01. Physical World

VERY SHORT ANSWER QUESTIONS (2 MARKS)

01. What is Physics ? TS Mar 16, May 22

02. What are the fundamental forces in nature ? TS May 18

03. What is the discovery of C.V. Raman ?

Mar 14; AP Mar 18, 20, May 16, 18; TS Mar 17, 18, 19, 20

04. What is the contribution of S. Chandra Sekhar to physics ?

AP Mar 15, 16, 17, June 15; TS Mar 15, 19, June 15

02. Units And Measurements

VERY SHORT ANSWER QUESTIONS (2 MARKS)

01. Distinguish between accuracy and precision.

AP Mar 15, 16, May 16, June 15; TS Mar 15, May 18

02. Distinguish between fundamental units and derived units. AP May 14; TS Mar 16, 19; May 22

03. What is dimensional analysis ?

04. Express unified atomic mass unit in kg. TS Mar 18, May 22

05. How can systematic errors be minimised or eliminated ?

AP Mar 14 , 17, 18, May 22; TS Mar 17

06. The velocity of a body is given by $V = At^2 + Bt + C$. If V and t are expressed in S.I, what are the units of A, B and C ? AP May 07

07. The error in measurement of radius of a sphere is 1%. What is the error in the measurement of volume ? AP Mar 19

08. The percentage error in the mass and speed are 2% and 3% respectively. What is the maximum error in kinetic energy calculated using these quantities ?

AP May 18, Mar 20; TS Mar 20

09. What are significant figures and what do they represent when reporting the result of a measurement ? TS Mar 18

10. Why do we have different units for the same physical quantity ? TS June 15, May 16, 22

03. Motion in A Straight Line

SHORT ANSWER QUESTIONS (4 MARKS)

01. Derive the equation $x = v_0 t + \frac{1}{2}at^2$ using graphical method where the terms have usual meaning. TS May 11, 16; Mar 19

02. Explain the terms 'average velocity' and 'instantaneous velocity'. When are they equal ?

Mar 19

03. A ball is thrown vertically upwards with a velocity of $20\ ms^{-1}$ from the top of a multistorey building. The height of the point from where the ball is thrown is $25.0\ m$ from the ground.
a) How high will the ball rise ? and
b) How long will it be before the ball hits the ground ? Take $g = 10\ ms^{-2}$ (actual value is $9.8\ ms^{-2}$).
TS Mar 15, May 17; AP Mar 15; SOLVED PROBLEM

04. A man runs across the roof of a tall building and jumps horizontally on to the (locus) roof of an adjacent building. If his speed is 9 mts and the horizontal distance between the building is 10 mts and the height difference between the roofs in 9 mts. Will he be able to land on the next building ? [Take $g = 10\ ms^{-2}$]
TS Mar 18

05. A car travels the first third of a distance with a speed of 10 kmph , the second third at 20 kmph and the last third at 60 kmph . What is its mean speed over the entire distance ?
May 14, 22; AP Mar 18; TS Mar 16; PROBLEM

06. A bullet moving with a speed of $150\ ms^{-1}$ strikes a tree and penetrates 3.5 cm before stopping. What is the magnitude of its retardation in the tree and the time taken for it to stop after striking the tree ?
TS May 18; PROBLEM

07. A particle moves in a straight line with uniform acceleration. Its velocity at time $t = 0$ is v_1 and at time $t = t$ is v_2. The average velocity of the particle in this time interval is $(v_1 + v_2)/2$. Is this correct ? Substantiate your answer ?

