**Quiz C12.2**

SHM (HL)

1. Two harmonic oscillators are described by the equations $x_1 = 5\sin(6\pi t + \frac{\pi}{3})$ and

   $x_1 = 5\sin(6\pi t - \frac{\pi}{6})$. What is the phase difference between the two?

   A $\frac{\pi}{6}$ **B** $\frac{\pi}{4}$ **C** $\frac{\pi}{2}$ **D** π

2. The displacement in a simple harmonic motion is given by $x = 6\sin(\frac{2\pi t}{3})$ where x is in m and t in s. What is the maximum speed and maximum acceleration in this motion?

 | | Maximum speed /m s^{-1} | Maximum acceleration /m s^{-2} |
   |---|---|---|
   | A | $\frac{4\pi}{3}$ | $\frac{8\pi^2}{3}$ |
   | B | $\frac{4\pi}{3}$ | $\frac{8\pi^2}{9}$ |
   | C | 4π | $\frac{8\pi^2}{3}$ |
   | D | 4π | $\frac{8\pi^2}{9}$ |

3. The graph shows the variation with time of the displacement of a particle performing simple harmonic oscillations.
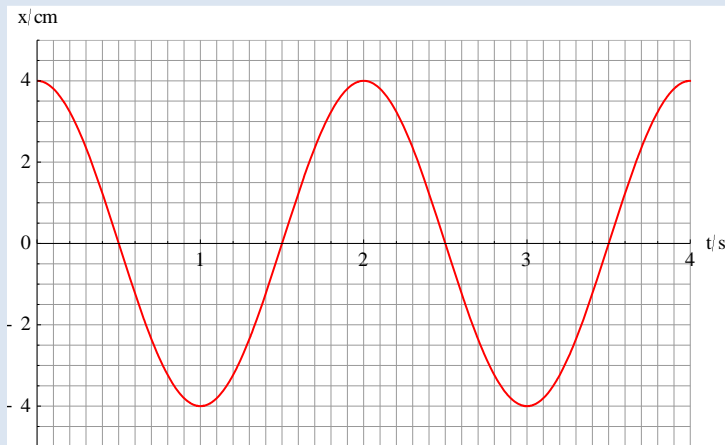
What is the equation for the displacement?

A $x = 4\sin(2t)$

B $x = 4\sin(2t + \frac{\pi}{2})$

C $x = 4\sin(\pi t)$

D $x = 4\sin(\pi t + \frac{\pi}{2})$

4. The maximum acceleration in a simple harmonic motion is 12 m s^{-2} and the maximum speed is 6.0 m s^{-1}. What is the period of oscillations in seconds?

A π B 2π C $\dfrac{1}{\pi}$ D $\dfrac{1}{2\pi}$

5. The amplitude in a simple harmonic motion is x_0. The maximum speed is v_{max}. What is the speed when the displacement is $\dfrac{x_0}{2}$?

A $\dfrac{v_{max}}{2}$ B $\dfrac{3}{4}v_{max}$ C $\dfrac{\sqrt{3}}{2}v_{max}$ D $\dfrac{v_{max}}{\sqrt{2}}$

