

Multiple Choice Answers

- Q1: D
 Q2: B
 Q3: B
 Q18: C
 Q22: D
 Q23: B
 Q24: D

Multiple Choice Answers

- Q24: A
 Q29: A

1(a)	the velocity is the speed in a particular direction OR velocity has a direction OR velocity is 56 m/s in a certain direction velocity is a vector OR speed is a scalar			
1(b)	6.9 × 10 ⁸ J OR 690 000 000 J OR 690 MJ			
	(KE =) $\frac{1}{2}mv^2$ OR 0.5 × 440 000 × (56) ²			
1(c)(i)	5.3 × 10 ⁵ N OR 530 000 N			
	(F =) ma OR 440 000 × 1.2			
1(c)(ii)	1300 m OR 1.3 km			
1(c)(ii)	(d =) W/F OR $(\Delta)t = \Delta v/a$ OR 56 / 1.2 OR $(\Delta)t = \text{change of momentum} / \text{force}$			
	(distance =) 6.9 × 10 ⁸ / 530 000 OR (distance =) average velocity × time taken OR 1.3 × 10 ^N			
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)	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			

8(a)	region in which a (magnetic) pole experiences a force
8(b)(i)	friction between trolley and track OR the (induced) current produces a magnetic field which opposes the (magnetic) field that causes the (induced) current
8(b)(ii)	any three from: • direction will (still) be left OR there is no change of direction • <u>induced</u> current / emf / voltage does not change direction • smaller deflection • smaller (rate of) change of magnetic field • smaller current / emf / voltage <u>induced</u> (in coil)

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												

4(a)(i)	convection
4(a)(ii)	warm air rises OR less dense air rises
	warm air is less dense (than cool air) ORA
	any one from: • cold air replaces warm air • cold air falls and the process repeats owtte • there is a convection current owtte
4(b)(i)	$P = IV$ OR $(I =) P \div V$
	2.0 kW = 2000 W OR $2000 \div 230$
4(b)(ii)	10 (A) AND any one from: • smaller fuse melts in normal use (of the heater) owtte • smaller fuse stops the heater working (at all) • larger fuse allows too much current (without melting) • larger fuse may not melt before the circuit is damaged • fuse (rating) must be higher than the (normal) current • the fuse will melt if current goes too high owtte
	any one from: • 10 (A) • 13 (A) AND fuse (rating) must be higher than (normal) current • 13 (A) AND 3 A / 5 A fuse melts in normal use owtte
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)	4.4×10^{14} Hz
	(speed of light / e-m waves is approximately) 3.0×10^8 m / s (in air)
	$v = f\lambda$ OR $(f =) 3.0 \times 10^8 \div 680 \times 10^{-9}$
6(a)	any one from: • magnetic materials are attracted to magnets • non-magnetic materials are not attracted to magnets • magnetic materials experience a force in magnetic fields • non-magnetic materials don't experience a force in magnetic fields
6(b)	any one from: • steel as it stays magnetised • steel makes a permanent magnet
6(c)	N and S poles correctly labelled braille: north to south owtte
6(d)	field lines close(r) indicates strong(er) (magnetic) field owtte ORA

Multiple Choice Answers

Q3: C

3(a)	particles (of liquid) are touching / close to each other
	forces (of repulsion) between particles (of liquid) are large
3(b)(i)	$(\Delta p =) \rho g(\Delta)h$
	$1000 \times 9.8 \times 0.087$ OR $(\Delta p =) 852.6$ (Pa)
3(b)(ii)	12 N
	$p = F / A$ OR $(F =) pA$ OR 850×0.014
3(b)(iii)	1.2 kg
	$g = W / m$ OR $(m =) F / g$ OR $12 / 9.8$

Multiple Choice Answers

Q2: B

Q5: D