Do not write outside the box

2 8 An object of mass m moves in a circle of radius r. It completes n revolutions every second.

What is the kinetic energy of the object?

[1 mark]

$E_k = \frac{1}{2}mv^2$

$\omega = \frac{v}{r}$

$\omega r = v$

$\omega = \frac{n \times 2\pi}{1}$ or $\frac{n}{t}$ $\quad v = 2\pi n r$

$E_k = \frac{1}{2} m 4\pi^2 n^2 r^2$

$= 2\pi^2 n^2 r^2 m$

A $\frac{mn^2r^2}{8\pi^2}$ ○

B $\frac{mn^2r^2}{4\pi^2}$ ○

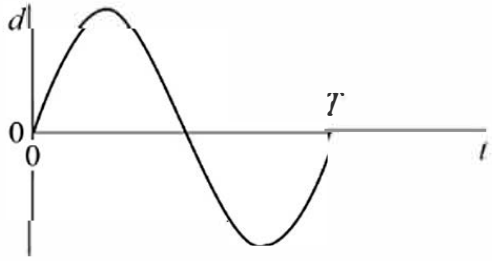
C $2m\pi^2n^2r^2$ ○

D $4m\pi^2n^2r^2$ ○

Turn over for the next question

Do not write outside the box

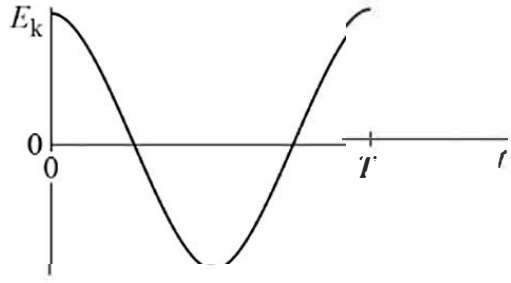
2 9 The graph shows the variation of displacement d with time t for a particle moving with simple harmonic motion of period T.



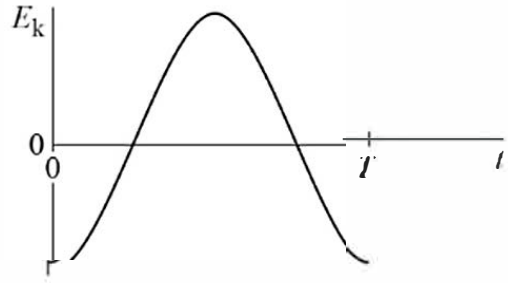
Which graph shows the variation of kinetic energy E_k of the particle with time?

[1 mark]

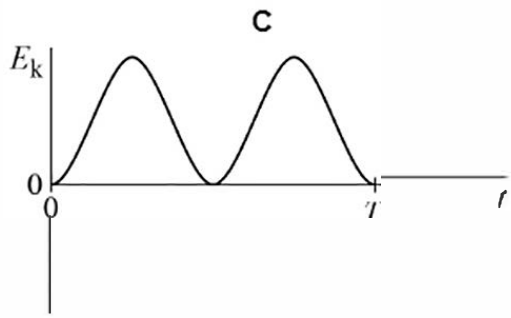
A



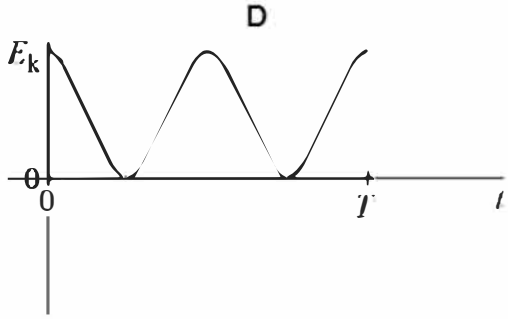
B



C



D



A ☐

B ☐

C ☐

D ☒

E_k is +ve

$d = 0$ is when V is max

Do not write outside the box

3 0 Two pendulums **A** and **B** oscillate with simple harmonic motion.
The time period of **A** is 2.00 s and the time period of **B** is 1.98 s.

A and **B** are released in phase.

What is the number of oscillations of **A** before **A** and **B** are next in phase?

[1 mark]

After 1 out by 0.02

has to gain

$\frac{1.98}{0.02} = 99$

A 49 ○

B 50 ○

C 99 ●

D 100 ○

3 1 The frequency of oscillation of a vertical spring is f when the mass hanging from the spring is m.

What is the relationship between f and m?

$T = 2\pi\sqrt{\frac{m}{k}}$

[1 mark]

A $f \propto m^{-\frac{1}{2}}$ ●

B $f \propto m^{-2}$ ○

C $f \propto m^{\frac{1}{2}}$ ○

D $f \propto m^{2}$ ○

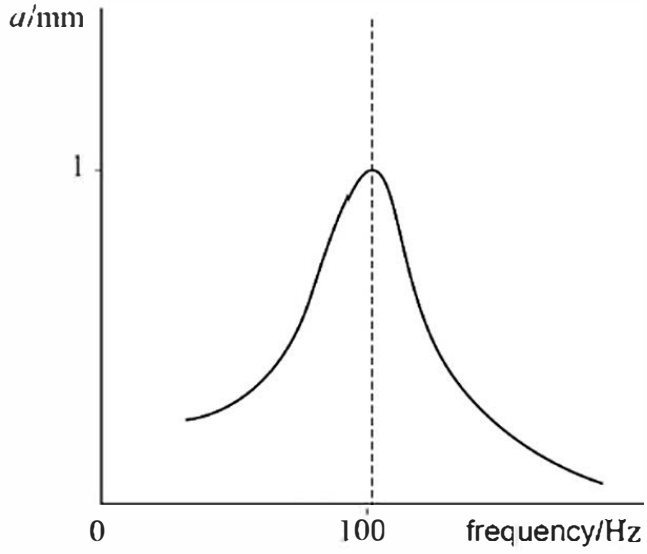
$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$

$f \propto \sqrt{\frac{1}{m}} = m^{-1/2}$

Turn over for the next question

Do not write outside the box

3 2 A metal panel is driven to vibrate at different frequencies. The amplitude a of the vibration is measured at each frequency. The graph shows the variation of amplitude with driven frequency.



