

5(a)(i)	straight line through the origin shows that a is proportional to x
	negative gradient shows that a is always in the opposite direction to x
5(a)(ii)	$a_0 = \omega^2 x_0$
	$\omega = 2\pi / T$
	$T = 2\pi \sqrt{(x_0 / a_0)}$
	$= 2\pi \sqrt{(1.2 / 13)}$ $= 1.9 \text{ s}$
5(b)(i)	loss of energy of oscillations
	due to <u>resistive</u> force(s)
5(b)(ii)	line starting from $x = \pm 1.2 \text{ cm}$ at $t = 0$
	line starting from non-zero value of x from $t = 0$ to $t = 2T$ that is entirely either above or below the t -axis
	curve from $t = 0$ starting from non-zero x value, with both magnitude of x value and magnitude of gradient continuously decreasing

7(a)(i)	loss of energy (of oscillations)
	due to resistive forces
7(a)(ii)	amplitude (of oscillations) decreases gradually or oscillations continue (for several periods)
7(a)(iii)	cutting of (magnetic) flux causes induced e.m.f. (in coil) or induced e.m.f. causes current (in resistor / circuit)
	current causes dissipation of thermal energy in resistor or current in resistor causes dissipation of thermal energy
	thermal energy comes from energy of oscillations
7(b)	(for any given e.m.f.) current is lower so thermal energy dissipated at a lower rate or (for any given e.m.f.) current is lower so the resistive force is lower
	oscillations are less damped or smaller decrease in amplitude of oscillations (in each period) or oscillations continue for longer

4(a)	(motion in which) acceleration is (directly) proportional to displacement
	(motion in which): acceleration is (always) in the opposite <u>direction</u> to displacement or acceleration is (always) directed towards a fixed point
4(b)(i)	$\omega = 2\pi / T$
	$\omega = 2\pi / 3.0$ $= 2.1 \text{ rad s}^{-1}$
4(b)(ii)	$E = \frac{1}{2}m\omega^2x_0^2$
	$= \frac{1}{2} \times 0.81 \times 2.1^2 \times 0.036^2$ $= 2.3 \times 10^{-3} \text{ J}$
4(c)	sketch: line starting at (0, 0.036) and not reaching $x = \pm 0.036 \text{ m}$ at any other time
	smooth curve, with no sudden changes in gradient, showing continuously decreasing magnitude of x from maximum displacement at $t = 0$ to final displacement of zero where the gradient is also zero
	displacement reaches final value of zero between $t = 0.75 \text{ s}$ and $t = 3.0 \text{ s}$ at the latest