

# Physics (Objective)

## Rawalpindi Board-G-1-2024 (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 When temperature of air increases then the speed of sound will:  
(A) Decrease (B) ☒ Increase (C) Remain same (D) Be Zero
2. The distance between first and third crest in transverse wave is:  
(A) ☒  $2\lambda$  (B)  $3\lambda$  (C)  $4\lambda$  (D)  $8\lambda$
3. Wave front and light rays are always:  
(A) Parallel (B) ☒ Perpendicular (C) Antiparallel (D) At  $120^\circ$
4. The advantage of graded index fibre over the step index fibre is due to no :  
(A) Refraction (B) ☒ Dispersion (C) Multiple reflection (D) Scattering
5. In the gas equation  $Pv = RT$ , where v represents volume of:  
(A) 1 g of gas (B) ☒ 1 mole of gas (C) 1 liter of gas (D) Any mass of gas
6. If  $T_1 > T_2$  then  $\frac{Q}{T_2} - \frac{Q}{T_1}$  is always:  
(A) Zero (B) Infinity (C) Negative (D) ☒ Positive
7. The dimension of  $\sqrt{\frac{f \times l}{m}}$  is  
(A)  $[LT^{-3}]$  (B)  $[LT^{-2}]$  (C)  $[MLT^{-1}]$  (D) ☒  $[LT^{-1}]$
8. The least count of a balance A is 10kg, of B is 1 kg, of C is 0.1 kg and of D is 0.01kg, which is most precise:  
(A) A (B) B (C) C (D) ☒ D
9.  $\hat{i} \times (\hat{j} + \hat{k})$  is equal to:  
(A) 1 (B)  $\vec{0}$  (C)  $\hat{j} - \hat{k}$  (D) ☒  $\hat{k} - \hat{j}$
10.  $\vec{A} = 5\hat{i} + 7\hat{j} - 3\hat{k}$  and  $\vec{B} = 2\hat{i} + 2\hat{j} - a\hat{k}$  are perpendicular vectors, the value of 'a' is:  
(A) -2 (B) 8 (C) ☒ -7 (D) -8
11. A body is moving with uniform velocity. its acceleration will be:  
(A) Variable (B) ☒ Zero (C) Uniform (D) Positive
12. Which of the following can be determined by finding the slope of the tangent of the velocity time graph at a point is:  
(A) ☒ Acceleration (B) Momentum (C) Displacement (D) Average velocity
13. The work done in taking a body from the floor to the table top depends on:  
(A) The path taken (B) ☒ Height of the table (C) Speed of the particle (D) Time taken for work
14. " $mr\omega^2$ " is an expression for:  
(A) Gravitational force (B) ☒ Centripetal force (C) Newton's force (D) Apparent force
15. The rate of change of angular momentum is:  
(A) Force (B) ☒ Torque (C) Pressure (D) Density
16. The terminal velocity of an object in a fluid of greater viscosity is:  
(A) Large (B) ☒ Small (C) Maximum (D) Zero
17. A body performing SHM, the distance covered by body in complete vibration is 20 cm. its amplitude will be:  
(A) ☒ 5 cm (B) 10 cm (C) 20 cm (D) 40 cm



Roll No \_\_\_\_\_

**Physics (Subjective)****Group-I**

Time: 2:40 hours

**SECTION-I****2. Write short answers of any eight parts from the following:**

- Does all physical measurements are accurate or precise, yes or not, explain.
- How do you calculate final uncertainty in a timing experiment?
- Find the dimension of coefficient of viscosity  $\eta$  in the relation  $F = 6\pi\eta r v$ .
- Name several repetitive phenomenon occurring in nature which could serve as reasonable time standards.
- How do you multiply a vector by a scalar number? vi. Can the magnitude of a vector have a negative value?
- Can a body rotate about its center of gravity under the action of its weight?
- Explain the circumstances in which the velocity and acceleration of a car are (i) Parallel (ii) Anti-parallel.
- Define impulse and how it is related to linear momentum? x. What is meant by a ballistic missile, how it works?
- An object has 1J of potential energy. Explain what does it mean? How much power does it have?
- A girl drops a cup from certain height, which breaks into pieces. Why it happens & what energy changes are involved?



(8x2=16)

**3. Write short answers of any eight parts from the following:**

- What is meant by angular momentum? Explain the law of conservation of angular momentum.
- When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain.
- Differentiate between tangential velocity and angular velocity. iv. Prove that  $2 \text{ radian} = 114.6^\circ$
- A person is standing near a fast moving train. Is there any danger that he will fall towards it?
- What are systolic and diastolic pressures? vii. Does frequency depend on amplitude for harmonic oscillators?
- What is meant by phase angle? Does it define angle between maximum displacement and the driving force?
- Show that when a pendulum moves from mean position to half of amplitude, time taken by it is,  $t = T/12$ .
- A wave is produced along a stretched string but some of its particles permanently show zero displacement. What type of wave is it?
- Why does sound travels faster in solids than in gases?
- Find the temperature of air, if the velocity of sound is  $340 \text{ ms}^{-1}$  at the temperature.

(8x2=16)

**4. Write short answers of any six parts from the following:**

- Under what conditions two or more sources of light behave as coherent sources?
- How would you manage to get more orders of spectra using a diffraction grating?
- What is graphical representation of diffraction pattern of monochromatic light produced due to a single slit?
- What do you understand by linear magnification and angular magnifications?
- How power is lost in optical fiber through dispersion? Explain. vi. Name the parts of a spectrometer?
- Does entropy of a system increases or decreases due to friction?
- Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- Draw a PV-diagram in case of isothermal process and adiabatic process.

(6x2=12)

**SECTION-II****Note Attempt any three questions. Each question carries equal marks:**

(8x3=24)

- (a) Derive the expression for the final velocities of two hard smooth balls after their elastic collision in one dimension. (5)  
(b) Find the angle between the two vectors.  $\vec{A} = 5\hat{i} + \hat{j}$  and  $\vec{B} = 2\hat{i} + 4\hat{j}$  (3)
- (a) Which field is produced by the earth? Prove that the work done in this field is independent of the path followed and work done in a closed path be zero. (5)  
(b) A stationary wave is established in a string which is 120cm long and fixed at both ends. The string vibrates in four segments, at a frequency of 120 Hz. Determine its wavelength and fundamental frequency. (3)
- (a) What is resonance phenomenon? Explain it with examples. (5)  
(b) A gramophone record turntable accelerates from rest to an angular velocity of 45.0 rev / min in 1.60 seconds. What is the average angular acceleration. (3)
- (a) How does the pressure of a gas in a container is directly proportional to average translational kinetic energy. (5)  
(b) An airplane wing is designed so that when the speed of the air across the top of the wing is  $450 \text{ ms}^{-1}$ , the speed of air below the wing is  $410 \text{ ms}^{-1}$ . What is the pressure difference between the top & bottom of the wings? (Density of air  $= 1.29 \text{ kg m}^{-3}$ ) (3)
- (a) Discuss Michelson's interferometer in detail. (5)  
(b) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24cm apart. Find focal lengths of lenses. (3)





