

1122 Warning:- Please write your Roll No. in the space provided and sign. Roll No.-----
(Inter Part - I) (Session 2018-20 to 2021-23) Sig. of Student -----

Physics (Objective)

(Group I)

590-5122 Paper (I)

Time Allowed:- 20 minutes

PAPER CODE 2471

Maximum 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. Write PAPER CODE, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

- 1) SI system is built up by how many kinds of units.
(A) Six (B) Five (C) Four (D) Three
- 2) The dimension of power is
(A) $[MLT^{-1}]$ (B) $[ML^2T^{-3}]$ (C) $[ML^2T^{-1}]$ (D) $[MLT^{-2}]$
- 3) If $\vec{A} = 2\hat{i} - \hat{j} + 3\hat{k}$ then magnitude of \vec{A} is
(A) 4 (B) 14 (C) $\sqrt{14}$ (D) 6
- 4) If $A_x = A_y$ the angle between \vec{A} and x-axis is
(A) 30° (B) 45° (C) 60° (D) 90°
- 5) When an object is moving towards earth the value of g is taken as
(A) Positive (B) Negative (C) Zero (D) Variable
- 6) A same force is applied on different masses m_1 and m_2 moving with accelerations a_1 and a_2 identify the correct relation.
(A) $\frac{m_1}{m_2} = \frac{a_1}{a_2}$ (B) $\frac{m_2}{m_1} = \frac{a_2}{a_1}$ (C) $\frac{m_1}{m_2} = \frac{a_2}{a_1}$ (D) $m_1 a_2 = m_2 a_1$
- 7) Power is also defined as dot product of
(A) $\vec{F} \cdot \vec{m}$ (B) $\vec{F} \cdot \vec{d}$ (C) $\vec{F} \cdot \vec{v}$ (D) $\vec{F} \cdot \vec{i}$
- 8) Magnitude of centripetal force on mass m moving with angular speed ω in a circle of radius r is
(A) $mr^2\omega$ (B) $\frac{mw^2}{r}$ (C) $mr\omega^2$ (D) $mr^2\omega^2$
- 9) Acceleration of a free falling body is
(A) $+9.8 \text{ m/s}^2$ (B) zero (C) -9.8 m/s^2 (D) 19.6 m/s^2
- 10) The product of cross-sectional area of pipe and fluid speed along a pipe always
(A) Zero (B) Variable (C) Constant (D) 9.8 ms^{-2}
- 11) One complete round trip of vibrating body is called
(A) Time period (B) Frequency (C) Vibration (D) Amplitude
- 12) The velocity of sound is maximum in
(A) Air (B) Nitrogen (C) Metal (D) Glass
- 13) Number of nodes between two consecutive antinodes is
(A) Zero (B) 3 (C) 2 (D) 1
- 14) Newton rings are formed due to
(A) Diffraction (B) Refraction (C) Reflection (D) Interference
- 15) How many types of optical fibre are in use
(A) One (B) Two (C) Three (D) Four
- 16) For one mole of The gas equation becomes.
(A) $PV = nRT$ (B) $PV = 3RT$ (C) $PV = mRT$ (D) $PV = RT$
- 17) Highest efficiency of heat engine whose lower temperature is 17°C and higher temperature is 200°C is
(A) 70 % (B) 100 % (C) 38 % (D) 35 %

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Physics (Subjective) Group (I) (Session 2018-20 to 2021-23) (Inter Part - I) Paper (I)

Time Allowed: 2.40 hours Section ----- I

Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- $540.57 \times 2 = 16$

- (i) Give the drawbacks to use the period of a time standard.
- (ii) Does a dimensional analysis give any information on constant of proportionality that may appear in an algebraic expressions?
- (iii) Give any two conventions for indicating units. (iv) What is scientific notation? Give example.
- (v) Motion with constant velocity is a special case of motion with acceleration. Is this statement true? Discuss.
- (vi) Can the velocity of an object reverse the direction when acceleration is constant? If so, give an example.
- (vii) How would you elaborate the importance of head-rest of the car seat?
- (viii) When a massive body collides with light stationary body then how would you predict the result?
- (ix) Is it possible to convert internal energy into mechanical energy? Explain with an example.
- (x) Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
- (xi) How would you relate work with change in volume. Derive the relation.
- (xii) Energy can be added to a system when no heat transfer takes place. Is this statement true? Support your response with an example.

3. Answer briefly any Eight parts from the followings:- $8 \times 2 = 16$

- (i) Is it possible to add a vector quantity to a scalar quantity? Explain.
- (ii) Two vectors have unequal magnitudes. Can their sum be zero? Explain.
- (iii) Show by diagram, The vector addition is commutative.
- (iv) A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?
- (v) A person holds a bag of groceries while standing still, a car is stationary with its engine running. From the stand point of work, how are these situations similar?
- (vi) Differentiate between geyser and aquifer.
- (vii) Why does a diver change his body positions, before and after diving in the pool?
- (viii) Prove that $1 \text{ radian} = 57.3^\circ$ (ix) Write down applications of communication satellites.
- (x) How would you manage to get more orders of spectra using diffraction grating?
- (xi) Define thin film. Write its two examples. (xii) What aspect of nature of light is proved by phenomena of polarization?

