

GCSE BITESIZE Examinations

General Certificate of Secondary Education

AQA SCIENCE A

PHY1B

Unit Physics P1b (Radiation and the Universe)

AQA Chemistry

Unit Physics P1b (Radiation and the Universe)

FOUNDATION TIER

Specimen Paper

Time allowed: 30 minutes

Maximum marks: 36

Instructions

- Answer **all** of the questions for the Tier you are attempting.
- Record your answers on a separate answer sheet only.
- Do all rough work in this book - **not** on your answer sheet.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.

FOUNDATION TIER

SECTION ONE

Questions **ONE** to **FIVE**

In these questions, match the letters **A**, **B**, **C** and **D** with the numbers **1-4**.

Use **each** answer only **once**.

Mark your choice on the answer sheet.

QUESTION ONE

Each of these applications uses electromagnetic radiation:

1
Mobile phones

2
Sterilising medical equipment

3
Hairdryers

4
Sunbeds

Match the parts of the electromagnetic spectrum **A**, **B**, **C** and **D** with the applications labelled **1**, **2**, **3** and **4**.

- A** Ultraviolet rays
- B** Microwaves
- C** Infrared rays
- D** Gamma rays

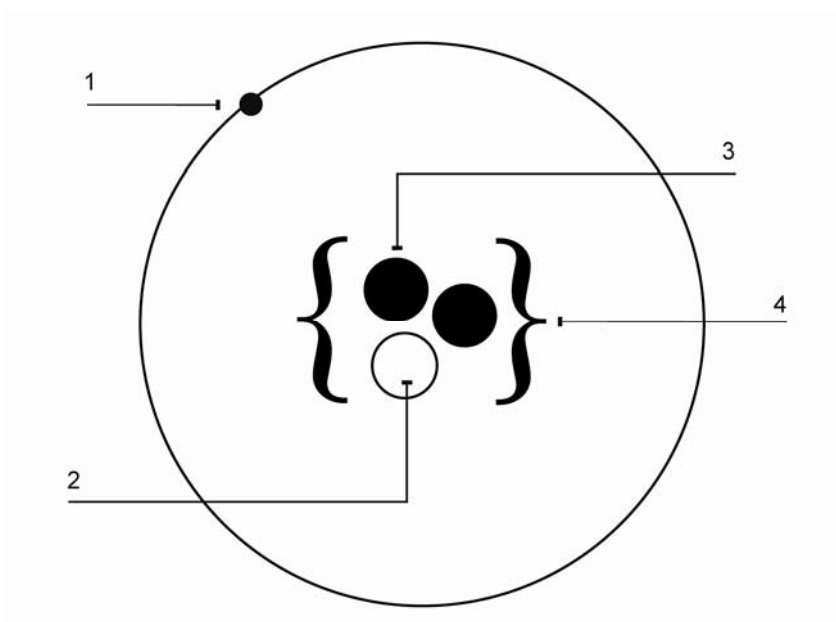
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QUESTION TWO

Tritium (Hydrogen-3) is a source of beta radiation. It has a proton number of 1 and a mass number of 3. The diagram below shows a tritium atom.

Match the parts of an atom **A**, **B**, **C** and **D** with the labels **1-4** on the diagram.

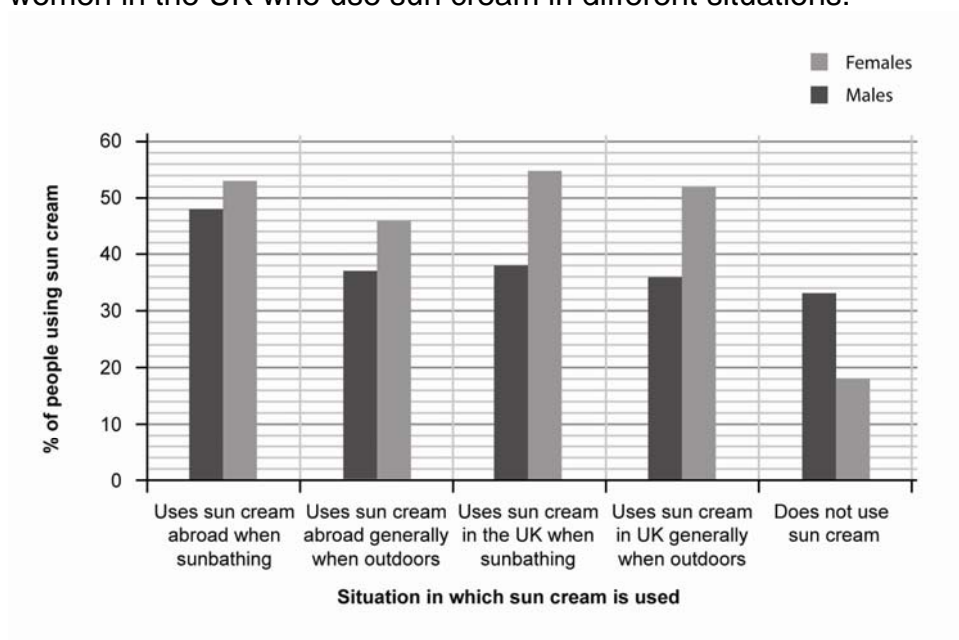
- A** neutron
- B** electron
- C** proton
- D** nucleus



