

Multiple Choice Answers

Q18: C

Q22: D

Q23: B

Multiple Choice Answers

Q18: C

5(a)	(speed of sound in air $\Rightarrow$ $330 \text{ m/s} \leq \text{value} \leq 350 \text{ m/s}$ 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)	Frequency kHz	amplitude	loudness	pitch
	14	Large	loud	high
	8	small	soft / quiet	low
	one mark for each column correct			
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><tr><td>security marking</td><td></td><td>gamma rays</td></tr><tr><td>Bluetooth</td><td></td><td>ultraviolet</td></tr><tr><td>optical fibres</td><td></td><td>infrared</td></tr><tr><td>detection of cancer</td><td></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 owtte 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