08. A parachutist flying in an aeroplane jumps when it is at a height of 3 km above the ground. He opens his parachute when he is at about 1 km above the ground. Describe his motion.
TS Mar 17

09. A ball is dropped from the roof of a tall building and simultaneously another ball is thrown horizontally with some velocity from the same roof. Which ball lands first ? Explain your answer.
TS June 15

10. A man walks on a straight road from his home to a market 2.5 km away with a speed of $5\ kmh^{-1}$. Finding the market closed, he instantly turns and walks back home with a speed of $7.5\ kmh^{-1}$. What is the a) magnitude of average velocity and b) average speed of the man over the time interval 0 to 50 min ?
May 18, Mar 19; TS Mar 18, 20; PROBLEM

11. A car moving along a straight highway with a speed of 126 kmph is brought to a stop within a distance of 200 m . What is the retardation of the car (assumed uniform), and how long does it take for the car to stop ?
AP Mar 20; ADD. PROBLEM

04. Motion in A Plane

SHORT ANSWER QUESTIONS (4 MARKS)

01. State parallelogram law of vectors. Derive an expression for the magnitude and direction of the resultant vector.
Mar 14; AP Mar 20; TS Mar 16, 17, 20, May 17, 22

02. Show that the trajectory of an object thrown at certain angle with the horizontal is a parabola.
AP Mar 15, 16, 17, 18, 22; May 17, 18, June 15; TS Mar 15, 18, May 16, 22; June 15

03. Show that the maximum height and range of a projectile are $\frac{u^2 \sin^2\theta}{2g}$ and $\frac{u^2 \sin 2\theta}{g}$ respectively. Where the terms have their regular meanings.
AP Mar 12

04. Show that the maximum height reached by a projectile launched at an angle of $45°$ is one quarter of its range. TS Mar 14

05. Define unit vector, null vector and position vector. AP May 97, Sep 2000, May 22, June 15

06. If $|\vec{a}+\vec{b}|=|\vec{a}-\vec{b}|$, prove that the angle between $\vec{a}$ and $\vec{b}$ is $90°$. TS Mar & May 18, May 22

07. A bird holds a fruit in its beak and flies parallel to the ground. It lets go of the fruit at some height. Describe the trajectory of the fruit as it falls to the ground as seen by a) the bird b) a person on the ground. TS May 22

08. A force $2\hat{i}+\hat{j}-\hat{k}$ newton acts on a body which is initially at rest. At the end of 20 secs, the velocity of the body is $4\hat{i}+2\hat{j}-2\hat{k}\ ms^{-1}$. What is the mass of the body ? AP May 16

09. 'O' is a point on the ground choosen as origin. A body first suffers a displacement $10\sqrt{2}$ m North - East, next 10 m North and finally $10\sqrt{2}$ m North - West. How far it is from the origin? TS Mar 19; SOLVED PROBLEM

VERY SHORT ANSWER QUESTIONS (2 MARKS)

10. The vertical component of a vector is equal to its horizontal component. What is the angle made by the vector with X-axis ? TS May 18; AP Mar 19

11. Two forces of magnitudes 3 units and 5 units act at $60°$ with each other. What is the magnitude of their resultant ? AP Mar 15, 17, May 16, 17; TS May 22

12. When two right angled vectors of magnitude 7 units and 24 units combine, what is the magnitude of their resultant ? May 14; AP Mar 16, 18, May 18

13. $\vec{A}=\hat{i}+\hat{j}$. What is the angle between the vector and X-axis ? AP Mar 13, 14, 20, May 22; TS Mar 17, 20

14. If $\vec{P}=2\hat{i}+4\hat{j}+14\hat{k}$ and $\vec{Q}=4\hat{i}+4\hat{j}+10\hat{k}$, then find the magnitude of $\vec{P}+\vec{Q}$. TS Mar 15, 16, May 22

15. What is the acceleration of a projectile at the top of its trajectory ? TS Mar 19

16. Wind is blowing from the south at $5\ ms^{-1}$. To a cyclist, it appears to be blowing from the east at $5\ ms^{-1}$. Find the velocity of the cyclist. SOLVED PROBLEM

05. Laws of Motion

LONG ANSWER QUESTIONS (8 MARKS)

01. i) State newton's second law of motion. Hence derive the equation of motion $F = ma$ from it. AP Mar 16, 17, 19, May 16, 17

ii) A body is moving along a circular path such that its speed always remains constant. Should there be a force acting on the body ?