Roll No \_\_\_\_\_

HSSC-(P-I)-A/2024

Paper Code

6

4

7

6

(For All Sessions)

**Physics (Objective)****(Group-II)****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.

**Rawalpindi Board-G-2-2024**

1.1 The location of submarines can be detected by:

- (A) ☒ Doppler effect (B) Compton's effect (C) Photoelectric effect (D) Temperature effect

2. The speed of sound is greater in:

- (A) Oxygen (B) Air (C) Water (D) ☒ Copper

3. The property of bending of light around obstacles is:

- (A) Reflection (B) Refraction (C) ☒ Diffraction (D) Polarization

4. Magnifying power of telescope is:

- (A)  $\frac{f_e}{f_o}$  (B) ☒  $\frac{f_o}{f_e}$  (C)  $f_e f_o$  (D)  $\frac{1}{f_e f_o}$

5.  $W = -\Delta U$  equation holds for:

- (A) Isothermal (B) ☒ Adiabatic (C) Isochoric (D) Isobaric

6. The efficiency of carnot engine depends on:

- (A) Working substance (B)  $T_1$  (C)  $T_2$  (D) ☒  $T_1$  &  $T_2$

7. The number of significant figures in 0.00232 are:

- (A) 6 (B) 5 (C) 4 (D) ☒ 3

8. Light year is the unit of:

- (A) Light (B) ☒ Distance (C) Time (D) Velocity

9. The relation  $\vec{A} + (-\vec{A})$  results the:

- (A) ☒ Null vector (B) Parallel vector (C) Unit vector (D) Position vector

10. Unit vector for a vector  $\vec{A} = 4\hat{i} + 3\hat{j}$  is:

- (A)  $\frac{4\hat{i} + 3\hat{j}}{25}$  (B)  $\frac{\sqrt{25}}{4\hat{i} + 3\hat{j}}$  (C) ☒  $\frac{4\hat{i} + 3\hat{j}}{5}$  (D)  $\frac{\sqrt{5}}{\sqrt{4\hat{i} + 3\hat{j}}}$

11. The horizontal range of projectile at  $30^\circ$  with horizontal is same as that at an angle of:

- (A)  $45^\circ$  (B) ☒  $60^\circ$  (C)  $90^\circ$  (D)  $120^\circ$

12. The mass of fuel consumed by a typical rocket to overcome earth's gravity is:

- (A)  $10 \text{ Kgs}^{-1}$  (B)  $100 \text{ Kgs}^{-1}$  (C) ☒  $10000 \text{ Kgs}^{-1}$  (D)  $1000 \text{ Kgs}^{-1}$

13. The work is said to be negative if:

- (A)  $\theta = 0^\circ$  (B)  $\theta = 90^\circ$  (C) ☒  $\theta > 90^\circ$  (D)  $\theta < 90^\circ$

14. The relation for moment of inertia of sphere is:

- (A) ☒  $\frac{2}{5}mr^2$  (B)  $\frac{5}{2}mr^2$  (C)  $\frac{1}{2}mr^2$  (D)  $2mr^2$

15. If  $1 \text{ rad} = 57.3^\circ$  then  $\frac{1}{2} \text{ rad}$  is:

- (A)  $57.3^\circ$  (B) ☒  $28.65^\circ$  (C)  $180^\circ$  (D)  $360^\circ$

16. The pressure will be low when the speed of fluid is:

- (A) ☒ High (B) Low (C) Zero (D) Constant

17. The acceleration of a body executing SHM depends upon its:

- (A) Time period (B) Amplitude (C) Frequency (D) ☒ Displacement

835-11-A

Roll No \_\_\_\_\_

**HSSC-(P-I)-A-2024  
(For All Sessions)**

**Marks : 68**

**Physics (Subjective)**

**Group-II**

**Time: 2:40 hours**

**Section-I**



(8x2=16)

**2. Write short answers of any eight parts from the following:**

- i. Write the dimension of (i) Pressure (ii) Density.
- ii. What are the dimension and unit of  $\sqrt{\frac{F \times l}{m}}$  ?
- iii. What are supplementary units? Define only one unit.
- iv. Give the drawbacks to use the period of a pendulum as a time standard.
- v. Two vectors have unequal magnitudes. Can their sum be zero? Explain.
- vi. Under what circumstances would a vector have components that are equal in magnitude?
- vii. If  $\vec{A} = 3\hat{i} - 5\hat{j}$ ,  $\vec{B} = 7\hat{k}$  find  $(\vec{A} \times \vec{B})$
- viii. What is ballistic missile? Define its trajectory.
- ix. Show that the area between the velocity time graph is numerically equal to the distance covered by the object.
- x. Explain what is meant by projectile motion. Derive expression for the time of flight
- xi. What is the solar constant and what is its value?
- xii. Calculate the work done in kilo joules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10m.

**3. Write short answers of any eight parts from the following:**

(8x2=16)

- i. Show that orbital angular momentum,  $L_0 = mvr$ .
- ii. How can you describe angular equations of motion analogous with linear equations of motion?
- iii. Prove that,  $\theta = \frac{s}{r}$  radian.
- iv. Can centripetal force perform any work? Explain.
- v. Fog droplet appears to be suspended in air. Why?
- vi. How an airplane is lifted up in the air?
- vii. Does the acceleration of a simple harmonic oscillator remains constant during its motion? Is the acceleration ever zero? Explain.
- viii. Why in S.H.M the acceleration is zero when the velocity is greatest?
- ix. Prove the relation  $U = f\lambda$
- x. Calculate the formula of the time period of a mass attached to a spring.
- xi. As a result of a distant explosion an observer senses a ground tremor & then hears the explosion. Explain the time difference.
- xii. What will be effect on speed of sound if the temperature of the gas through which it passes increases to three times keeping the pressure of the gas constant?

**4. Write short answers of any six parts from the following:**

(6x2=12)

- i. Can visible light produce interference fringes? Explain.
- ii. How would you manage to get more orders of spectra using a diffraction grating?
- iii. When mirror  $M_1$  of Michelson interferometer is moved a distance 0.5 mm, 200 fringes are observed, then calculate the wavelength of light used.
- iv. Explain the difference between angular magnification and resolving power of an optical instrument.
- v. How the power is lost in optical fibre through dispersion? Explain
- vi. What is meant by length of the telescope? Explain
- vii. Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
- viii. A thermos flask containing milk as a system is shaken rapidly. Does the temperature of milk rise?
- ix. Does the efficiency of Carnot engine depends on the nature of working substance? Explain it.