4. Answer briefly any Six parts from the followings:- $6 \times 2 = 12$

- (i) How the swing is produce in a fast moving cricket ball? (ii) Can we realize an ideal simple pendulum?
- (iii) Explain the term crest, trough, node and antinode.
- (iv) How are beats useful in tuning the musical instruments?
- (v) Why would it be advantageous to use blue light with compound microscope?
- (vi) Does frequency depends on amplitude for harmonic oscillators?
- (vii) What are damped oscillation? (viii) Define electromagnetic waves. Write example.
- (ix) Define Snell's Law.

Note: Attempt any three questions. Section ----- II $(8 \times 3 = 24)$

5. (a) Define gravitational field prove that work done in the gravitational field is independent of path followed by the body.
(b) The line of action of a force \vec{F} passes through a point P of a body whose position vector in meter is $\hat{i} - 2\hat{j} + \hat{k}$. If $\vec{F} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ (N) determine the torque about the point 'A' Whose position vector is $2\hat{i} + \hat{j} + \hat{k}$ (in m)
6. (a) Why geostationary orbits are important? Derive relation and find radius of the geostationary orbit.
(b) A ball is thrown with a speed of 30 ms^{-1} in the direction 30° above the horizon. Determine the horizontal range.
7. (a) State and derive "Bernoulli's Equation" of fluid dynamics.
(b) Find the temperature at which the velocity of sound in air is two times its velocity at 10°C .
8. (a) Derive the relations for time period, displacement and velocity in horizontal mass spring system?
(b) In a double slit experiment, the second order maximum occurs at $\theta = 0.25^\circ$. The wavelength is 650 nm. Determine the slit separation.
9. (a) Define molar specific heat capacity and show that $C_p - C_v = R$
(b) A Simple astronomical telescope in normal adjustment has an objective of focal length 100 cm and an eye-piece of focal length 5.0 cm. (i) Where is the final image formed?
(ii) Calculate the angular magnification.

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Physics (Objective)

(Group II) **540-92-22** Paper (I)

Time Allowed:- 20 minutes

PAPER CODE 2476

Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

- 1) Efficiency of steam locomotive is
(A) 10 % (B) 7 % (C) 9 % (D) 8 %
- 2) The famous book Principia written in
(A) 1787 (B) 1607 (C) 1687 (D) 1534
- 3) The total base units are
(A) 7 (B) 6 (C) 5 (D) 4
- 4) If $\vec{A} + \vec{B} = \vec{B} + \vec{A}$ vector addition is
(A) Associative (B) Commutative (C) Additive (D) Additive Inverse
- 5) Which relation is true for Newton 2nd Law
(A) $m = \frac{a}{F}$ (B) $F = \frac{m}{a}$ (C) $a = \frac{F}{m}$ (D) $a = \frac{m}{F}$
- 6) One watt hour is equal to
(A) 3.6 MJ (B) 3.6 KJ (C) 36 KJ (D) 36 MJ
- 7) The dimension of angular acceleration is
(A) $[T^{-1}]$ (B) $[LT^2]$ (C) $[T^{-2}]$ (D) $[T^{-3}]$
- 8) Terminal velocity is related with the radius 'r' of a spherical object is
~~(a) $v_t \propto r^2$ (b) $v_t \propto r$ (c) $v_t \propto \frac{1}{r}$ (d) $v_t \propto \frac{1}{r^2}$~~
- 9) If $F=0.08$ N and $x = 4$ cm then k is
(A) 56 Nm^{-1} (B) 5.6 Nm^{-1} (C) 23 Nm^{-1} (D) 2 Nm^{-1}
- 10) The speed of sound is greater in solid due to their high
(A) Density (B) Pressure (C) Temperature (D) Elasticity
- 11) Soap film shows colour due to
(A) Interference (B) Diffraction (C) Polarization (D) Reflection
- 12) Refractive Index is given by $n =$
(A) $\frac{c}{v}$ (B) $\frac{v}{c}$ (C) $\sqrt{\frac{c}{v}}$ (D) $\sqrt{\frac{v}{c}}$
- 13) The tripple point of water is
(A) 273.16°F (B) 273.16°C (C) 273.16 K (D) 373.16 K
- 14) The dimension of mc^2 is equal to
(A) Force (B) Momentum (C) Time Period (D) Torque
- 15) $(\hat{i} \times \hat{j}) \times \hat{k} + (\hat{j} \times \hat{k}) \times \hat{i}$ will be
(A) $-\hat{j}$ (B) \hat{j} (C) 0 (D) $-\hat{i}$
- 16) Speed of hoop at the bottom of an inclined plane is
(A) \sqrt{gh} (B) $\sqrt{2gh}$ (C) $\sqrt{\frac{4}{3}gh}$ (D) $\sqrt{4gh}$
- 17) Star moving away from earth shows
(A) Green shift (B) Red Shift (C) Blue Shift (D) Yellow Shift

