CHAPTER 4 TEST REVIEW -- MARKSCHEME

1.	C	**6.**	B	**11.**	C	**16.**	C
2.	B	**7.**	A	**12.**	C	**17.**	C
3.	A	**8.**	B	**13.**	C	**18.**	A
4.	C	**9.**	B	**14.**	C		
5.	A	**10.**	A	**15.**	C		

19. (a) 1. acceleration proportional to displacement from equilibrium/ centre (of motion) /mean position;

2. acceleration directed to equilibrium/centre/mean position; 2

(b) (i) $\frac{d}{2}$; 1

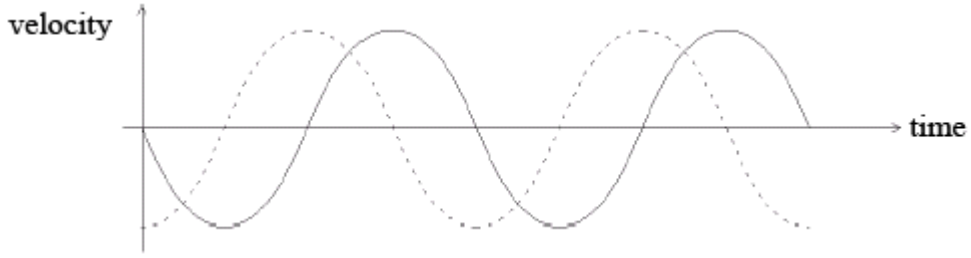
(ii) sine/cosine curve shape reasonable; 1
Do not allow semi-circle for half sine curve.

(iii) period labelled;
amplitude labelled; 2

(c) (i) $v = a2\pi f$ seen/used;
3.3 m s^{-1}; 2

(ii) acceleration = $a4\pi^2 f^2$ seen/used;
9.2×10^3 m s^{-2}; 2

(d) cosine with the same period;
negative cosine;
Accept any amplitude.



2

Amplitudes need not be the same.

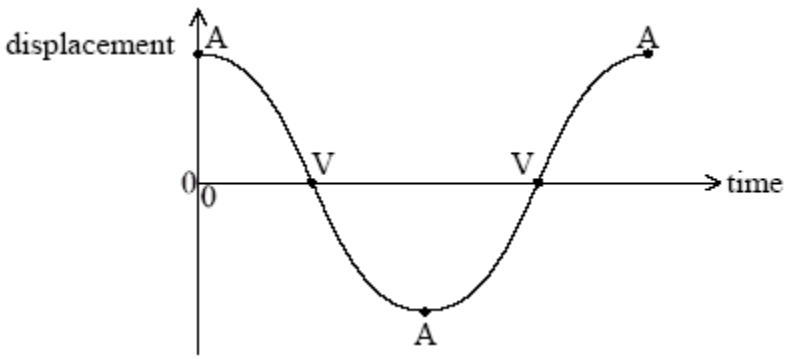
(e) (i) (a situation in which) a (resistive) force opposes the motion / the amplitude decays with time; 1

(ii) energy lost to surroundings / air resistance / frictional force is \acting on the fork; 1

20. (a) (i) one A correctly shown;

(ii) one V correctly shown;

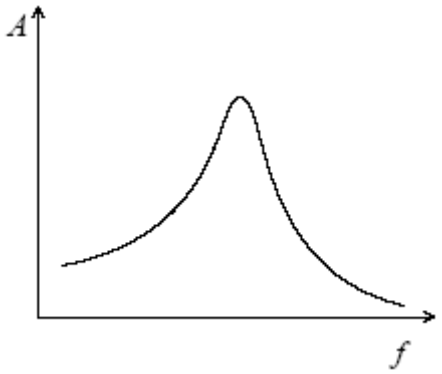
(b) pendulum bob accelerates towards centre of circular path / *OWTTE;*
therefore force upwards;
that <u>adds</u> to tension produced by the weight;



(c) (i) evidence shown of equating kinetic energy and gravitational potential energy;
$v = \sqrt{(2 \times 9.8 \times 0.025)}$;
$= 0.70 \text{ m s}^{-1}$ 2
Allow g = 10 m s^{-2} answer 0.71 m s^{-2}.

