Physics (Objective)   (For All Sessions)   (Group-I)   Time: 20 Minutes   Marks : 17

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1. Which one of the following cannot be polarized?

    (A) UV Rays   (B) Radio Waves   (C) T.V waves   (D) Sound waves

2. The speed of light in a medium of refractive index 1.3 is:

    (A) $1.3\,C$ (B) $\dfrac{1.3}{C}$ (C) $\dfrac{C}{1.3}$ (D) C

3. If the temperature of the source increases then efficiency of a Carnot engine:

    (A) Increases   (B) Decreases   (C) Remains constant   (D) First increases then decreases

4. The S.I unit of molar specific heat is: (A) $J\,mol^{-1}\,K^{-1}$ (B) $J\,mol\,K^{-1}$ (C) $J\,mol\,K$ (D) $J\,mol$

5. The number of significant zeros in the number 0.00904 is / are:

    (A) 1   (B) 2   (C) 3   (D) 4

6. The dimension of angular momentum "$\vec{L}$" are:

    (A) $[ML\,T^{-1}]$ (B) $[ML^2\,T^{-1}]$ (C) $[ML^2\,T^{-2}]$ (D) $[ML^{-2}\,T]$

7. If $\vec{A} = 6\hat{i}$ and $\vec{B} = +6\hat{j}$ then angle of $\vec{A} + \vec{B}$ with $Y-axis$ is:

    (A) 0^0 (B) 15^0 (C) 30^0 (D) 45^0

8. If $\vec{A}.\vec{B} = 0$ and $\vec{A}.\vec{C} = 0$ then vector $\vec{A}$ is parallel to:

    (A) $\vec{B}$ (B) $\vec{C}$ (C) $\vec{B} \times \vec{C}$ (D) $\vec{B}.\vec{C}$

9. The velocity of an object dropped from a building at any instant 't' will be:

    (A) $\dfrac{1}{2}\,gt^2$ (B) gt (C) $\dfrac{1}{2}\,gt$ (D) at

10. The slope of velocity-time graph of a body is constant. The body is moving with:

    (A) Uniform velocity   (B) Variable acceleration   (C) Uniform acceleration   (D) Negative variable acceleration

11. Tidal energy is due to the gravitational pull of:

    (A) Sun   (B) Earth   (C) Mars   (D) Moon

12. The angular velocity of the minute hand of a clock is:

    (A) $2\pi\,rad\,S^{-1}$ (B) $\pi\,rad\,S^{-1}$ (C) $\dfrac{\pi}{60}\,rad\,S^{-1}$ (D) $\dfrac{\pi}{1800}\,rad\,S^{-1}$

13. If the linear velocity and radius are both made half for a body moving in a circle then centripetal force will be:

    (A) $2F_C$ (B) $\dfrac{F_C}{2}$ (C) $\dfrac{F_C}{4}$ (D) F_C

14. The dimensions of 'sgh' are similar to that of:

    (A) Pressure   (B) K.E   (C) Torque   (D) Power

15. If a pendulum oscillates with a frequency 0.5 Hz then its length will be:

    (A) 10 cm   (B) 50 cm   (C) 80 cm   (D) 100 cm

16. Speed of sound at 10 degree Celsius is:

    (A) $332\,ms^{-1}$ (B) $339\,ms^{-1}$ (C) $349\,ms^{-1}$ (D) $360\,ms^{-1}$

17. Velocity of sound has maximum value at 20^0C in:

    (A) Lead   (B) Copper   (C) Glass   (D) Iron

Roll No _____ to be filled in by the candidate

HSSC-(P-I)-A/2023

Marks : ~~

(For All Sessions)

(GROUP-I)

Time: 2:40 hours

Physics (Subjective)

SECTION-I

Rwp-11-1-23

2. **Write short answers of any eight parts from the following:** (8x2=16)

  i. Why do we find it useful to have two units for the amount of substance, the kilogram and the mole?

  ii. The period of a simple pendulum is measured by a stop watch. What types of errors are possible in the time period?

  iii. What are the dimensions and units of gravitational constant G in the formula $F = G m_1 m_2 / r^2$

  iv. Check the correctness of the relation $V = \sqrt{\dfrac{F \times l}{m}}$, where V is speed of transverse wave on a stretched string.

  v. Can a body rotate about its center of gravity under the action of its weight? Explain

  vi. Name the three different conditions that could make $\vec{A}_1 \times \vec{A}_2 = \vec{0}$

  vii. Explain briefly the right hand rule to find the direction of vector product.

  viii. Can the velocity of an object reverse direction when acceleration is constant? If so give an example.

  ix. Define impulse and show how it is related to linear momentum.

  x. What happens when two bodies of same masses collide elastically?   xi. Derive a relation for the range of the projectile.

  xii. A person is standing near a fast moving train. Is there any danger that he will fall towards it?

