

The Electromagnetic Spectrum

Q1.(2018)

A ✓

Q2.a(2019)

FIRST CHECK THE ANSWER ON ANSWER LINE

If answer = 1.2 (ms) award 1 mark

$$t = 0.2 \times 6 = 1.2 \text{ (ms)} \checkmark$$

Q2.b(2019)

FIRST CHECK THE ANSWER ON ANSWER LINE

If answer = 90 000 (m) award 2 marks

$$d = (3 \times 10^8 \times) 0.0003 \checkmark$$

$$d = 90\,000 \text{ (m)} \checkmark$$

OR

$$d = (3 \times 10^8 \times 0.0006 =) 180\,000 (\div 2) \checkmark$$

$$d = (180\,000 \div 2) = 90\,000 \text{ (m)} \checkmark$$

Q2.c(2019)

energy lost (to the surroundings/air) / AW ✓

1

3.2b

ALLOW energy is dissipated / not all energy reflects / some energy is absorbed

Q2.d(2019)

FIRST CHECK THE ANSWER ON ANSWER LINE

If answer = 1.5 (m) award 4 marks

Recall and rearrange to give: $\lambda = v \div f$ ✓

(Conversion $200(\text{MHz}) = 2 \times 10^8 \text{ (Hz)}$) ✓

$$(\lambda =) 3 \times 10^8 \div 2 \times 10^8 \checkmark$$

$$(\lambda =) 1.5 \text{ (m)} \checkmark$$

4

1.1

ALLOW correct formula in words

1.2

2 × 2.1

ALLOW $\lambda = 3 \times 10^8 \div 2 \times 10^8$ for two marks

ALLOW 1.5×10^0 for correct calculation but incorrect conversion of MHz to Hz for 3 marks

Q3.(2020)

B

Q4.(2021)

C

Q5.a(2021)

Frequency or energy too high / too dangerous / gamma is ionising radiation / can cause cancer / AW ✓	1	1.2	ALLOW wavelength too small / can kill cells
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Q5.b(2021)

Any one from: Microwaves ✓ Visible light ✓ Infra-red ✓ UV ✓	1	1.1	IGNORE X-rays / gamma rays / radio waves
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Q5.c(2021)

Any one from: Radar ✓ Satellite (TV) ✓ Mobile phones ✓ Remote controls ✓ Optical fibres / optical wireless communications ✓ Morse code ✓ To see/to read CDs or DVDs ✓ Bluetooth ✓	1	1.1	IGNORE any use which does not involve communications / just 'TV'
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Q6.a(2021)

As frequency increases, wavelength decreases / ORA ✓	2	2x3.1a	Possible pairs: f (MHz) λ(m) 562 0.533 571 0.526 578 0.519 586 0.511 594 0.505 691 0.435
Any two pairs of values of frequency and wavelength that shows this relationship ✓			

Q6.b(2021)

Three / 3 ✓

Q6.c(2021)

FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 299 970 000 (m / s) award 3 marks	3		
594 MHz = 594 000 000 Hz ✓ (Speed =) 594 000 000 × 0.505 ✓		1.2 2.1	ALLOW 300 000 000 or 3×10^8 (m / s) with workings shown ✓✓✓
(Speed =) 299 970 000 (m / s) ✓		2.1	ALLOW 2.9997×10^8 (m / s) ✓✓✓ ALLOW 299.97 (unit not changed) ✓✓

Q6.d(2021)

FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.4 award 3 marks	3		
(efficiency =) useful E output ÷ input E ✓ (efficiency =) $100 \div 250$ ✓ (efficiency =) 0.4 ✓		1.2 2.1 2.1	ALLOW 40% ✓✓✓ ALLOW 0.4% or 0.4 with units or 40 ✓✓

Q7.a(2022)

FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.028 (m) award 4 marks	4		IGNORE wave speed = frequency x wavelength (in question)
(Wavelength =) wave speed / frequency ✓		1.2	ALLOW symbol equation / equation in any form
(Wavelength =) $3 \times 10^8 \div 1.07 \times 10^{10}$ ✓		2.1	
(Wavelength =) 0.0280007 (m) ✓		2.1	IGNORE 0.03
(Wavelength =) 0.028 (m) to 3 decimal places ✓		1.2	ECF for any correct 3 decimal places but must be a visible change from one figure to another e.g. 4.23416 changed to 4.234 = 1 mark

Q7.b(2022)

Cannot see radio or IR / eyes detect only a limited range of frequencies / AW ✓	1	2.1	ALLOW so it can be seen / so it is visible / to show it is working / to check it is working
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Q8.(2023)

B

Q9.(2023)

B

Q10.a(2023)

Gamma rays ✓	1	2.2	ALLOW gamma / symbol γ
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Q10.b(2023)

Gamma rays ✓	1	1.1	ALLOW gamma / symbol γ
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Q10.c(2023)

10^2 ✓	1	2.2	<p>ALLOW any indication of the correct answer selected e.g., ticking or underlining but circling takes precedence</p> <p>DO NOT ALLOW more than one answer circled</p>
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Q10.d(2023)

First check the answer on answer line
If answer = 1 000 000 (Hz) award 2 marks

(Frequency =) 10^6 (Hz) ✓

(Frequency =) 1 000 000 (Hz) ✓

2		<p>ALLOW answer on graph</p>
	1.2	ALLOW 1×10^6 (Hz) for 1 mark
	2.2	ALLOW ECF from standard form to non-standard form e.g., 10^7 to 10 000 000 (Hz) for 1 mark

Q10.e(2023)

They are transverse waves ✓

1	1.1	<p>ALLOW any indication of the fourth box selected e.g., X or circling but ticking takes precedence</p> <p>DO NOT ALLOW more than one box ticked</p>
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Q10.f(2023)

First check the answer on answer line
If answer = 0.7 (h) award 3 marks

(Time =) $\frac{\text{energy transferred}}{\text{power}}$ ✓

(Time =) $\frac{0.56}{0.8}$ ✓

(Time =) 0.7 (h) ✓

3		<p>ALLOW POT error e.g., 7 / 70 / 0.07 on answer line = 2 marks</p>
	1.2	<p>ALLOW symbols (t =) $\frac{W}{P}$ or $\frac{E}{P}$</p> <p>ALLOW for 1 mark the numbers in an unarranged equation e.g.: $0.56 = 0.8 \times t$</p>
	2 × 2.1	

Q11.(2024)

B

Q12.(2024)

B