3.3 Electromagnetic spectrum

01. 0625_m21_qp_22 Q: 25

Which row gives the approximate speeds at which ultraviolet waves travel in air and in a vacuum?

	speed in air / m/s	speed in a vacuum / m/s
A	340	3.0×10^8
B	340	340
C	3.0×10^8	340
D	3.0×10^8	3.0×10^8

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02. 0625_s21_qp_21 Q: 25

A remote-controlled vehicle is travelling on the surface of a planet. The vehicle senses an obstacle ahead. It sends a radio message to the control room from where it is being controlled. The control room is 2.4×10^6 km away from the vehicle. The control room sends a message back to the vehicle telling it to stop.

What is the minimum time that elapses between the vehicle sensing the obstacle and receiving the message back from the control room?

A 8.0 ms **B** 16 ms **C** 8.0 s **D** 16 s

---

03. 0625_s21_qp_22 Q: 25

Here are three statements about the speed of electromagnetic waves.

1 The speed of an electromagnetic wave in a vacuum is 340 m/s.

2 The speed of an electromagnetic wave in a vacuum is 3.0×10^8 m/s.

3 The speed of an electromagnetic wave in a vacuum is approximately the same as in air.

Which statements are correct?

A 1 and 3 **B** 1 only **C** 2 and 3 **D** 2 only

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04. 0625_s21_qp_23 Q: 25

Which row correctly describes what happens to the frequency and to the speed of electromagnetic waves as we move through the spectrum from γ-rays to radio waves?

	frequency	speed in a vacuum
A	decreases	increases
B	decreases	remains the same
C	increases	decreases
D	increases	remains the same

---

05. 0625_w21_qp_21 Q: 22

The Sun emits infrared radiation and light.

Light from the Sun reaches the Earth in 8 minutes.

Which row gives correct information about the infrared radiation?

	wavelength of infrared radiation	time taken for infrared radiation to reach the Earth
A	longer than wavelength of light	8 minutes
B	longer than wavelength of light	much less than 8 minutes
C	shorter than wavelength of light	8 minutes
D	shorter than wavelength of light	much more than 8 minutes

---

06. 0625_w21_qp_21 Q: 23

Which list shows regions of the electromagnetic spectrum in order of increasing frequency?

A X-ray → ultraviolet → visible light → infrared

B X-ray → infrared → visible light → ultraviolet

C infrared → visible light → ultraviolet → X-ray

D ultraviolet → visible light → infrared → X-ray

---

07. 0625_w21_qp_22 Q: 22

The Sun emits infrared radiation and light.

Light from the Sun reaches the Earth in 8 minutes.

Which row gives correct information about the infrared radiation?

	wavelength of infrared radiation	time taken for infrared radiation to reach the Earth
A	longer than wavelength of light	8 minutes
B	longer than wavelength of light	much less than 8 minutes
C	shorter than wavelength of light	8 minutes
D	shorter than wavelength of light	much more than 8 minutes

---

08. 0625_w21_qp_22 Q: 23

Which statement about electromagnetic waves is **not** correct?

A They travel at 3×10^8 m/s in a vacuum.

B They transfer energy.

C They travel at 340 m/s in air.

D They are transverse waves.

---

09. 0625_w21_qp_23 Q: 22

The Sun emits infrared radiation and light.

Light from the Sun reaches the Earth in 8 minutes.

Which row gives correct information about the infrared radiation?

	wavelength of infrared radiation	time taken for infrared radiation to reach the Earth
A	longer than wavelength of light	8 minutes
B	longer than wavelength of light	much less than 8 minutes
C	shorter than wavelength of light	8 minutes
D	shorter than wavelength of light	much more than 8 minutes

10. 0625_s20_qp_21 Q: 24

An intruder alarm sensor detects that a person is warmer than his surroundings.

Which type of electromagnetic wave does the sensor detect?

A infrared

B radio

C ultraviolet

D visible light

11. 0625_w20_qp_23 Q: 25

The diagram shows three types of electromagnetic radiation listed in a particular order. The electromagnetic radiation is travelling in a vacuum.

Which quantities increase in magnitude going from left to right across the list?

A frequency only

B neither speed nor frequency

C speed and frequency

D speed only

12. 0625_m19_qp_22 Q: 25

What is the speed of X-rays in a vacuum and in air?

	in a vacuum	in air
A	3.0×10^6 m/s	2.0×10^6 m/s
B	3.0×10^6 m/s	3.0×10^6 m/s
C	3.0×10^8 m/s	2.0×10^8 m/s
D	3.0×10^8 m/s	3.0×10^8 m/s

13. 0625_s19_qp_21 Q: 23

An eclipse of the Sun happens when the Moon comes between the Earth and the Sun.

Which statement is correct?

