COMPETENCY BASED QUESTIONS
Class 11
Physics

1. A ball is projected with velocity 10 m/sec at angle of 30° with the horizontal surface. The range of the projectile is
   a. 10 m
   b. $10\sqrt{3}$m
   c. $20\sqrt{3}$m
   d. $30\sqrt{3}$m
   e. $5\sqrt{3}$m

2. The angle of projection for the range of projectile to be equal to its maximum height is
   a. $\theta = \tan^{-1}(2)$
   b. $\theta = \tan^{-1}(3)$
   c. $\theta = \tan^{-1}(4)$
   d. $\theta = \tan^{-1}(2/\sqrt{3})$
   e. $\theta = \tan^{-1}(1/\sqrt{3})$

3. **An object of mass 2000 g covers a maximum vertical distance of 6 m when it is projected at an angle of 45° from the ground. Calculate the velocity with which it was thrown. Take g = 10 m/s2,**

   a. 12.10 m/s

   b. 15.49 m/s

   c. 2.155 m/s

   d. 12.0 m/s

4. The velocity v of a particle depends upon the time 't' according to the equation

   $$v = \sqrt{ab} + bt + \frac{c}{d+t}$$
   Determine the units of a, b, c and d. What physical quantities they represent.

5. Find dimensions of constants a and b in equation.

   $(P + \frac{a}{V2})(V-b) = RT$, where P is pressure and V is volume, R is universal gas constant, T is temperature.

6. 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.

7. The displacement x of a particle varies with time as
   $$x = 4t^2 - 15t + 25$$
   Find the velocity and acceleration of the particle at t = 0. When will the velocity of the particle become zero? Name the type of motion the particle is executing.

8. The escape velocity v of a body depends upon the acceleration due to gravity of a planet g and the radius of the planet R. Establish dimensionally the relation between v, g and R.

9. Why does not a heavy gun kick so strongly as a light gun using the same bullets (i.e. cartridges)?

10. A pebble of mass 0.05 kg is thrown vertically upwards. Give the direction and magnitude of the net force on the pebble,

(a) during its upward motion, .

(b) during its downward motion,

(c) at the highest point where it is momentarily at rest. Do your answers change if the pebble was thrown at an angle of 45° with the horizontal direction? Ignore air resistance.

11. What is the angle between $\hat{i} + \hat{j}$ and $\hat{i}$ vectors?

12. What must be the value of 'a' in $2\hat{i} + 2\hat{j} - a\hat{k}$ so that it is perpendicular to $5\hat{i} + 7\hat{j} - 3\hat{k}$?

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