**SECTION-II**

**Note Attempt any three questions. Each question carries equal marks:**

(8x3=24)

5. (a) Define vector product and also discuss torque as an example of vector product in detail. (5)
- (b) Two blocks of masses 2.0 kg and 0.50 kg are attached at the two ends of a compressed spring. The elastic potential energy is stored in the spring is 10J. Find the velocities of the block if the spring delivers its energy to blocks when released. (3)
6. (a) How would you derive a relation for the effect of temperature on the speed of sound in a gas? (5)
- (b) A 70 kg man runs up a long flight of stairs in 4.0 sec. The vertical height of the stairs is 4.5 m. calculate his power output in watts. (3)
7. (a) Prove that energy is conserved in simple harmonic motion. (5)
- (b) A 1000 kg car travelling with a speed of  $144 \text{ kmh}^{-1}$  round a curve of radius 100m. Find the necessary centripetal force. (3)
8. (a) State first law of thermodynamics and explain (i) Isothermal process (ii) Adiabatic process. (5)
- (b) Water flows through a hose, whose internal diameter is 1 cm at a speed of 1m/s . What should be the diameter of the nozzle if the water is to emerge at 21 m/s? (3)
9. (a) Explain the construction and working of an astronomical telescope. Also derive a relation for its magnifying power. (5)
- (b) A light is incident normally on a grating which has 2500 lines per centimeter. Compute the wavelength of the spectral line for which the deviation in second order is  $15.0^\circ$  (3)



## 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)  $\frac{1.3}{C}$  (C)  $\frac{C}{1.3}$  (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)  $[MLT^{-1}]$  (B)  $[ML^2T^{-1}]$  (C)  $[ML^2T^{-2}]$  (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)  $0^\circ$  (B)  $15^\circ$  (C)  $30^\circ$  (D)  $45^\circ$

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

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

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

- (A)  $\frac{1}{2} g t^2$  (B)  $gt$  (C)  $\frac{1}{2} gt$  (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)  $\frac{\pi}{60} rad S^{-1}$  (D)  $\frac{\pi}{1800} rad S^{-1}$

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)  $\frac{F_c}{2}$  (C)  $\frac{F_c}{4}$  (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  $20^\circ C$  in:

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



## SECTION-I

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

- Why do we find it useful to have two units for the amount of substance, the kilogram and the mole?
- The period of a simple pendulum is measured by a stop watch. What types of errors are possible in the time period?
- What are the dimensions and units of gravitational constant  $G$  in the formula  $F = G \frac{m_1 m_2}{r^2}$ ?
- Check the correctness of the relation  $V = \sqrt{\frac{F \times l}{m}}$ , where  $V$  is speed of transverse wave on a stretched string.
- Can a body rotate about its center of gravity under the action of its weight? Explain.
- Name the three different conditions that could make  $\vec{A}_1 \times \vec{A}_2 = \vec{0}$ .
- Explain briefly the right hand rule to find the direction of vector product.
- Can the velocity of an object reverse direction when acceleration is constant? If so give an example.
- Define impulse and show how it is related to linear momentum.
- What happens when two bodies of same masses collide elastically?
- Derive a relation for the range of the projectile.
- 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)

- Prove  $P = \vec{F} : \vec{V}$ .
- An object has 1 J of potential energy. Explain what does it mean?
- A boy uses a catapult to throw a stone which accidentally smashes a green house window. List the possible energy changes.
- Find out the relation between linear and angular velocity.
- Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V transmission?
- Why does a diver change his body positions before and after diving in the pool?
- What should be the length of a simple pendulum whose period is 1.0 second at a place where  $g = 9.8 \text{ ms}^{-2}$ ?
- Does frequency depend on amplitude for harmonic oscillators?
- Can we realize an ideal simple pendulum?
- Write four applications of Doppler's Effect.
- Explain why sound travels faster in warm air than in cold air.
- Explain the terms crest, trough node and antinode.

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

- What do you understand by the term "selective absorption" in polarization?
- How would you elaborate optical rotation?
- Calculate the speed of light in a glass of refractive index 1.5.
- Can visible light produce interference fringes? Explain your answer with proper reasons.
- How would you elaborate the use of convex lens as magnifier? Make a diagram to support your answer.
- State Carnot Theorem and also state extended theorem by Carnot.
- How would you develop postulates of kinetic theory of gases which can help to formulate a mathematical model.
- What happens to the temperature of the room, when an air conditioner is left running on a table in the middle of the room?
- 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)

- What is scalar product of two vectors? Write down its characteristics. 5
  - 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
- Define centripetal force and prove that  $F_c = \frac{mv^2}{r}$ . 5
  - A truck weighing 2500kg and moving with a velocity of  $21 \text{ ms}^{-1}$  collides with a stationary car weighing 1000kg. The truck and the car move together after the impact. Calculate their common velocity. 3
- State and explain Bernoulli's equation. (b) Find the average speed of oxygen molecules in air at S.T.P.? 5+3=8
- How stationary waves are produced in a string? Show that harmonics are integral multiples of fundamental frequency? 5
  - A block of mass 4.0 kg is dropped from a height of 0.80m on to a spring of spring constant =  $1960 \text{ Nm}^{-1}$ . Find the maximum distance through which the spring will be compressed. 3
- Define telescope. Describe the construction of an astronomical telescope and derive an expression for its magnifying power. 5
  - Sodium light ( $\lambda = 589 \text{ nm}$ ) 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)

09/01/23

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. The example of mechanical waves is:

- (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) 8 (C) 5 (D) 4

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

- (A)  $30^\circ$  (B)  $45^\circ$  (C)  $60^\circ$  (D)  $90^\circ$

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

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

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  $4\text{ms}^{-1}$  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



Physics (Subjective)



(For All Sessions)

GROUP-II

Time: 2:40 hours

## SECTION-I

2. Write short answers of any eight parts from the following:

(8x2=16)

- What are the dimensions and units of gravitational constant 'G' in the formula  $F = G \frac{m_1 m_2}{r^2}$ ?
- How many years are in 1 second?
- Define light year. What are units and dimensions of light year?
- Show that  $S = V_i t + \frac{1}{2} a t^2$  is dimensionally correct.
- Write down the steps for addition of vectors by rectangular component method.
- Is it possible to add a vector quantity to a scalar quantity? Explain.
- Can a body rotate about its center of gravity under the action of its weight?
- An object is thrown vertically upward. Discuss the sign of acceleration due to gravity, relative to velocity, while the object is in air.
- At what point or points in its path does a projectile has its minimum speed, its maximum speed?
- A rubber ball and lead ball of same size are moving with same velocity. Which ball has great momentum and why?
- Show that  $\vec{f} = \Delta \vec{p}$
- Why fog droplets appear to be suspended in air?

3. Write short answers of any eight parts from the following:

(8x2=16)

- Calculate the work done in kilo joules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10m.
- A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?
- Describe the negative work with an example?
- What is meant by moment of inertia? Explain its significance.
- When mud flies off the tyre of a moving bicycle, in what direction does it fly?
- If a person is falling in an elevator freely. What will be his weight? Measured by himself.
- Does frequency depend on amplitude for harmonic oscillators?
- Describe two common phenomena in which resonance plays an important role.
- How long must a simple pendulum be in order to have a period of one second?
- How are beats useful in tuning musical instruments?
- Explain the term trough and node.
- What happens when a pebble is dropped into a quiet pond?