A Infra-red radiation from the Sun disappears before visible light and ultra-violet radiation.

B Ultra-violet radiation from the Sun disappears before visible light and infra-red radiation.

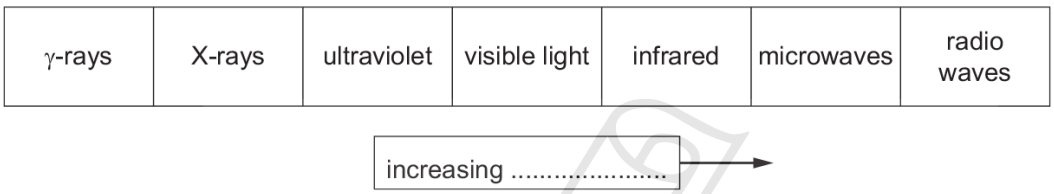
C Visible light from the Sun disappears before ultra-violet radiation and infra-red radiation.

D Infra-red radiation, ultra-violet radiation and visible light from the Sun all disappear at the same moment.

---

14. 0625_w19_qp_21 Q: 24

The diagram shows the electromagnetic spectrum.



A word is missing from the label below the spectrum.

Which word is missing?

A amplitude

B frequency

C speed

D wavelength

---

15. 0625_s18_qp_21 Q: 23

The Sun emits infra-red radiation and light.

Light from the Sun reaches the Earth in 8 minutes.

Which row gives correct information about the infra-red radiation?

	wavelength of infra-red radiation	time taken for infra-red radiation to reach Earth
A	longer than wavelength of light	8 minutes
B	longer than wavelength of light	much less than 8 minutes
C	shorter than wavelength of light	8 minutes
D	shorter than wavelength of light	much more than 8 minutes

---

16. 0625_s18_qp_22 Q: 23

Which statement is **not** correct?

A The speed of long-wavelength infra-red radiation in a vacuum is greater than that of short-wavelength ultraviolet light.

B The speed of microwaves in air is approximately 3.0×10^8 m/s.

C The speed of γ-rays emitted from a sample of cobalt-60 is 3.0×10^5 km/s.

D The X-rays emitted in a supernova explosion reach the Earth at the same time as the visible light emitted.

---

17. 0625_w18_qp_21 Q: 24

Different parts of the electromagnetic spectrum are used for different purposes. Below are four statements about parts of the spectrum.

statement 1: Infra-red waves are used in television remote controllers.

statement 2: Radio waves are used to transmit television pictures from satellites to Earth.

statement 3: Ultraviolet waves are used for intruder alarms.

statement 4: X-rays are used for security checks.

Which statements are correct?

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

---

18. 0625_w18_qp_22 Q: 23

A transmitter produces radio waves of wavelength 1500 m. It takes the waves 0.025 s to travel from the transmitter to a radio receiver.

What is the distance between the radio transmitter and the receiver?

A 5.0×10^3 m **B** 2.0×10^5 m **C** 7.5×10^6 m **D** 1.1×10^{10} m

---

19. 0625_s17_qp_23 Q: 22

Light travels in a vacuum and then enters a glass block. The speed of the light in the glass block is 2.0×10^8 m/s.

Which statement about the speed of light is correct?

A The speed in a vacuum is 1.5 times the speed in the glass.

B The speed in the glass is the same as the speed in a vacuum.

C The speed in the glass is 1.5 times the speed in a vacuum.

D The speed in the glass is 1.0×10^8 times the speed in a vacuum.

---

20. 0625_w17_qp_21 Q: 23

Visible light, X-rays and microwaves are all components of the electromagnetic spectrum.

Which statement about the waves is correct?

A In a vacuum, microwaves travel faster than visible light and have a shorter wavelength.

B In a vacuum, microwaves travel at the same speed as visible light and have a shorter wavelength.

C In a vacuum, X-rays travel faster than visible light and have a shorter wavelength.

D In a vacuum, X-rays travel at the same speed as visible light and have a shorter wavelength.

---

21. 0625_w17_qp_21 Q: 24

The Moon is 380 000 km from the Earth. A laser light beam is directed from the Earth to the Moon. The beam is reflected back to the Earth.

How long does it take for the light to travel to the Moon and back to the Earth?

A 1.27 ms **B** 2.53 ms **C** 1.27 s **D** 2.53 s

---

22. 0625_w17_qp_22 Q: 23

Which piece of equipment is designed to produce a type of electromagnetic wave?

A electric fire

B electric generator

C electric motor

D electromagnet

---

23. 0625_w17_qp_22 Q: 24

The Moon is 380 000 km from the Earth. A laser light beam is directed from the Earth to the Moon. The beam is reflected back to the Earth.

How long does it take for the light to travel to the Moon and back to the Earth?

