Roll No. of Candidate : _____

PHYSICS   Intermediate Part-I , Class 11ᵗʰ (1ˢᵗA 323- I)   Paper : I   Group – I

Time: 20 Minutes   **OBJECTIVE**   **Code : 6471**   **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.

1. 1 - Dimension ratio of angular momentum to linear momentum is

    (A) $[M^0L^1T^0]$ (B) $[M^1L^1T^1]$ (C) $[ML^2T^{-1}]$ (D) $[M^{-1}L^{-1}T^{-1}]$

   2 - Time taken by light from moon to earth is

    (A) 1 min 10 sec   (B) 1 min 20 sec   (C) 1 min 30 sec   (D) 1 min 40 sec

   3 - The angle of $\vec{A} = A_x\hat{i} - A_y\hat{j}$ with x-axis will be in between

    (A) $0^o \rightarrow 90^o$ (B) $90^o \rightarrow 180^o$ (C) $180^o \rightarrow 270^o$ (D) $270^o \rightarrow 360^o$

   4 - $ABSin\theta\,\hat{n} \times ABSin\theta\,\hat{n}$ is

    (A) $A^2B^2Sin^2\theta$ (B) A^2B^2 (C) $A^2B^2\hat{n}$ (D) 0

   5 - The correct relation between height H and total time of flight T of a projectile is

    (A) $H = \dfrac{gT^2}{8}$ (B) $H = \dfrac{8T^2}{g}$ (C) $H = \dfrac{8g}{T^2}$ (D) $H = \dfrac{8}{gT^2}$

   6 - An athlete runs with a speed of $12\,ms^{-1}$, the longest jump he can undertake is ($g = 10\,ms^{-2}$)

    (A) 12.2 m   (B) 16.2 m   (C) 14.4 m   (D) 24.4 m

   7 - Two electrons brought closer together the P.E. of the system will/will be

    (A) zero   (B) decrease   (C) increase   (D) infinity

   8 - The largest satellite system is managed by countries

    (A) 126   (B) 136   (C) 120   (D) 3

   9 - If a body is moving counter clockwise then angular displacement is

    (A) minimum   (B) zero   (C) negative   (D) positive

  10 - The velocity of rain drop attains constant value because of

    (A) surface tension   (B) up thrust of air

    (C) viscous force exerted by air   (D) air currents

  11 - The time period of seconds hand of a watch is

    (A) 1 sec   (B) 1 min   (C) 1 hr   (D) 12 hrs

  12 - Types of waves used in sonar are

    (A) sound waves   (B) light waves   (C) heat waves   (D) water waves

  13 - Speed of sound in helium gas at S.T.P. is

    (A) 258 m/sec   (B) 332 m/sec   (C) 972 m/sec   (D) 1286 m/sec

  14 - The fringe spacing increases if we use

    (A) red light   (B) blue light   (C) yellow light   (D) green light

  15 - In a compound microscope magnification produced by objective and eye piece is 5 cm and 10 cm respectively. Total magnification is

    (A) 5   (B) 15   (C) 10   (D) 50

  16 - The concept of entropy was introduced by Clausius in

    (A) 1656   (B) 1856   (C) 1756   (D) 1956

  17 - Average translational K.E. of molecules in a gas at temperature 27^oC is

    (A) $8314\times10^3 J$ (B) $1.38\times10^{-23} J$ (C) $6.21\times10^{-21} J$ (D) $8.314\times10^{-3} J$

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PHYSICS   Intermediate Part-I, Class 11th (1stA 323)   Paper : I Group – I

Time: 2:40 Hours   **SUBJECTIVE**   ③   Marks: 68

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

SECTION – I Guj-11-1-23

2. Write short answers to any EIGHT questions.   (2 x 8 = 16)

i. Define supplementary units.

ii. What are significant figures? How many are the significant figures in 0.04670 ?

iii. Does a dimensional analysis give any information on constant of proportionality? Explain.

iv. Name several repetitive phenomenon occurring in nature which could serve as reasonable time standards.

v. Define position vector and give its formula.

vi. The vector sum of three vectors gives a zero resultant. What can be the orientation of the vectors?

vii. Is it possible to add a vector quantity to a scalar quantity?

viii. What information can we get from velocity-time graphs?

ix. What is an isolated system? State law of conservation of linear momentum.

x. Motion with constant velocity is a special case of motion with constant acceleration, is this statement true? Discuss.

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

xii. Explain the working of a carburetor of a motor car using Bernoulli's principle.

3. Write short answers to any EIGHT questions.   (2 x 8 = 16)

i. Show that power is a dot product of force and velocity.

ii. A boy uses a catapult to throw a stone which accidently smashes a greenhouse window. List the possible energy changes.

iii. An object has 1 J of potential energy. Explain what does it mean?

iv. Show that work done by centripetal force is zero.

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

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

vii. Explain by graph that for a body executing SHM, its velocity leads displacement by 90°.

viii. Does the acceleration of a simple harmonic oscillator remain constant during its motion? Is the acceleration ever zero?

ix. What happens to period of pendulum if its length is doubled? What happens if the suspended mass is doubled?

x. What is the effect of density on speed of sound?

xi. What features do longitudinal waves have in common with transverse waves?

xii. Open organ pipes are richer in harmonic than closed organ pipes. Explain

4. Write short answers to any SIX questions.   (2 x 6 = 12)

i. What are the conditions for detectable interference of light waves?