SHORT ANSWER QUESTIONS (4 MARKS)

02. Mention the methods used to decrease friction. AP Mar & May 14; AP Mar & May 18; May 22; TS Mar 16, 19, May 16, 17

03. Why pulling the lawn roller is preferred than pushing the lawn roller ? AP Mar 06, 08, 10, June 10

04. Explain the advantages and the disadvantages of friction ?

AP Mar 06, 15; TS Mar 15, 17, May 22

05. Define the terms momentum and impulse. State and explain the law of conservation of linear momentum. Give its examples. AP Mar 20; TS June 15, May 18

06. State the laws of rolling friction. TS Mar 20, May 22

VERY SHORT ANSWER QUESTIONS (2 MARKS)

07. What is inertia ? What gives the measure of inertia ? AP Mar 14, 19, TS Mar 17

08. When a bullet is fired from a gun, the gun gives a kick in the backward direction. Explain.

Mar 15

09. If a bomb at rest explodes into two pieces, the pieces must travel in opposite directions. Explain. TS Mar 15, 16, May 22, June 15

10. Can the coefficient of friction be greater than one ? TS Mar 18

11. Why does the car with a flattened tyres stop sooner than the one with inflated tyres ?

AP Mar 20, May 11

12. A horse has to pull harder during the start of the motion than later. Explain ?

AP Mar 13, 18, May 09, 16, 22

13. What happens to coefficient of friction if weight of the body is doubled ?

AP May 14, Mar 16; TS Mar 19, May 22

14. Calculate the time needed for a net force of 5N to change the velocity of a 10 kg mass by $2\ ms^{-1}$. TS May 16; SOLVED PROBLEM

15. A constant force acting on a body of mass 3.0 kg changes its speed from $2.0\ ms^{-1}$ to $3.5\ ms^{-1}$ in 25 sec. The direction of motion of the body remains unchanged. What is the magnitude and direction of the force ? ADD. PROBLEM

16. A batsman hits back a ball straight in the direction of the bowler without changing its initial speed of $12\ ms^{-1}$. If the mass of the ball is $0.15\ kg$, determine the impulse imparted to the ball. (Assume linear motion of the ball) AP Mar 17; TS Mar 20; EXAMPLE PROBLEM

06. Work-Energy-Power

LONG ANSWER QUESTIONS (8 MARKS)

01. a) State the law of conservation of energy and verify it in case of a freely falling body. What are the conditions under which the law of conservation of energy is applicable ?

AP June 15, Mar 15, 16, 18, May 16, 18; TS June 15, Mar 16, 17, 19, 20, May 16, 17, 18

b) A machine gun fires 360 bullets per minute and each bullet travels with a velocity of $600\ ms^{-1}$. If the mass of each bullet is $5\ gm$, then find the power of the machine gun ?

Mar 14; AP June 15, May 16, Mar 16, 18; TS May 18; PROBLEM

02. Develop the notions of work and kinetic energy and show that it leads to work-energy theorem. AP Mar 14, 15, 17, May 17; TS Mar 15, May 22

03. a) What are collisions ? Explain the possible types of collisions ? Develop the theory of one dimensional elastic collision. May 14, AP Mar 19, 20; TS Mar 18, TS May 22

b) Show that in the case of one dimensional elastic collision, the relative velocity of approach of two colliding bodies before collision is equal to the relative velocity of separation after collision.

c) A body freely falling from a certain height 'h', after striking a smooth floor rebounds and raises to a height 'h / 2'. What is the coefficient of restitution between the floor and the body? TS Mar 18

SHORT ANSWER QUESTIONS (4 MARKS)

04. A pump is required to lift 600 kg of water per minute from a well 25 m deep and to eject it with a speed of $50\ ms^{-1}$. Calculate the power required to perform the above task ?
AP Mar 15, June 15, May 18; TS Mar 16, 19, 20; May 22 ; PROBLEM

