GCSE and IGCSE Physics: Waves Worksheet - Mark Scheme

Year 10-11 · GCSE (AQA 4.6) and Cambridge IGCSE 0625 topics 3 and 2 · Exam-style questions

Section A: Wave properties [12 marks]

1	Maximum displacement from the rest position; distance between two identical points on adjacent waves; number of waves passing a point per second; time for one complete wave. Guidance: 1 mark each.	**4**
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. Guidance: 1 mark each.	**3**
4	f = 1 ÷ T (1) = 40 Hz (1).	**2**

Section B: Reflection and refraction [13 marks]

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) and the wavefront 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). Condition: from a denser to a less dense material (1). Use: optical fibres / periscopes (1). Guidance: Higher tier / Extended.	**4**

Section C: Electromagnetic spectrum [13 marks]

9	Gamma, X-rays, ultraviolet, visible light, infrared, microwaves, radio waves (3 marks for all in order; 2 marks if one pair swapped; 1 mark for 3 correct in order).	**3**
10	Radio: broadcasting. Microwaves: satellite communication / cooking. Infrared: remote controls / thermal imaging. X-rays: medical imaging. Gamma: sterilising / cancer treatment. Guidance: 1 mark each for a correct use.	**5**
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 radiation (1) and can damage cells / DNA (1) causing cancer or cell mutations (1).	**3**

Section D: Sound, ultrasound and seismic waves [9 marks]

13	A probe sends ultrasound into the body (1). Waves are partly reflected at boundaries between different tissues (1). The time for the echo to return is used to build an image (1).	**3**
14	Distance = 1500 × 0.60 = 900 m (2); depth = 450 m (1).	**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). Guidance: Higher tier / Extended.	**3**

Total: 47 marks. Accept any scientifically correct alternative wording.