

Solutions

Each answer shows the steps, then the **result**.

2.1

- total energy equals the spring energy at the amplitude:

$$E = \frac{1}{2}kA^2 = \frac{1}{2}(100 \text{ N m}^{-1})(0.2 \text{ m})^2$$

- $E = \mathbf{2 \text{ J}}$

2.2

- At the equilibrium position

2.3

- Four times

2.4

- elastic potential energy:

$$U = \frac{1}{2}kx^2 = \frac{1}{2}(100 \text{ N m}^{-1})(0.1 \text{ m})^2$$

- $U = \mathbf{0.5 \text{ J}}$

3.1 A

- $E = \frac{1}{2}kA^2$

3.2 B

- $E \propto A^2$, so $2^2 = 4$

3.3

(a)

- total energy equals the spring energy at the amplitude:

$$E = \frac{1}{2}kA^2 = \frac{1}{2}(400 \text{ N m}^{-1})(0.1 \text{ m})^2$$

- $E = \mathbf{2 \text{ J}}$

(b)

- at equilibrium $x = 0$, so $U = 0$ and all the energy is kinetic: $K = \mathbf{2 \text{ J}}$

3.4

(a)

- At the extremes (maximum x)

(b)

- No – each is greatest where the other is zero