07. System of Particles & Rotational Motion

LONG ANSWER QUESTIONS (8 MARKS)

01. State and prove the principle of conservation of angular momentum. Explain the principle of conservation of angular momentum with examples. AP Mar 08, 16

SHORT ANSWER QUESTIONS (4 MARKS)

02. Distinguish between centre of mass and centre of gravity.
AP Mar 13, 14, 15, 16, 17, 18, June 15, May 17, 22; TS Mar 15, 16, May 17, 18

03. Define angular acceleration and torque. Establish the relation between angular acceleration and torque. AP June 15, Mar 19; TS Mar 17, 18, 20, May 17, June 15

04. Define vector product. Explain the properties of a vector product with two examples.
AP Mar 15, 17, 20, May 17, 18, 22; TS Mar 15, 16, 17, May 16, 18

05. Define angular velocity (ω). Derive $v = r\omega$. AP Mar 19, May 14; TS Mar 16, 17, 19, May 22

06. Find the centre of mass of three particles at the vertices of an equilateral triangle. The masses of the particles are 100 g, 150 g and 200 g respectively. Each side of the equilateral triangle is 0.5 m long. AP & TS Mar 18

07. Find the torque of a force $7\hat{i}+3\hat{j}-5\hat{k}$ about the origin. The force acts on a particle whose position vector is $\hat{i}-\hat{j}+\hat{k}$. AP Mar 14

08. The moment of inertia of a flywheel making 300 revolutions per minute is $0.3\ kg\ m^2$. Find the torque required to bring it to rest 20s. Mar 20

09. Is it necessary that a mass should be present at the centre of mass of any system ?
AP Mar 11, May 11, 12, 14, 16; TS May 22

10. Why are spokes provided in a bicycle wheel ? May 14

11. We cannot open or close the door by applying force at the hinges. Why ?
AP May 16, TS May 22

12. By spinning eggs on a table top, how will you distinguish a hard boiled egg from a raw egg ?
AP Mar 13; TS May 22

13. Why is it easier to balance a bicycle in motion ? TS Mar 19

08. Oscillations

LONG ANSWER QUESTIONS (8 MARKS)

01. a) Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period. What is seconds pendulum ?

AP Mar 15, 16, 17, 20, May 17, June 15; TS Mar 15, 17, 18, 20, May 16, 17

b) The mass and radius of a planet are doubled that of the earth. If the time period of a simple pendulum on the earth is 'T', then find the time period on the planet.

AP Mar 20; UNSOLVED PROBLEM

c) Calculate the change in the length of a simple pendulum of length 1 m , when its period of oscillation changes from 2 s to 1.5 s . TS Mar 18; UNSOLVED PROBLEM

d) Find the length of a simple pendulum which ticks seconds. ($g = 9.8\ ms^{-2}$)

AP Mar 17, 18; TS Mar 17

02. a) Define simple harmonic motion. Show that the motion of (point) projection of a particle performing uniform circular motion, on any diameter, is simple harmonic.

AP May 14, 16; Mar 18, 19; TS June 15, Mar 16, 19, May 18, 19

b) On an average a human heart is found to beat 75 times in a minute. Calculate its frequency and period. AP Mar 19

c) A mass of 2 kg is a attached to spring of force constant $200\ Nm^{-1}$. Find its time period.

TS Mar 19; ADD. PROBLEM

09. Gravitation

SHORT ANSWER QUESTIONS (4 MARKS)

01. What is escape velocity ? Obtain an expression for it.

AP Mar 15, 18, 19, May 16, 17; TS Mar 16, 19, May 22

02. What is orbital velocity ? Obtain an expression for it. Mar & May 14; AP Mar 17, May 18

03. What is a geostationary satellite? State its uses.

AP June 15, Mar 16, 20, May 22; TS Mar 15, 18, May 16, 18, 22 June 15

04. State Kepler's laws of planetary motion ? TS Mar 17, 20

05. Derive the relation between acceleration due to gravity (g) at the surface of a planet and gravitational constant (G). AP May 12