4. Write short answers of any six parts from the following:

(6x2=12)

- An oil film spreading over a wet footpath shows colour. Explain how does it happen?
- How would you manage to get more orders of spectra using a diffraction grating?
- How coherent light beams can be produced? Explain.
- Why would it be advantageous to use blue light with a compound microscope?
- What do you mean by length of telescope?
- Explain the average velocity of the molecules in a gas is zero but the average of the square of velocities is not zero?
- Give an example of a process in which no heat is transferred to or from the system but the temperature of the system changes.
- Does entropy of a system increases or decreases due to heat engine?
- Define the 2<sup>nd</sup> law of thermodynamics.

## SECTION-II

Note Attempt any three questions. Each question carries equal marks:

(8x3=24)

- Discuss the inter-conversion of potential energy and kinetic energy for falling object when friction force is not considered.
- 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.
- What is meant by artificial gravity? Prove that  $f = \frac{1}{2\pi} \sqrt{\frac{g}{R}}$ 
  - A ball is thrown with a speed of  $30 \text{ m s}^{-1}$  in a direction  $30^\circ$  above the horizon. Determine the height to which it rises and time of flight.
- Show that the product of cross sectional area of the pipe and fluid speed at any point along the pipe is constant.
  - 336J of energy is required to melt 1g of ice at  $0^\circ\text{C}$ . What is change in entropy of 30g of water as it is changed to ice at  $0^\circ\text{C}$  by a refrigerator?
- Why simple pendulum is called simple? Also derive the relation for time period and discuss how the time period depends upon length and gravity.
  - Find the temperature at which the velocity of sound in air is two times its velocity at  $10^\circ\text{C}$ .
- What is simple microscope? Calculate its magnifying power.
  - Sodium light ( $\lambda = 589 \text{ nm}$ ) is incident normally on a grating having 3000 lines per centimeter. What is the highest order of the spectrum obtained with this grating?





Roll No. \_\_\_\_\_ to be filled in by the candidate.

Inter. (Part-I)-A-2022

(For all Sessions)

Paper Code	6	4	7	1
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**Physics** (Objective Type)

Time: 20 Minutes

Group-I

Marks:17

**Note:** You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

- The fractional uncertainty in the measurement of radius  $r = 2.25 \pm 0.01 \text{ cm}$  is:  
(A) 0.4 (B) 0.04 (C) 0.004 (D) 0.0004
- The dimensions of pressure are:  
(A)  $[ML^{-1}T^{-2}]$  (B)  $[MLT^{-2}]$  (C)  $[ML^2T^{-2}]$  (D)  $[ML^{-1}T^{-1}]$
- The projection of  $\vec{A}$  in the direction of  $\vec{B}$  is:  
(A)  $B \cos \theta$  (B)  $AB \cos \theta$  (C)  $A \cos \theta$  (D)  $A \sin \theta$
- Dot product of two antiparallel vectors  $\vec{A}$  and  $\vec{B}$  is:  
(A)  $AB \cos \theta$  (B)  $AB$  (C) 0 (D)  $-AB$
- The two masses  $m_1$  and  $m_2$  will interchange their velocities after collision if:  
(A)  $m_1 \gg m_2$  (B)  $m_1 = m_2$  (C)  $m_2 \gg m_1$  (D)  $m_2$  is at rest
- $\text{Kg ms}^{-1}$  is the SI unit of:  
(A) Force (B) Momentum (C) Energy (D) Power
- The work done is said to be negative if:  
(A) Work is always positive (B)  $\theta < 90^\circ$   
(C)  $\theta > 90^\circ$  (D)  $\theta = 90^\circ$
- When a body attains its terminal velocity, the acceleration of body becomes.  
(A) Zero (B) equal to  $g$  (C) maximum (D) equal to  $-g$
- Moment of inertia of sphere is  
(A)  $mr^2$  (B)  $\frac{1}{2}mr^2$  (C)  $\frac{2}{3}mr^2$  (D)  $\frac{2}{5}mr^2$
- The low flying earth satellites have acceleration:  
(A)  $9.8 \text{ m/s}^2$  (B)  $4.9 \text{ m/s}^2$  (C)  $10 \text{ m/s}^2$  (D)  $7.9 \text{ m/s}^2$
- When a quarter of the cycle is completed, the phase of vibration is.  
(A)  $2\pi \text{ rad}$  (B)  $\frac{\pi}{2} \text{ rad}$  (C)  $\frac{3\pi}{2} \text{ rad}$  (D)  $\pi \text{ rad}$
- For each degree rise in temperature of air, the speed of sound through it rises by:.  
(A) 0.60 cm/s (B) 0.61 m/s (C) 0.61 cm/s (D) 0.60 m/s
- If organ pipe is open at both ends, then the frequency of fundamental note is:  
(A)  $\frac{v}{2l}$  (B)  $\frac{v}{l}$  (C)  $\frac{v}{4l}$  (D)  $\frac{4v}{l}$
- If blue light is used instead of red light, the fringe spacing:  
(A) Increases (B) Disappears (C) Remains same (D) Decreases
- If magnifications of objective lens and eye - piece are 4 and 5 respectively, then the magnification of compound microscope will be:  
(A) 9 (B) 20 (C) 1 (D) 10
- Average kinetic energy of molecules of a gas gives.  
(A) Heat energy (B) Work done (C) Internal energy (D) Entropy
- If temperature of sink is decreased, the efficiency of Carnot engine.  
(A) Decreases (B) Increases  
(C) Remains same (D) May increase or decrease



**Roll No.** \_\_\_\_\_ *to be filled in by the Candidate.*

**Inter. (Part-I)-A-2022**

**Physics (Essay Type)**

**(For All Sessions)**

**Time: 2:40 Hours**

**Group-I**

**Marks: 68**



**Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.**

## SECTION - I

**2. Write short answers to any EIGHT questions.**

**(2 x 8 = 16)**

- i. Name several repetitive phenomenon which could serve as reasonable time standards.
- ii. Give the drawbacks to use the period of pendulum as time standard.
- iii. Check the correctness of  $v = \sqrt{\frac{F \times l}{m}}$  where  $v$  is speed of transverse wave on a stretched string of tension  $F$ , length  $l$  and mass  $m$ .
- iv. Define base units and name all SI base units.
- v. At which angle of projection a projectile for which its maximum height and horizontal range are equal.
- vi. What are objectives of velocity time graph.
- vii. Motion with constant velocity is a special case of constant acceleration. Is this statement true? Discuss.
- viii. Define impulse and how it is related to linear momentum.
- ix. Why the pressure of a car tyre increase when it is driven through some distance.
- x. Is it possible to convert internal energy into mechanical energy. Explain with an example.
- xi. Give an idea of working refrigerator.
- xii. Can mechanical energy be converted into heat energy? If so give an example.

