

Multiple Choice Answers

Q18: C

Q22: D

Q23: B

Multiple Choice Answers

Q18: C

5(a)	(speed of sound in air =) 330 m/s ≤ value ≤ 350 m/s AND (speed of sound in water) is faster															
5(b)	Yes AND (normal) human hearing range is 20 Hz to 20 kHz (and all dolphin sounds lie in this range)															
	Yes AND all the dolphin sounds are in the range of human hearing															
5(c)	<table border="1"><tr><td>Frequency kHz</td><td>amplitude</td><td>loudness</td><td>pitch</td></tr><tr><td>14</td><td>Large</td><td>loud</td><td>high</td></tr><tr><td>8</td><td>small</td><td>soft / quiet</td><td>low</td></tr></table> one mark for each column correct				Frequency kHz	amplitude	loudness	pitch	14	Large	loud	high	8	small	soft / quiet	low
Frequency kHz	amplitude	loudness	pitch													
14	Large	loud	high													
8	small	soft / quiet	low													
5(d)	Particles															
5(d)	high pressure AND low pressure															
	Parallel															

5(a)(i)	all four correct = 2 marks; any two correct = 1 mark <table border="1"> <tr> <td>security marking</td><td>gamma rays</td></tr> <tr> <td>Bluetooth</td><td>ultraviolet</td></tr> <tr> <td>optical fibres</td><td>infrared</td></tr> <tr> <td>detection of cancer</td><td>radio waves</td></tr> </table>	security marking	gamma rays	Bluetooth	ultraviolet	optical fibres	infrared	detection of cancer	radio waves
security marking	gamma rays								
Bluetooth	ultraviolet								
optical fibres	infrared								
detection of cancer	radio waves								
5(a)(ii)	any one from: - only require a short aerial / antenna - can pass through the atmosphere / ionosphere to satellites - can transmit large amounts of data at high speeds / high rate of data transmission								
5(b)	any two from: transverse: - oscillations / vibrations are at right angles to direction of propagation - medium not required / can travel through a vacuum (for e-m wave) - have crests / peaks and troughs longitudinal: - oscillations / vibrations are parallel to direction of propagation - medium is required - have rarefactions and compressions								
5(c)(i)	longitudinal								
5(c)(ii)	refraction any one from: - change in speed of the wave - change in density of the medium								
5(d)	<u>increase</u> in carbon dioxide / greenhouse gases (in the atmosphere) OR <u>increase</u> in methane / water vapour (in the atmosphere) any one from: prevents / reduces (re-emitted) radiation escaping (into space) OR radiation re-emitted / reflected back to surface (by atmosphere / greenhouse gases) OR (amount of) radiation absorbed is greater than (the amount of) radiation leaving the atmosphere								

5(a)	(refractive index is) the ratio of the speed of light in two different regions OR (refractive index =) $\frac{\text{speed of light in air}}{\text{speed of light in (soap) film}}$
5(b)(i)	$n = \frac{\sin i}{\sin r}$ OR $(r =) \sin^{-1} \left\{ \frac{\sin i}{n} \right\}$ OR $1.28 = \frac{\sin 60}{\sin r}$ $i = 60^\circ$
5(b)(ii)	normal drawn (at the point incident ray meets film) refracted ray drawn (refraction towards normal in film) and angle of refraction labelled braille: angle identified but not labelled
5(c)(i)	(light of) a single frequency

5(c)(ii)	$4.4 \times 10^{14} \text{ Hz}$
	(speed of light / e-m waves is approximately) $3.0 \times 10^8 \text{ m/s}$ (in air)
	$v = f\lambda$ OR ($f =$) $3.0 \times 10^8 \div 680 \times 10^{-9}$

Multiple Choice Answers

Q23: D

4(a)(i)	(point / place / position) where (all) the weight (seems to) acts
4(a)(ii)	a small tilt / rotation makes G no longer vertically above the base OR small tilt / rotation produces moment (that topples transmitter)
4(b)(i)	arrow(head) marked along wire W towards ground
4(b)(ii)	moment = $F \times d$ AND correct indication of F and d on Fig. 4.1.
	(moment is) force $\times$ (perpendicular) distance (from base / pivot)
	(moment is) force $\times$ perpendicular distance (from base / pivot)
4(c)	a use of radio waves, e.g. RFID / astronomy / Bluetooth / RADAR / wifi