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

iii. Could you obtain Newton's rings with transmitted light? If yes, would the pattern be different from that obtained with reflected light?

iv. Define resolving power and give formula for its calculation in case of diffraction grating.

v. One can buy a cheap microscope for use by the children. The images seen in such a microscope have coloured edges. Why is this so?

(Turn Over)

vi.   State 2nd law of Thermodynamics. Support your answer with a schematic diagram.

vii.   How would you elaborate four steps of Carnot cycle? Support your answer with a diagram.

viii.   Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?

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

SECTION – II

Note: Attempt any THREE (3) questions.

5. (a) Define the term torque. What are factors upon which torque depends. Calculate torque due to force acting on rigid body.   **(5)**

   (b) A force (thrust) of 400 N is required to overcome road friction and air resistance in propelling an automobile at 80 Kmh^{-1}. What power (KW) must the engine develop?   **(3)**

6. (a) Define projectile motion. Derive formulas for   **(5)**
   i) Horizontal range   ii) Height of projectile

   (b) A 1000 Kg car is travelling with a speed of 144Kmh^{-1} around a curve of radius 100 m. Find the necessary centripetal force.   **(3)**

7. (a) Define molar specific heat at constant volume and at constant pressure and prove that $C_p - C_v = R$ **(5)**

   (b) How large must a heating duct be if air moving 3.0 ms^{-1} along it can replenish the air in a room at 300 m^3 volume every 15 min? Assume the air's density remains constant   **(3)**

8. (a) Discuss the motion of horizontal mass spring system. Also derive the expression for time period, displacement and velocity of the mass attached to the spring.   **(5)**

   (b) An organ pipe has a length of 50 cm. Find the frequency of its fundamental note and the next harmonic when it is closed at one end. (speed of sound = 350 ms^{-1})   **(3)**

9. (a) Describe the construction of a simple microscope and derive an expression for its magnifying power.   **(5)**

   (b) A light is incident normally on a grating which has 2500 lines per centimeter. Compute the wavelength of a spectral line for which the deviation in second order is 15.0°.   **(3)**

PHYSICS   Intermediate Part-I , Class 11th (1stA 323- I)   Paper : I   Group – II

Time: 20 Minutes   OBJECTIVE   Code : 6472   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.

1. 1 - Silicon is obtained from
   (A) space   (B) sand   (C) moon   (D) air

2 - $[ML^{-1}T^{-1}]$ is dimension of
   (A) force   (B) viscosity   (C) power   (D) energy

3 - The vector of zero magnitude and arbitrary direction is called
   (A) equal vector   (B) null vector   (C) unit vector   (D) resultant vector

4 - 1st condition of equilibrium is written as
   (A) $\vec{F} = 0$ (B) $\sum \vec{F} = 0$ (C) $\sum \vec{\tau} = 0$ (D) $\vec{\tau} = 0$

5 - A mass of fuel consumed by a typical rocket to overcome earth's gravity is
   (A) 10000 Kgs^{-1} (B) 1000 Kgs^{-1} (C) 100 Kgs^{-1} (D) 10 Kgs^{-1}

6 - Projectile motion is a
   (A) three dimensional motion   (B) one dimensional motion
   (C) two dimensional motion   (D) no dimensional motion

7 - The total work done in a closed path in gravitational field is
   (A) maximum   (B) positive   (C) zero   (D) minimum

8 - The relation for centripetal acceleration is given by
   (A) $\dfrac{v^2}{r}$ (B) $v\omega$ (C) $r\omega^2$ (D) $a = \dfrac{f}{m}$

9 - 1 GHz =
   (A) 10^{13}Hz   (B) 10^{6}Hz   (C) 10^{15}Hz   (D) 10^{9}Hz

10 - Human blood pressure is measured in
   (A) Nm^{-1} (B) Nm^{-3} (C) Nm^{-2} (D) torr

11 - Tuning of radio is an example of resonance
   (A) mechanical   (B) physical   (C) magnetic   (D) electrical

12 - Ripples produced in water is an example of
   (A) light waves   (B) electromagnetic waves
   (C) electronic waves   (D) progressive waves

13 - The speed of sound does not depend upon
   (A) compressibility of fluids   (B) inertia of fluids
   (C) density of fluids   (D) viscosity of fluids

14 - In Young's double slit experiment, the position of dark fringe is expressed as
   (A) $y_m = \left(m + \dfrac{1}{2}\right)\dfrac{\lambda L}{d}$ (B) $y_m = \left(m - \dfrac{1}{4}\right)\dfrac{\lambda L}{d}$
   (C) $y_m = \dfrac{m\lambda L}{d}$ (D) $y_m = \dfrac{m\lambda d}{2L}$

15 - Spectrometer consists of
   (A) four parts   (B) three parts   (C) five parts   (D) two parts

16 - The sum of all molecular energies of a substance is called
   (A) K.E.   (B) P.E.   (C) internal energy   (D) Chemical energy

17 - Heat engine converts thermal energy into
   (A) mechanical work   (B) electrical energy   (C) hydro energy   (D) solar energy

PHYSICS

Intermediate Part-I , Class 11ᵗʰ (1ˢᵗ A 323)   Paper : I Group – II

Time: 2:40 Hours

SUBJECTIVE ③   Marks: 68

Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.   *(w)–11–2–23*

SECTION – I

(2 x 8 = 16)