3. **Write short answers of any eight parts from the following:** (8x2=16)

  i. Prove $P = \vec{F} \cdot \vec{V}$ ii. An object has 1 J of potential energy. Explain what does it mean?

  iii. A boy uses a catapult to throw a stone which accidentally smashes a green house window. List the possible energy changes.

  iv. Find out the relation between linear and angular velocity.

  v. Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V transmission?

  vi. Why does a diver change his body positions before and after diving in the pool?

  vii. What should be the length of a simple pendulum whose period is 1.0 second at a place where $g = 9.8\,ms^{-2}$?

  viii. Does frequency depend on amplitude for harmonic oscillators?

  ix. Can we realize an ideal simple pendulum?   x. Write four applications of Doppler's Effect.

  xi. Explain why sound travels faster in warm air than in cold air.   xii. Explain the terms crest, trough node and antinode.

4. **Write short answers of any six parts from the following:** (6x2=12)

  i. What do you understand by the term "selective absorption" in polarization?

  ii. How would you elaborate optical rotation?   iii. Calculate the speed of light in a glass of refractive index 1.5.

  iv. Can visible light produce interference fringes? Explain your answer with proper reasons.

  v. How would you elaborate the use of convex lens as magnifier? Make a diagram to support your answer.

  vi. State Carnot Theorem and also state extended theorem by Carnot.

  vii. How would you develop postulates of kinetic theory of gases which can help to formulate a mathematical model.

  viii. What happens to the temperature of the room, when an air conditioner is left running on a table in the middle of the room?

  ix. Can the mechanical energy be converted completely into heat energy? If so, give an example.

SECTION-II

Note   Attempt any three questions. Each question carries equal marks: (8x3=24)

5. (a) What is scalar product of two vectors? Write down its characteristics.   5

  (b) A force (thrust) of 400 N is required to overcome road friction and air resistance in propelling an automobile at 80 km / h. What power (KW) must the engine develop?   3

6. (a) Define centripetal force and prove that $Fc = \dfrac{mv^2}{r}$ 5

  (b) A truck weighing 2500kg and moving with a velocity of $21\,ms^{-1}$ collides with a stationary car weighing 1000kg. The truck and the care move together after the impact. Calculate their common velocity.   3

7. (a) State and explain Bernoulli's equation.   (b) Find the average speed of oxygen molecules in air at S.T.P.?   5+3=8

8. (a) How stationary waves are produced in a string? Show that harmonics are integral multiples of fundamental frequency?   5

  (b) A block of mass 4.0 kg is dropped for a height of 0.80m on to a spring of spring constant $= 1960\,Nm^{-1}$. Find the maximum distance through which the spring will be compressed.   3

9. (a) Define telescope. Describe the construction of an astronomical telescope and derive an expression for its magnifying power.   5

  (b) Sodium light ($\lambda = 589\,nm$) is incident normally on a grating having 3000 lines per centimeter. What is the highest order of the spectrum obtained with this grating?   3

Physics (Objective)   (For All Sessions)   (Group-I)   Time: 20 Minutes   Marks : 17

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1.1. The example of mechanical waves is: *Rwp-11-2-23*

(A) Water waves (B) Radio waves (C) Infrared waves (D) Ultraviolet waves

2. Sound waves cannot travel through:

(A) Water (B) Air (C) Material medium (D) Vacuum

3. Light is polarized by using:

(A) Sodium chloride (B) Optical fiber (C) Dichroic substance (D) Plane glass

4. It becomes possible to send light to inaccessible place due to:

(A) Coaxial cable (B) Optical fiber (C) Copper wire (D) Glass wire

5. When hot and cold water are mixed, the entropy:

(A) Decreases (B) Increases (C) Remains constant (D) Is zero

6. Force acting on the piston to move outward is:

(A) Intake stroke (B) Compressive stroke (C) Power stroke (D) Exhaust stroke

7. The number of significant figures in 0.00232 is :

(A) 3 (B) 4 (C) 5 (D) 6

8. Number of colours used in process of colour printing to produce the entire range of colours are:

(A) 7 (B) 6 (C) 5 (D) 4

9. If $Ax = Ay$, then the angle between $\vec{A}$ and $x-axis$ is:

(A) 30° (B) 45° (C) 60° (D) 90°

10. If $\vec{A}$ has components Ax and Ay, the magnitude of Ax is given by:

(A) $A - Ay$ (B) $(A - Ay)^{-\frac{1}{2}}$ (C) $(A - Ay)^{\frac{1}{2}}$ (D) $(A^2 - Ay^2)^{\frac{1}{2}}$

11. When average velocity becomes equal to instantaneous velocity then body is said to be called moving with:

(A) Instantaneous acceleration (B) Variable acceleration (C) Uniform velocity (D) Variable velocity

