



Standard 11
PHYSICS
Part - I

Time: 3.00 Hours

Marks: 70

i) Answer all questions.**15x1=15****ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer**

- 1) If the force is proportional to square of velocity, then the dimension of proportionality constant is
a) $[MLT^0]$ b) $[MLT^{-1}]$ c) $[ML^{-2}T]$ d) $[ML^{-1}T^0]$
- 2) If a particle executes uniform circular motion, choose the correct statement
a) The velocity and speed are constant
b) The acceleration and speed are constant
c) The velocity and acceleration are constant
d) The speed and magnitude of acceleration are constant
- 3) An engine pumps water continuously through a hose. Water leaves the hose with a velocity v and m is the mass per unit length of the water of the jet. What is the rate at which kinetic energy is imparted to water?
a) $\frac{1}{2} mv^3$ b) mv^3 c) $\frac{3}{2} mv^2$ d) $\frac{5}{2} mv^2$
- 4) Force acting on the particle moving with constant speed is
a) always zero b) need not be zero
c) always non zero d) cannot be concluded
- 5) The speed of the centre of a wheel rolling on a horizontal surface is V_0 . A point on the rim in level with the centre will be moving at a speed of
a) zero b) V_0 c) $\sqrt{2} V_0$ d) $2 V_0$
- 6) If the acceleration due to gravity becomes 4 times, its original value, then escape speed
a) remains same b) 2 times of original value
c) becomes halved d) 4 times of original value
- 7) A small sphere of radius 2cm falls from rest in a viscous liquid. Heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity is proportional to
a) 2^2 b) 2^3 c) 2^4 d) 2^5
- 8) When a uniform rod is heated, which of the following quantity of the rod will increase
a) mass b) weight
c) centre of mass d) moment of inertia
- 9) The damping force on an oscillator is directly proportional to the velocity. The units of the constant of proportionality are
a) $kg\ ms^{-1}$ b) $kg\ m\ s^{-2}$ c) $kg\ s^{-1}$ d) $kg\ s$
- 10) An air column in a pipe which is closed at one end, will be in resonance with the vibrating body of frequency 83 Hz. Then the length of the air column is
a) 1.5 m b) 0.5m c) 1.0m d) 2.0 m
- 11) Consider a circular road of radius 20m banked at an angle of 15° . The speed required for a car has to move on the turn to have safe turn
a) $7.1\ ms^{-1}$ b) $8.1\ ms^{-1}$ c) $7.8\ ms^{-1}$ d) $10\ ms^{-1}$
- 12) Consider two masses of 10kg and 1 kg moving with the same speed $10ms^{-1}$. Calculate the magnitude of the momentum
a) $0.1\ kg\ ms^{-1}$, $10\ kg\ ms^{-1}$ b) $10\ kg\ ms^{-1}$, $1\ kg\ ms^{-1}$
c) $0.1\ g\ ms^{-1}$, $10\ g\ ms^{-1}$ d) $10\ kg\ ms^{-1}$, $21\ kg\ ms^{-1}$
- 13) Calculate the energy consumed in electrical units when a 75 w fan is used for 8 hours daily for one month
a) 18 kwh b) 18000 kwh c) 20 kwh d) 11 kwh
- 14) A refrigerator has COP of 3. How much work must be supplied to the refrigerator in order to remove 200 J of heat from its interior?
a) 66.60 J b) 66 J c) 66.67J d) 70.07 J

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15) Compute the distance between anti-node and neighbouring node

- a) $\frac{\lambda}{8}$ b) $\frac{\lambda}{2}$ c) $\frac{\lambda}{4}$ d) $\frac{\lambda}{6}$

Part - II**II. Answer any six questions. Q.No. 24 is compulsory.****6x2=12**

- 16) Define coefficient of restitution.
- 17) What are precision and accuracy?
- 18) Define molar specific heat capacity.
- 19) Why moon has no atmosphere?
- 20) State Newton's first law.
- 21) A particle moves along the x-axis in such a way that its coordinates x varies with time 't' according to the equation $x = 2 - 5t + 6t^2$. What is the initial velocity of the particle?
- 22) What is the relation between torque and angular momentum?
- 23) Which one of these is more elastic, steel or rubber? why?
- 24) Calculate the amplitude, angular frequency, frequency and time period for the simple harmonic oscillation $y = 0.3 \sin(40\pi t + 1.1)$

Part - III**III. Answer any six questions. Q.No. 33 is compulsory.****6x3=18**

- 25) State Kelper's three laws.
- 26) What are the uses and limitations of dimensional analysis.
- 27) Explain any three different types of oscillations.
- 28) Discuss the Laplace's correction.
- 29) Write a short note on Carnot engine efficiency.
- 30) Discuss the properties of vector products
- 31) A fly wheel rotates with a uniform angular acceleration. If its angular velocity increases from 20π rad/s to 40π rad/s in 10 seconds. Find the number of rotations in that period.
- 32) Calculate the energy consumed in electrical units when a 75w fan is used for 8 hours daily for one month (30 days)
- 33) Mercury has an angle of contact equal to 140° with soda lime glass. A narrow tube of radius 2 mm, made of this glass is dipped in a trough containing mercury. By what amount does the mercury dip down in the tube relative to the liquid surface outside? Surface tension of mercury $T = 0.456 \text{ Nm}^{-1}$. Density of mercury $\rho = 13.6 \times 10^3 \text{ kgm}^{-3}$

Part - IV**IV. Answer all the questions.****5x5=25**

- 34) Explain how overtones are produced in a open organ pipe

(OR)

Assuming that the frequency γ of a vibrating string may depend upon (i) applied force(F) (ii) length (l) (iii) mass per unit length(m). Prove that $\gamma \propto \frac{1}{l} \sqrt{\frac{F}{m}}$ using dimensional analysis.

- 35) Discuss in detail the energy in simple harmonic motion.

(OR)

Derive the equation of motion, range and maximum height reached by the particle thrown at an oblique angle θ with respect to the horizontal direction.

- 36) What are concurrent forces? State Lami's theorem

(OR)

Derive the expression for mean free path of the gas.

- 37) Derive the work done in an adiabatic process

(OR)

Explain with graphs the difference between work done by a constant force and by a variable force.

- 38) Derive the expression for moment of inertia of a uniform ring about an axis passing through the centre and perpendicular to the plane.

(OR)

Derive an expression for energy of satellite.