2. Write short answers to any EIGHT questions.

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

ii.   Does a dimensional analysis give any information on constant of proportionality that may appear in an algebraic expression? Explain.

iii.   How much distance is covered by light in one year?

iv.   Define significant figures and give its example.

v.   Define the terms (i) unit vector (ii) components of a vector

vi.   Can you add zero to a null vector?

vii.   What is the unit vector in the direction of the vector $\vec{A} = 3\hat{i} + 2\hat{j}$

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.   Explain the circumstances in which the velocity $\vec{v}$ and acceleration $\vec{a}$ of a car are
(i) Antiparallel   (ii) Perpendicular to one another

x.   Define elastic collision and inelastic collision with examples.

xi.   State law of conservation of momentum.

xii.   Explain the term viscosity.

(2 x 8 = 16)

3. Write short answers to any EIGHT questions.

i.   An object has 1J of P.E. Explain what does it mean?

ii.   Show that $K.E = \dfrac{P^2}{2m}$, where P is momentum.

iii.   How can we get energy from tides?

iv.   Define critical velocity, write its formula.

v.   Explain what is meant by centripetal force and why it must be furnished to an object if the object is to follow a circular path?

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

vii.   If mass attached to a vibrating spring-mass is increased by four times, what is the effect on its frequency?

viii.   Why the soldiers are advised to break their steps while marching on a bridge of long span?

ix.   Describe some common phenomena in which resonance plays an important role.

x.   Is it possible for two identical waves travelling in the same direction along a string to give rise to stationary wave?

xi.   Why does sound travel faster in solids than in gases?

xii.   State the principle of super position.

(2 x 6 = 12)

4. Write short answers to any SIX questions.

i.   Write down two parts of Huygen's principle.

ii.   How is the distance between interference fringes affected by the separation between the slits of Young's experiment?

iii.   How would you distinguish between un-polarized and plane-polarized lights?

iv.   Find the refractive index of the medium if critical angle in 39°.

(Turn Over)

v.   What do you understand by linear magnification and angular magnification ?
vi.   Define triple point of water and give its value for water.
vii.   Give two postulates of kinetic theory of gases.
viii.   Explain that the average velocity of the molecules in a gas is zero but the average of the square of velocities is not zero.
ix.   Is it possible to convert internal energy into mechanical energy? Explain with an example.

SECTION – II

Note: Attempt any THREE (3) questions.

5.   (a) Write down a note on addition of vectors by their rectangular components.   **(5)**
   (b) How large a force is required to accelerate an electron ($m = 9.1 \times 10^{-31}$ kg) from rest to a speed of 2×10^7 m/s, through a distance of 5.0 cm ?   **(3)**

6.   (a) Derive the equations for final velocities in one dimensional elastic collision.   **(5)**
   (b) A 1000 Kg car travelling with a speed of 144 km/h, round a curve of radius 100m. Find the necessary centripetal force.   **(3)**

7.   (a) State and explain Bernoulli's equation.   **(5)**
   (b) 336 J of energy is required to melt 1g of ice at $0°C$. What is the change in entropy of 30 g of water at $0°C$ as it is changed to ice at $0°C$ by a refrigerator?   **(3)**

8.   (a) Discuss the motion of horizontal mass spring system and also derive formula for time period, displacement and velocity.   **(5)**
   (b) A stationary wave is established in a string which is 120 cm 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)**

9.   (a) Describe construction and working of compound microscope. Also derive relation for its magnifying power.   **(5)**
   (b) A light is incident normally on a grating which has 2500 lines per centimeter. Compute the wave length of a spectral line for which deviation in second order is $15.0°$.   **(3)**

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.

1. 1 - The unit of solid angle is _____ .

    (A) radian   (B) degree   (C) steradian   (D) revolution

   2 - Light year is the unit of _____ .

    (A) speed   (B) intensity   (C) time   (D) distance

   3 - What is the angle between $\hat{i}+\hat{j}$ and $\hat{i}-\hat{j}$ vectors?

    (A) 0° (B) 45° (C) 90° (D) 180°

   4 - _____ is not scalar.

    (A) work   (B) power   (C) wavelength   (D) torque

   5 - When rocket moves upward its acceleration _____ .

    (A) increases   (B) decreases   (C) becomes zero   (D) remains constant

   6 - Shape of trajectory of projectile is _____ .

    (A) parabola   (B) hyperbola   (C) circle   (D) straight line

   7 - The rocks containing hot water are called _____ .

    (A) geyser   (B) aquifer   (C) megma   (D) tor

   8 - The angular displacement for daily rotation of the earth is _____ .

    (A) 0 rad   (B) π rad   (C) 2π rad   (D) 4π rad

   9 - A body of 1 kg moving up with a = g then its apparent weight is _____ .

    (A) 19.6 N   (B) 9.8 N   (C) 0 N   (D) 10 N

  10 - Pressure is high where speed is _____ .

    (A) high   (B) low   (C) constant   (D) zero

  11 - Frequency of second's pendulum is _____ .

    (A) 0.5 Hz   (B) 5.0 Hz   (C) 0.2 Hz   (D) 2.0 Hz

  12 - Distance between two consecutive nodes is _____ .

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

  13 - Speed of sound is independent of _____ .