6. A block of mass m is placed on a horizontal plate. The plate is performing vertical simple harmonic oscillations with period T and amplitude Z.
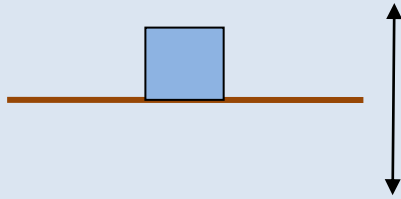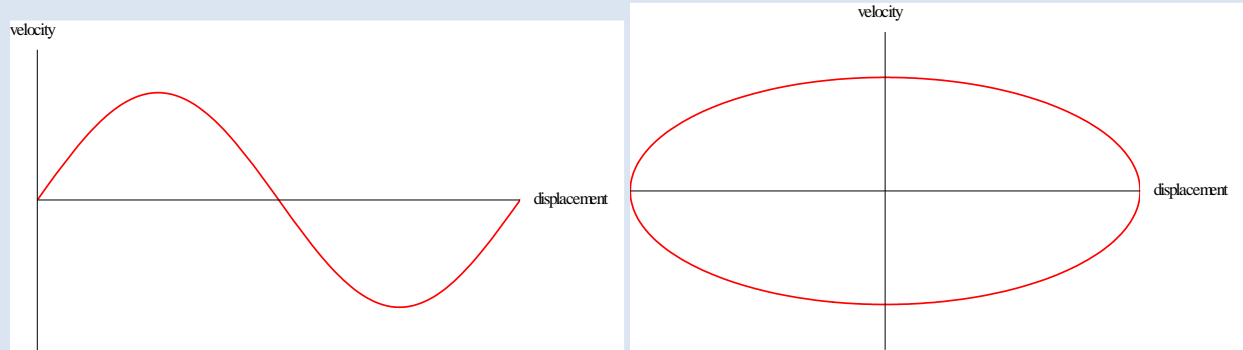
What is the difference between the magnitude of the normal force on the block at the bottom of the motion and that at the top?
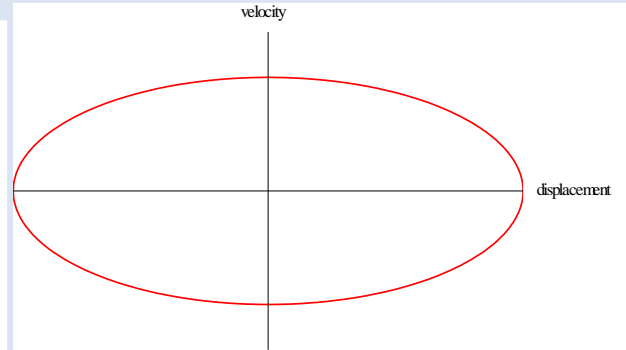
A 0

B $\dfrac{2\pi^2 mZ}{T^2}$

C $\dfrac{4\pi^2 mZ}{T^2}$

D $\dfrac{8\pi^2 mZ}{T^2}$

7. The displacement in a simple harmonic motion is given by $x = 6\sin(\dfrac{\pi t}{3} + \dfrac{\pi}{2})$. What is the equation for the velocity?

A $v = -2\pi \sin(\dfrac{\pi t}{3})$

B $v = 2\pi \sin(\dfrac{\pi t}{3})$

C $v = -2\pi \cos(\dfrac{\pi t}{3})$

D $v = 2\pi \cos(\dfrac{\pi t}{3})$

8. Which graph describes simple harmonic oscillations?

velocity

displacement

A

velocity

displacement

B

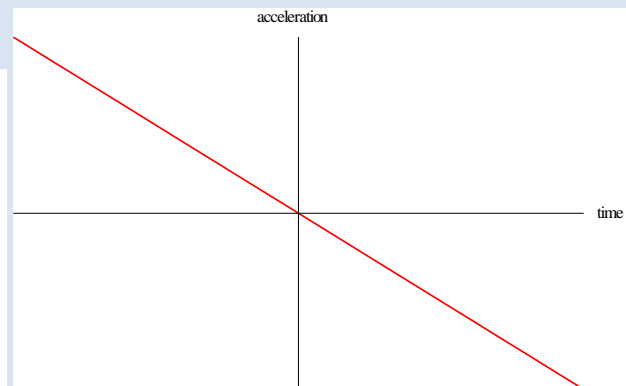acceleration
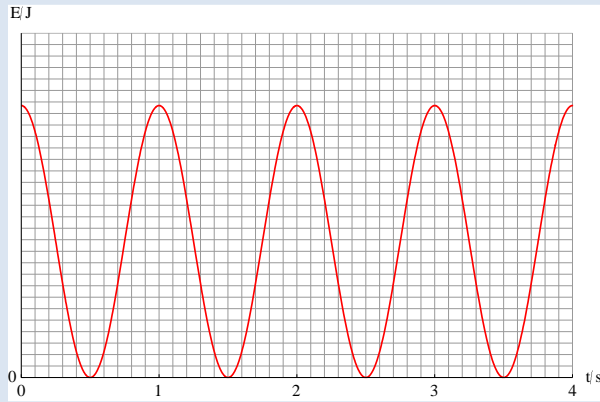
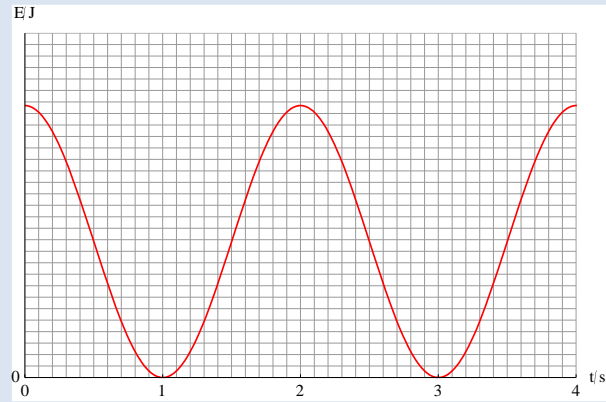displacement