10. Mechanical Properties of Solids

SHORT ANSWER QUESTIONS (4 MARKS)

01. Describe the behaviour of a wire under, gradually increasing load.

AP Mar 15, 16, 17, 18, 20, May 16; TS Mar 15, 17, 18, 20, May 16, 17, 22; June 15

02. Define strain energy and derive the equation for the same. Mar & May 14; TS May 18, Mar 19

(or) Explain the concept of elastic potential energy in a stretched wire and hence obtain the expression for it. AP May 17, 18, June 15

03. Define modulus of elasticity, stress, strain and Poisson's ratio.
04. Define Young's modulus, bulk modulus and rigidity modulus.
05. Define stress and explain types of stress. AP Mar 19; TS Mar 16
06. Define strain and explain the types of strain. May 22

11. Mechanical Properties of Fluids

VERY SHORT ANSWER QUESTIONS (2 MARKS)

01. What is hydrostatic paradox ? TS Mar 19
02. Define average pressure. Mention its units and dimensional formula. Is it a scalar (or) vector? AP Mar 17, 20, 22
03. Define viscosity. What are its units and dimensions ? AP Mar 12, May 16; TS June 15, May 18
04. What is the principle behind the carburetor of an automobile ? AP Mar 15, 19, June 15; TS Mar 17, 18
05. What is magnus effect ? AP Mar 15, May 17, 18; TS Mar 16, 19, May 22
06. Why drops and bubbles are spherical ? AP Mar 16, 17, 18, May 16, 17, 18; TS May 16, 17, 18, 22
07. Give the expression for excess pressure in a liquid drop. TS Mar 17
08. Give the expression for excess pressure in an air bubble inside the liquid. AP Mar 19; TS Mar 20
09. Give the expression for the excess pressure in a soap bubble in air. TS Mar 16, May 22
10. What are water proofing agents and water wetting agents ? What do they do ? AP Mar 20
11. What is angle of contact ? What are its values for pure water and mercury ? AP May 14 , Mar 16; TS Mar 20
12. If the diameter of a soap bubble is 10 mm and its surface tension is $0.04\ Nm^{-1}$, then find the excess pressure inside the bubble. AP Mar 14, 18, June 15; TS Mar 15, 18, May 16 PROBLEM
13. Mention any two examples that obey Bernoulli's theorem and justify them ? AP Mar 18; TS Mar 15
14. The density of the atmosphere at sea level is $1.29\ kg/m^3$. Assume that it does not change with altitude. Then, how high would the atmosphere extend ? EXAMPLE PROBLEM
15. Calculate the work done in blowing a soap bubble of diameter 0.6 cm against the surface tension (surface tension of soap solution $= 2.5 \times 10^{-2}\ Nm^{-1}$). PROBLEM

12. Thermal Properties of Matter

SHORT ANSWER QUESTIONS (4 MARKS)

01. In what way does the anomalous behaviour of water advantageous to aquatic animals ? Mar & May 14; AP Mar 17, 18; TS May 18, 22
02. Pendulum clocks generally go fast in winter and slow in summer. Why ? TS Mar 17, 19
03. Write a short notes on triple point of water. AP Mar 10, 13, 16, May 11, June 10

04. Explain conduction, convection and radiation with examples.
AP Mar 15, 19, 20, May 16; TS Mar 15, 16, 18, 20, June 15

05. Explain Celsius and Fahrenheit scales of temperature. Obtain the relation between Celsius and Fahrenheit scales of temperature. TS May 22

VERY SHORT ANSWER QUESTIONS (2 MARKS)

