

A-Level Physics

Name: _____ Score: _____

1. In simple harmonic motion, the acceleration is:
 - ☐ proportional to displacement and directed back toward equilibrium
 - ☐ constant in size and direction
 - ☐ proportional to the speed
 - ☐ always zero
2. The kinetic energy of an oscillator is greatest:
 - ☐ at the equilibrium position
 - ☐ at the extreme positions
 - ☐ everywhere equally
 - ☐ never
3. Damping of an oscillation is caused by:
 - ☐ a resistive force removing energy
 - ☐ a driving force adding energy
 - ☐ increasing the mass
 - ☐ resonance
4. An oscillation has a period of 2.0 s. What is its angular frequency ω ?
_____ rad/s
5. At the extreme positions of the motion, all the energy is potential.
 - ☐ True ☐ False
6. A forced oscillator vibrates at:
 - ☐ the driving frequency
 - ☐ its own natural frequency
 - ☐ half the driving frequency
 - ☐ zero frequency
7. In SHM the speed is greatest at the _____ position.

8. With no damping, the total energy of an oscillator stays constant.

☐ True ☐ False

9. Resonance happens when the driving frequency equals the _____ frequency.

10. At the extremes of the motion ($x = \pm x_0$), the speed is zero.

☐ True ☐ False

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1. proportional to displacement and directed back toward equilibrium

That is exactly $a = -\omega^2 x$ — bigger displacement, bigger pull back; always toward the middle.

2. at the equilibrium position

Speed is greatest at the middle, so KE peaks there while PE is at its lowest.

3. a resistive force removing energy

Friction or drag carries energy away as heat, so each swing is smaller than the last.

4. 3.14 rad/s

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{2.0} = \pi \approx 3.14 \frac{\text{rad}}{\text{s}}.$$

5. True

The oscillator is momentarily at rest there, so KE = 0 and all the energy is potential.

6. the driving frequency

It follows the driver — it oscillates at the driving frequency f_d .

7. equilibrium

At the middle all the energy is kinetic, so the speed is maximum ($v = \omega x_0$).

8. True

Energy just swaps between KE and PE; their sum is conserved.

9. natural

At $f_d = f_0$ the driver feeds energy in most effectively and the amplitude peaks.

10. True

The oscillator stops for an instant at each end before reversing — speed zero, acceleration maximum.