Solutions to Further mechanics and thermal physics – Test B

1. A **[1]**

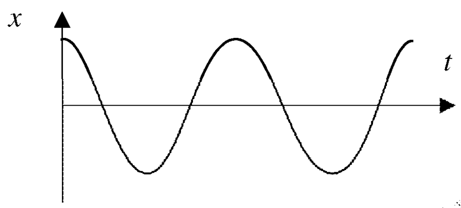
2. B **[1]**

3. D **[1]**

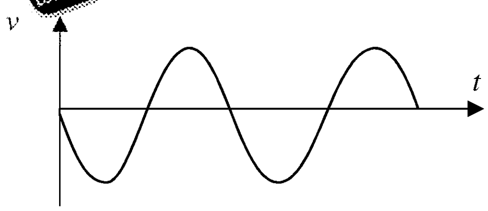
4. (a) orbital period = 16 × 24 × 60 × 60 = 1.38 × 10^6 s [1]
distance travelled in one orbit = π × 2 × 1.2 × 10^6 × 1000 = 7.54 × 10^9 m [1]
7.54 × 10^9 / 1.38 × 10^6 [1]
5.46 × 10^3 m s^{-1} [1]

(b) $\frac{\ldots^{23} \times (5.46\times10^3)^2}{1.2\times10^6\times1000}$ **[1]**
3.23 × 10^{21} N **[1]**
Must include unit

5. (a) graph with velocity/v on the vertical axis and time/t on the horizontal **[1]**
graph is a cosine curve starting at maximum positive **[1]**
two cycles shown, finishing at maximum positive **[1]**



(b) (i) graph with acceleration/a on the vertical axis and time/t on the horizontal **[1]**
graph is a sine curve starting at zero and first going negative **[1]**
two cycles shown, finishing at zero **[1]**



(ii) acceleration is rate of change of velocity / change of velocity per unit time **[1]**
so the acceleration–time graph shows the gradient of the velocity–time graph **[1]**

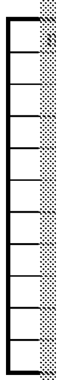
6. (a) 1100 × 2 × π **[1]**
6900 rad s^{-1} **[1]**
Must include unit

(b) (i) 6900 × 2.9 × 10^{-4} **[1]**
2.0 ms^{-1} [1]
Must include unit

(ii) 2.9 × 10^{-4} × cos (6900 × 0.15) **[1]**
−4.5 × 10^{-5} m **[1]**

7. (a) make the time measurements as long as possible **[1]**
time for 10/20 oscillations and then divide by the number of oscillations **[1]**

(b) (i) all



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(ii) gra
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8. 1.2 kW = 120

$\Delta\theta = \frac{12}{1000\times4}$

$\Delta\theta$ = 29.3 (°C

(29 + 20) = 4

9. energy remov
= 0.058 × 420
= 2920 (J) [
energy remov
= 19 400 (J)
energy remov
= 0.058 × 210
= 2440 (J) [
2920 + 19 400

10. Mass of a nitr
= 5.31 × 10^{-2}
= 5.31 × 10^{-2}

$\frac{3}{2}kT = ½\, m(c$

$\sqrt{\frac{\frac{3}{2}\times1.38\times10}{5.31\times}}$

483 ms^{-1} **[1]**

Preview of Answers Ends Here