version 1.0

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science A

Specimen Papers and Key Sheets

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Registered address AQA, Devas Street, Manchester M15 6EX. *Dr Michael Cresswell Director General.*

Contents

Science A (4461)

The specimen assessment materials accompanying the new AQA GCSE Sciences specifications are provided to give centres a reasonable idea of the general shape and character of the planned question papers in advance of the first operational examinations.

Surname		Other Names	
Centre Number						Candidate Number				
Candidate signature										

General Certificate of Secondary Education
Specimen Paper

SCIENCE A
Human Biology (Unit Biology 1a)

Date and Time

For this paper you must have:
- a black ball-point pen
- an objective test answer sheet

You may use a calculator.

Time allowed: 30 minutes

Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Human Biology' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown: 1 2 3 4
- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown: 1 2 3 4
- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown: 1 2 3 4

Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Higher Tier starts on page 16 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **SIX**.

In these questions match the letters with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

The drawing shows a skater.
The skater has organs which contain different receptors.

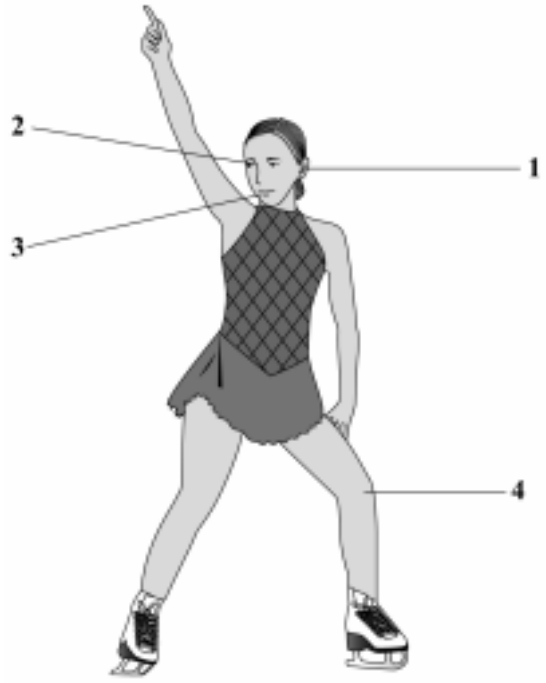
Match statements, **A**, **B**, **C** and **D**, with the labels **1 – 4** on the drawing.

A Contains light receptors

B Contains receptors sensitive to chemicals

C Contains sound receptors

D Contains temperature receptors



[6]

QUESTION TWO

The table is about the effects of some substances on the body.

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

A Alcohol

B Carbon monoxide

C Cannabis

D Nicotine

Substance	Effect on body
1	Is the addictive substance in cigarettes
2	Is thought to cause psychological problems in many people
3	Reduces the amount of oxygen which the blood carries
4	Slows down reaction time

Turn over for the next question

QUESTION THREE

The table is about substances which are effective against microorganisms.

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

A Antibody

B Antitoxin

C Blood clot

D Penicillin

Substance	Feature
1	Kills bacteria but not viruses
2	Kills both bacteria and viruses
3	Neutralises poisons produced by microorganisms
4	Seals cuts to prevent entry of microorganisms

QUESTION FOUR

Many people are obese.

