

# Electromagnetic Waves

## Mark Scheme 1

<b>Level</b>	GCSE (9-1)
<b>Subject</b>	Combined Science: Trilogy - Physics
<b>Exam Board</b>	AQA
<b>Topic</b>	6.6 Waves
<b>Sub-Topic</b>	Electromagnetic Waves
<b>Difficulty Level</b>	Bronze Level
<b>Booklet</b>	Mark Scheme 1

**Time Allowed:** 57 minutes

**Score:** /57

**Percentage:** /100

**Grade Boundaries:**

**M1.(a)** decreases

*correct order only*

1

increases

1

(b) (i) intensity (of transmitted light ) depends on thickness

**or**

to enable a valid comparison

**or**

it is a control variable

*accept absorption depends on thickness*

*it would affect the results is insufficient*

*fair test is insufficient*

1

(ii) transmits the least light

**or**

absorbs the most light

*accept very little light is transmitted*

*do **not** accept transmits none of the light*

*do **not** accept absorbs all of the light*

*any reference to heat negates this mark*

1

[4]

**M2.(a)** transmits

*correct order*

1

absorbs

1

(b) light

*allow ultra violet **or** UV **or** infrared **or** IR **or** gamma*

1

(c) 20

allow 1 mark for correct working, ie  $\frac{60}{3}$  provided no subsequent step

2

(d) Killing cancer cells

1

[6]

**M3.(a)** (i) (visible) light

accept visible

1

(ii) microwaves

1

(b) J

1

(c) (i) B

1

(ii) shorter than

1

(d) (i) To find out if using a mobile phone is harmful to health

1

(ii) any **two** from:

- (X has a) low(er) SAR value  
"it" refers to mobile phone  
accept has a low(er) rate
- (maximum) energy absorbed (by the head) is less

accept energy emitted (by phone) is less  
accept radiation for energy

- (if mobiles are harmful) less likely to cause harm  
accept will not cause harm  
accept it is safer

2

[8]

**M4.(a)** vibrate / oscillate

accept a correct description  
move is insufficient

1

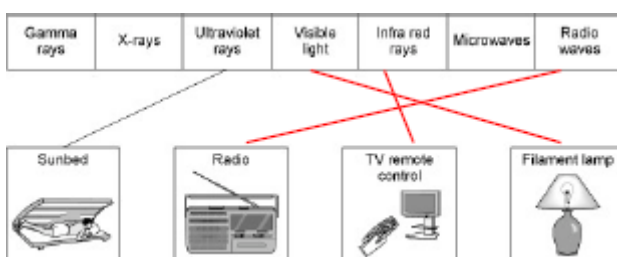
(b) 336

allow 1 mark for correct substitution, ie  $420 \times 0.8(0)$  provided  
no subsequent step shown

2

[3]

**M5.(a)** all three lines correct



allow 1 mark for each correct line  
if more than one line goes from a device then all lines from  
that device are wrong

3

(b) (i) skin cancer

do **not** accept cancer  
do **not** accept sunburn  
correct answer only

1

- (ii) other factors may be involved

*accept may have been in the Sun too long*

*accept (over)-use of sunbeds and (over)- exposure to the Sun (both) give the same symptoms accept any other sensible factor that could lead to doubt*

*do **not** accept irrelevant answers eg may be run over by a car*

*do **not** accept killed by exposure to the Sun*

1

- (iii) can assess risk

*answers should be in terms of assessing our own health risk*

**or**

make your own decision

*accept so you limit its use / don't use one*

*do **not** accept so you don't get skin cancer*

*do **not** accept so you don't get sunburn*

1

[6]

**M6.**less / no light pollution

*accept no / fewer streetlights*

1

less cloud cover / above clouds

1

less atmospheric pollution

*accept air for atmosphere*

*accept idea of thinner atmosphere*

*do **not** accept closer to stars*

1

[3]

M7.	(a)	(i)	X-ray(s)	1
		(ii)	gamma rays	1
		(iii)	infrared	1
	(b)		the same speed as	1
	(c)	(i)	horizontal arrow drawn pointing to the right <i>judge by eye</i> <i>accept drawn anywhere on diagram</i>	1
		(ii)	Y	1
		(iii)	any <b>one</b> from: <ul style="list-style-type: none"><li>any type of electromagnetic wave <i>accept electromagnetic wave(s)</i></li><li>water (wave) <i>do not accept seismic waves</i></li><li>(earthquake / seismic) S waves <i>do not accept P waves</i> <i>do not accept earthquakes</i></li></ul>	1
	(d)	(i)	3	

1

(ii) 3.6

**or**

their (d)(i)  $\times 1.2$  correctly calculated

*$v = f \times \lambda$  allow 1 mark for correct substitution*

*ie 3 or their (d)(i)  $\times 1.2$  provided that no subsequent step is shown*

2

[10]

**M8.** (a) (i) bat(s)

1

(ii) elephant(s)

1

(iii) any example in the inclusive range  $5 \leftrightarrow 29$  Hz / hertz  
*appropriate number and unit both required*

1

(b) (i) **B**

1

(ii) **F**

1

[5]

**M9.** (a) (i) infra red (rays)

*accept IR*

**or** radio (waves)

*do **not** accept heat waves*

*do **not** accept TV waves*

1

(ii) radio (waves)

*this answer only*

1

(b) frequency

1

(c) (i) *answer should be in terms of establishing if harmful or not* *harmful ie trying to clear up any uncertainty*

*do **not** accept answers that assume it is harmful*

*eg Wi-Fi systems will make you ill*

*need to know if it is harmful / makes you ill*

*accept idea that safety issue may worry people*

*accept idea that (more) research may reassure people*

*accept idea of finding out (the truth)*

1

(ii) an opinion

1

[5]

##

(i) X-rays

infra red (rays)

radio (waves)

*all three in correct order*

*allow 1 mark for 1 correct*

2



(ii) to kill cancer cells

1

(iii) energy

1

**[4]**

**M11.** (a) C (only)

1

(b) A (only)

1

**[2]**