12. The velocity time graph is parallel to the time axis, the acceleration of the moving body is:

(A) Positive (B) Negative (C) Maximum (D) Zero

13. A body of mass 2kg moving with velocity $4ms^{-1}$ has K.E equal to:

(A) 16 J (B) 8 J (C) 2 J (D) 32 J

14. Apparent weight of an object in a lift moving down with acceleration $a = g$ is:

(A) $W + ma$ (B) Zero (C) W (D) Infinity

15. If radius of earth is increased four times of the present, critical velocity V_o becomes:

(A) $V_o/\sqrt{2}$ (B) $\sqrt{2} V_o$ (C) $2V_o$ (D) $V_o/2$

16. Venturimeter is a device used to measure:

(A) Density of fluid (B) Speed of fluid (C) Pressure of fluid (D) Viscosity of fluid

17. By increasing the mass of the object four times attached to a spring. Time period will become:

(A) Same (B) Twice (C) Three times (D) Four times

Roll No _____ to be filled in by the candidate

HSSC-(P-I)-A/2023

(For All Sessions)

GROUP-II

Marks : 66

Time: 2:40 hours

Physics (Subjective)

RWP-11-2-23

SECTION-I

2. Write short answers of any eight parts from the following: (8×2=16)

i. What are the dimensions and units of gravitational constant 'G' in the formula $F = G\frac{m_1 m_2}{r^2}$

ii. How many years are in 1 second?

iii. Define light year. What are units and dimensions of light year?

iv. Show that $S = V_i t + \frac{1}{2}at^2$ is dimensionally correct.

v. Write down the steps for addition of vectors by rectangular component method.

vi. Is it possible to add a vector quantity to a scalar quantity? Explain.

vii. Can a body rotate about its center of gravity under the action of its weight?

viii. An object is thrown vertically upward. Discuss the sign of acceleration due to gravity, relative to velocity, while the object is in air.

ix. At what point or points in its path does a projectile has its minimum speed, its maximum speed?

x. A rubber ball and lead ball of same size are moving with same velocity. Which ball has great momentum and why?

xi. Show that $\vec{I} = \Delta\vec{P}$

xii. Why fog droplets appear to be suspended in air?

3. Write short answers of any eight parts from the following: (8×2=16)

i. Calculate the work done in kilo joules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10m.

ii. A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?

iii. Describe the negative work with an example?

iv. What is meant by moment of inertia? Explain its significance.

v. When mud flies off the tyre of a moving bicycle, in what direction does it fly?

vi. If a person is falling in an elevator freely. What will be his weight? Measured by himself.

vii. Does frequency depend on amplitude for harmonic oscillators?

viii. Describe two common phenomena in which resonance plays an important role.

ix. How long must a simple pendulum be in order to have a period of one second?

x. How are beats useful in tuning musical instruments?

xi. Explain the term trough and node.

xii. What happens when a pebble is dropped into a quiet pond?

4. Write short answers of any six parts from the following: (6×2=12)

i. An oil film spreading over a wet footpath shows colour. Explain how does it happen?

ii. How would you manage to get more orders of spectra using a diffraction grating?

iii. How coherent light beams can be produced? Explain.

iv. Why would it be advantageous to use blue light with a compound microscope?

v. What do you mean by length of telescope?

vi. Explain the average velocity of the molecules in a gas is zero but the average of the square of velocities is not zero?

vii. Give an example of a process in which no heat is transferred to or from the system but the temperature of the system changes.

viii. Does entropy of a system increases or decreases due to heat engine?

ix. Define the 2nd law of thermodynamics.

SECTION-II

Note Attempt any three questions. Each question carries equal marks: (8×3=24)

5. (a) Discuss the inter-conversion of potential energy and kinetic energy for falling object when friction force is not considered.

(b) Find the angle between two forces of equal magnitude when the magnitude of their resultant is also equal to the magnitude of either of these forces.

6. (a) What is meant by artificial gravity? Prove that $f = \frac{1}{2\pi}\sqrt{\frac{g}{R}}$

(b) A ball is thrown with a speed of $30 ms^{-1}$ in a direction $30°$ above the horizon. Determine the height to which it rises and time of flight.

7. (a) Show that the product of cross sectional area of the pipe and fluid speed at any point along the pipe is constant.

(b) 336J of energy is required to melt 1g of ice at 0°C. What is change in entropy of 30g of water as it is changed to ice at 0°C by a refrigerator?

8. (a) Why simple pendulum is called simple? Also derive the relation for time period and discuss how the time period depends upon length and gravity.

(b) Find the temperature at which the velocity of sound in air is two times its velocity at 10°C.

9. (a) What is simple microscope? Calculate its magnifying power.

(b) Sodium light ($\lambda = 589 nm$) is incident normally on a grating having 3000 lines per centimeter. What is the highest order of the spectrum obtained with this grating?

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