    (A) density   (B) temperature   (C) elasticity   (D) pressure

  14 - _____ proves that light waves are transverse.

    (A) reflection   (B) polarization   (C) diffraction   (D) interference

  15 - Single mode step index fibre can transmit T.V channels more than _____ .

    (A) 3   (B) 5   (C) 7   (D) 14

  16 - If the temperature of sink decreases then efficiency of engine _____ .

    (A) increases   (B) decreases   (C) remains same   (D) becomes zero

  17 - One Pascal is the unit of _____ .

    (A) volume   (B) pressure   (C) force   (D) power

PHYSICS

(Intermediate Part-I, Class 11th) 322   Paper I   (Group – I)

Time: 2:40 Hours   **SUBJECTIVE**   **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.   How the accuracy is increased by decreasing the limit of precision?

   ii.   How many expected number of significant figures are in 8000 kg?

   iii.   Check the homogeneity of the relation $V = \sqrt{\dfrac{F \times \ell}{m}}$.

   iv.   Name the several repetitive phenomena occuring in nature which could serve as reasonable time standards.

   v.   Is it necessary, when the acceleration of a body is zero then its velocity is also zero?

   vi.   Find angle of projection of a projectile for which its max. height and horizontal range are equal.

   vii.   Write down two significance of velocity-time graph.

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

   ix.   How can we differentiate between reversible and irreversible processes on the basis of entropy?

   x.   Why molar specific heat at constant pressure is greater than molar specific heat at constant volume?

   xi.   Why the curve of adiabatic process is steeper than isothermal process?

   xii.   If $PV^r =$ constant ; prove that $TV^{r-1} =$ constant.

3. Write short answers to any EIGHT questions.   **(2 x 8 = 16)**

   i.   How a vector can be determined when rectangular components are known?

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

   iii.   Describe the method to find the direction of cross product?

   iv.   When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?

   v.   What sort of energy is in the following:
          (a) Compressed Spring   (b) Water in high dam.

   vi.   Point out the positions where gravitational potential energy is taken as zero.

   vii.   Derive relation between linear and angular velocity.

   viii. Explain how many minimum number of geostationary satellites are required for global coverage of T.V. transmission?

   ix.   A disc without slipping rolls down a hill of height 10 meters. If the disc starts from rest at the top of the hill, then what is its speed at the bottom?

   x.   Can the visible light produce interference fringes? Explain.

   xi.   How would you distinguish between un-polarized and plane polarized light?

   xii.   What are Newton's rings? Why is the centre of Newton's rings dark?

4. Write short answers to any SIX questions.   **(2 x 6 = 12)**

   i.   Explain the working of carburetor of a motor car using Bernoulli's principle.

   ii.   What are free, forced and damped oscillations?

   iii.   Does frequency depend on amplitude for harmonic oscillator?

   iv.   Describe some common phenomena in which resonance plays an important role.

   v.   State principle of superposition.

vi. Differentiate between in phase and out of phase points in transverse periodic waves with the help of a diagram.

vii. How beats are useful in tuning the musical instruments?

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

ix. If a person was looking through a telescope at full moon, how would the appearance of the moon be changed by covering half of the objective lens.

(SECTION – II)

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

5. (a) Define vector product and write down its four characteristics. **(5)**

   (b) A force of 400 N is required to overcome road friction and air resistance in propelling an automobile at 80 kmh^{-1}. What power (KW) must the engine develop? **(3)**

6. (a) Explain velocity-time graph and how would you figure out the slope and distance covered from the graphs. **(5)**

   (b) A ball tied to the end of a string, is swung in a vertical circle of radius ' r ' under the action of gravity as shown in the fig. What will be the tension in the string when the ball is at the point ' A ' of the path and speed is ' V ' at this point. **(3)**
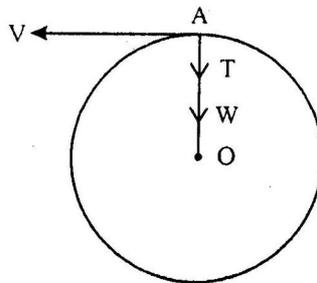
7. (a) How would you elaborate the effects of pressure and density on the speed of sound in air. Also, derive a relation for the effect of temperature on the speed of sound in air. **(5)**

   (b) Water flows through a hose, whose internal diameter is 1 cm at a speed of 1 $m\!/\!s$. What should be the diameter of the nozzle if the water is to emerge at 21 $m\!/\!s$. **(3)**

8. (a) What is simple pendulum? Show that motion of simple pendulum is SHM. Also find relation for its time period and frequency. **(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 $15^\circ.0$. **(3)**

9. (a) What is spectrometer? Discuss its different parts. Write down its uses. **(5)**

   (b) The turbine in a steam power plant takes steam from boiler at 427° and exhausts into low temperature reservoir at $77^\circ C$. What is maximum possible efficiency? **(3)**

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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.

