WJEC Physics GCSE Topic 1.5: Features of waves

Mark Schemes for Questions by topic

1.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)		3	Scale on x-axis from 0 – 4.0 present with intervals of 0.5 **and** scale on y-axis from 0 – 6.0 present with intervals of 1.0 (1) Points plotted within ± ½ small square division (1) don't penalise for point (0,0) not being present Smooth curve of best fit from origin ± 1 small square division on each point (1)	If scale transposed or incorrect don't award the scale mark but if correct the plots and curve marks can be awarded		Thick, wobbly, disjointed, wispy curves
	(ii)		2	As the depth increases the wave speed increases (1) At a decreasing rate (1) No **ecf** from graph	Positive correlation (for the 1st mark) Slower rate	Non-linear	For a straight line graph they are proportional Answer for incorrect wave speed
(b)	(i)		3	5.3 (1) = $f \times$ 8.1 (1) f = 0.65 [Hz](1) N.B. **Speed value must be taken from candidate's graph** N.B. If speed is: 5.0 then f = 0.617 [Hz] 5.1 then f = 0.630 [Hz] 5.2 then f = 0.642 [Hz] 5.4 then f = 0.666 [Hz] 5.5 then f = 0.679 [Hz]			
	(ii)		2	Waves have decreasing wavelength [from A to B] (1) because speed decreases [but f remains constant] (1) **The 2nd mark can only be awarded if it is linked to the 1st mark.**		Any reference to amplitude change	
Total Mark			10				

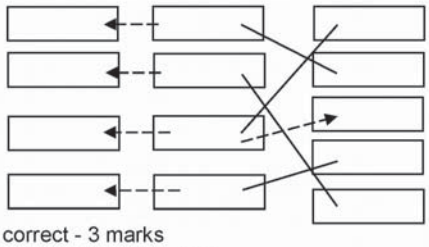
2.

Question			Marking details	Mark
6.	(a)		15 [cm]	1
	(b)		20 [cm]	1
	(c)		$f = \frac{10}{5}$ (1) = 2 [Hz] (1)	2
	(d)		wave speed = 20 (ecf) x 2 (ecf) (1 – substitution) = 40(1) Unit cm/s (1)	3
	(e)		stay the same	1
			Question total	[8]

3.

Question			Marking details	Mark
2.	(a)	(i)	900 or 1800 MHz (1) (value + unit for the mark)	1
		(ii)	The bigger the frequency, the smaller the output power (1) whereas to be proportional, as one increases, the other would increase.(1) OR EQUIVALENT	2
		(iii)	more research (1) by other scientists (1)	2
	(b)		microwaves	1
			Question total	[6]

4.

Mark			Answer	Accept	Neutral answer	Do not accept
(i)		3	 4 correct - 3 marks 2 or 3 correct – 2 marks 1 correct – 1 mark			Any extra lines – lose one mark for each. Two added lines from the same box
(ii)		1	Heat [damage to internal] organs / cells / body tissue			
(iii)		2	U.V. (1) – damages cells / causes [skin] cancer / DNA (1) **Or** X rays (1) – damages cells / DNA (1) Harmful effect must link with the type If no type or wrong type credit can be given for valid effect	Damages skin / eyes. Causes sunburn Causes cancers/ cell mutation.		
(iv)		1	Only one wave drawn with longer wavelength / less than 4 cycles shown across the whole grid		Ignore changes in amplitude	Waves drawn not on the grid
Total		**7**				

5.

Question				Marking details	Marks
6.				**Indicative content:** A geostationary / geosynchronous satellite orbits the Earth in 24 hours – the same time as the rotation period of the Earth. It therefore stays above the same point on the Earth so that ground satellite dishes do not have to be moved. A minimum of three satellites are needed to relay messages around the world. They relay only microwaves which carry TV, telephone and other signals. Signals can also be relayed along optical fibres which transfer via coded infra-red signals and radio waves can be reflected off the atmosphere. **5 – 6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3 – 4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1 – 2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit. **Question total**	6 **[6]**
				Higher tier paper total	**[60]**

6.

Question			Marking details	Marks
5.	(a)		*....stays above the same point on the Earth* (1) *.....and orbits the Earth in 24 hours / same time / same rate as Earth spins [once].* (1) Don't accept orbits the Earth at the same speed	2
	(b)	(i)	2(1) x 0.2 (1) = [0.4 V] On the answer line: If 0.4 only award 2 marks / 0.2 award 1 mark / 2 or 0.8 award 0 marks	2
		(ii)	signal has to travel twice as far [as 36 million km] / up and down	1
		(iii)	[single cycle of] smaller amplitude (1) starting at 0.24 ± 0.02 on horizontal axis (1) Ignore the wavelength or number of cycles.	2
			Question total	**[7]**

7.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)		2	Refraction (1) The waves change speed **OR** change in density (1)	Glass is more dense Waves move more slowly	Reference to direction changing	Internal refraction Waves move more quickly Glass is less dense
	(ii)	I	1	Reflected at same angle (by eye)	Angle labelled as 55°	Ignore any effect on the ray after B	
		II	2	Directed from a more dense to a less dense medium (1) [at an angle] greater than critical angle [for glass] / greater than 42° (1) **no ecf** **The 2nd mark must be linked to the 1st mark.**		Reference to TIR	
(b)	(i)		1	1.3 [cm]	13 mm if cm is deleted		
	(ii)		2	**At least 3 wavefronts:** All drawn wavefronts beyond the boundary bending downwards (1) All drawn wavefronts parallel to each other **and** with a smaller wavelength (1) **2nd mark can't be awarded unless the 1st mark has been awarded.**		Wave direction without wavefronts	Extra wavefronts drawn in between – 0 marks
(c)			6	**Indicative content:** The P waves are the fastest. They are able to pass through solids and liquids because they are longitudinal in nature. S waves are transverse in nature so cannot travel through liquids. They travel slower than P waves. P and S waves refract as they pass through the Earth. Surface waves do not travel through the Earth but only on the surface as their name suggests. They are most slow moving but create most damage. They can be both transverse and longitudinal in nature.			

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		5-6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.			
	14				