A 1.27 ms **B** 2.53 ms **C** 1.27 s **D** 2.53 s

---

24. 0625_w17_qp_23 Q: 25

Which statement about radio waves is correct?

A They are used in television remote controllers.

B They can be detected by the human eye.

C They travel as longitudinal waves.

D They have the same speed in a vacuum as ultraviolet waves.

---

25. 0625_s16_qp_22 Q: 24

Visible light has a frequency of approximately 5.0×10^{14} Hz.

M and N are two other types of electromagnetic radiation.

The frequency of M is 5.0×10^{6} Hz.

The frequency of N is 5.0×10^{15} Hz.

Which types of radiation are M and N?

	M	N
A	radio waves	infra-red
B	radio waves	ultraviolet
C	ultraviolet	X-rays
D	X-rays	infra-red

---

26. 0625_w16_qp_21 Q: 24

Radiation from which part of the electromagnetic spectrum is used in the remote controller for a television?

A infra-red waves

B microwaves

C radio waves

D ultraviolet waves

---

27. 0625_w16_qp_22 Q: 24

Which part of the electromagnetic spectrum is used to send television signals from a satellite to Earth?

A infra-red

B microwaves

C ultraviolet

D visible light

---

28. 0625_w16_qp_23 Q: 23

Which description applies to infra-red radiation?

A longitudinal and electromagnetic

B longitudinal but not electromagnetic

C transverse and electromagnetic

D transverse but not electromagnetic

---

29. 0625_m15_qp_12 Q: 22

How do infra-red waves differ from ultraviolet waves?

A Infra-red waves are longitudinal.

B Infra-red waves have a lower speed *in vacuo* (in a vacuum).

C Infra-red waves have lower frequencies.

D Infra-red waves have smaller wavelengths.

---

30. 0625_s15_qp_11 Q: 20

The diagram shows the electromagnetic spectrum, in order of increasing wavelength.

Three types of radiation, P, Q and R, are missing from the spectrum diagram.

γ-rays	X-rays	P	visible light	Q	microwaves	R

Which types of electromagnetic radiation are represented by P, by Q and by R?

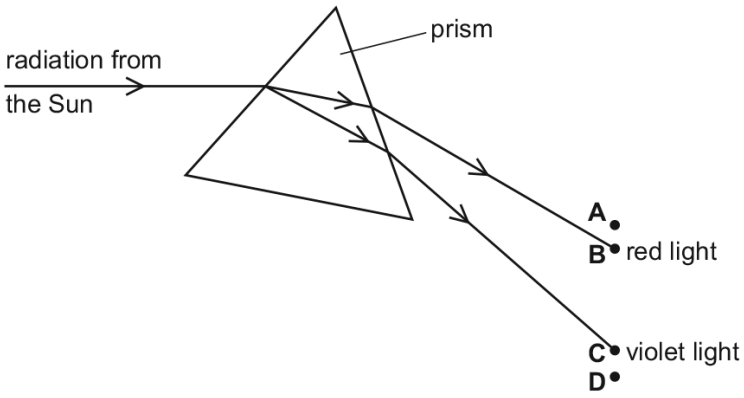
	P	Q	R
A	infra-red	radio waves	ultraviolet
B	infra-red	ultraviolet	radio waves
C	ultraviolet	infra-red	radio waves
D	ultraviolet	radio waves	infra-red

---

31. 0625_s15_qp_11 Q: 21

Radiation from the Sun is dispersed by a prism. The prism does not absorb any of the radiation. Four identical thermometers are placed, one at each of the labelled positions.

In which position does the thermometer show the greatest rise in temperature?



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32. 0625_w15_qp_11 Q: 20

The diagram represents the electromagnetic spectrum.

Some regions have been labelled, and some labels are missing.

Which region should be labelled as infra-red waves?

radio waves	**A**	**B**	visible light	**C**	**D**	γ-rays

---

33. 0625_w15_qp_12 Q: 22

Which group contains only electromagnetic waves?

A light waves, radio waves, γ-rays

B light waves, radio waves, sound waves

C light waves, sound waves, γ-rays

D radio waves, sound waves, γ-rays

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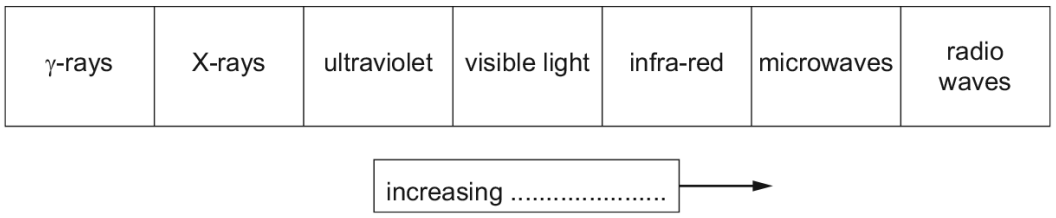
34. 0625_w15_qp_13 Q: 20

The diagram shows the electromagnetic spectrum.