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

A Arthritis

B Exercise

C Food

D Mass

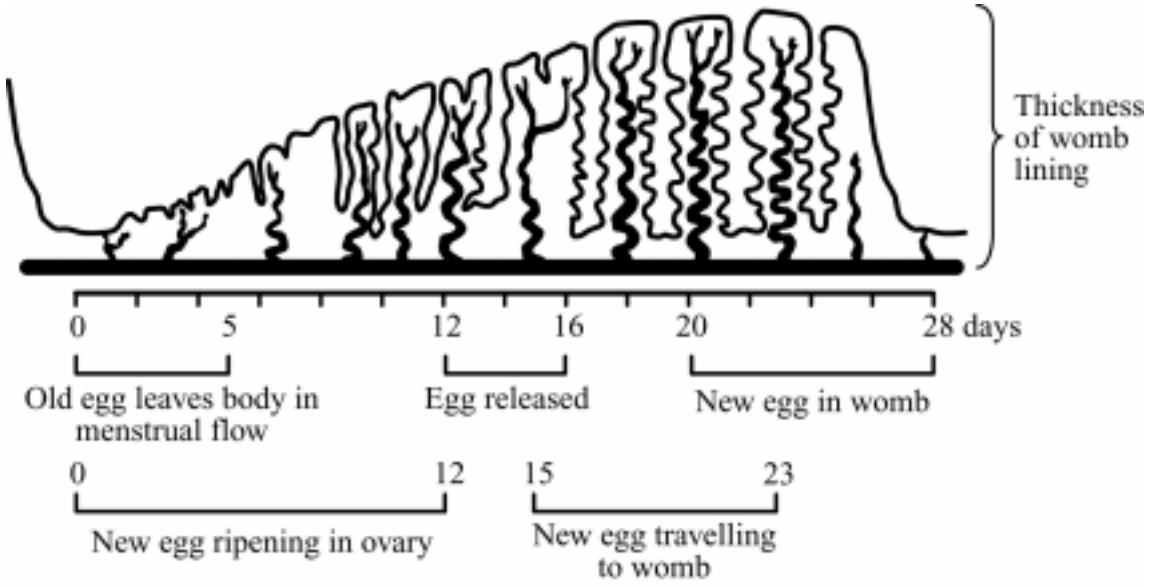
Obesity is caused by doing less …**1**… and taking in more …**2**… .

This causes an increase in body …**3**… which can lead to …**4** … .

[8]

QUESTION FIVE

The diagram shows some of the events in a woman's monthly cycle.



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

A 4

B 14

C 21

D 26

1	A day when an egg could be released
2	A day when an old egg is leaving the body
3	A day when the womb lining is breaking down
4	The day when the womb lining is thickest

QUESTION SIX

The parts of blood help to keep us healthy in different ways.

Table 1 shows the number of these parts in a healthy person.

Table 1

Part of blood	Number per mm^3 in healthy person
White blood cells	4000 to 11 000
Red blood cells	4.5 to 6.5 million
Platelets	150 000 to 350 000

Table 2 shows the blood test results for four people.

Table 2

Test	James	John	Michael	Paul
White blood cells	6500	1000	4100	30 000
Red blood cells	5.3 million	5.2 million	3.0 million	5.5 million
Platelets	70 000	210 000	200 000	180 000

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

A James

B John

C Michael

D Paul

The person with the least red blood cells is …**1**… .

The person whose blood would clot most slowly is …**2**… .

The person who would be most likely to catch an infection is …**3**… .

One of the symptoms of leukaemia is a large increase in the number of white blood cells.

The person most likely to be suffering from leukaemia is …**4**… .

[10]

Turn over for the next question

SECTION B

Questions **SEVEN** to **NINE**.
Each of these questions has four parts.

