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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

Electromagnetic Spectrum

Paper 1 — Multiple-Choice Questions (topical compilation)

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3.3 Electromagnetic spectrum

PAPER 1

1 Which application may use the part of the electromagnetic spectrum called microwaves?

- A** cooking vegetables
- B** detecting small cracks in metals
- C** gaining a sun-tan
- D** lighting a fluorescent tube

5054/11/M/J/11/Q24

2 Light is incident on one face of a glass block at an angle of incidence of 40° . The glass block is in air.

The refractive index of the glass is 1.46.

What is the angle of refraction inside the glass block?

- A** 26° **B** 27° **C** 58° **D** 70°

5054/11/M/J/12/Q23

3 Which device uses ultra-violet radiation?

- A** electric grill
- B** intruder alarm
- C** television remote controller
- D** sunbed

5054/12/M/J/12/Q25

4 Which wave property has the same value for all X-rays travelling in air?

- A** amplitude
- B** frequency
- C** speed
- D** wavelength

5054/11/M/J/13/Q22

5 Which statement is correct?

- A Gamma rays have a longer wavelength than ultra-violet waves.
- B Infra-red waves have a lower frequency than radio waves.
- C Microwaves have a longer wavelength than visible light.
- D X-rays have a higher speed in air than visible light.

5054/11/M/J/14/Q26

6 Which statement is correct for all electromagnetic waves?

- A They are transverse.
- B They cannot travel in a vacuum.
- C They have the same frequency.
- D They travel through lead.

5054/12/M/J/14/Q27

7 Which component of the electromagnetic spectrum is used for television transmission from satellites?

- A microwaves
- B radio waves
- C ultra-violet
- D X-rays

5054/12/M/J/15/Q28

8 Microwaves are used to transmit television signals to and from a satellite.

Which statement about microwaves is correct?

- A They have a longer wavelength than radio waves.
- B They penetrate the atmosphere without significant loss of energy.
- C They travel much faster than radio waves in a vacuum.
- D They warm the satellite and stop it freezing.

5054/11/M/J/16/Q24

9 Where are gamma-rays used?

- A in fluorescent tubes
- B in killing cancerous cells
- C in pre-natal scanning
- D in sunbeds

5054/11/M/J/16/Q25

10 A wall poster showing the electromagnetic spectrum is displayed in a laboratory.



A section of the electromagnetic spectrum has been accidentally ripped from this wall poster.

Which piece is missing?

- A infra-red visible light microwave
- B microwave infra-red visible light
- C visible light infra-red microwave
- D visible light microwave infra-red

5054/11/M/J/17/Q29

11 Which type of wave is used to send television signals to a satellite?

- A infra-red waves
- B light waves
- C microwaves
- D sound waves

5054/11/M/J/17/Q30

12 Which device uses total internal reflection?

- A** magnifying glass
- B** optical fibre
- C** photographic enlarger
- D** projector

5054/12/M/J/18/Q29

13 A television controller emits an infra-red beam.

Which statement about infra-red radiation is correct?

- A** It causes ionisation.
- B** It consists of longitudinal waves.
- C** It has a higher frequency than ultra-violet light.
- D** It travels at the speed of light.

5054/12/M/J/18/Q30

14 What is a feature of red light compared with that of violet light?

- A** A prism deviates red light more.
- B** Red light has a lower frequency.
- C** Red light has a shorter wavelength.
- D** The speed of red light in a vacuum is smaller.

5054/11/M/J/20/Q29

15 Which two waves are components of the electromagnetic spectrum?

- A** light and sound
- B** water waves and infrared
- C** ultrasound and ultraviolet
- D** X-rays and microwaves

5054/12/M/J/21/Q27

16 Which waves are **not** part of the electromagnetic spectrum?

- A radio waves
- B television signals
- C ultrasound
- D ultraviolet

5054/11/M/J/22/Q23

17 How do the speed and the wavelength of red light in air compare with the speed and the wavelength of violet light in air?

	speed of red light	wavelength of red light
A	greater	greater
B	greater	less
C	same	greater
D	same	less

5054/11/O/N/11/Q20

18 The diagram shows the main sections of the electromagnetic spectrum in order of increasing frequency. Some of the sections are labelled.

radio waves		R	light			gamma-rays
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—————→ increasing frequency

The section R has a frequency just below that of light.

Which application uses the section R?