**3. Write short answers to any EIGHT questions.**

**(2 x 8 = 16)**

- i. Two vectors have unequal magnitudes. Can their sum be zero? Explain.
- ii. Define the terms unit vector and position vector.
- iii. Explain the addition of two vectors by head to tail rule.
- iv. Define conservative field and give example.
- v. Explain fermentation process to get energy from biomass.
- vi. An object has 1J of potential energy. Explain what does it mean?
- vii. Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V transmission.
- viii. What is meant by moment of inertia? Explain its significance.
- ix. Prove that  $1 \text{ rad} = 57.3^\circ$ .
- x. What is meant by wave fronts?
- xi. Under what conditions two or more sources of light behave as coherent sources?
- xii. An oil film spreading over a wet footpath shows colours. Explain how does it happen.

**4. Write short answers to any SIX questions.**

**(2 x 6 = 12)**

- i. A person is standing near a fast moving train. Is there any danger that he will fall towards it?
- ii. Does the acceleration of a simple harmonic oscillator remains constant during its motion? Is the acceleration zero? Explain.
- iii. What is resonance? Give one application.
- iv. Give an application of damped oscillations.
- v. Why does sound travel faster in solids than in gases?
- vi. What is meant by blue shift in dopplers effect?
- vii. How beats are useful in tuning a musical instrument?
- viii. Why a convex lens of shorter focal length is preferred for a magnifying glass?
- ix. How the power is lost in optical fibre through dispersion? Explain.

## SECTION - II

**Note: Attempt any THREE (3) questions from Section II.**

5. (a) Define vector product of two vectors. Show that it is non commutative. Also write any four characteristics. (5)  
 (b) A car of mass 800 kg travelling at  $54 \text{ Km h}^{-1}$  is brought to rest in 60 meters. Find the average retarding force. What has happened to original K.E? (3)
6. (a) Define centripetal force. Derive a relation for centripetal force on a body of mass  $m$  moving with velocity  $v$  in a circle of radius  $r$ . (5)  
 (b) A ball is thrown horizontally from a height of 10m with velocity of  $21 \text{ m/s}$ . How far off it hit the ground and with what velocity? (3)
7. (a) State and prove equation of continuity using Law of conservation of mass. (5)  
 (b) A church organ consists of pipes, each open at one end of different lengths. The minimum length is 30cm and longest is 4m. Calculate the frequency range of fundamental notes. Speed of sound =  $340 \text{ ms}^{-1}$  (3)
8. (a) Derive the expression for time period, displacement and velocity of horizontal mass spring system. (5)  
 (b) A monochromatic light of  $\lambda = 588 \text{ nm}$  is allowed to fall on the half silvered glass plate G1, in Michelson interferometer. If mirror M1 is moved through 0.233 mm, how many fringes will be observed to shift? (3)
9. (a) Draw ray diagram of a compound microscope and derive expression for its magnification. (5)  
 (b) A heat engine perform 100 J of work and at the same time rejects 400 J of heat energy to the cold reservoirs. What is the efficiency of the engine? (3)



# Physics (Objective Type)

Time: 20 Minutes

Group-II

Marks:17

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.



- Venturi meter is a device used to measure:
  - Pressure of fluid
  - speed of fluid
  - Density of fluid
  - Viscosity of fluid
- 1 radian is equal to:
  - 45°
  - 60°
  - 57.3°
  - 73.3°
- If moment of inertia of a body becomes double, then angular momentum becomes:
  - One half
  - Doubled
  - Three times
  - Four times
- The product of frequency (f) and time period (T) is equal to:
  - 2.5
  - 0.5
  - 2
  - 1
- If organ pipe is open at both ends, the frequency of fundamental harmonic is:
  - $\frac{v}{2l}$
  - $\frac{2v}{l}$
  - $\frac{v}{4l}$
  - $\frac{4v}{l}$
- The speed of sound in air is 332 m/s at 0°C. Its speed at 20°C is:
  - 331.22 m/s
  - 332.22 m/s
  - 333.22 m/s
  - 332 m/s
- Colourful pattern produced by a thin soap film is due to \_\_\_\_\_ of light:
  - dispersion
  - polarization
  - diffraction
  - interference
- Magnification of simple microscope can be expressed as:
  - $1 + f/d$
  - $1 - f/d$
  - $1 + d/f$
  - $1 - f/d$
- For an adiabatic process, first law of thermodynamics takes the form:
  - $Q = \Delta U + W$
  - $Q = W$
  - $Q = \Delta U$
  - $W = -\Delta U$
- If the temperature of sources is two times the temperature of sink, the efficiency of heat engine will be:
  - 0.2
  - 0.3
  - 0.5
  - 1
- $[M^0 L T^{-2}]$  are the dimensions of:
  - Force
  - Velocity
  - Pressure
  - Acceleration
- The number 0.00320 can be expressed in scientific notation as:
  - $3.20 \times 10^{-2}$
  - $3.20 \times 10^{-4}$
  - $3.20 \times 10^{-3}$
  - $3.20 \times 10^3$
- $(\hat{i} \times \hat{j}) \cdot \hat{k}$  is equal to:
  - 1
  - 0
  - $\hat{i}$
  - $\hat{k}$
- Cross product of two antiparallel vectors  $\vec{A}$  and  $\vec{B}$  is:
  - $AB \cos \theta$
  - AB
  - 0
  - AB
- The quantity impulse has the same units as that of:
  - Force
  - Momentum
  - Power
  - Work done
- The speed of the gases ejected by a typical rocket is:
  - 3900 m/s
  - 4100 m/s
  - 4000 m/s
  - 4200 m/s
- Which force is non – conservative force?
  - Gravitational
  - Frictional
  - Electric
  - Magnetic



**Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.**

**SECTION – I**

**2. Write short answers to any EIGHT questions.**

**(2 x 8 = 16)**

- i. What are rule for zero to be a significant figure?
- ii. What are dimensions of angular momentum and torque?
- iii. A light year is distance light travel in one year. How many meters are there in one light year? (speed of light =  $3 \times 10^8 \text{ ms}^{-1}$ )
- iv. How many seconds are in one year?
- v. Can velocity of an object reverse direction when acceleration is constant? If so, give an example.
- vi. Find change in momentum for an object subjected to a given force for a given time and state law of motion in terms of momentum.
- vii. Find angle of projection of a projectile when its horizontal range is twice the maximum height.
- viii. Derive Newton's 1<sup>st</sup> Law of motion from the second Law of motion.
- ix. What are environmental crisis we are facing due to direct impact of thermodynamics.
- x. Prove that  $\langle v^2 \rangle = \frac{3P}{l}$
- xi. Explain that the average velocity of molecules in gas is zero but average of the square of velocities is not zero.
- xii. Give an example of process in which no heat is transferred to or from the system but the temperature of system changes.