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Physics (Subjective)

Group (II)

(Session 2018-20 to 2021-23)

Paper (I)

Time Allowed: 2.40 hours Section ----- I (Inter Part - I) Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- $8 \times 2 = 16$

590-62-22

- (i) Check the correctness of the relation $V = \sqrt{\frac{F \times l}{m}}$ where V is the speed of transverse wave on a stretched string of tension F, length l and mass m.
- (ii) Add the following masses given in Kg upto appropriate precision 2.189, 0.089, 11.8 and 5.32
- (iii) Define radian and steradian.
- (iv) Name several repetitive phenomenon occurring in nature which could serve as reasonable time standards.
- (v) Derive an expression for the time of flight of projectile.
- (vi) Show that the range of projectile is maximum when projectile is thrown at an angle of 45° with horizontal.
- (vii) Water flows out from a pipe at 3 kgs^{-1} and its velocity changes from 5 ms^{-1} to zero on striking the wall then find the force due to water flow.
- (viii) A 100 g golf ball is moving to the right with a velocity of 20 ms^{-1} . It makes head on collision with an 8 kg steel ball, initially at rest. Compute velocity of the golf ball after collision.
- (ix) Define First and Second law of thermodynamics. (x) Prove that $W = -\Delta U$ for adiabatic expansion process
- (xi) Why is the average velocity of the molecules in a gas zero, but the average of the square of velocities is not zero?
- (xii) Give an example of a natural process that involves an increase in entropy.

3. Answer briefly any Eight parts from the followings:- $8 \times 2 = 16$

- (i) How we can find the direction of torque of rotating fan? Explain.
- (ii) Can a body rotate about its centre of gravity under the action of its weight?
- (iii) Name the three different conditions that could make, $\vec{A}_1 \times \vec{A}_2 = 0$
- (iv) What is the SI units of work? and also define it. (v) Show that orbital angular momentum $L_o = mvr$.
- (vi) Calculate the work done in Kilo joules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10 m.
- (vii) When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
- (viii) Why does a diver change his body positions before and after diving in the pool?
- (ix) Prove that $1 \text{ rad} = 57.3^\circ$. (x) Why the polaroid sunglasses are better than ordinary sunglasses?
- (xi) How would you distinguish between un-polarized and plane-polarized lights?
- (xii) What is meant by diffraction of light?

4. Answer briefly any Six parts from the followings:- $6 \times 2 = 12$

- (i) When water falls from a tap; its cross-sectional area decreases as it comes down? Explain.
- (ii) Name two characteristics of simple harmonic motion (SHM)
- (iii) Show that P.E of mass-spring system is $P.E = \frac{1}{2} m \omega^2 x^2$
- (iv) What is meant by second pendulum? Calculate its length at the earth surface.
- (v) Why sound travels faster in warm air than in cold air? (vi) State principle of superposition of waves.
- (vii) What is "Doppler Effect"? Does it hold for both sound and light waves?
- (viii) How the power is lost in optical fibre through dispersion? Explain. (ix) Name the essential parts of spectrometer.

Note: Attempt any three questions. Section ----- II $(8 \times 3 = 24)$

5. (a) Discuss the inter conversion of potential energy and kinetic energy when friction force is not considered.
- (b) Find the angle between the two vectors: $\vec{A} = 5\hat{i} + \hat{j}$ $\vec{B} = 2\hat{i} + 4\hat{j}$
6. (a) Define centripetal force and derive its formula.
- (b) A truck weighing 2500 kg and moving with a velocity 21 ms^{-1} collides with a stationary car weighing 1000 kg. The truck and the car move together after the impact. Calculate their common velocity.
7. (a) Derive equation of continuity for non-viscous and incompressible fluid flowing steadily. Also discuss its physical significance.
- (b) An organ pipe has a length of 50 cm. Find the frequency of its fundamental note and the next harmonic when it is (a) open at both ends (b) closed at both ends. (speed of sound = 350 m/s)
8. (a) Show that total energy of vibrating mass and spring system remains constant.
- (b) A second order spectrum is formed at an angle of 38.0° when light falls normally on a diffraction grating having 5400 lines per centimetre. Determine wavelength of light used.
9. (a) What information would you use to prioritize compound microscope over simple microscope. Also, derive a relation for the magnification of compound microscope.
- (b) What is the average translational kinetic energy of molecules in a gas at temperature 27°C ?