CHAPTER ONE

PHYSICAL WORLD

Question Bank

1) What is science?
2) What are the main branches of science?
3) What is scientific attitude?
4) What is scientific method? Mention various steps involved in a scientific method.
5) What is scientific theory?
6) When does a scientific theory need a modification or replacement by a new theory?
7) What are unification and reductionism?
8) Count the scope of physics?
9) What are branches of physics?
10) How many forces are there in nature?
11) Define the followings:

    A) Gravitational force B) Electromagnetic force

    C) Weak nuclear force D) Strong nuclear force

12) Electromagnetic force is enormously stronger than the gravitational force. Give an example from daily life to illustrate it.
13) Although gravitational force is incomparably weaker than the electromagnetic force, yet it governs the large-scale motion both on terrestrial and astronomical scales. How?
14) Give three properties for each of the following forces:

A) Gravitational force B) Electromagnetic force

C) Weak nuclear force D) Strong nuclear force

15) Give an example for each of the following forces:

A) Gravitational force B) Electromagnetic force C) Strong nuclear force

16) What is the basic quest of modern physicists? Mention the various significant attempts made towards the unification of forces in a chronological order.

17) Give three examples of physics in relation with:

A) other science B) society C) technology

18) What are the four conservation laws in classical physics?

19) Define the following laws and give two examples for each:

A) conservation of energy B) conservation linear momentum

C) conservation of angular momentum D) conservation of charge

CHAPTER TWO

UNITS AND MEASUREMENTS

Question Bank:

1) What are physical quantities?
2) Distinguish between fundamental and derived quantities?
3) What is meant by the term measurement of a physical quantity?
4) How is the result of measurement of a physical quantity expressed?
5) What is a physical unit?
6) What are the characteristics of a standard unit?
7) What are fundamental and derived units? Give some examples.
8) What is a system unit? mention the various types of systems of unit?
9) Define the following basic unit:

   i) Meter *ii*) Kilogram *iii*) Second *iv*) Ampere

   v)Kelvin *vi*) Candela *vii*) Temperature.

10) Define the following supplementary unit:

    i) radian *ii*) steradian

11) What are the advantages of SI units over other systems?
12) What are the rules for writing SI units in symbolic form?
13) What do you mean by dimension of physical quantity? Explain with the help of an example.
14) How can we classify variables and constants on the basis of dimensions? Give examples of each type.
15) Define dimensional analysis and mention some application of dimensional analysis?
16) What are the limitations of dimensional analysis?
17) What is meant by significant figures in a measured quantity?

18) State the rules for counting the number of significant figures in a measured quantity?

19) Define accuracy and precision.

20) Count different types of errors and define two of them?

21) Define absolute error, final absolute error and relative error and write their laws?

22) The length, breadth and height of a rectangular block of wood were measured to be: $l = 12.13 \pm 0.02\ cm,\quad b = 8.16 \pm 0.01\ cm,\quad h = 3.46 \pm 0.01\ cm$ determine the percentage error of in the volume of the block. (Hint $V = lbh$)

23) Find the relative error in *Z*, if $Z = \frac{A^4 B^{1/3}}{C\ D^{3/2}}$.

24) A physical quantity X is given by $X = \frac{a^2 b^3}{c\sqrt{d}}$. If the percentage errors of measurement in *a*, *b*, *c*, and *d* are 4%, 2%, 3% and 1%, respectively. Then calculate the percentage error of X.

25) If $l_1 = 10.0 \pm 0.1\ cm$ and $l_2 = 9.0 \pm 0.1\ cm$, find their sum, difference and error in each.

CHAPTER THREE

VECTORS

Question Bank:

1) What is coordinate system?
2) Define scalar and vector quantities.
3) Compare between scalar and vector quantities.
4) Mention different types of vectors.
5) Define the followings:

   a) Equal vectors ***b)*** Negative of a vector ***c)*** Modulus of a vector

   d) Unit vector ***e)*** Fixed vector ***f)*** Free vector

   g) Collinear vector ***h)*** Coplanar vectors ***i)*** Co-initial vectors

   j) Co-terminus vectors
6) Give three physical examples of dot and cross products of two vectors?
7) Find the vector $\overrightarrow{AB}$ and its magnitude if it has the initial point $A\ (1,2,-1)$ and final point $B\ (3,2,2)$.
8) Find unit vector parallel to the resultant of the vectors $\vec{A} = \hat{\imath} + 4\hat{\jmath} - 2\hat{k}$ and $\vec{B} = 3\hat{\imath} - 5\hat{\jmath} + 2\hat{k}$.
9) A vector $\vec{X}$, when added tor the resultant of the vectors $\vec{A} = 3\hat{\imath} - 5\hat{\jmath} + 7\hat{k}$ and $\vec{B} = 2\hat{\imath} + 4\hat{\jmath} - 3\hat{k}$ gives a unit vector along Y-axis. Find the vector $\vec{X}$.
10) Two forces $\vec{F}_1 = 3\hat{\imath} + 4\hat{\jmath}$ and $\vec{F}_2 = 3\hat{\jmath} + 4\hat{k}$ are acting simultaneously at a point. What is the magnitude of the resultant force?
11) If the magnitudes of two vectors are 3 and 4 and their scalar product is 6, then find the angle between the two vectors.
12) A force of $7\hat{\imath} + 6\hat{k}$ newton makes a body move on a rough plane with a velocity of $3\hat{\imath} + 4\hat{k}\ ms^{-1}$. Calculate the power in watt? Hint: $\vec{P} = \vec{F}.\vec{V}$