Turn over ►

QUESTION THREE

Sun cream is one method of protecting ourselves from the Sun's harmful electromagnetic radiation. The graph below shows the percentage of men and women in the UK who use sun cream in different situations:



Match the situations when sun cream is used - **A**, **B**, **C** and **D** - with the numbers **1-4** in the table.

- A** Uses sun cream abroad when sunbathing
- B** Uses sun cream abroad, generally when outdoors
- C** Uses sun cream in the UK when sunbathing
- D** Uses sun cream in the UK, generally when outdoors

Statement	
Situation in which 37 per cent of men use sun cream	1
Situation in which highest percentage of women use sun cream	2
Situation in which 52 37 per cent of women use sun cream	3
Situation in which 48 per cent of men use sun cream	4

QUESTION FOUR

In 1990, NASA launched the Hubble Space Telescope. This had many advantages and disadvantages compared with telescopes on Earth.

Match statements **A**, **B**, **C** and **D** with the numbers **1-4** in the table.

- A** Light pollution makes it difficult to view dim objects
- B** Costly to position the telescope
- C** Easy to maintain the telescope
- D** Images are not obscured by gases in the atmosphere

	Advantage	Disadvantage
Hubble telescope	1	2
Telescope on Earth	3	4

Turn over ►

QUESTION FIVE

Read the article below:

Wireless networking (Wi-fi) fears are 'unproven'

Wi-fi technology uses electromagnetic radiation to communicate from devices such as laptops. More and more schools are now installing wireless networks, but some people have reported suffering from ill-health as a result.

The BBC's *Panorama* programme employed a scientist from Powerwatch, an organisation promoting the dangers of radiation, to measure electromagnetic radiation levels. He measured radiation levels 100m from a mobile phone mast and 1m from a school laptop computer. The scientist reported that measurements of radiation levels near the laptop were three times higher than those 100m from the phone mast, although they were still 600 times less than the government's safety limits.

But other scientists have criticised the findings, saying they are "grossly unscientific".

Match words **A**, **B**, **C** and **D** with the numbers **1-4** in the sentences.

- A** reliable
- B** related
- C** controlled
- D** biased

Scientists criticised the findings as being unscientific because the distances at which the measurements were taken were not ...**1**...

By only sampling the radiation around only one computer, the findings were not ...**2**...

Many people believe that the programme should have used an independent scientist, as the scientist from Powerwatch may have presented ...**3**... evidence.

The programme also did not survey pupils to measure their health. This meant that scientists have no evidence to conclude whether ill-health and Wi-fi are ...**4**...

SECTION TWO

Questions **SIX** to **NINE**

Each of these questions has four parts.

In each part, choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION SIX

Alpha, beta and gamma are the three types of nuclear radiation.

6A Which of these statements is **not** true of nuclear radiation?

- 1 All types of nuclear radiation are dangerous.
- 2 All types of nuclear radiation have different ionisation properties.
- 3 All types of nuclear radiation are affected by magnetic fields.
- 4 All types of nuclear radiation originate from the nucleus of an atom.

6B What is beta radiation?

- 1 A wave travelling at high speed
- 2 An electron travelling at high speed
- 3 A helium nucleus travelling at high speed
- 4 A proton travelling at high speed

Turn over ►

Read the information in the tables below, and use it to answer the questions which follow.

Table 1 compares the different types of radiation.

Type of nuclear radiation	Relative ionising power	Relative penetrating power
Alpha	Strong	Stopped by paper and skin
Beta	Weak	Stopped by 3mm of aluminium
Gamma	Very weak	Reduced but not stopped by lead

Table 2 gives details of some radioactive sources that are commonly available.

Isotope	Type of radiation emitted	Half-life
Radon-220	Alpha	54.5 seconds
Radon-222	Alpha	28 years
Bismuth-83	Beta	61 minutes
Hydrogen-3	Beta	12 years
Technetium-99	Gamma	Six hours
Cobalt-60	Gamma	Five years

6C Which radioactive source combines the strongest ionising power together with a long half-life?

- 1 Radon-220
- 2 Radon-222
- 3 Hydrogen-3
- 4 Cobalt-60

6D Radioactive tracers are used by doctors to trace the movement of substances within a patient's body. Which source would be the safest to use as a radioactive tracer?

