiling and melting point of the substance?
- (c) A piece of ice of mass 60 g is dropped into 140 g of water at 50°C. [4]  
 Calculate the final temperature of water when all the ice has melted.  
 (Assume no heat is lost to the surrounding)  
 Specific heat capacity of water = 4.2 Jg<sup>-1</sup>k<sup>-1</sup>  
 Specific latent heat of fusion of ice = 336 Jg<sup>-1</sup>

Question 10

- (a) (i) Draw a neat labeled diagram of a d.c. motor. [3]  
 (ii) Write any one use of a d.c. motor.
- (b) (i) Differentiate between nuclear fusion and nuclear fission. [3]  
 (ii) State one safety precaution in the disposal of nuclear waste.
- (c) An atomic nucleus A is composed of 84 protons and 128 neutrons. The nucleus [4]  
 A emits an alpha particle and is transformed into a nucleus B.  
 (i) What is the composition of B?  
 (ii) The nucleus B emits a beta particle and is transformed into a nucleus C.  
 What is the composition of C?  
 (iii) What is mass number of the nucleus A?  
 (iv) Does the composition of C change if it emits gamma radiations?