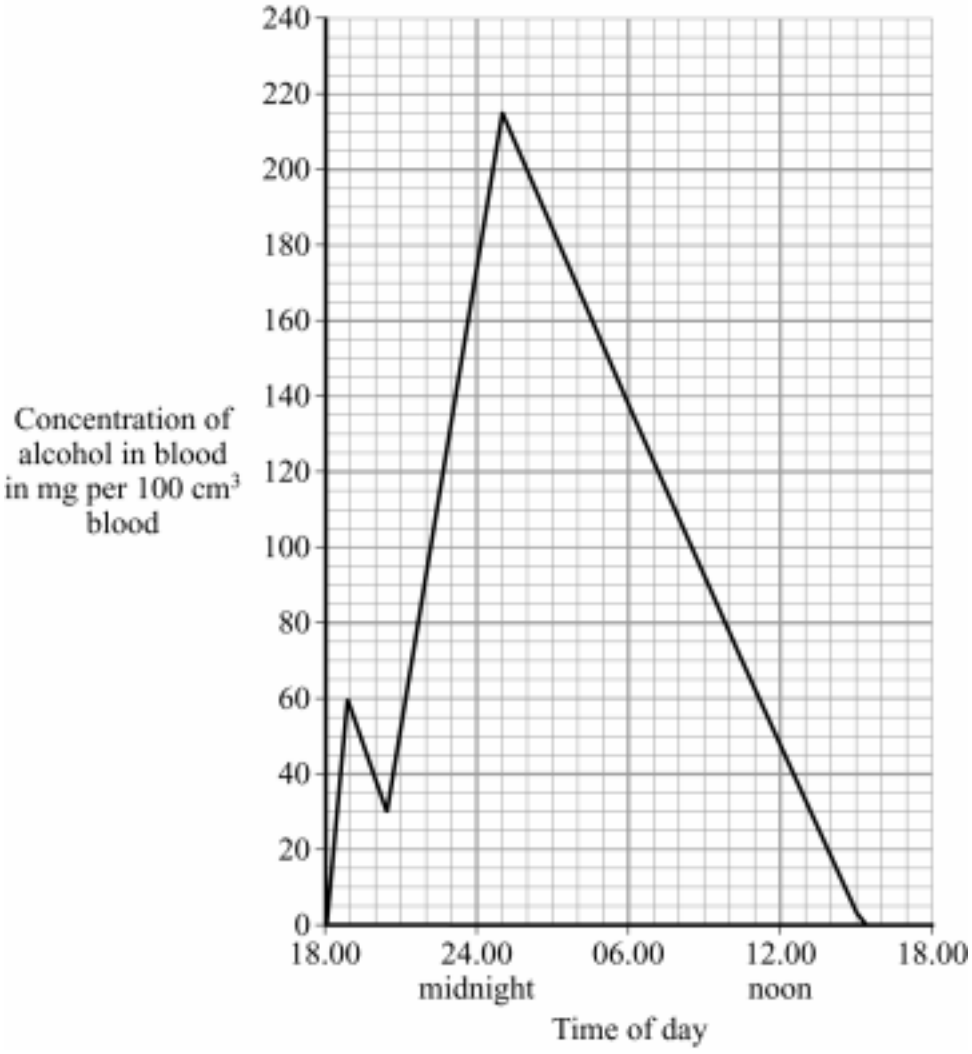
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION SEVEN

A man had some alcoholic drink at home.
Later he went out and had some more alcoholic drink.

The graph shows the concentration of alcohol in the man's blood over this period and the following few hours.



[12]

7.1 What was the highest concentration of alcohol in the man's blood?

A 205 mg per 100 cm^3

B 208 mg per 100 cm^3

C 215 mg per 100 cm^3

D 218 mg per 100 cm^3

7.2 The legal limit for driving in Britain is 80 mg alcohol per 100 cm^3 of blood.

During which of the following complete periods would it be illegal for the man to drive?

A 18.30 to 14.45

B 19.00 to 01.00

C 21.00 to 01.00

D 22.15 to 09.15

7.3 It is dangerous to drive a car after drinking alcohol because . . .

A alcohol causes psychological problems.

B alcohol is a drug.

C alcohol is addictive.

D alcohol slows reactions.

