CHAPTER-5 | Work, Energy and Power

QUIZ PART-03

1. **When a body falls freely from a height h, the total mechanical energy at any point is:**
   A. $1/2\ mv^2$ B. mgh
   C. mg(h-s) D. Zero (B)

Explanation : As the body falls, potential energy decreases while kinetic energy increases, but their sum remains constant at mgh.

2. **For a spring stretched by a distance x, the potential energy stored is:**
   A. kx^2 B. $1/2\ kx^2$
   C. $1/3\ kx^2$ D. $2kx^2$ (B)

Explanation : Work done in stretching a spring follows Hooke's law, giving $U = 1/2\ kx^2$.

3. **The SI unit of power is:**
   A. Joule B. Watt
   C. Newton
   D. Horsepower (B)

Explanation : Power is the rate of doing work, measured as Joule per second, which is Watt.

4. **Instantaneous power delivered by a force is:**
   A. $Fv\cos\theta$ B. F/v
   C. Fv^2 D. F/v^2 (A)

Explanation : Power at a moment is the dot product of force and velocity, giving $P = F\cdot v\cos\theta$.

5. **The energy of a body at the top of a vertical fall is entirely:**
   A. Kinetic B. Potential
   C. Both kinetic and potential
   D. Zero (B)

Explanation : At the top, velocity is zero, so kinetic energy is zero; total energy is potential mgh.

6. **A spring has a large spring constant k. This means:**
   A. The spring is soft
   B. The spring is stiff
   C. The spring has no restoring force
   D. Energy stored is zero (B)

Explanation : Larger k implies stronger restoring force per unit displacement, making the spring stiffer.

7. **Relation between kilowatt-hour and joule is:**
   A. 1 kWh = 360 J B. 1 kWh = 3600 J
   C. 1 kWh = 3.6 × 10^6 J
   D. 1 kWh = 746 J (C)

Explanation : One kilowatt-hour is the energy consumed by 1000 W in 1 hour, equal to 1000 × 3600 = 3.6 × 10^6 J.

8. **An elevator of 1800 kg moves upward with constant speed 2 m/s against 4000 N friction. The power required is:**
   A. 22,000 W B. 36,000 W
   C. 44,000 W D. 59,000 W (C)

Explanation : Total opposing force = (1800 × 10) + 4000 = 22000 N. Power = Fv = 22000 × 2 = 44,000 W.

9. **The maximum kinetic energy of a spring–block system occurs when:**
   A. Block is at maximum extension
   B. Block is at equilibrium
   C. Block is at half extension
   D. Block is at maximum compression (B)

Explanation : At equilibrium position, potential energy is zero, so total energy is entirely kinetic.

10. **The equation $E = mc^2$ represents:**
    A. Law of gravitation
    B. Work–energy theorem
    C. Mass–energy relation
    D. Conservation of momentum (C)

Explanation : The equation shows that mass and energy are equivalent; a small mass corresponds to huge energy because c^2 is very large.