

## Half Yearly Examination 2017-2018

Std. : X  
Subject : PHYSICS

Full Marks : 80  
Time : 2 Hrs.

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### SECTION-A (40 MARKS) (Attempt all questions)

- Q1.** (a) Write the SI unit for the following physical quantities. [½x4=2]
- (i) Intensity of sound (ii) Conductivity  
(iii) Specific heat capacity (iv) Mechanical Advantage
- (b) What type of lever is formed by the human body while — [1+1=2]
- (i) raising a load on the palm.  
(ii) raising the weight of body on toes ?
- State whether the M.A. is less than, more than or equal to one in each case.
- (c) An electric motor of power 100 w is used to drive the stirrer in a water bath. If 50% of the energy supplied to the motor spent in stirring the water. Calculate the work done on water in one minute. [2]
- (d) A satellite revolves around the earth in a circular orbit. What is the work done by the satellite? Give reason. [2]
- (e) Derive the relationship between the SI and CGS unit of work. [2]
- Q2.** (a) For the same kinetic energy of body, what should be the change in its velocity if its mass is increased four times ? [2]
- (b) How does the refractive index of a medium depend on — (i) the wavelength of light used.  
(ii) It's temperature. [2]
- (c) A water pond appears to be 2.7m deep. If the refractive index of water is 4/3. Find the shift of the which it is raised. [2]
- (d) Name the lens which is used to give magnified and virtual image. Write any two properties of this lens. [2]
- (e) The focal length of a camera lens is 20 cm. Find how far away from the film must be lens be set in order to photograph an object located at a distance 100 cm from the lens. [2]
- Q3.** (a) Name the radiation which can be detected by —
- (i) a thermopile (ii) a solution of silver chloride. Write any one use of each. [2]
- (b) State two conditions necessary for an echo to be heard distinctly. [2]
- (c) The stem of a vibrating tuning fork is pressed against a table top. [2]

- (i) will it produce an audible sound ?
  - (ii) Does it cause the table to set in vibrations ? If yes what type of vibrations are they ?
  - (iii) Under what condition does it lead to resonance ?
- (d) Name the unit used to measure the sound level. What is the safe limit of sound level for our ears ? [2]
- (e) An electric gadget draws a current 200 mA from a battery of 12V. Find its resistance. [2]
- Q4.** (a) How does (i) resistance and specific resistance of a wire depend on its length and radius ? [2]
- (b) Four resistors each of  $2\Omega$  are connected in such way that the equivalent resistance is more than  $4\Omega$  but less than  $6\Omega$ . Draw the diagram for the arrangement and find the each equivalent resistance. [3]
- (c) Define the SI unit of electrical power. [1]
- (d) Write any two dissimilarities between a current carrying solenoid and a bar magnet. [2]
- (e) A piece of iron of mass 2.0 kg has a heat capacity of 966 J/K. Find (i) heat energy needed to warm it by  $15^{\circ}\text{C}$ , and (ii) its specific heat capacity in SI unit. [2]

**SECTION-B (40 MARKS)**  
**(Attempt any four questions)**

- Q5.** (a) An iron door of a building is 3 m broad. It can be opened by applying a force of 100 N normally at the middle of the door. Calculate : (a) the torque needed to open the door, (b) the least force and its point of application to open the door. [3]
- (b) (i) State the principle of moments. [3]
- (ii) Is it possible that no transfer of energy takes place even when a force is applied to a body ?
- (c) A ball of mass 10g falls from a height of 5m. It rebounds from the ground to a height of 4m.[4]
- Find — (i) the initial potential energy of the ball.
- (ii) the kinetic energy of the ball just before striking the ground.
- (iii) the kinetic energy of the ball after striking the ground, and
- (iv) the loss in kinetic energy on striking the ground. ( $g = 9.8 \text{ m/s}^2$ )
- Q6.** (a) Give reasons — [3]
- (i) The lower block of a block and tackle pulley system must be of negligible weight.
- (ii) The temperature of water at the bottom of a water fall differ from the temperature at the top.
- (b) A machine is operated by an effort of 80 N acting downward and moving through a downward displacement of 0.15m. The load of mass 10 kg, is raised up by 10 cm. Calculate the M.A., V.R, work input useful work out put and efficiency. [4]

- (c) An object of mass 'm' is allowed to fall freely from point A as shown in the figure. Calculate the total mechanical energy of the object at — [3]
- (i) Point A
  - (ii) Point B
  - (iii) Point C

- Q7.** (a) (i) A ray of light is passing from one transparent medium to the other medium having different optical density. How do the following quantities change : speed wavelength, frequency and amplitude if second medium is denser than the first medium. [3]
- (ii) The critical angle for glass-air is  $45^\circ$  for the light of yellow colour. State whether it will be less than equal to, or more than  $45^\circ$  for (A) red light, and (B) Blue light.
- (b) Find the critical angle for the given figures. [3]

- (c) (i) The wavelength of red colour is  $7 \times 10^{-7}$  m and that of blue is  $4 \times 10^{-7}$  m. will the speed of both colours be same in (A) vacuum (ii) Glass ? [4]
- (ii) Calculate the frequency of yellow light of wavelength 550nm. The speed of light is  $3 \times 10^8$  m/s.

- Q8.** (a) A man fires a gun and hears it echo after 5 sec. The man then moves 310 m towards the hill and fires his gun again. This time if he hears the echo after 3sec, calculate the speed of sound.
- (b) State the principle on which 'SONAR' is based. [2+1]
- (b) i) State two ways of increasing the frequency of vibrations of a stretched string.
- ii) Give one example for each kind of vibration —
- (i) Damped vibration
  - (ii) Forced vibration [2+1=3]
- (c) a) A string vibrates with a natural frequency of 256 Hz. Which of the tuning fork given below will resonate with the string ? [2+2]
- (i) A of frequency 512 Hz
  - (ii) B of frequency 256 Hz
  - (iii) C of frequency 128 Hz. Give reason for your answer.

- b) Write the differences between forced vibrations and resonant vibrations in terms of —
- (i) amplitude of vibration
  - (ii) time taken by vibrations of the body.

**Q9. (a)** When a potential difference of 2 volt is applied across the ends of a wire of 5m length a current of 1A flows through it. Calculate —

- (i) the resistance per unit length of the wire.
- (ii) the resistance of 2m length of the wire.
- (iii) the resistance across the ends of the wire if it is doubled on itself. [3]

Define the SI unit of potential difference. [3]

- c) i) Give two characteristics of high tension wire.
- ii) An electric kettle is rated 3kw, 250v. Give reason whether this kettle can be used in a circuit which contains a fuse of current rating 13A. [4]

**Q10. (a)** A spiral coil wound on a hollow cardboard tube AB. A magnetic compass is placed close to it current is switched on by closing the key. (i) what will be the polarity at the ends A & B ? (ii) How will the compass needle be affected ? Give reason. [3]

- (b) (i) State two ways by which the strength of an electromagnet can be increased.
- (ii) It is generally cold after a hail storm than during and before the hail-storm. Give reason. [2+2=4]

(c) 1 kg of ice is heated at a constant rate until the whole of it vaporises. How much heat is required? Sp. latent heat of fusion of ice =  $336 \times 10^3 \text{ J/kg}^{-1}$ , sp. latent heat of steam is  $2268 \times 10^3 \text{ J/kg}$ , sp. heat capacity of ice =  $2.1 \times 10^3 \text{ J/kg/K}$ , sp. heat capacity of water is  $4.2 \times 10^3 \text{ J/Kg/K}$ . [3]