TS JUNIOR INTER

SUB: PHYSICS   **IMPORTANT QUESTIONS**   **2022-23**

I   VERY SHORT QUESTIONS:

QUESTION NO-1

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

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

3. What are the fundamental forces in nature?

4. What is physics?

QUESTION NO:2

1. 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.

2. Distinguish between accuracy and precision.
3. Distinguish between fundamental units and derived units.

4. How can systematic errors be minimised or eliminated?

5. Express unified atomic mass unit in kg.

QUESTION NO:3

1. $A = \bar{i} + \bar{j}$. What is the angle between the vector and x-axis.
2. If $\overline{P} = 2\hat{i} + 4\hat{j} + 14\hat{k}$ and $\overline{Q} = 4\hat{i} + 4\hat{j} + 10\hat{k}$ find the magnitude of $\overline{P} + \overline{Q}$.
3. The vertical component of a vector is equal to its horizontal component. What is the angle made by the vector with x-axis?
4. Two forces of magnitudes 3 units and 5 units act at 60^0 with each other. What is the magnitude of their Resultant?
5. When two right angled vectors of magnitude 7 units and 24 units combine, what is the magnitude of their resultant?
6. What is the accelertion of a projectile at the top of its trajectory?

QUESTION NO:4

1. 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)
2. What is inertia? What gives the measure of inertia?

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

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

5. Can the coefficient of friction be greater than one?

QUESTION NO:5

1. Give the expression for the excess pressure in an air bubble inside the liquid.

2. What is the principle behind the carburettor of an automobile

3. Why are drops and bubbles spherical?

4. What is magnus effect?

5. If the diameter of a soap bubble is 10mm and its surface tension is 0.04N/m, Find the excess pressure inside the bubble.

QUESTION NO:6

1. What is angle of contact? What are its values for pure water and mercury?
2. Mention any two applications of Bernoulli's theorem.
3. Define average pressure. Mention its units and dimensional formula.

4. Define Viscosity. What are it's units and dimensions?

5. Give the expression for the excess pressure in a liquid drop.

QUESTION NO:7

1. State Wien's displacement law?

2. Why utensils are coated black? Why are the bottom of the utensils made of copper?

3. Why gaps are left between rails on a railway track?

4. Can a substance contract on heating? Give an example.

5. What are the lower and upper fixing points in Celsius and Fahrenheit scales?

QUESTION NO:8

1. Distinguish between heat and temperature.

2. What is latent heat of vaporisation?

3. The roof of buildings are often painted white during summer. Why?

4. What is greenhouse effect? Explain global warming?

5. Why do liquids have no linear and areal expansions?

QUESTION NO:9

1. State Dalton's law of partial pressures.

2. Define mean free path.

3. When does a real gas behave like an ideal gas?

4. State Boyle's Law and Charles Law.

5. What is the expression between pressure and kinetic energy of a gas molecule?

QUESTION NO:10

1. If the absolute temperature of a gass increased to 3 times, what will be the increase in RMS velocity of ths gass molecule?

2. When pressure increases by 2%. What is the percentage decreases in the volume of a gas. Assuming Boyle's law is obeyed.

3. Explain the concept of degrees of freedom for molecules of a gas.

4. What is the law of equipartition of energy?

5. Name two prominent phenomena which provide conclusive evidence of molecular motion.

1. Is it necessary that a mass should be present at the centre of mass of any system?
2. Why are spokes provided in a bicycle wheel?
3. By spinning eggs on a table top, how will you distinguish a hard boiled egg from a raw egg?
4. If the polar ice caps of the earth were to melt, what would the effect of the length of the day be?
5. What is the moment of inertia of a rod of mass M. Length about an axis perpendicular to it through one end?

SHORT ANSWER QUESTION:
QUESTION NO:11

1. Explain the terms the average velocity and instantaneous velocity. When are they equal?
2. Derive the equation $x = v_0 t + \dfrac{1}{2} at^2$ using graphical method where the terms have usual meaning
3. 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?
4. A man walks an straight road from his home to a market 2.5 km away with a speed $5\, kmh^{-1}$. Finding the market is 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 minutes
5. A man runs across the roof of a tall building and jumps horizontally on to the (lower) roof of an adjacent building. If his speed is 9 m/s and the horizontal distance between the building is 10m and the height difference between the roofs is 9m, will he be able to land on the next building (Take g=10 m/s^2)

