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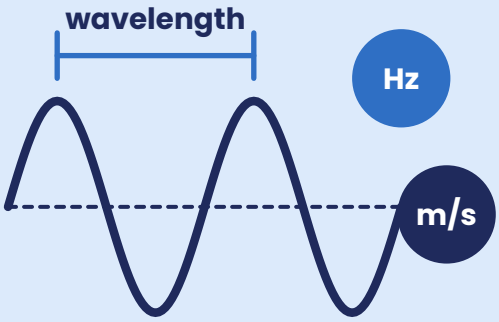
Year 10–11 • GCSE & IGCSE Physics



Waves

Mark Scheme – Teacher Copy

Answers, marking points and guidance for the Waves worksheet.

Wave terms | Wave equation | Reflection | Refraction | EM spectrum | Sound

KEY IDEAS IN THIS WORKSHEET

YEAR 10–11

Name: _____ Class: _____

Date set: _____ Date due: _____

What's inside

Section A	Wave properties	**12 marks**
Section B	Reflection and refraction	**13 marks**
Section C	Electromagnetic spectrum	**13 marks**
Section D	Sound, ultrasound and seismic waves	**9 marks**

Marking notes

- (1) = one mark for each marking point.
- / separates alternative answers.
- Allow error carried forward in calculations.
- Accept any correct, clearly expressed alternative.

Total marks

47

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Waves Worksheet – Mark Scheme

Total: 47 marks. (1) = one mark. Accept any scientifically correct alternative wording.

Section A – Wave properties

Q	Answer	Mark	Guidance
1	amplitude: maximum displacement from the rest position; wavelength: distance between two identical points on adjacent waves; frequency: number of waves passing a point per second; period: time for one complete wave	4	1 mark each
2	transverse: oscillations at right angles to the direction of energy transfer, e.g. light / water waves (1); longitudinal: oscillations parallel to the direction of energy transfer, e.g. sound (1); longitudinal waves have compressions and rarefactions (1)	3	
3	200 m/s; 680 Hz; 2×10^{-6} m	3	1 mark each
4	f = 1 ÷ T (1); = 40 Hz (1)	2	
	Section A total	**12**	

Section B – Reflection and refraction

Q	Answer	Mark	Guidance
5	shine a ray at the mirror at an angle (1); draw the normal at the point of incidence (1); mark the incident and reflected rays and measure each angle to the normal (1); the two angles are equal (1)	4	
6	it bends towards the normal (1); because it slows down in the denser material (1); one side of the wavefront slows first so it changes direction (1)	3	
7	it still slows down in the glass (1); but all parts of the wavefront slow together so there is no change in direction (1)	2	
8	at the critical angle the refracted ray travels along the boundary (1); above the critical angle all light is reflected inside (1); only when going from a denser to a less dense material (1); use: optical fibres / periscopes / endoscopes (1)	4	Higher tier / Extended
	Section B total	**13**	

Section C – Electromagnetic spectrum

Q	Answer	Mark	Guidance
9	gamma, X-rays, ultraviolet, visible light, infrared, microwaves, radio waves	3	3 marks for all in order; 2 marks if one pair swapped; 1 mark for 3 correct in order
10	radio: broadcasting / communication; microwaves: satellite communication / cooking; infrared: remote controls / thermal imaging; X-rays: medical imaging; gamma: sterilising / cancer treatment	5	1 mark each for a correct use
11	any two: transverse waves; travel at the same speed in a vacuum (3×10^8 m/s); transfer energy; can travel through a vacuum	2	
12	they are ionising (1); can damage cells / DNA (1); causing cancer or mutations (1)	3	
	Section C total	**13**	

Section D – Sound, ultrasound and seismic waves

Q	Answer	Mark	Guidance
13	a probe sends ultrasound into the body (1); waves are partly reflected at boundaries between different tissues (1); the time for each echo to return is used to build an image (1)	3	allow: ultrasound is not ionising so it is safe
14	distance = 1500 × 0.60 = 900 m (2); depth = 900 ÷ 2 = 450 m (1)	3	450 m alone scores 3
15	P waves are longitudinal and S waves are transverse (1); P waves travel faster (1); P waves travel through solids and liquids but S waves only through solids (1)	3	Higher tier / Extended
	Section D total	**9**	

Worksheet total: 47