1. 1 - Carnot engine is a _____ .
   (A) real   (B) ideal   (C) both (A) & (B)   (D) none of these

   2 - The slope at any point on the velocity-time graph gives _____ .
   (A) distance   (B) acceleration   (C) average velocity   (D) average speed

   3 - If the initial phase is $\frac{\pi}{2}$, the displacement of SHM is _____ .
   (A) $x = x_0^2 \sin \omega t$ (B) $x = \sin \omega t$ (C) $x = x_0 \cos \omega t$ (D) zero

   4 - Radius of Geo-stationary satellite is _____ .
   (A) 4.23×10^4 m   (B) 4.23×10^4 km   (C) 4.23×10^7 m   (D) 4.23×10^3 m

   5 - The speed of light in different medium is always _____ .
   (A) equal to 'c'   (B) different   (C) greater than c   (D) becomes zero

   6 - Intensity of light depends upon _____ .
   (A) wavelength   (B) amplitude   (C) velocity   (D) frequency

   7 - The value of 'g' at the centre of the earth is _____ .
   (A) infinite   (B) 2 g   (C) 3 g   (D) zero

   8 - Dimensions of $\sqrt{\dfrac{F \times \ell}{m}}$ are _____ .
   (A) $[M^0 L T^{-1}]$ (B) $[ML^{-1}T]$ (C) $[ML^2 T^{-3}]$ (D) $[ML^{-1}T^{-1}]$

   9 - SI unit of molar specific heat are _____ .
   (A) $J\,mol^{-1}\,k^{-1}$ (B) $J\,mol\,k^{-1}$ (C) $J\,mol\,k$ (D) $J\,mol^{-1}$

   10 - The ballistic missiles are only for _____ .
   (A) short range   (B) long range   (C) zero range   (D) none of these

   11 - The value of constant 'γ' for mono-atomic gas is _____ .
   (A) 1.67   (B) 1.40   (C) 1.0   (D) 1.2

   12 - If least count is 10 kg then 8.00×10^3 has significant digit _____ .
   (A) 1   (B) 2   (C) 3   (D) 4

   13 - The angle between rectangular components is _____ .
   (A) 60° (B) 90° (C) 180° (D) Zero

   14 - Projection of $\vec{B}$ on $\vec{A}$ is _____ .
   (A) $A \cos \theta$ (B) $B \cos \theta$ (C) $A \sin \theta$ (D) $B \sin \theta$

   15 - Gravity performs no work, if the body moves _____ .
   (A) vertically   (B) horizontally   (C) 60° vertical   (D) none of these

   16 - The droplet of water has terminal velocity the acceleration is _____ .
   (A) maximum   (B) minimum   (C) zero   (D) changed

   17 - Speed of sound in copper is _____ .
   (A) $38000\ mS^{-1}$ (B) $3600\ mS^{-1}$ (C) $3500\ mS^{-1}$ (D) $3400\ mS^{-1}$

PHYSICS   *16* (Intermediate Part-I, Class 11th) 322   Paper I   (Group – II)

Time: 2:40 Hours   **SUBJECTIVE**   **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. Give the draw backs to use period of a simple pendulum as a time standard.

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

   iii. What are the three main frontiers of fundamental science?

   iv. Differentiate between precise measurement and accurate measurement.

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

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

   vii. What is velocity-time graph? What does its slope represent?

   viii. A projectile is thrown horizontally from a height with velocity of 10 mS^{-1} and reaches the ground after 2 sec. Find the horizontal distance covered by the projectile.

   ix. Calculate the entropy change when 1.0 kg of ice at $0^{\circ}C$ melts into water at $0^{\circ}C$. Latent heat of fusion of ice is $L_f = 3.36 \times 10^{5} \text{ J kg}^{-1}$.

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

   xi. Give an example of a natural process that involves an increase in entropy.

   xii. 100 J of heat is supplied to a gas which increases its internal energy by 20 J. Find the work done by the system.

3. Write short answers to any EIGHT questions.   **(2 x 8 = 16)**

   i. Define null vectors and equal vectors.

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

   iii. Can a body rotate about its centre of gravity under the action of its weight?

   iv. When rocket re-enters the atmosphere, its nose cone becomes very hot.
   Where does this heat energy come from?

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

   vi. Name different sources of geothermal energy with brief discussion.

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

   viii. Show that orbital angular momentum $L_0 = mvr$.

   ix. What is the minimum orbital velocity for close orbiting satellite?

   x. Write down the postulates of Huygens's principle.

   xi. Can visible light produce interference fringes? Explain.

   xii. Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.

(Turn Over)

4. Write short answers to any SIX questions. *Gur-G2-22* (2 x 6 = 12)

  i. Explain, how the swing is produced in a fast moving cricket ball?

  ii. Show that in SHM the acceleration is zero when the velocity is greatest and the velocity is zero when the acceleration is greatest.

  iii. What are damping devices? Give at least one example.

  iv. If length of simple pendulum is increased four times, then what will be effect on its time period?

  v. How are beats useful in tuning musical instruments?

  vi. What features do longitudinal waves have in common with transverse waves?

  vii. What is the frequency and wavelength of 3rd mode of stationary waves in closed organ pipe?

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

  ix. How the light signal is transmitted through the optical fibre?

(SECTION – II)

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

5. (a) What is gravitational field? Show that gravitational field is conservative field. **(5)**

  (b) The magnitude of dot and cross products of two vectors are $6\sqrt{3}$ and 6 respectively. Find the angle between the vectors. **(3)**

6. (a) State and explain law of conservation of linear momentum. **(5)**

  (b) The earth rotates on its axis once a day. Suppose by some process the earth contracts so that its radius is only half as large as at present. How fast will it be rotating then? **(3)**

7. (a) What is meant by Doppler's effect? Discuss this effect for these two cases. **(5)**
    i) An observer moving towards a stationary source of sound.
    ii) Source of sound moving away from a stationary observer.