7.4 Which one of the following is most likely to be caused by drinking too much alcohol?

A Babies with low birth mass

B Heart disease

C Liver disease

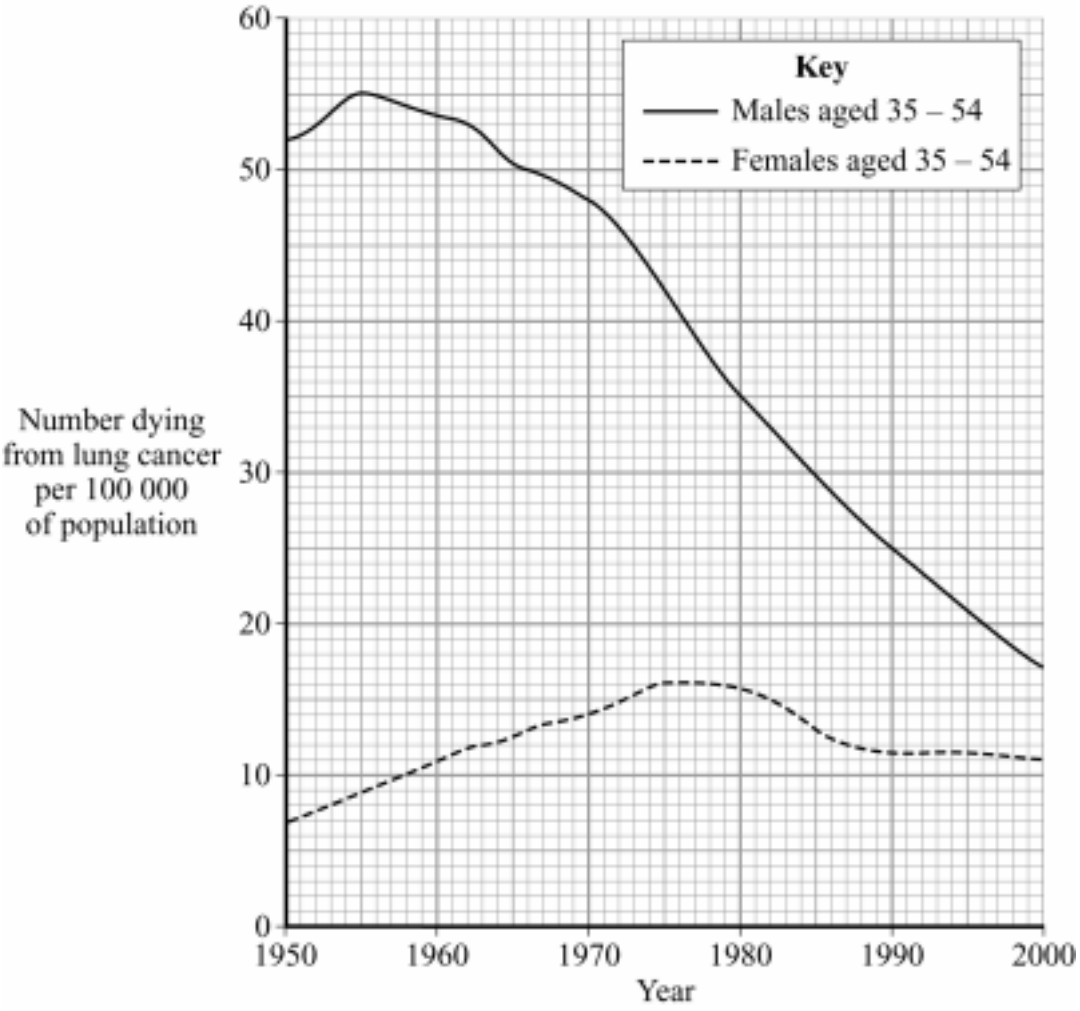
D Obesity

QUESTION EIGHT

Scientists study the effect of smoking on the number of people dying from lung cancer.

Graph 1 shows the number of people aged 35–54 who died from lung cancer in this country between 1950 and 2000.

Graph 1



[14]

8.1 How did the number of men, aged 35 – 54 who died from lung cancer, change between 1960 and 2000?

A It rose then fell.

B It rose to 11 per 100 000.

C It fell to 17.

D It fell by 37 per 100 000.

8.2 A town in this country had 500 000 inhabitants in 1955.

How many men aged 35–54 from that town are likely to have died from lung cancer in 1955?