- A killing cancerous cells
- B satellite television
- C sterilisation
- D television remote controller

5054/11/O/N/11/Q24

- 19 The table lists the main components of the electromagnetic spectrum and their approximate frequency range.

	frequency / Hz
gamma rays	10^{22} to 10^{19}
X-rays	10^{21} to 10^{18}
ultra-violet	10^{18} to 10^{15}
visible light	10^{15} to 10^{14}
infra-red	10^{14} to 10^{12}
microwaves	10^{12} to 10^9
radiowaves	10^9 to 10^3

Which range of frequencies can be used to detect cracks inside a block of metal?

- A 10^3 Hz to 10^{12} Hz
- B 10^{12} Hz to 10^{15} Hz
- C 10^{15} Hz to 10^{18} Hz
- D 10^{18} Hz to 10^{22} Hz

5054/11/O/N/13 /Q22

- 20 Which application uses microwaves?

- A detecting small cracks in metals
- B gaining a sun-tan
- C lighting a fluorescent tube
- D satellite television

5054/11/O/N/14/Q24

- 21 A star explodes in outer space.

Which waves from the exploding star do **not** reach the Earth?

- A infra-red
- B light
- C radio
- D sound

5054/11/O/N/14/Q25

22 Which statement is correct?

- A Infra-red radiation cannot travel in a vacuum.
- B Infra-red radiation cannot travel in solids or in gases.
- C Infra-red radiation can only travel in a vacuum.
- D Infra-red radiation can travel in a vacuum and in gases.

5054/12/O/N/15/Q20

23 Which two types of electromagnetic radiation are both used to kill cancerous cells and are both used to detect cracks in metals?

- A gamma-rays and microwaves
- B gamma-rays and X-rays
- C microwaves and ultra-violet radiation
- D ultra-violet radiation and X-rays

5054/11/O/N/16/Q28

24 Which statement about waves is correct?

- A All electromagnetic waves are transverse waves.
- B All transverse waves travel at 300 000 000 m/s.
- C Longitudinal waves cannot be refracted.
- D Water waves are longitudinal waves.

5054/12/O/N/16/Q25

25 A type of electromagnetic radiation possesses the following properties.

- It is ionising.
- Its frequency is higher than the frequency of microwaves.
- It is not detected by the human eye.

What is this radiation?

- A gamma rays
- B infra-red
- C light
- D radio waves

5054/11/O/N/17/Q23

- 26 The diagram shows the electromagnetic spectrum with three components named. The spectrum is in order from long wavelength to short wavelength.

Which component of the spectrum is used in a sunbed to produce a suntan?

long wavelength

short wavelength

radio waves	A	B	visible light	C	D	gamma rays
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5054/12/O/N/17/24

- 27 Which statement about radio waves is correct?

- A** Radio waves are sound waves.
- B** Radio waves are used to kill cancerous cells.
- C** Radio waves are used in television communications.
- D** Radio waves have frequencies higher than those of visible light.

5054/12/O/N/18/Q26

- 28 The frequency of microwaves used in an experiment is 3.0×10^9 Hz. Their speed in air is 3.0×10^8 m/s.

What is a possible frequency and a possible speed in air of a radio wave?

	frequency / Hz	<u>speed in air</u> m/s
A	3.0×10^5	1500
B	3.0×10^5	3.0×10^8
C	3.0×10^{14}	1500
D	3.0×10^{14}	3.0×10^8

5054/11/O/N/19/Q25

29 Applications use different components of the electromagnetic spectrum.

Which shows correct applications for X-rays, ultraviolet light and microwaves?

	X-rays	ultraviolet light	microwaves
A	mobile phone	fluorescent tube	intruder alarm
B	killing cancerous cells	sterilising surgical instruments	satellite television
C	medical imaging	television controller	sunbed
D	sterilising surgical instruments	television controller	detecting cracks in metal

5054/12/O/N/20/Q25

30 Which component of the electromagnetic spectrum is used for the remote control of a television?

- A gamma rays
- B infrared rays
- C radio waves
- D ultraviolet rays

5054/11/O/N/21/Q24

31 A satellite orbits the Earth at a height of 300 km above the surface. The speed of electromagnetic waves is 3.0×10^8 m/s.

What is the minimum time taken for a radio signal transmitted from the Earth to reach the satellite?

- A 1.0×10^{-6} s B 2.0×10^{-6} s C 1.0×10^{-3} s D 2.0×10^{-3} s

5054/12/O/N/21/Q27