  (b) What gauge pressure is required in the city mains for a stream from a fire hose connected to the mains to reach a vertical height of 15.0 meter? **(3)**

8. (a) What is simple pendulum? Show that its motion is SHM. Derive an expression for its time period. Also find its frequency. **(5)**

  (b) A mono-chromatic light of $\lambda = 588$ nm is allowed to fall on a half silvered glass plate G_1 in Michelson interferometer. If mirror M is moving through 0.233 mm. How many fringes will be observed to shift? **(3)**

9. (a) State and explain carnot engine and carnot theorem in detail and how would you determine which fact makes carnot engine a superior one? **(5)**

  (b) A telescope is made of an objective of focal length 20 cm and an eye piece of 5.0 cm, both convex lenses. Find the angular magnification. **(3)**

PHYSICS   (INTERMEDIATE PART - I) 321 - (I)   Paper- I   Group-I

Time: 20 Minutes   **OBJECTIVE** - - - - - - - - - **Code: 6471**   **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.

1.

1. Which of the following is correct

  (A) $f = V\lambda$ (B) $f = \dfrac{V}{\lambda}$ (C) $f = \dfrac{1}{V\lambda}$ (D) $f = \dfrac{\lambda}{V}$

2. The SI unit of co-efficient of viscosity is
  (A) $kg\,m\,s$ (B) $kg\,m^{-1}\,s$ (C) $kg\,m^{-1}\,s^{-1}$ (D) $kg\,m\,s^{-1}$

3. $\overline{A} \times \overline{A} =$
  (A) $2\overline{A}$ (B) A^2 (C) $\overline{0}$ (D) 0

4. The direction of a vector in a plane is denoted by the angle which the representative line of the vector makes with
  (A) positive x-axis in the anti-clock wise direction
  (B) positive x-axis in the clock wise direction
  (C) negative x-axis in the anti-clock wise direction
  (D) negative x-axis in the clock wise direction

5. If mass m of the water strikes the wall in time ' t ' then force F on the wall is
  (A) $F = \dfrac{mv}{t}$ (B) $F = \dfrac{mt}{v}$ (C) $F = \dfrac{vt}{m}$ (D) $F = \dfrac{m}{vt}$

6. A typical rocket consumes fuel about
  (A) $100\ kg\,s^{-1}$ (B) $1000\ kg\,s^{-1}$ (C) $10000\ kg\,s^{-1}$ (D) $100000\ kg\,s^{-1}$

7. The value of escape velocity is maximum for
  (A) Moon   (B) Earth   (C) Jupiter   (D) Mercury

8. The moment of inertia for a cylinder is
  (A) mr^2 (B) $\dfrac{1}{2}mr^2$ (C) $\dfrac{2}{5}mr^2$ (D) $\dfrac{1}{12}mr^2$

9. The rotational K.E. of a disc is
  (A) $K.E_{rot} = mv^2$ (B) $K.E_{rot} = \dfrac{1}{2}mv^2$ (C) $K.E_{rot} = \dfrac{1}{4}mv^2$ (D) $K.E_{rot} = 2mv^2$

10. The Bernoulli's equation is for a fluid which is
  (A) viscous   (B) compressible   (C) inturbulent flow   (D) in steady flow

11. In a microwave oven, the waves produced have a wavelength of
  (A) 10 cm   (B) 12 cm   (C) 14 cm   (D) 16 cm

12. It becomes difficult to recognize the beats if the difference between the frequencies of the two sounds is more than about
  (A) 6 Hz   (B) 8 Hz   (C) 4 Hz   (D) 10 Hz

13. If a string vibrates in four segments at a frequency of 120 Hz, its fundamental frequency will be
  (A) 30 Hz   (B) 60 Hz   (C) 120 Hz   (D) 480 Hz

14. The distance between two adjacent dark fringes is equal to
  (A) $\dfrac{\lambda L}{d}$ (B) $\dfrac{\lambda d}{L}$ (C) $\dfrac{dL}{\lambda}$ (D) $\dfrac{d}{L\lambda}$

15. The equation used to determine the speed of light by Michelson is
  (A) $c = 8fd$ (B) $c = 16fd$ (C) $c = \dfrac{8}{fd}$ (D) $c = \dfrac{16}{fd}$

16. By kinetic theory of gases, the gas molecules are in
  (A) angular motion   (B) circular motion   (C) random motion   (D) linear motion

17. The conversion of available heat energy into work by a petrol engine is about
  (A) 10%   (B) 15%   (C) 20%   (D) 25%

(all correct)

PHYSICS   (INTERMEDIATE PART - I) 321 (3)   Paper- I   Group - I

Time: 2:40 Hours   **SUBJECTIVE**   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.   Calculate the dimension of physical quantities, if possible, 2π and rupees hundred.

  ii. Add the following masses given in kg upto appropriate precision 2.189, 0.089, 11.8 and 5.32.

  iii. State the principle of homogeneity of physical quantities equation.

  iv. What are the dimensions and units of gravitational constant G in the formula $F = \dfrac{G\, m_1\, m_2}{r^2}$?

  v.   Find the dot product of two vectors, if $\vec{A} = 3\hat{K}$ and $\vec{B} = -5\hat{j}$.

  vi. Write down the five steps to find addition of vectors by rectangular components.

  vii. Suppose the sides of a closed polygon represent vectors arranged by head-to-tail rule. What is the sum of these vectors?

  viii. Add a vector $\vec{A} = 2\hat{i} + 3\hat{j}$ and thirty chairs.

  ix. When two identical masses collide with each other in elastic collision. What will be the velocities after collision?

  x.   Is momentum is conserved in an inelastic collision? Explain the reason.

  xi. How the hair acts like a crumple zone on your skull?

  xii. Is law of conservation of momentum is valid in an inelastic collision?