A word is missing from the label below the spectrum.

Which word is missing?

A amplitude

B frequency

C speed

D wavelength

---

35. 0625_s14_qp_11 Q: 20

Which list shows electromagnetic waves in order of increasing frequency?

A visible light, X-rays, γ-rays

B visible light, γ-rays, X-rays

C X-rays, γ-rays, visible light

D γ-rays, X-rays, visible light

---

36. 0625_s14_qp_12 Q: 21

Which statement about ultraviolet waves is correct?

A They are used in television remote controllers.

B They can be detected by the human eye.

C They travel as longitudinal waves.

D They have the same speed in a vacuum as radio waves.

---

37. 0625_w14_qp_11 Q: 21

Which type of electromagnetic wave is used in airport security scanners?

A infra-red

B microwaves

C radio waves

D X-rays

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38. 0625_w14_qp_13 Q: 21

An intruder alarm sensor detects that a human is warmer than his surroundings.

Which type of electromagnetic wave does the sensor detect?

A infra-red

B radio

C ultraviolet

D visible light

---

39. 0625_s13_qp_11 Q: 19

Visible light and γ-rays are both waves.

How may they correctly be described?

	visible light	γ-rays
A	longitudinal	longitudinal
B	longitudinal	transverse
C	transverse	longitudinal
D	transverse	transverse

---

40. 0625_s13_qp_12 Q: 21

Which group of electromagnetic radiations is arranged in order of increasing frequency?

A infra-red, visible light, ultraviolet

B γ-rays, X-rays, infra-red

C ultra-violet, visible light, radio waves

D X-rays, radio waves, γ-rays

---

41. 0625_s13_qp_12 Q: 22

An electronic engineer makes devices which can receive television pictures from satellites.

Which type of electromagnetic radiation must these devices be able to receive?

A infra-red waves

B microwaves

C radio waves

D ultra-violet waves

---

42. 0625_w13_qp_11 Q: 21

The table gives common uses for three types of electromagnetic wave.

Which row correctly identifies the waves?

	satellite television	terrestrial television (not satellite)	television remote controllers
A	infra-red waves	microwaves	radio waves
B	microwaves	radio waves	infra-red waves
C	radio waves	infra-red waves	microwaves
D	radio waves	microwaves	infra-red waves

---

43. 0625_w13_qp_13 Q: 21

Infra-red waves, microwaves, radio waves and sound waves are all used for communications.

Which waves travel at the same high speed in a vacuum?

A infra-red waves, microwaves and radio waves

B infra-red waves, microwaves and sound waves

C infra-red waves, radio waves and sound waves

D microwaves, radio waves and sound waves

SN	Paper	Q. No.	Answer
01	0625_m21_qp_22	25	D
02	0625_s21_qp_21	25	D
03	0625_s21_qp_22	25	C
04	0625_s21_qp_23	25	B
05	0625_w21_qp_21	22	A
06	0625_w21_qp_21	23	C
07	0625_w21_qp_22	22	A
08	0625_w21_qp_22	23	C
09	0625_w21_qp_23	22	A
10	0625_s20_qp_21	24	A
11	0625_w20_qp_23	25	A
12	0625_m19_qp_22	25	D
13	0625_s19_qp_21	23	D
14	0625_w19_qp_21	24	D
15	0625_s18_qp_21	23	A
16	0625_s18_qp_22	23	A
17	0625_w18_qp_21	24	B
18	0625_w18_qp_22	23	C
19	0625_s17_qp_23	22	A
20	0625_w17_qp_21	23	D
21	0625_w17_qp_21	24	D
22	0625_w17_qp_22	23	A
23	0625_w17_qp_22	24	D
24	0625_w17_qp_23	25	D
25	0625_s16_qp_22	24	B
26	0625_w16_qp_21	24	A
27	0625_w16_qp_22	24	B
28	0625_w16_qp_23	23	C
29	0625_m15_qp_12	22	C
30	0625_s15_qp_11	20	C
31	0625_s15_qp_11	21	A
32	0625_w15_qp_11	20	B
33	0625_w15_qp_12	22	A
34	0625_w15_qp_13	20	D
35	0625_s14_qp_11	20	A
36	0625_s14_qp_12	21	D
37	0625_w14_qp_11	21	D
38	0625_w14_qp_13	21	A
39	0625_s13_qp_11	19	D
40	0625_s13_qp_12	21	A
41	0625_s13_qp_12	22	B
42	0625_w13_qp_11	21	B
43	0625_w13_qp_13	21	A