- 1 Radon-220
- 2 Bismuth-83
- 3 Technetium-99
- 4 Cobalt-

QUESTION SEVEN

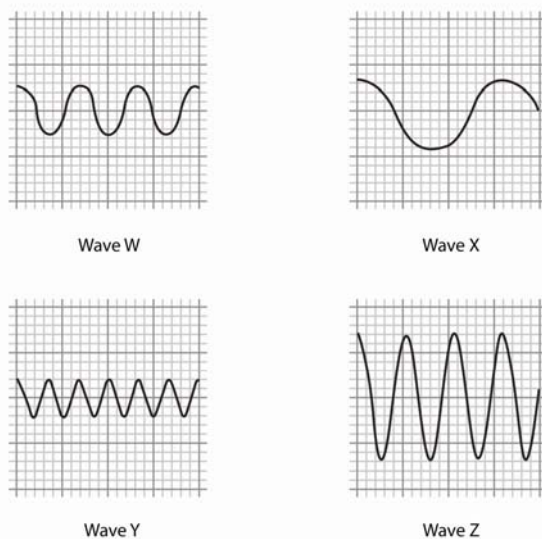
The diagram below shows all of the types of radiation which make up the electromagnetic spectrum:

Radio	Microwaves	Infra-red	Visible light	Ultra-violet	X-rays	Gamma rays
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7A Working from left to right in the diagram, which of the statements correctly describes the way in which the waves of the E.M. spectrum change?

- 1 Wavelength increases and frequency increases
- 2 Wavelength increases and frequency decreases
- 3 Wavelength decreases and frequency increases
- 4 Wavelength decreases and frequency decreases

7B The diagram below shows four electromagnetic waves, drawn to the same scale.



Which of these statements is true?

- 1 **Wave W** has twice the wavelength of **Wave Y**.
- 2 **Wave Z** has twice the wavelength of **Wave W**.
- 3 **Wave Z** has twice the frequency of **Wave W**.
- 4 **Wave W** has twice the frequency of **Wave Y**.

- 7C** The Sun emits high levels of infrared radiation. An infrared wave has a wavelength of 0.0008m and a frequency of 375,000,000,000Hz.

Calculate the speed of the infrared wave in metres/second.

wave speed (metres/second, m/s)	=	frequency (hertz, Hz)	x	wavelength (metres, m)
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- 1 30,000,000 m/s
 - 2 300,000,000 m/s
 - 3 468,750,000,000 m/s
 - 4 468,750,000,000,000 m/s
- 7D** Many scientists have observed that visible light from distant galaxies shows a shift toward the red end of the visible spectrum (known as a red-shift).

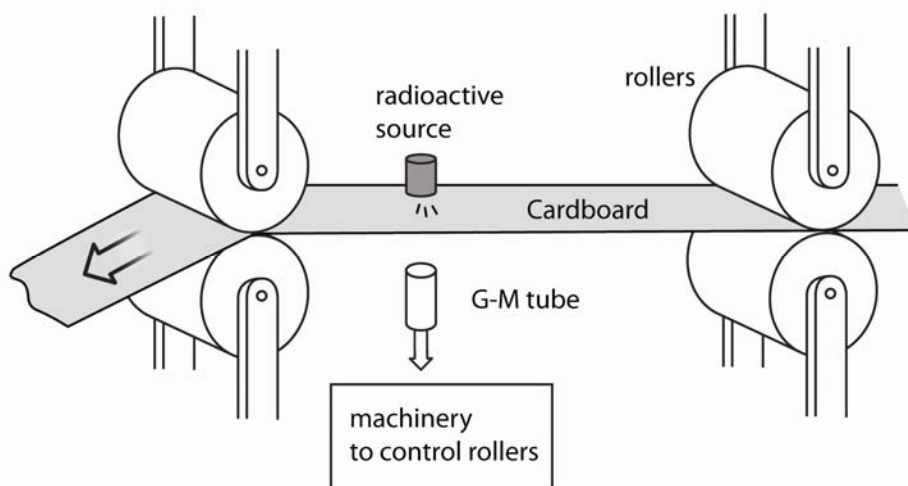
Scientists believe this provides evidence that...

- 1 galaxies are moving apart from one another.
- 2 galaxies are moving toward one another.
- 3 galaxies are moving in random directions in relation to one another.
- 4 galaxies are circling one another.