3. Write short answers to any EIGHT questions.   (2 x 8 = 16)

  i.   An object has one J of potential energy. Explain what does it mean?

  ii. Calculate the work done in kilo joules in lifting a mass of 10 kg through a vertical height of 10 m.

  iii. State law of conservation of energy.

  iv. Define escape velocity. Give its units.

  v.   State law of conservation of angular momentum. Also define isolated system.

  vi. State the direction of following in simple situation, angular momentum, angular velocity.

  vii. Is it possible for two identical waves travelling in same direction along a string to give rise to a stationary wave?

  viii. How are beats useful in tuning musical instruments?

  ix. What is relation between total energy, potential energy and kinetic energy of a body executing SHM?

  x.   What is meant by phase angle; does it define angle between maximum displacement and driving force?

  xi. Describe some common phenomena in which resonance plays an important role.

  xii. Define free and forced oscillations.

4. Write short answers to any SIX questions.   (2 x 6 = 12)

  i.   How would you get more orders of spectra using a diffraction grating?

  ii. Could you obtain Newton's rings with transmitted light? If yes, would the pattern be different from that obtained with reflected light?

  iii. Define diffraction grating. Write the formula for grating element.

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

v.   Define isothermal process and adiabatic process.

vi.   Differentiate between reversible and irreversible processes.

vii. Is it possible to construct a heat engine that will not expel heat into the atmosphere?

viii. Briefly explain total internal reflection.

ix.   Derive Boyles law from kinetic molecular theory of gases.

(SECTION - II)

5. (a) Define elastic collision. Show that relative speed of approach is equal to relative speed   5
         of separation for one dimensional collision.

    (b) The magnitude of dot and cross product of two vectors are $6\sqrt{3}$ and 6 respectively.   3
         Find the angle between the vectors.

6. (a) Define stationary waves. Show that frequencies of stationary waves in a stretched string   1+4
         are quantized.

    (b) A car of mass 800 kg travelling at 54 km h^{-1} is brought to rest in 60 metres. Find the average   3
         retarding force on the car.

7. (a) Define moment of inertia. Give its unit and dimension. Derive its relation for a rigid body.   5

    (b) Certain globular protein particle has a density of 1246 kg m^{-3}. It falls through pure water   3
         ($\eta = 8.0 \times 10^{-4}$ kg m^{-1} s^{-1}) with a terminal speed 3.0 cm h^{-1}. Find radius of the particle.

8. (a) What is SHM? Derive a relation for instantaneous velocity and acceleration in terms of ω 1+4
         in SHM and uniform circular motion.

    (b) A thermodynamic system under goes a process in which its internal energy decreases by 300 J.   3
         If at the same time 120 J of work is done on the system. Find the heat lost by the system.

9. (a) What is a simple microscope? Calculate its magnifying power.   5

    (b) A second order spectrum is formed at an angle of 38° when light falls normally on a diffraction   3
         grating having 5400 lines per centimetre. Determine wavelength of the light used.

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.

1.

1. The dimensions of pressure are
(A) MLT^{-2} (B) $ML^2 T^{-2}$ (C) $ML^{-1} T^{-2}$ (D) MLT^{-3}

2. If $r = 2.25 \pm 0.01$ cm then (%) percentage uncertainty in r is
(A) 0.225%   (B) 22.5%   (C) 0.2%   (D) 0.4%

3. If $\overline{A} = 4\hat{i} + 3\hat{j}$ then $\hat{A} =$
(A) $\dfrac{4\hat{i} + 3\hat{j}}{7}$ (B) $\dfrac{4\hat{i} + 3\hat{j}}{5}$ (C) $\dfrac{4\hat{i} + 3\hat{j}}{12}$ (D) $\dfrac{4\hat{i} + 3\hat{j}}{6}$

4. The SI unit for toque is
(A) Nm (B) Nm^{-1} (C) mN^{-1} (D) $N^{-1} m^{-1}$

5. If the water flows out from a pipe at 3 kg s^{-1} and its velocity changes from 5 ms^{-1} to zero on striking the wall then applied force is equal to
(A) 5N   (B) 8N   (C) 15N   (D) 1.66N

6. The fuel consumed by a typical rocket is about
(A) 100 kg s^{-1} (B) 1000 kg s^{-1} (C) 10000 kg s^{-1} (D) 100000 kg s^{-1}

7. Kilowatt hour is a unit for
(A) energy   (B) power   (C) time   (D) momentum

8. One revolution =
(A) $\dfrac{\pi}{2}$ rad   (B) π rad   (C) 2π rad   (D) 4π rad

9. The moment of inertia of a sphere is given as
(A) $\dfrac{1}{2} mr^2$ (B) $\dfrac{2}{5} mr^2$ (C) $\dfrac{1}{5} mr^2$ (D) $\dfrac{1}{12} mr^2$

