

Mark Scheme

Combined Science GCSE

Light and the Electromagnetic Spectrum Test
(Levels 4-9)

	Answer	Marks														
1. (a)	Transverse.	(1)														
1. (b)	Wavelength: this is the distance between one point on a wave to the same point on the next wave , for example may be from crest to crest. (1) Frequency: the number of waves per second. (1)	(2)														
1. (c)	<table><tr><td>Gamma rays</td><td>X-rays</td><td>Ultra violet</td><td>Visibe light</td><td>Infrared</td><td>Microwaves</td><td>Radio waves</td></tr><tr><td>10-15m</td><td>10-10m</td><td>10-8m</td><td>10-7m</td><td>10-5m</td><td>10-2m</td><td>1m- 104m</td></tr></table>	Gamma rays	X-rays	Ultra violet	Visibe light	Infrared	Microwaves	Radio waves	10-15m	10-10m	10-8m	10-7m	10-5m	10-2m	1m- 104m	(2)
Gamma rays	X-rays	Ultra violet	Visibe light	Infrared	Microwaves	Radio waves										
10-15m	10-10m	10-8m	10-7m	10-5m	10-2m	1m- 104m										
1. (d)	Gamma rays.	(1)														

(Total for Question 1 = 6 marks)

	Answer	Marks																														
2.	(1) for each correct answer. <table><tr><th colspan="5">Damage</th></tr><tr><th>EM wave</th><th>Internal Heating of Cells</th><th>Skin Burns</th><th>Damage Cells and May Produce Skin Cancer</th><th>Mutation of Cells</th></tr><tr><td>Gamma Rays</td><td></td><td></td><td></td><td>✓</td></tr><tr><td>Infra Red</td><td></td><td>✓</td><td></td><td></td></tr><tr><td>Microwaves</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>Ultra Violet</td><td></td><td></td><td>✓</td><td></td></tr></table>	Damage					EM wave	Internal Heating of Cells	Skin Burns	Damage Cells and May Produce Skin Cancer	Mutation of Cells	Gamma Rays				✓	Infra Red		✓			Microwaves	✓				Ultra Violet			✓		(3)
Damage																																
EM wave	Internal Heating of Cells	Skin Burns	Damage Cells and May Produce Skin Cancer	Mutation of Cells																												
Gamma Rays				✓																												
Infra Red		✓																														
Microwaves	✓																															
Ultra Violet			✓																													

(Total for Question 2 = 3 marks)

	Answer	Marks
3. (a) (i)	Gamma rays: (any 2 from) • Sterilise medical equipment. • Sterilise food. • As a cancer treatment.	(2)
3. (a) (ii)	Ultra violet: (any 2 from) • Sterilise water by killing microbes. • Fluorescent lights. • Security (for example pens/ bank notes/ passports).	(2)
3. (a) (iii)	Infrared: (any 2 from) • Remote controls. • Thermal imaging. • Electrical heaters.	(2)

(Total for Question 3 = 6 marks)

	Answer	Marks								
4. (a)	Dependent on the amount of radiation the earth reflects (1) , absorbs (1) and emits.	(2)								
4. (b)	(i) Different surfaces of the Leslie cube. (ii) IR meter placed set distance from each side of the cube. (iii) Care to be taken with hot water.	(3)								
4. (c)	Enables a mean to be calculated. (1) Anomalies can easily be identified. (1)	(2)								
4. (d)	More infra red radiation from the black surface.	(1)								
4. (e)	<table border="1"><thead><tr><th>0 marks</th><th>1-2 marks</th><th>3-4 marks</th><th>5-6 marks</th></tr></thead><tbody><tr><td>No relevant content.</td><td>A brief outline of a workable method. Some of the equipment listed.</td><td>A more detailed method with some of the control variable listed.</td><td>A detailed method, including control variable and a full equipment list.</td></tr></tbody></table> Equipment • 4 test tubes and test tube rack • Rubber bungs to place in test tubes • Kettle or source of hot water • Thermometers • Paper/ covering of different types i.e. black paper, white paper • Stop watch Method • Cover the test tubes with the different types of paper and place in a test tube rack. • Boil the water in the kettle and fill each of the test tubes, ensuring they all contain the same volume of water. • Place rubber bungs into the top of each test tube. • Start the stopwatch, after 1 minute, record the temperature of the water in each of the test tubes. • Repeat every minute for 10 minutes.	0 marks	1-2 marks	3-4 marks	5-6 marks	No relevant content.	A brief outline of a workable method. Some of the equipment listed.	A more detailed method with some of the control variable listed.	A detailed method, including control variable and a full equipment list.	(6)
0 marks	1-2 marks	3-4 marks	5-6 marks							
No relevant content.	A brief outline of a workable method. Some of the equipment listed.	A more detailed method with some of the control variable listed.	A detailed method, including control variable and a full equipment list.							

(Total for Question 4 = 15 marks)

	Answer	Marks
5.	Long wave radio can bent around the surface of the earth (1) and short wave radio signals are reflected by the earths atmosphere. (1)	(2)

(Total for Question 5 = 2 marks)

	Answer	Marks
6. (a)	Energy can be stored, transferred and dissipated between stores, but it cannot be created or destroyed.	(1)
6. (b)	(i) Reflected ray (ii) Angle of incidence (iii) Angle of reflection	(3)
6. (c)	Total internal reflection involves wave being reflected back into the material .	(1)

(Total for Question 6 = 5 marks)

	Answer	Marks
7. (a)	A = red (1) B = Violet (1)	(2)
7. (b)	The prism is a glass block that when the light waves enter it they are refracted (1) The shorter the wave length the more it is refracted (1) and the longer the wave length the less it is refracted (1) .	(3)
7. (c)	When light rays move from one medium to another (1) its speed (1) and direction (1) will change.	(3)

(Total for Question 7 = 8 marks)

Question	Answer	Marks
8. (a)	Air (1) , the angle of incident is greater than the refracted angle (1) .	(2)
8. (b)	Oscillating charges.	(1)
8. (c)	Any 2 from: • police chasing suspects. • to determine where heat is being lost from a building. • sporting injuries. • another sensible suggestion.	(2)

(Total for Question 8 = 5 marks)**TOTAL FOR PAPER = 50 MARKS**