The damping of the metal panel is increased without changing the mass of the panel.

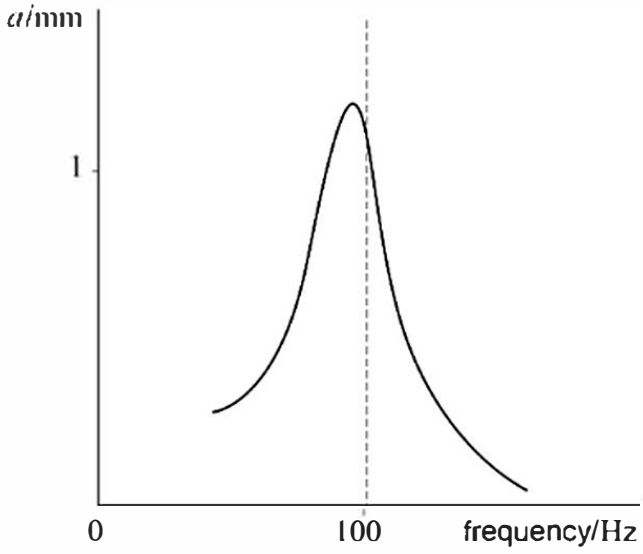
Which graph on the opposite page shows the variation of a with frequency with increased damping?

[1 mark]

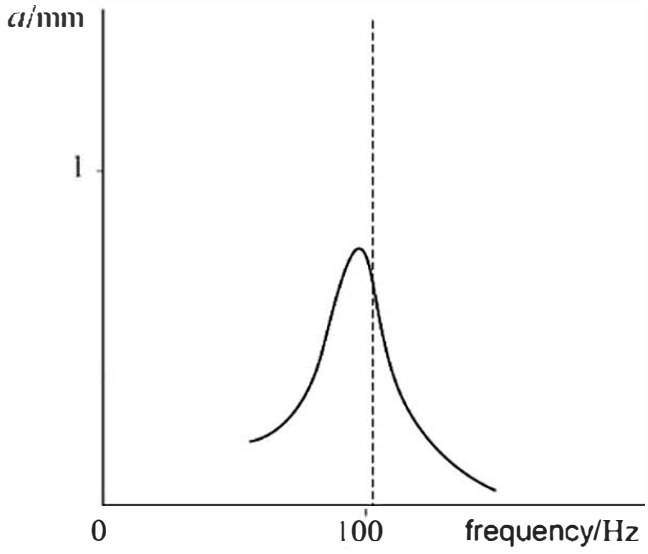
Lower amplitude
Lower freq
wider spread

Do not write outside the box

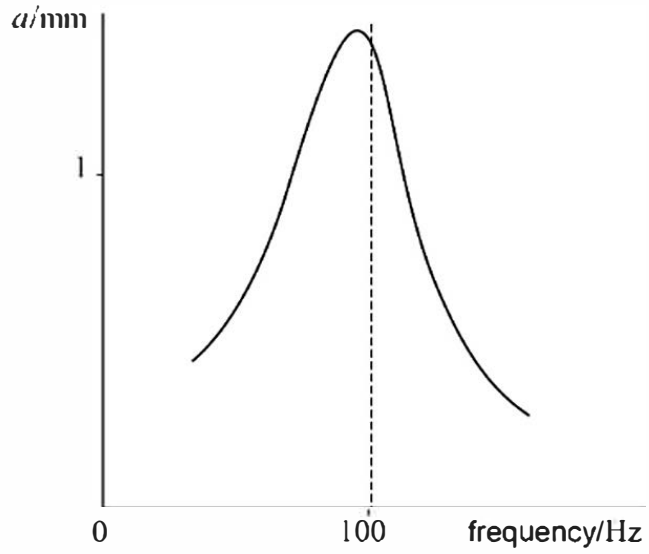
A



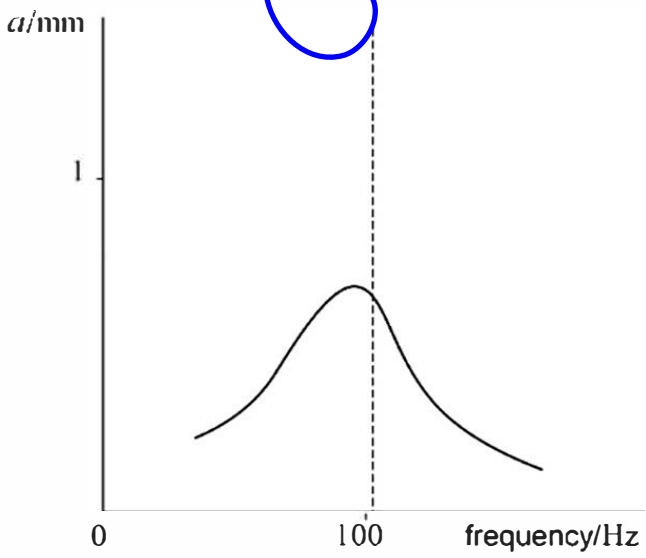
B



C



D



A ☐

B ☐

C ☐

D ☒

END OF QUESTIONS