10. Torricelli's theorem can be written as
(A) $V = \sqrt{2g(h_1 - h_2)}$ (B) $V = 2g(h_1 - h_2)$ (C) $V = 2g\sqrt{(h_1 - h_2)}$ (D) $V = \sqrt{2g}(h_1 - h_2)$

11. The total distance travelled by an object with SHM, having amplitude A, in a time equal to its period is
(A) $\dfrac{A}{4}$ (B) $\dfrac{A}{2}$ (C) 2A   (D) 4A

12. If the wavelength of a wave is 1500 m and moves with a velocity of 3×10^8 ms^{-1}, its frequency will be
(A) 5×10^{-6} Hz   (B) 2×10^5 Hz   (C) 45×10^{10} Hz   (D) 3.15×10^6 Hz

13. Waves transport
(A) energy   (B) wavelength   (C) power   (D) mass

14. Bragg equation is given as
(A) $2d \, Sin\theta = n\lambda$ (B) $d \, Sin\theta = n\lambda$ (C) $2d = n\lambda$ (D) $2d = (n + \dfrac{1}{2})\lambda$

15. The least distance of distinct vision is
(A) 10 cm   (B) 15 cm   (C) 20 cm   (D) 25 cm

16. Operating between the same two temperatures which heat engine is the most efficient?
(A) carnot engine   (B) diesel engine   (C) petrol engine   (D) steam engine

17. The value of universal gas constant 'R' is
(A) 1.6 J mol^{-1} k^{-1} (B) 1.38 J mol^{-1} k^{-1} (C) 8.314 J mol^{-1} k^{-1} (D) 6.02 J mol^{-1} k^{-1}

PHYSICS   **SUBJECTIVE**   **Marks: 68**

Time: 2:40 Hours

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

(SECTION – I)

(2 x 8 = 16)

2. Write short answers to any EIGHT questions.

  i.   Describe the methods to find uncertainty in the average value of many measurements.

  ii.   The time of 30 vibrations of simple pendulum recorded by a stop watch accurate upto one tenth of a second is 54.6 seconds. Find its uncertainty.

  iii. By using dimensional analysis, find the dimension of power.

  iv. Find the percentage uncertainty in the volume of a cylinder, if the percentage uncertainties in length and diameter of cylinder are 0.3% and 0.6% respectively.

  v.   Write down the five steps to find addition of vectors by rectangular components.

  vi. If $\vec{A} = 3\hat{i} - \hat{j}$ and $\vec{B} = 5\hat{K}$. Find the dot product of $\vec{A}$ and $\vec{B}$ vectors.

  vii. Suppose the sides of a closed polygon represent vectors arranged by head-to-tail rule. What is the sum of these vectors?

  viii. Show that impulse and momentum has same unit.

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

  x.   In the absence of friction, then how the vertical and horizontal components of velocity change?

  xi. How does the rocket propulsion take place?

  xii. Explain what do you understand the term viscosity?

(2 x 8 = 16)

3. Write short answers to any EIGHT questions.

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

  ii.   When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?

  iii. State work energy principle.

  iv. Give the units and dimensions of angular velocity.

  v.   Define moment of inertia. Give its units and dimension.

  vi. Show that orbital angular momentum $L_o = mvr$.

  vii. Define resonance. What are its types?

  viii. What is difference between free and forced oscillations?

  ix. What is relation between total energy, potential energy and kinetic energy of a body executing SHM?

  x.   Why does sound travel faster in solids than in gases?

  xi. How are beats useful in tuning musical instruments?

  xii. Define node and antinode.

(2 x 6 = 12)

4. Write short answers to any SIX questions.

  i.   Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.

  ii.   The centre of Newton's rings is dark. why?

  iii. How is the distance between interference fringes affected by the separation between the slits of Young's experiment?

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

  v.   Write down two advantages of fibre optics over radio wave carriers.

(Turn Over)

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

vii. Is it possible to convert internal energy into mechanical energy? Explain with an example.

viii. Define isothermal and adiabatic processes.

ix. State second law of thermodynamics.

(SECTION - II)

5. (a) Define projectile motion. Derive expressions for the height of the projectile and time of flight of the projectile. 1+2+2

   (b) Two forces of magnitude 10 N and 20 N act on a body in directions making angles 30° and 60° with x-axis respectively. Find the resultant force. 3

6. (a) Define conservative field and prove that work done is independent of the path followed by the body in gravitational field. 5

   (b) A car of mass 800 kg travelling at 54 km h⁻¹ is brought to rest in 60 metres. Find the average retarding force on the car. 3

7. (a) State the Stokes' law and derive the equation of continuity. 1+4

   (b) What is the least speed at which an aeroplane can execute a vertical loop of 1.0 km radius So that there will be no tendency for the pilot to fall down at the highest point? 3

8. (a) What is simple pendulum? Show that the motion of pendulum is SHM. Also derive relation for its time period. 5

   (b) A heat engine performs 100 J work and at the same time rejects 400 J of heat energy to the cold reservoirs. What is the efficiency of the engine? 3

9. (a) Describe the principle, construction and working of Michelson's interferometer. How can you find the wavelength of light used? 5

   (b) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24 cm apart. Find the focal lengths of the lenses. 3