**3. Write short answers to any EIGHT questions.**

**(2 x 8 = 16)**

- i. If all the components of the vectors  $\vec{A}_1$  and  $\vec{A}_2$  were reversed, how would this alter  $\vec{A}_1 \times \vec{A}_2$
- ii. How would you keep torque constant by varying moment arm and force. Support your answer with reasons.
- iii. What data would you use to evaluate maximum cross product with minimum dot product and vice versa?
- iv. A boy uses catapult to throw a stone which accidentally smashes a green house window. List the possible energy changes.
- v. What is the special case of law of conservation of energy? Support your reason with an equation.
- vi. Define escape velocity. Which one of the planet has the highest value of escape velocity?
- vii. Show that orbital angular momentum  $L_o = mvr$
- viii. Determine the rotational KE of a disc.
- ix. How would you made a distinction between spin angular momentum and orbital angular momentum? Support your distinction by considering the moment of inertia of a body.
- x. Why the polaroid sun glasses are better than ordinary sun glasses?
- xi. What is the precision of Michelson's interferometer and how Michelson redefine meter with his experiment.
- xii. Why the central spot of Newton's rings is dark? Also make a diagram of this experiment.

**4. Write short answers to any SIX questions.**

**(2 x 6 = 12)**

- i. Two row boats moving parallel in the same direction are pulled towards each other. Explain.
- ii. What is the total distance travelled by an object moving with SHM in a time equal to its period, if its amplitude is A?
- iii. What is Second Pendulum? Find its frequency.
- iv. What is meant by sharpness of resonance?
- v. Explain why sound travels faster in warm air than in cold air?
- vi. What is the Principle of super position?
- vii. What is effect of temperature on speed of sound?
- viii. How the power is lost in optical fibre through dispersion? Explain.
- ix. What is least distance of distinct vision?

**SECTION - II**

**Note: Attempt any THREE (3) questions from Section II.**

5. (a) Define torque. Explain in the case of rigid body. (5)  
 (b) How large a force is required to accelerate an electron ( $m = 9.1 \times 10^{-31} \text{ Kg}$ ) from rest to a speed of  $2.0 \times 10^7 \text{ ms}^{-1}$  through a distance of 5.0cm? (3)
6. (a) Define artificial gravity and prove the relation  $f = \frac{1}{2\pi} \sqrt{\frac{g}{R}}$  (5)  
 (b) A hose pipe ejects water at a speed of  $0.3 \text{ ms}^{-1}$  through a hole of area  $50 \text{ cm}^2$ . If the water strikes a wall normally, calculate the force on the wall, assuming the velocity of water normal to the wall is zero after striking. (3)
7. (a) Derive Bernoulli's equation for an ideal fluid. Also state Bernoulli's relation. (5)  
 (b) The wave length of signals from a radio transmitter is 1500m and the frequency is 200 KHz. What is the wavelength for a transmitter operating at 1000 KHz and with what speed the radio waves travel? (3)
8. (a) Describe the principle, construction and working of "Michelson's interferometer". How can you find the wave length of monochromatic source of light? (5)  
 (b) A load of 15.0 g alongates a spring by 2.0 cm. If body of mass 294 g is attached to the spring and is set into vibrations with an amplitude of 10.0 cm. What will be its time period? (3)
9. (a) Describe the construction and working of compound microscope. Also derive the relation for its magnifying power. (5)  
 (b) The turbine in a steam power plant takes steam from a boiler at  $427^\circ\text{C}$  and exhausts into a low temperature reservoir at  $77^\circ\text{C}$ . What is the maximum possible efficiency? (3)



# Physics (Objective Type)

Time: 20 Minutes

Marks: 17

**NOTE:** Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & 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 is correct?

- (A)  $m = \frac{E}{C^2}$  (B)  $m = \frac{C^2}{E}$  (C)  $m = C^2 E$  (D)  $m = CE$

2. Which of the following is perpendicular to  $4\hat{i} - 3\hat{j}$  :

- (A)  $4\hat{i} + 3\hat{j}$  (B)  $6\hat{i}$  (C)  $7\hat{k} + \hat{i}$  (D)  $3\hat{i} + 4\hat{j}$

3. Torque is rotational analogous of:

- (A) Momentum (B) Force (C) Weight (D) Axis of rotation

4. A ball is dropped from a height of 4.2 meters. To what height it will rise if there is no loss after rebounding?

- (A) 4.2 m (B) 8.4 m (C) 12.6 m (D) 2.4 m

5. Total time for which the projectile remains in air is called:

- (A) Time of projectile (B) Time period (C) Time of flight (D) Time constant

6. Dimensions of angular acceleration are:

- (A)  $[T^{-1}]$  (B)  $[T^{-2}]$  (C)  $[T^{-3}]$  (D)  $[LT^{-2}]$

7. When a body moves in a circular path it's linear velocity:

- (A) remains constant (B) becomes zero (C) changes (D) increases

8. If 20 waves pass through medium in one second with speed of  $20 \text{ ms}^{-1}$ , the wavelength is:

- (A) 20 m (B) 2 m (C) 400 m (D) 1 m

9. Distance between two consecutive nodes is:

- (A)  $\lambda$  (B)  $2\lambda$  (C)  $\frac{\lambda}{2}$  (D)  $\frac{\lambda}{4}$

10. For mono atomic gas  $C_v = \frac{3R}{2}$  therefore  $\gamma$  for this gas is:

- (A)  $\frac{3}{5}$  (B)  $\frac{5}{3}$  (C)  $\frac{4}{15}$  (D)  $\frac{15}{4}$

11. Average velocity of molecules in gas is:

- (A) zero (B) positive (C) negative (D) infinity

12. Gravity performs zero work when body moves:

- (A) Vertically (B) Horizontally (C) at  $60^\circ$  with vertical (D) at  $60^\circ$  with horizontal

13. The SI unit of rate of flow of fluid is:

- (A) m/s (B)  $\text{m}^3/\text{s}$  (C)  $\text{m}/\text{s}^2$  (D) Kg m/s

14. Energy of particle executing SHM of amplitude  $X_0$  is proportional to:

- (A)  $X_0^2$  (B)  $X_0^{-2}$  (C)  $X_0$  (D)  $\frac{X_0^2}{2}$

15. Formula for Fringe spacing is:

- (A)  $\frac{\lambda d}{L}$  (B)  $\frac{\lambda L}{d}$  (C)  $\frac{Ld}{\lambda}$  (D)  $\frac{m\lambda L}{d}$

16. Length of astronomical telescope for normal adjustment is:

- (A)  $f_o + f_e$  (B)  $f_o - f_e$  (C)  $\frac{1}{f_o} - \frac{1}{f_e}$  (D)  $\frac{1}{f_o} + \frac{1}{f_e}$

17. Least count of meter rod is:

- (A) 0.01 cm (B) 0.001 cm (C) 0.1 cm (D) 1 cm



**Physics** (Essay Type)**Rawalpindi Board-2021**

Time: 2:40 Hours

**Section - I**

pakcity.org

Marks: 68

2 x 8 = 16

**2- Write short answers of any eight parts from the following.**

- Write the dimensions of (a) Pressure (b) Density
- Define the terms (a) Unit vector (b) Position vector
- Calculate the maximum height of the projectile.
- Why fog droplets appear to be suspended in air?
- What are the dimensions and units of coefficient of viscosity " $\eta$ " in the formula  $F = 6\pi\eta rv$ .
- How the uncertainty in the average value of many measurements is assessed?
- Which of the given equation is correct?  $f = v\lambda$  or  $f = \frac{v}{\lambda}$ .
- Show that the sum and difference of two perpendicular vectors of equal lengths are also perpendicular and of the same length.
- State and illustrate the "Right Hand Rule" of vector product.
- Find the angle of projection of a projectile for which its maximum height and horizontal range are equal.