C

acceleration

time
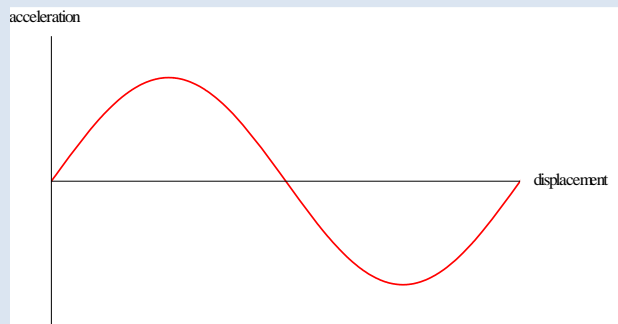
D

9. The amplitude in a simple harmonic motion is Z. What is the displacement when the kinetic energy is double the potential energy?

A $\dfrac{Z}{\sqrt{2}}$ **B** $\dfrac{Z}{\sqrt{3}}$ **C** $\dfrac{Z}{2\sqrt{2}}$ **D** $\dfrac{2Z}{\sqrt{3}}$
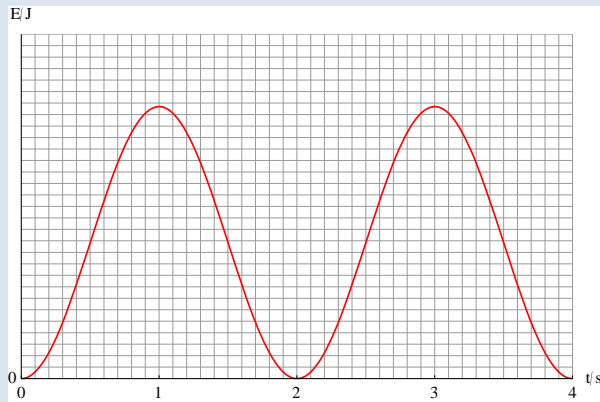
10. The displacement in a simple harmonic motion is given by $x = 2\sin(\pi t)$. Which is a possible graph for the variation with time of the potential energy?
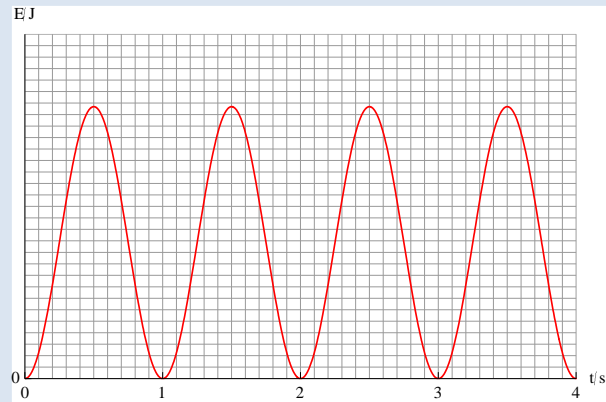
E/J

A

E/J

B

E/J

C

E/J

D

Quiz C12.2 Answers	
1	C
2	C
3	D
4	A
5	C
6	D
7	A
8	B
9	B
10	D