(ii) centripetal acceleration $\left(= \frac{v^2}{r}\right)\left[= \frac{0.7^2}{0.8}\right] = 0.61 \text{ (m s}^{-2}\text{)}$
net acceleration = (9.81 + 0.61 =) 10.4 (m s^{-2}) ***or*** $T - mg = m \times 0.61$;
tension= (ma =) 0.59 N; 3
Allow g = 10 m s^{-2} answer 0.60 N.

(d) (i)



one maximum shown <u>and</u> curve broadly similar to example above;
amplitude falls on each side as shown; 2

(ii) resonance is where driving frequency equals/close to natural frequency; the frequency at the maximum amplitude of the graph; 2

(e) lower amplitude everywhere on graph;
with a much broader resonance peak;
maximum moves to left on graph; 2 max
*Award **[2]** for a sketch graph.*

21. (a) standing wave formed;
by superposition/interference of (forward) wave and reflected wave;
maximum where interference is constructive / minimum where interference is destructive;
maxima where waves in phase;
minima where waves are <u>completely</u>/<u>180°</u>/<u>π</u>/<u>half wavelength</u> out of phase; 4 max

(b) (i) 130 mm = 9 half wavelengths;
29 mm; 2

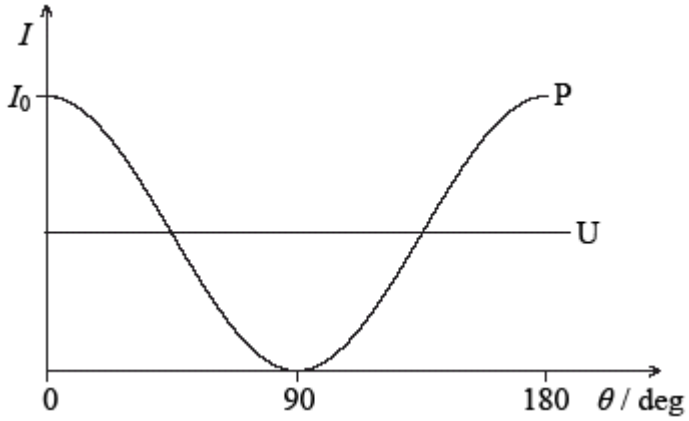
(ii) $f = \frac{c}{\lambda}$;
= 10 GHz; 2

(c) place a metal grid/analyser between source and detector;
electric field vector (of the microwaves) vibrates in only one direction/plane;
rotate the metal grid/detector;
until minimum signal is detected; 3 max

or

electric field vector vibrates in only one direction/plane;
rotate transmitter through an angle;
need to rotate receiver through same angle to restore signal in transmitter;

22.



(a) horizontal line; (*labelled U)*
through half the incident intensity; 2

(b) curve starting at I_0; (*labelled P)*
with minima and maxima as shown; 2

23. (a) light in which the electric field is oscillating on only one plane; 1

(b) (i) refracted ray shown <u>at right angles</u> to reflected ray; 1
Judge by eye.

(ii) $\sin\varphi = n\sin(90^\circ - \varphi)$;
$\sin\varphi = n\cos\varphi$;
$n = \tan\varphi$; (*this marking point must be justified)* 3

(iii) $\varphi = 52°$ ***or*** 0.92 rad; 1

24. (a) all possible polarization directions are equally represented /
where the direction of polarization is random; 1

(b) 0.50 W m^{-2};
($I \propto \cos^2\theta$) average value is $\frac{1}{2}$ 2

(c) polarizer and analyser separated by sugar solution; *Accept a diagram for this marking point.*
measure angle / rotation of plane of polarization;
concentration proportional to angle; 2 max