1. Which of the following conditions results in zero work being done by a force?
   A. Force and displacement are in the same direction
   B. Force and displacement are in opposite directions
   C. Displacement is zero D. Force is large (C)

Explanation : Work is defined as the dot product of force and displacement. If displacement is zero, the work done is zero regardless of the force applied.

2. What is the scalar product of vectors A and B when the angle between them is 90°?
   A. AB B. AB cos 90°
   C. AB sin 90° D. A + B (B)

Explanation : The scalar product is $A \cdot B = AB \cos \theta$. Since cos 90° = 0, the product becomes zero.

3. Which of the following statements is true about a conservative force?
   A. Work depends only on time
   B. Work depends on the path taken
   C. Work done in a closed path is not zero
   D. Work depends only on initial and final positions (D)

Explanation : For conservative forces, the work done depends only on the initial and final positions, not on the path taken.

4. A spring is stretched by 0.2 m. If the spring constant is 100 N/m, what is the potential energy stored in the spring?
   A. 2 J B. 4 J
   C. 1 J D. 0.5 J (C)

Explanation : Potential energy = $\frac{1}{2} kx^2 = \frac{1}{2} \times 100 \times (0.2)^2 = 1$ J.

5. In a collision, total kinetic energy is conserved only if the collision is :
   A. Elastic B. Inelastic
   C. Completely inelastic D. Glancing (A)

Explanation : In elastic collisions, both momentum and kinetic energy are conserved.

6. If a person pushes hard against a rigid wall, but the wall does not move, what is the work done by the person on the wall?
   A. Positive B. Negative
   C. Zero
   D. Cannot be determined (C)

Explanation : Work requires displacement. Since the wall doesn't move, the work is zero.

7. A body of mass m moving with velocity v has kinetic energy given by :
   A. mv B. $\frac{1}{2} mv^2$
   C. $v^2/2m$ D. $m^2v/2$ (B)

Explanation : Kinetic energy is defined as $\frac{1}{2} mv^2$.

8. A 1000 kg car moving at 5 m/s hits a spring with spring constant 5.25×10^3 N/m. What is the maximum compression of the spring?
   A. 1.5 m B. 1.0 m
   C. 2.0 m D. 0.5 m (C)

Explanation : Using $\frac{1}{2}mv^2 = \frac{1}{2}kx^2$, $x = \sqrt{(mv^2/k)} = \sqrt{(1000 \times 25 / 5250)} = 2$ m.

9. The dot product of two perpendicular unit vectors i and j is:
   A. 1 B. 0
   C. -1 D. Undefined (B)

Explanation : Dot product of perpendicular vectors is zero since cos 90° = 0.

10. In the case of a completely inelastic collision between two masses, the final velocity is given by:
   A. $(m_1 - m_2)/(m_1 + m_2)\ v_i$
   B. $2m_1/(m_1 + m_2)\ v_i$
   C. $m_1/(m_1 + m_2)\ v_i$
   D. $(m_1 + m_2)/m_1\ v_i$ (C)

Explanation : In a completely inelastic collision, the masses stick together. Final velocity: $v_f = m_1/(m_1 + m_2)\ v_i$.