9) A simple pendulum has a period of 2 s on Earth's surface. If suddenly the radius of Earth decreased by a factor 2, the period of the pendulum would be:

a) 2 s
b) 1 s
c) 4 s
d) 0.5 s
e) 8 s

$$T = 2\pi\sqrt{\frac{L}{g}}$$

$$R_E \to R_E/2 \Rightarrow g \to 4g \Rightarrow T \to T/\sqrt{4} = T/2$$

10) A 4 kg particle attached to a spring moves according to a simple harmonic motion. This motion is described by its horizontal position as:

$$x(t) = \cos\left(\pi t - \frac{\pi}{2}\right) \text{ (m)}$$

The total mechanical energy of this motion is:

a) 63 J
b) 30 J
c) 70 J
d) 35 J
e) 20 J

$$E_{TOTAL} = \frac{1}{2} k A^2$$

$$k = m\omega^2 = (4\text{kg})\left(\pi \text{ rad/s}\right)^2 = 4\pi^2 \text{ N/m}$$

$$A = 1 \text{ m}$$

$$\rightarrow E_{TOTAL} = \frac{1}{2}(4)\pi^2 \text{ J} = 2\pi^2 \text{ J} \simeq 20 \text{ J}$$