PARISHRAM PUBLICATIONS
PUNE

NAME of Student : _____

Subject : PHYSICS

Chapter Test 1

Class : XI   Max. Marks :- 80

Topic : Vector, Units and Dimensions

Instructions :

(i) For each question in Section I, you will be awarded 3 Marks if you have darkened only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (– 1) mark will be awarded.

(ii) For each question in Section II, you will be awarded 3 Marks if you have darkened only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (– 1) mark will be awarded.

(iii) For each question in Section III, you will be awarded 3 Marks if you have darkened only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (– 1) mark will be awarded.

(iv) For each question in Section IV, you will be awarded 2 marks for each row in which you have darkened the bubble(s) corresponding to the correct answer. Thus, each question in this section carries a maximum of 8 marks. There is no negative marking for incorrect answer(s) for this section.

(v) For each question in Section V, you will be awarded 3 marks if you darken the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (–1) mark will be awarded.

(vi) For each question in Section VI, you will be awarded 3 Marks if you have darkened only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (– 1) mark will be awarded.

SECTION - I

This section contains 8 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

Q.1 Just after firing, a bullet is found to move at an angle of 37° to horizontal. Its acceleration is 10m/s^2 downwards. Find the component of acceleration in the direction of the velocity.

(A) – 6 m/s^2 (B) – 4 m/s^2

(C) – 8 m/s^2 (D) – 5 m/s^2

Q.2 A man rows a boat with a speed of 18 km/hr. in northwest direction. The shoreline makes an angle of 15° south of west. Obtain the component of the velocity of the boat along the shoreline

(A) 9 km/hr   (B) $18\dfrac{\sqrt{3}}{2}$ km/hr   (C) 18 cos 15° km/hr   (D) 18 cos 75° km/hr

Q.3 A bird moves from point (1, –2) to (4, 2). If the speed of the bird is 10m/sec, then the velocity vector of the bird is –

(A) $5\,(\hat{i} - 2\hat{j})$ (B) $5\,(4\hat{i} + 2\hat{j})$ (C) $0.6\hat{i} + 0.8\hat{j}$ (D) $6\hat{i} + 8\hat{j}$

Q.4 Considering two vectors, $\vec{F} = (4\vec{i} - 10\vec{j})$ newton and $\vec{r} = (-5\vec{i} - 3\vec{j})$ m compute $\vec{r} \times \vec{F}$.

(A) $62\,\vec{k}$ N-m   (B) $32\,\vec{k}$ N-m   (C) $38\,\vec{k}$ N-m   (D) $52\,\vec{k}$ N-m

Q.5 The dimensional formula stands for –

(A) Torque   (B) Angular momentum

(C) Latent heat   (D) Coefficient of thermal conductivity

Q.6 In a system of units if force (F), acceleration (A) and time (T) are taken as fundamental units then the dimensional formula of energy is –

(A) FA^{2}T   (B) FAT^2 (C) F^{2}AT   (D) FAT

Q.7 If e is charge, V is potential difference, T is temperature, then units of $\dfrac{eV}{T}$ are same as of –

(A) Planck's constant   (B) Stefan's constant

(C) Boltzman constant   (D) Gravitational constant

Q.8 For a body moving along x-axis, the distance travelled by body from a reference point is given as function of time t as $x = at^2 + b$, where a and b are constants, then the dimension of $\sqrt{ab}$ is same as

(A) Speed   (B) Distance travelled

(C) Acceleration   (D) None of these

This section contains 3 multiple choice questions . Each question has 4 choices (A), (B), (C) and (D), out of which one or more answers are correct.

Q.9 If energy (E), velocity (v) and force (F) be taken as fundamental quantity, then which of the following does not match the dimensions of mass –

(A) Ev^2 (B) Ev^{-2} (C) Fv^{-1} (D) Fv^{-2}

Q.10 A physical quantity x depends on quantities y and z as follows: x = Ay + B tan Cz, where A, B and C are constants. Which of the following have the same dimensions

(A) x and B   (B) C and z^{-1} (C) y and B/A   (D) x and A

Q.11 Two forces $\vec{A}$ and $\vec{B}$ have resultant $\vec{R}_1$. If $\vec{B}$ is doubled the new resultant $\vec{R}_2$ is at right angles to $\vec{A}$. Choose the correct options –

(A) $R_1 = B$ (B) $R_2 = \sqrt{4B^2 - A^2}$ (C) $R_1 = 2B$ (D) $R_2 = \sqrt{2B^2 - A^2}$

SECTION - III

This section contains paragraph. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D), out of which only one is correct.

Passage (Q.12-Q.14)

A ball starting from origin moves for 1 second at constant velocity $(\hat{i} + 2\hat{j} + 2\hat{k})\,m/s$.

If then bounces of a wall, and moves for 2 second at new constant velocity $(\hat{i} + 2\hat{j} - 2\hat{k})\,m/s$.

Q.12 What is the change in velocity due to collision with wall –

(A) zero   (B) $4\hat{k}\,m/s$ (C) $-4\hat{k}\,m/s$ (D) $2\hat{i} + 4\hat{j}\,m/s$

Q.13 At the end of motion described above the distance of ball from the origin is –

(A) zero   (B) 3m   (C) 6m   (D) 7m

Q.14 What is the average velocity for the period of above described 3 seconds ?