A 45

B 55

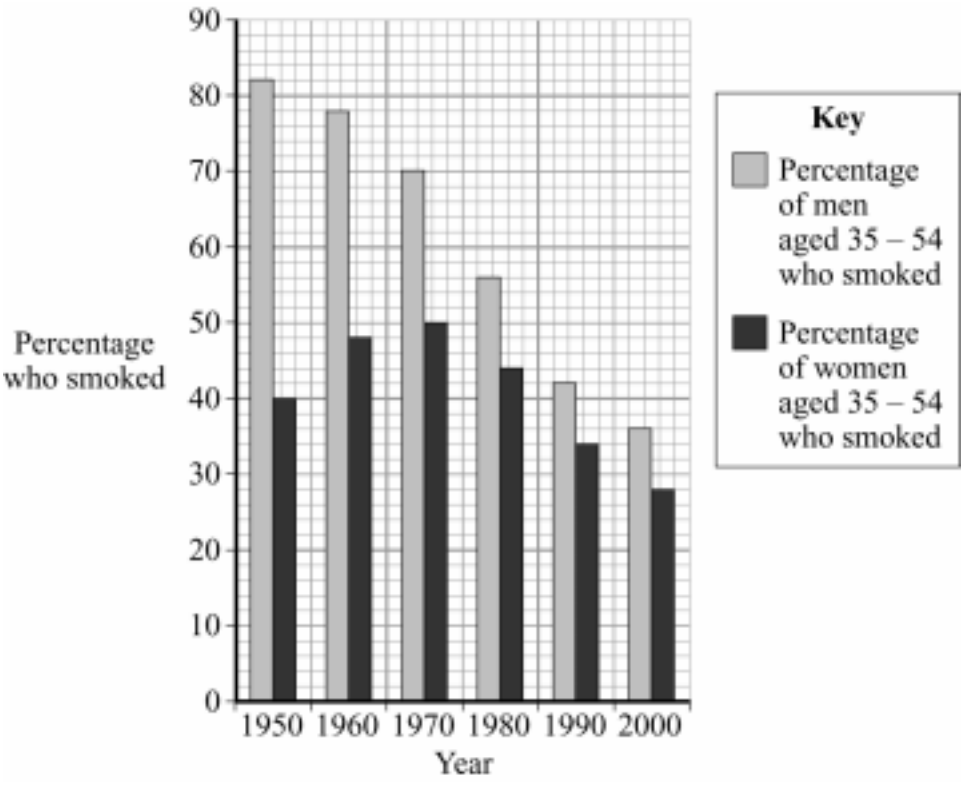
C 275

D 550

Question 8 continues on the next page

Graph 2 shows the percentage of the population who smoked between 1950 and 2000.

Graph 2



8.3 What conclusion can be drawn from the data in **Graphs 1** and **2**?

A Smoking causes lung cancer.

B The more cigarettes you smoke, the more likely you are to get lung cancer.

C The younger you start smoking, the more likely you are to get lung cancer.

D There is a correlation between the percentage of people who smoke and the number of deaths from lung cancer.

8.4 How was the data in **Graphs 1** and **2** most likely to have been collected?

A Scientists carried out telephone surveys.

B Scientists collated information from medical databases.

C Scientists did experiments.

D Scientists did internet searches.

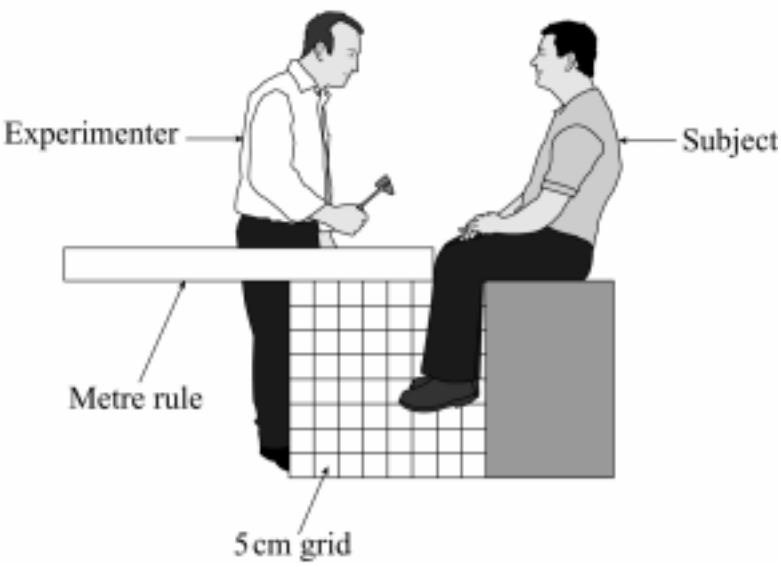
[16]