QUESTION NO:12

1. State parallelogram law of vectors. Derive an expression for the magnitude and direction of the resultant vector.
2. Show that the trajectory of an object thrown at certain angle with the horizontal is a parabola.
3. Show that the maximum height reached by a projectile launched at an angle of 45^0 is one quarter of its range.
4. Show that the maximum height and range of a projectile are $\dfrac{U^2 \sin^2 \theta}{2g}$ and $\dfrac{U^2 \sin 2\theta}{g}$ respectively.
   Where the terms have their regular meanings.
5. If $\left|\vec{a} + \vec{b}\right| = \left|\vec{a} - \vec{b}\right|$ prove that the angle between $\vec{a}$ and $\vec{b}$ is 90^0.

QUESTION NO:13

1. State the laws of rolling friction.
2. Mention the methods used to decrease friction.
3. Explain advantages and disadvantages of friction.
4. Why is pulling the lawn roller preferred to pushing it?
5. Define the terms momentum and impulse. State and explain the law of conservation of linear momentum. Give examples.

QUESTION NO:14

1. Distinguish between centre of mass and centre of gravity
2. Define angular velocity (ω). Derive $V = r\omega$.
3. Define vector product. Explain the properties of vector product with two examples.
4. Find the scalar and vector products of two vectors $\vec{a} = \left(3\hat{i} - 4\hat{j} + 5\hat{k} \right)$ and $\vec{b} = \left(-2\hat{i} + \hat{j} - 3\hat{k} \right)$
5. State and prove the principle of conservation of angular momentum. Explain the principle of conservation of angular momentum with examples

QUESTION NO:15

1. Define angular acceleration and torque. Establish the relation between angular acceleration and torque.
2. Find the center of mass of three particles at the vertices of an equilateral triangle. The masses of the particles are 100-gram, 150 gram and 200 gram respectively. Each side of the equilateral triangle is 0.5m long.
3. Find torque of a force $7\bar{i}+3\bar{j}-5\bar{k}$ about the origin, The force acts on a paricle whose position vector is $\bar{i}-\bar{j}+\bar{k}$.
4. State and prove perpendicular axes theorem.
5.State and prove parallel axis theorem

QUESTION NO:16
1. State Kepler's laws of planetary motion.
2. What is escape velocity? Obtain an expression for it.
3. What is orbital velocity? Obtain an expression for it.
4. What is a geostationary satellite? State its uses.
5. Derive the relation between acceleration due to gravity(g) at the surface of a planet and Gravitational constant(G).

QUESTION NO:17
1. Describe the behaviour of a wire under gradually increasing load.
2. Explain the concept of Elastic Potential Energy in a stretched wire and hence obtain the expression for it.
3. Define stress and explain the types of stress.
4. Define Hooke's law of elasticity, proportionality, permanent set and breaking stress.

QUESTION NO:18
1. In what way is the anomalous behaviour of water advantageous to aquatic animals?
2. Pendulum clocks generally go fast in winter and slow in summer. Why?
3. Explain conduction, convection and radiation with examples.
4. A body cools from $60^0 C$ to $40^0 C$ in 7 minutes. What will be its temperature after next 7 minutes if the temperature of its surroundings is $10^0 C$?
5. Write a short note on triple point of water.

LONG ANSWER QUESTIONS:
QUESTION NO: 19
1. a) State and prove law of conservation of energy in case of freely falling body.
   b) A pump is required to lift 600kg of water per minute from a well 25m deep and to eject it with a speed of $50ms^{-1}$.Calculate the power required to perform the above task?
2. What are collisions? Explain the possible types of collisions? Develop the theory 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. A body freely falling from a certain height 'h' after striking a smooth floor rebound to a height h/2. What is coefficient of restitution between the floor and the body?
3. a) Develop the notions of work and kinetic energy and show that it leads to work-energy theorem.
   b) Calculate the power of the pump required to lift 600kg of water per minute from a well of 25m deep.

QUESTION NO: 20
1. Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period. What is seconds pendulum? What is the length of a simple pendulum which ticks seconds?
2. 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.

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

3. Derive the equation for the kinetic energy and potential energy of a simple harmonic oscillator and show that the total energy of a particle in simple harmonic motion is constant at any point on its path.

QUESTION NO:21

1. State second law of thermodynamics. How is heat engine different from a refrigerator?
2. Explain reversible and irreversible processes. Describe the working of Carnot engine. Obtain an expression for the efficiency.