(A) $\hat{i} - 2\hat{j} + \dfrac{2\hat{k}}{3}(m/s)$ (B) $\hat{i} + 2\hat{j} - \dfrac{2\hat{k}}{3}(m/s)$ (C) $\hat{i} + 2\hat{j} - 6\hat{k}(m/s)$ (D) $\hat{i} + 2\hat{j} - 4\hat{k}(m/s)$

Passage (Q.15-Q.17)

The limit of a derived quantity in terms of necessary basic units is called dimensional formula and the raised powers on the basic units are dimensions.

The dimension of physical quantity on the left hand side of dimensional equation should equal to the net dimensions of all physical quantities on the right hand side of it. Only those physical quantities can be added or subtracted which have same dimensions.

Q.15 The equation of a wave is given by $Y = A \sin \omega \left(\dfrac{x}{v} - k \right)$, where ω is the angular velocity and v is the linear velocity. The dimension of k is –

(A) LT   (B) T   (C) T^{-1} (D) T^2

Q.16 The period of a body under SHM i.e. presented by ; where P is pressure, D is density and S is surface tension. The value of a, b and c are –

(A) $-\dfrac{3}{2}, \dfrac{1}{2}, 1$ (B) –1, –2, 3   (C) $\dfrac{1}{2}, -\dfrac{3}{2}, -\dfrac{1}{2}$ (D) $1, 2, \dfrac{1}{3}$

Q.17 The velocity of a freely falling body changes as $g^p h^q$ where g is acceleration due to gravity and h is the height. The values of p and q are –

(A) $1, \dfrac{1}{2}$ (B) $\dfrac{1}{2}, \dfrac{1}{2}$ (C) $\dfrac{1}{2}, 1$ (D) 1, 2

SECTION - IV

This section contains match the column question. Four statements (A, B, C and D) are given in column I and four/five statements (p, q, r, s and t) in Column II. Any given statement in column I can have correct matching with one or more statement(s) given in column II.

Q.18 Three forces $\vec{F_1}, \vec{F_2}$ and $\vec{F_3}$ are represented as shown. Each of them is of equal magnitude.

Column I (Combination)	Column II (Approximate Direction)	
(A) $\vec{F_1} + \vec{F_2} + \vec{F_3}$	(p)	
(B) $\vec{F_1} - \vec{F_2} + \vec{F_3}$	(q)	
(C) $\vec{F_1} - \vec{F_2} - \vec{F_3}$	(r)	
(D) $\vec{F_2} - \vec{F_1} - \vec{F_3}$	(s)	
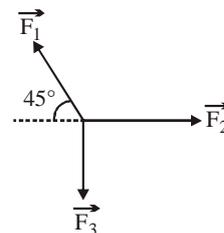
SECTION - V

This section contains 5 questions numbered . The answer to each of the questions is a single digit integer, ranging from 0 to 9.

Q.19 A particle is displaced from position $3\hat{i} + 2\hat{j}$ meter to another position $14\hat{i} + 13\hat{j}$ meter by applying a force $4\hat{i} + \hat{j}$ newton on it. The work done by the force is $(11 \times x)$ J. Find the value of x.

Q.20 If P represents radiation pressure, c represents speed of light and Q represents radiation energy striking a unit area per second, then non-zero integers x, y and z such that $P^x Q^y c^z$ is dimensionless, are x = 1, y = –a, z = b. Find the value of a + b.

Q.21 If velocity v, acceleration A and force F are chosen as fundamental quantities, if the dimensional formula of angular momentum in terms of v, A and F is $Fv^x A^{-2}$. Find the value of x.

Q.22 If the time period (T) of vibration of a liquid drop depends on surface tension (S), radius (r) of the drop and density (ρ) of the liquid, if the expression of T is $k\sqrt{\rho r^x / S}$. Find the value of x.

Q.23 A position vector of point is $(2\hat{i} + 2\hat{j})$ m. The volume of cone which is generated when a line segment representing this position vector is rotated about x-axis with one end remaining fixed at origin is $\dfrac{x\pi}{3} m^3$. Find the value of x.

SECTION - VI

This section contains 2 questions. Each questions contain STATEMENT-1 (Assertion) and STATEMENT-2 (Reason). Each question has 4 choices (A), (B), (C) and (D) out of which ONLY ONE is correct.

(A) Statement- 1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement -1
(B) Statement -1 is True, Statement -2 is True ; Statement-2 is NOT a correct explanation for Statement - 1
(C) Statement - 1 is True, Statement- 2 is False
(D) Statement -1 is False, Statement -2 is True

Q.24 Statement 1 : When two parallel $\vec{F_1}$ & $\vec{F_2}$ act on a body, the magnitude of the resultant force acting on the body is less than sum of F_1 and F_2.

Statement 2 : In a triangle, any side is less than the sum of the other two sides.

Q.25 Statement 1 : Mass, length and time are fundamental physical quantities.

Statement 2 : They are independent of each other.