Turn over for the next question

QUESTION NINE

When the tendon below the knee is tapped with a hammer, the lower leg jerks upwards in a reflex action. A group of students wanted to find out how the speed of the hammer affected the distance the lower leg moved.

The diagram shows how the experiment was set up.



Each trial was recorded on a video. A frame was taken every 33 milliseconds. The video was then played using single-frame advance. The number of frames for the hammer to move to the knee was found. The faster the speed, the smaller was the number of frames. The video was also used to find the distance moved by the toe.

In each trial, the experimenter held the hammer 20 cm from the subject's knee then hit the subject's tendon. For each trial the experimenter used the hammer at a different speed.

The table shows some of the results.

Trial number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Distance hammer moved to knee (in cm)	20	20	20	20	20	20	20	20	20	20
Number of frames it took the hammer to move to the knee	15	16	12	10	9	8	7	6	2	2
Distance moved by toe (in cm)	0	0	5	5	10	10	10	10	15	15

[18]

9.1 What was the control variable in this experiment?

A The distance moved by the hammer

B The distance moved by the toe

C The number of frames

D The speed of the hammer

9.2 One advantage of using the video to record the results was that . . .

A it took less time to record the results.

B it was easier to work out an average.

C the distance moved by the hammer could be measured more accurately.

D the speed of the hammer could be measured more accurately.

9.3 Which is the best conclusion that can be drawn from the results?

A The faster the hammer moves, the further the foot moves.

B The distance the foot moves is related to the speed of the hammer.

C The speed at which the foot moves is directly proportional to the speed of the hammer.

D The slower the hammer moves, the further the foot moves.

9.4 The precision of the experiment could be improved by . . .

A using a 1 cm grid rather than a 5 cm grid.

B using a greater range of hammer speeds.

C using a stop watch instead of a video.

D using a tape measure rather than a metre rule.

END OF TEST

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** and **TWO**

In these questions match the letters with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

The parts of blood help to keep us healthy in different ways.

Table 1 shows the number of these parts in a healthy person.

Table 1

Part of blood	Number per mm^3 in healthy person
White blood cells	4000 to 11 000
Red blood cells	4.5 to 6.5 million
Platelets	150 000 to 350 000

Table 2 shows the blood test results for four people.

Table 2

Test	James	John	Michael	Paul
White blood cells	6500	1000	4100	30 000
Red blood cells	5.3 million	5.2 million	3.0 million	5.5 million
Platelets	70 000	210 000	200 000	180 000

[20]

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

A James

B John

C Michael

D Paul

The person with the least red blood cells is …**1**… .

The person whose blood would clot most slowly is …**2**… .

The person who would be most likely to catch an infection is …**3**… .

One of the symptoms of leukaemia is a large increase in the number of white blood cells.

The person most likely to be suffering from leukaemia is …**4**… .

QUESTION TWO

The table is about the effects of some conditions on the body.

Match words, **A**, **B**, **C**, and **D**, with the words **1 – 4** in the table.

A Being overweight

B High blood cholesterol

C High level of salt in the diet

D Lack of food

Substance	Effect on body
1	arthritis
2	disease of the blood vessels
3	high blood pressure
4	irregular periods

SECTION B

Questions **THREE** to **NINE**.

Each of these questions has four parts.