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

xii. Define isolated system. What is the importance of an isolated system in the conservation of linear momentum?

**3- Write short answers of any eight parts from the following.**

2 x 8 = 16

- Prove that  $P = \vec{F} \cdot \vec{V}$ .
- Derive the relation of work energy principle.
- Define Beats and Stationary waves.
- Prove that  $v = r\omega$ .
- When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
- Define angular momentum and write its different mathematical forms.
- When mud flies off the tyre of a moving bicycle in what direction does it fly? Explain.
- A block weighing 4.0 Kg extends a spring by 0.16m from its unstretched position. The block is removed and 0.50 Kg body is hung from the same spring. If the spring is now stretched and then released what is its period of vibration?
- Define simple pendulum and find the frequency of second pendulum.
- Does the acceleration of a simple harmonic oscillator remain constant during its motion? Is the acceleration ever zero? Explain.
- What is the effect of pressure and density on speed of sound.
- Why does sound travel faster in warm air than in cold air? Explain.

**4- Write short answers of any six parts from the following.**

2 x 6 = 12

- Write down the main parts of spectrometer and two uses of spectrometer.
- Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?
- Derive Charles's Law from Kinetic theory of gases.
- Is it possible to construct heat engine that will not expel heat into the atmosphere?
- How can we increase the internal energy? Explain.
- What do you mean by the term wavefront and ray of light?
- What is diffracting grating? Write its equation.
- In the Young experiment, one of the slits is covered with blue filter and other with red filter. What would be the pattern of light intensity on the screen?
- What do you understand by linear magnification and angular magnification?

**Section - II**

24

**NOTE: Answer any three questions from the following.**

- Define scalar product. Write down four characteristics of vector product. 05
  - Find the angle of projection of a projectile for which its maximum height and horizontal range are equal. 03
- What is gravitational field? Show that in gravitational field work done is independent of path followed. 05
  - A church organ consists of pipes, each open at one end, of different lengths. The minimum length is 30mm and the longest is 4 m. Calculate the frequency range of the fundamental notes. (Speed of sound = 340ms<sup>-1</sup>). 03
- Define and explain the centripetal force and derive the relation for it. 05
  - What gauge pressure is required in the city mains for a stream from a fire hose connected to the city mains to reach a vertical height of 15.0m? 03
- Discuss energy conservation in SHM. 05
  - Find the average speed of oxygen molecule in the air at STP. 03
- Write down the construction and working of a Michelson's interferometer. Give its equation. 05
  - A compound microscope has lenses of focal length 1.0 cm and 3.0cm. An object is placed 1.2cm from the object lens. If a virtual image is formed 25cm from the eye, calculate the magnification of the instrument. 03



## Objective Code : 6475

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

1. A system does 700 Joules of work and at the same time its internal energy increases to 400 Joules, heat supplied by the source is  
(A) 700 Joules (B) 400 Joules (C) 1100 Joules (D) 300 Joules
2. No entropy change takes place in  
(A) isothermal process (B) adiabatic process (C) isobaric process (D) isochoric process
3. Microphone converts  
(A) electrical signal into sound signal (B) electrical signal into light signal  
(C) light signal into electrical signal (D) sound signal into electrical signal
4. When a mirror of Michelson interferometer is moved a distance of 0.5 mm, then 2000 fringes are observed, the wavelength of light used is  
(A)  $5000 \times 10^{-10} m$  (B)  $5000 \times 10^{-9} m$  (C)  $1000 \times 10^{-7} m$  (D)  $5000 \times 10^{-7} m$
5. The waves which do not require any medium for their propagation are called:  
(A) mechanical waves (B) matter waves (C) electromagnetic waves (D) longitudinal waves
6. The number of beats produced per sec. in two tuning forks is equal to  
(A) sum of two frequencies (B) ratio of two frequencies  
(C) the frequency of either of two tuning fork (D) the difference of the frequencies of two tuning forks
7. The frequency of waves produced in microwave oven is  
(A) 2850 MHz (B) 2450 MHz (C) 2400 MHz (D) 2750 MHz
8. The speed of efflux is equal to the velocity gained by the falling fluid under the action of gravity through a certain height is called  
(A) Torricelli's theorem (B) Bernoulli's theorem (C) Stoke's theorem (D) Venturi's theorem
9. Formula one racing cars have a  
(A) streamlined design (B) turbulent design (C) rectangular design (D) elliptical design
10. In one revolution the angular displacement covered is  
(A)  $60^\circ$  (B)  $360^\circ$  (C)  $90^\circ$  (D)  $180^\circ$
11. When a body moves in a circular path, the angle between its linear velocity and angular velocity is  
(A)  $180^\circ$  (B) zero degree (C)  $90^\circ$  (D)  $45^\circ$
12. The maximum velocity required of an object to go out from the gravitational field in heavenly body is  
(A) moon (B) mercury (C) mars (D) earth
13. If a shell explodes in mid air, its fragments fly off in different directions. The total momentum of the fragments  
(A) decreases (B) increases (C) becomes zero (D) remains the same
14. If cross product of two vectors  $\vec{A} \times \vec{B}$  points along positive z-axis, then the vectors  $\vec{A}$  and  $\vec{B}$  must lie in  
(A) yz-plane (B) xz-plane (C) xy-plane (D) No plane
15. Magnitude of unit vectors  $\hat{i} \times \hat{j}$  is  
(A) 1 (B) -1 (C)  $-\hat{j}$  (D)  $+\hat{k}$
16. How many years in one second  
(A)  $3.1536 \times 10^7 \text{ years}$  (B)  $3.1536 \times 10^8 \text{ years}$  (C)  $3.1 \times 10^{-8} \text{ years}$  (D)  $3.1 \times 10^8 \text{ years}$
17. Light year is the unit of  
(A) time (B) distance (C) energy (D) time and distance





Roll No. \_\_\_\_\_ to be filled in by the candidate.