13) If vectors $\vec{P}, \vec{Q}$ and $\vec{R}$ have magnitudes 5, 12, and 13 units and $\vec{P} + \vec{Q} = \vec{R}$, Find the angle between $\vec{Q}$ and $\vec{R}$.

14) Determine the angles which the vector $\vec{A} = 3\hat{\imath} - 5\hat{\jmath} + 7\hat{k}$ makes with *X*-, *Y*- and *Z*- axes.

15) Calculate the area of the parallelogram whose two adjacent sides are formed by vectors $\vec{A} = 3\hat{\imath} + 4\hat{\jmath}$ and $\vec{B} = -3\hat{\imath} + 7\hat{\jmath}$.

16) If $\vec{A}$ and $\vec{B}$ denotes the sides of a parallelogram and its area is *AB/2*, find the angle between $\vec{A}$ and $\vec{B}$.

17) Find a vector whose length is 7 and which is perpendicular to each of the vectors: $\vec{A} = 2\hat{\imath} - 3\hat{\jmath} + 6\hat{k}$ and $\vec{B} = \hat{\imath} + \hat{\jmath} - \hat{k}$.

18) The magnitude of vector product of two non-zero vectors $\vec{A}$ and $\vec{B}$ is zero. Calculate the scalar product of $\vec{A}.(\vec{A} + \vec{B})$.

CHAPTER FOUR

MOTION IN ONE AND TWO DIMENSIONS

Question Bank:

1) What are the sub branches of mechanics?
2) Define the followings:
   a) Statics b) Kinematics c) Dynamics D) Rest E) Motion
3) What is meant by a point object and give an example.
4) What do you mean by motion in one, two and three dimensions? give two examples for each type?
5) Define distance and displacement.
6) Compare between distance and displacement.
7) What is speed and mention its types.
8) Define the followings:
   a) Uniform speed b) Variable speed
   c) Average speed d) Instantaneous speed
9) What is velocity and mention its types.
10) Define the followings:
   b) Uniform velocity b) Variable velocity
   c) Average velocity d) Instantaneous velocity
11) What is meant uniform motion? give three important features of it.
12) What is meant by non-uniform motion?
13) Define acceleration and mention its types.
14) What is meant by positive acceleration and negative acceleration?
15) For the following terms write their equations:
   a) Velocity b) Speed c) Average speed d) Instantaneous speed
16) Write equations of motion in their conventional form.
17) What is meant by free fall of a body?

18) What is meant by a projectile motion? give three examples.

19) In projectile motion, for the following terms write their equations.

a) Time of maximum height b) Time of flight c) Maximum height

d) Horizontal range e) Maximum horizontal range f) velocity at any instant

20) A man is $s = 9\,m$ behind the door of a train when it starts moving with acceleration $a = 2\,ms^{-2}$. Th man runs at full speed. How far does he have to run and after what time does he get into the train?

21) A body covers 12 *m* in 2nd second and 40 *m* in 4th second. How much distance will it cover in 4 seconds after the 5th second?

22) Two buses *A* and *B* are at positions 50 *m* and 100 *m* from the origin at time *t=0*. They start moving in the same direction simultaneously with uniform velocity of 10 ms^{-1} and 5 ms^{-1}, respectively. Determine the time and position at which *A* overtakes *B*.

23) A food packet is released from a helicopter which is rising steadily at 2 ms^{-1}. After two seconds (*i*) What is the velocity of the packet? (*ii*) How far is it below the helicopter? Take g=9.85 ms^{-2}

24) A stone falls from a cliff and travels 24.5 *m* in the last second before it reaches the ground at the foot of the cliff. Find the height of the cliff.

25) Find the angle of projection which the horizontal range and the maximum height are equal.

26) Prove that the maximum horizontal range is four times the maximum height attained by the projectile, when fired at an inclination so as to have maximum horizontal range.

27) A football player kicks a ball at an angle of 37° to the horizontal with an initial speed of 15 ms^{-1}. Assuming that the ball travels in a vertical plane, calculate (*i*) the time at which the ball reaches the highest point (*ii*) the maximum height reached (*iii*) the horizontal range of the projectile and (*iv*) the time for which the ball is in air.