06. Distinguish between heat and temperature. TS Mar 15, 20

07. Why gaps are left between rails on a railway track ?
AP June 15, Mar 16, 17, 19, May 16, 22; TS Mar 19

08. What are the lower and upper fixed points in Celsius and Fahrenheit scales ?
May 14; AP Mar 16, 18, 19; TS Mar 16

09. Can a substance contract on heating ? Give an example.
AP Mar 16, 18, May 16; TS May 16, 18

10. What is latent heat of fusion ? AP May 17; TS May 17

11. What is latent heat of vaporisation ? AP Mar 13

12. What is specific gas constant ? Is it same for all gases ?

13. What are the units and dimensions of specific gas constant ? AP Mar 14

14. Why utensils are coated black ? Why the bottom of the utensils are made of copper ?
TS Mar 18

15. State Wien's displacement law ? AP Mar 17; TS Mar 20

16. Ventilators are provided in rooms just below the roof. Why ? AP Mar 14, 20

17. Define emissive power and emissivity.

18. What is greenhouse effect ? Explain global warming. AP Mar 15; TS Mar 16, May 16

19. Define absorptive power of a body. What is the absorptive power of a perfect black body ?
May 14

20. State Newton's law of cooling. AP June 15, Mar 20, May 17, 18; TS Mar 18, May 16

21. State the condition under which Newton's law of cooling is applicable.

22. The roof of buildings are often painted white during summer. Why ?
AP May 16; TS Mar 15, 17

23. What is the temperature for which the readings on Kelvin and Fahrenheit scales are same ?
PROBLEM

24. Find the increase in temperature of aluminium rod if its length is to be increased by 1%.
(α for aluminium $= 25 \times 10^{-6} / °C$) AP Mar 15, June 15, May 22; PROBLEM

25. Why is it easier to perform the skating on the snow ? TS Mar 16

26. Why do liquids have no linear and areal expansions ? TS Mar 19

27. If the maximum intensity of radiation for a black body is found at $1.45\ \mu m$, then what is the temperature of a radiating body (Wiens constant $= 2.9 \times 10^{-3}$ mK). TS Mar 19

13. Thermodynamics

LONG ANSWER QUESTIONS (8 MARKS)

01. a) Explain reversible and irreversible processes. Describe the working of Carnot engine. Obtain an expression for the efficiency.
Mar 14; AP Mar 16, 17, 18, 20, May 16, 17, 18; TS Mar 15, 17, 19, May 17

b) A refrigerator is to maintain eatables kept inside at $9^{\circ}C$. If room temperature is $36^{\circ}C$, then calculate the coefficient of performance. **AP Mar 20**

02. State second law of thermodynamics. How is heat engine different from a refrigerator ?

May 14; AP Mar 15, 16, 19, June 15; TS Mar 16, 18, 20, May 16, 18

14. Kinetic Theory of Gases

SHORT ANSWER QUESTIONS (4 MARKS)

01. Four molecules of a gas have speeds 1, 2, 3 and 4 km / s . Find rms speed of the gas molecules.

AP May 13

02. What is the ratio of rms speed of oxygen and hydrogen molecules at the same temperature ?

AP May 14

VERY SHORT ANSWER QUESTIONS (2 MARKS)

03. Define mean free path. **AP Mar 15, 17, 18, 19, 20; TS Mar 15, 17, May 18**
04. Name two prominent phenomena which provide conclusive evidence of molecular motion.
05. When does a real gas behave like an ideal gas ?

Mar 14; AP Mar 19; TS Mar 16, 19, May 16, 18, June 15

06. State Boyle's law and Charles Law ? **AP June 15, Mar 18, 20; TS Mar 15, May 16**
07. State Dalton's law of partial pressures. **Mar 17, 18, 20**
08 Explain the concept of degrees of freedom for molecules of a gas.
09. What is the expression between pressure and kinetic energy of a gas molecule ?

AP Mar 15, 16, 17, May 18

10. When pressure increases by 2%, what is the percentage decrease in the volume of a gas assuming Boyle's law is obeyed ?
11. What is the law of equipartition of energy ? **TS Mar 16, 17, 18**
12. If the absolute temperature of a gas is increased to 3 times, what will be the increase in rms velocity of the gas molecule ? **TS June 15, Mar 19, 20**

THE END