Paper Code	2	4	7	7
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Sessions; 2015-2017, 2016-2018 &amp; 2017-2019

**Physics** (Objective Type)

Time: 20 Minutes

Marks: 17

**NOTE:** Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & 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.

- If the period of wavemotion is 0.01Sec and wave speed is  $100\text{mS}^{-1}$  then frequency of wave is:  
(A) 0.5 Hz (B) 1 Hz (C) 10 Hz (D) 100 Hz
- A bat finding its correct location by sending.  
(A) Matter waves (B) Ultrasonic waves (C) Infrasonic waves (D) Electromagnetic waves
- Which one of the following cannot be polarized:  
(A) Radio waves (B) light waves (C) X-rays (D) Sound waves
- The first person who attempted to measure the speed of light was:  
(A) Michelson (B) Huygen (C) Galileo (D) Newton
- In thermodynamics process, the equation  $w = -\Delta u$  represents.  
(A) Isothermal expansion (B) Isothermal compression (C) Adiabatic expansion (D) Adiabatic compression
- The potential energy to the molecules of an ideal gas is considered to be:  
(A) 100J (B) 212J (C) 273J (D) Zero J
- In colour printing the whole range of colours can be obtained by mixing.  
(A) three colours (B) four colours (C) five colours (D) seven colours
- Minimum number of unequal forces whose vector sum can be zero are:  
(A) 5 (B) 4 (C) 3 (D) 2
- Change in momentum is equivalent to:  
(A) Force (B) Energy (C) Impulse (D) Weight
- Before the launch of a rocket the mass of the fuel of the rocket approximately consists of:  
(A) 20% of rocket mass (B) 40% of rocket mass (C) 60% of rocket mass (D) 80% of rocket mass
- Identify the non-conservative force among the following:  
(A) Air resistance (B) Gravitational force (C) Elastic spring force (D) Electric force
- If a body is moving in the counter clockwise direction then the direction of angular velocity will be:  
(A) Towards the centre (B) Away from the centre  
(C) Along the linear velocity (D) Perpendicular to both radius and linear velocity
- The moment of inertia of 10kg hoop about the axis of rotation perpendicular to its plane having radius 5m is:  
(A) 50  $\text{Kg m}^2$  (B) 100  $\text{Kg m}^2$  (C) 150  $\text{Kg m}^2$  (D) 250  $\text{Kg m}^2$
- The apparent weight of a pilot diving down with an acceleration  $9.8\text{mS}^{-2}$  will become:  
(A) Half (B) Zero (C) Double (D) Increases to four times
- The S.I units of flow rate of fluid is:  
(A)  $\text{mS}^{-1}$  (B)  $\text{m}^2\text{S}^{-2}$  (C)  $\text{m}^3\text{S}^{-1}$  (D)  $\text{m}^3\text{S}^{-2}$
- When three-fourth of the cycle of a vibrating body completed then the phase of vibration is:  
(A)  $\frac{\pi}{4}$  radian (B)  $\frac{\pi}{2}$  radian (C)  $\frac{3\pi}{2}$  radian (D)  $\pi$  radian
- Waves produced in organ pipes are:  
(A) transverse stationary waves (B) longitudinal stationary waves  
(C) Electromagnetic waves (D) Matter waves



Roll No. \_\_\_\_\_ (To be filled in by the candidate)

Sessions; 2015-2017, 2016-2018 & 2017-2019

# Physics (Essay Type)



Time: 2:40 Hours

Marks: 68

2x22=44

2 x 8 =16

## Section - I

2- Write short answers of any eight parts from the following.

- Under what conditions zeros are not significant?
- Give the drawbacks to use period of a pendulum as time standard.
- Distinguish between precision and accuracy.
- Define radian and steradian. Are they basic units of S.I?
- Can a body rotate about its centre of gravity under the action of its weight?
- What is the unit vector in the direction of vector,  $\vec{A} = 4\hat{i} + 3\hat{j}$
- You are standing on the edge. What should you do to avoid falling?
- Can the velocity of an object reverse direction when acceleration is constant? If so give an example.
- Explain the circumstances in which (a).  $\vec{V}$  is zero but  $\vec{a}$  is not zero (b).  $\vec{a}$  is zero but  $\vec{V}$  is not zero.

- Which will be more effective in knocking down a bear and why? (a). A rubber bullet. (b). a lead bullet of same momentum.
- When a massive body collides elastically with a light stationary body, what will be their final velocities?
- Why should chimney be tall for its better working?

3- Write short answers of any eight parts from the following.

2 x 8 =16

- A boy uses a catapult to throw a stone which accidentally smashes a green house window, list possible energy changes.
- Explain briefly how the energy is obtained from the fermentation of biomass.
- Differentiate between renewable and non-renewable energy sources with examples.
- What is critical velocity for a satellite which is orbiting at nearest height to earth? Derive this value.
- Why does a diver change his body position before and after diving in the pool?
- A hoop and disc start moving down on an inclined plane at the same time, which one will be moving faster on reaching the ground?
- What is a phase angle?
- Define SHM and angular frequency.
- Write any two applications of Dopplers effect.
- How are beats useful in tuning a musical instrument?
- Describe some common phenomenon in which resonance plays an important role
- What happens when a jet plane like a Concorde flies faster than speed of sound

4- Write short answers of any six parts from the following.

2 x 6 =12

- Can visible light produce interference fringes? Explain.
- Define wave fronts also write its types.
- The center of Newton's ring is dark. Why?
- Why would it be advantageous to use blue light with a compound microscope?
- Define critical angle and total internal reflection.
- Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- Can the mechanical energy be converted completely into heat energy? if so give an example.
- Define molar specific heat of a gas at constant volume and molar specific heat at constant pressure.
- Does the entropy of system increase or decrease due to friction?

## Section - II

NOTE: Answer any three questions from the following.

8x3=24

- Describe elastic collision in one dimension. Show that relative velocity before collision = Relative velocity after collision. 05
  - A load of 10N is suspended from a clothes line. This distorts the line so that it makes an angle of  $15^\circ$  with the horizontal at each end. Find the tension in the clothes line. 03
- What is meant by rotational Kinetic energy? Find rotational Kinetic energy for a disc and hoop. 05
  - $100\text{m}^3$  of water is pumped from a reservoir into a tank 10m higher than the reservoir in 20 minutes. If density of water is  $1000\text{kgm}^{-3}$ , find the power delivered by the pump. 03
- Define and explain Molar specific heat of a gas at constant pressure and at constant volume and also derive relation between them. 05
  - A tiny water droplet of radius 0.01cm descends through air from a height. Calculate its terminal velocity. Given that for air  $\eta = 19 \times 10^{-6} \text{kgm}^{-1}\text{s}^{-1}$  and density of water  $\rho = 1000\text{kgm}^{-3}$ . 03
- What is simple pendulum? Show that its motion is SHM. Derive a formula for its time period. 05
  - A train is approaching a station at  $90\text{Kmh}^{-1}$  sounding a whistle of frequency 1000 Hz. What will be the apparent frequency of the whistle heard by a listener sitting on the platform. Speed of sound  $v = 340\text{ms}^{-1}$ . 03
- What is astronomical telescope? Using ray diagram, calculate magnification power of astronomical telescope. 05
  - X-ray of wavelength 0.150nm are observed to undergo a first order reflection at a Bragg angle of  $13.3^\circ$  from the quartz crystal. What is the interplaner spacing of the reflecting planes in the crystal? 03