Turn over ►

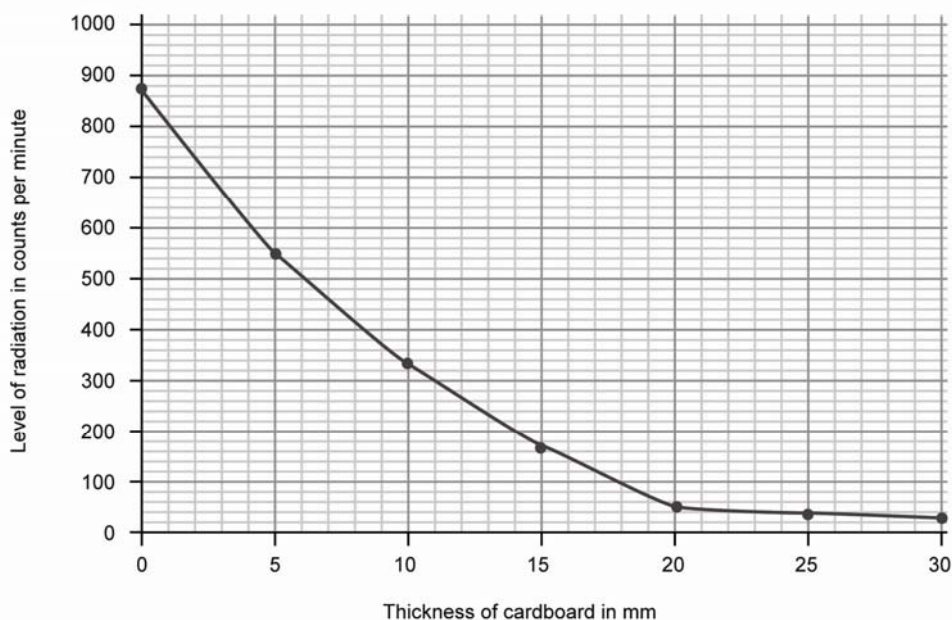
QUESTION EIGHT

A paper mill wanted to use Strontium-90 as a source of beta radiation to allow it to measure and control the thickness of the cardboard it was producing. The thicker the cardboard, the less radiation passes through to the Geiger-Müller tube.



Before the mill could set up the roller machinery, it first had to work out the levels of radiation which penetrated different thicknesses of cardboard. To do this, it set up a controlled laboratory investigation to establish the levels of radiation which penetrated different thicknesses of paper.

The results are shown below:



Turn over ►

8A In this investigation, the thickness of the paper was the independent variable. Thickness of paper is a...

- 1 discrete variable.
- 2 continuous variable.
- 3 categoric variable.
- 4 ordered variable.

8B The decay of the Strontium-90 was not constant - rather it fluctuated. When the experiment was repeated, this produced variation between repeats. This is known as...

- 1 random error.
- 2 systematic error.
- 3 human error.
- 4 zero error.

8C The company used the known values from the pilot experiment to set up the roller machinery.

This is known as...

- 1 error reduction.
- 2 validation.
- 3 evaluation.
- 4 calibration.

8D The company decided to run one roller machine to produce 18mm cardboard continuously. What level of radiation would the machinery need to be set to?

- 1 90 counts per minute
- 2 100 counts per minute
- 3 120 counts per minute
- 4 130 counts per minute

QUESTION NINE

On 6 August 1945, the US dropped an atomic bomb on the Japanese city of Hiroshima. This resulted in the release of radioactive material into the environment. After the war, no reliable data was kept as to the number of cancers which the radiation caused, until 1975.

The table below shows the number of cases of a brain cancer called meningioma per 100,000 people per year for people living different distances from the site at which the bomb was detonated.

Distance from detonation site in km	Meningioma cases per 100,000 people per year, during the period 1975 to 1994			
	1975 to 1979	1980 to 1984	1985 to 1989	1990 to 1994
Less than 1 km	16	14	23.5	38
1 km to 1.5 km	5.5	4.5	10.5	14
1.5 km to 2 km	3	8	6.5	10
Not exposed	1.5	3	4	5.5

9A Why did the scientists who did the study include data for people who had not been exposed to radiation?

- 1 To act as a control group which other data could be compared against.
- 2 To prove that radiation had spread further than was originally thought.
- 3 To establish other causes of meningioma, other than nuclear radiation.
- 4 To work out how much zero error was contained within the data.

9B By how many did the number of cases of meningioma per 100,000 increase between the period 1975 to 1979 and 1990 to 1994 for those living less than 1km from the detonation site?

- 1 8.5
- 2 22
- 3 24
- 4 32.5

- 9C** Which of these is a valid conclusion to draw from the study?
- 1 Exposure to nuclear radiation results in meningioma.
 - 2 The number of cases of meningioma has grown year upon year.
 - 3 Meningioma is only contracted through exposure to nuclear radiation.
 - 4 Those who were living nearer the detonation site were generally more likely to develop meningioma.
- 9D** There are three different types of nuclear radiation. At these distances, the cancers are likely to have been caused by...
- 1 ...alpha, beta and gamma radiation.
 - 2 ...beta and gamma radiation.
 - 3 ...beta radiation only.
 - 4 ...gamma radiation only.

END OF QUESTIONS