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

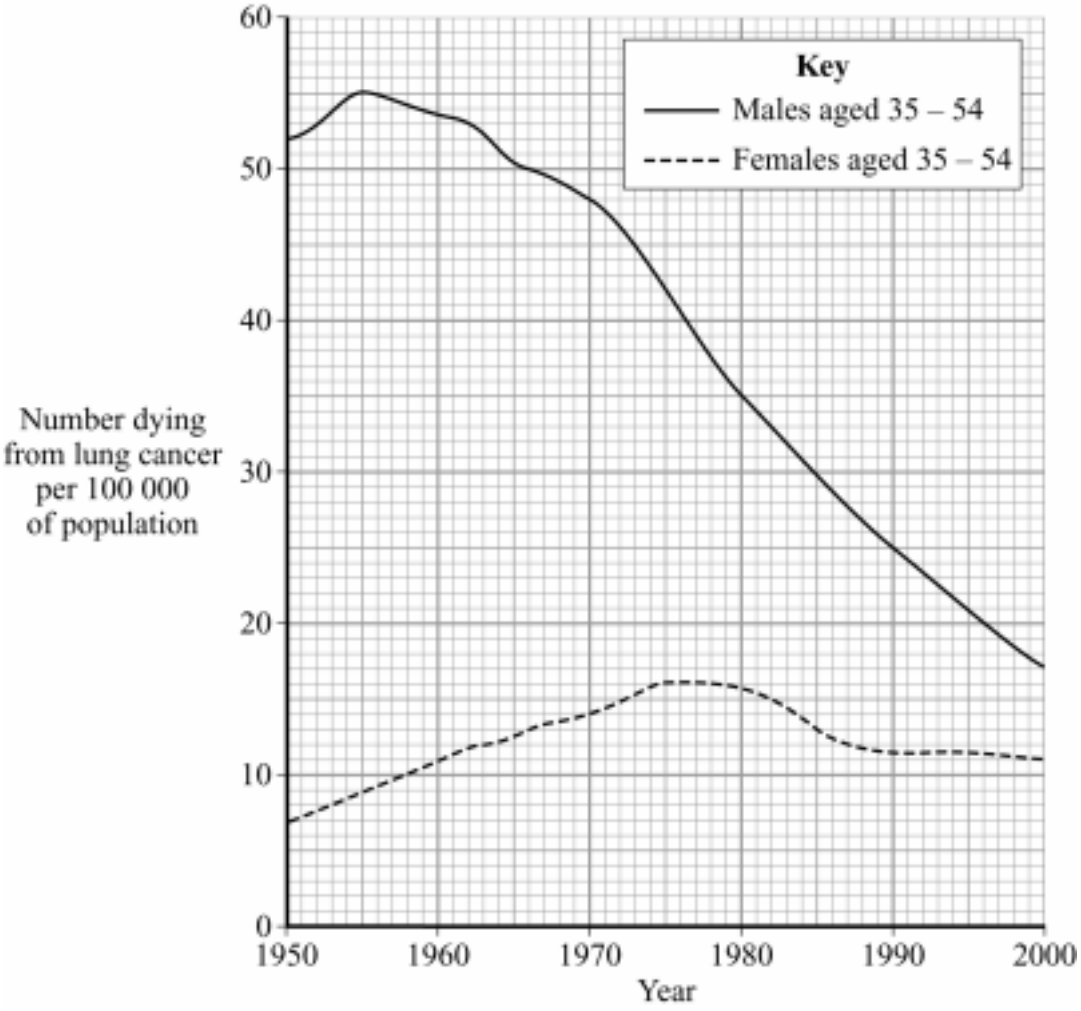
Mark your choices on the answer sheet.

QUESTION THREE

Scientists study the effect of smoking on the number of people dying from lung cancer.

Graph 1 shows the number of people aged 35–54 who died from lung cancer in this country between 1950 and 2000.

Graph 1



3.1 How did the number of men, aged 35–54 who died from lung cancer, change between 1960 and 2000?

A It rose then fell.

B It rose to 11 per 100 000.

C It fell to 17.

D It fell by 37 per 100 000.

3.2 A town in this country had 500 000 inhabitants in 1955.

How many men aged 35–54 from that town are likely to have died from lung cancer in 1955?

A 45

B 55

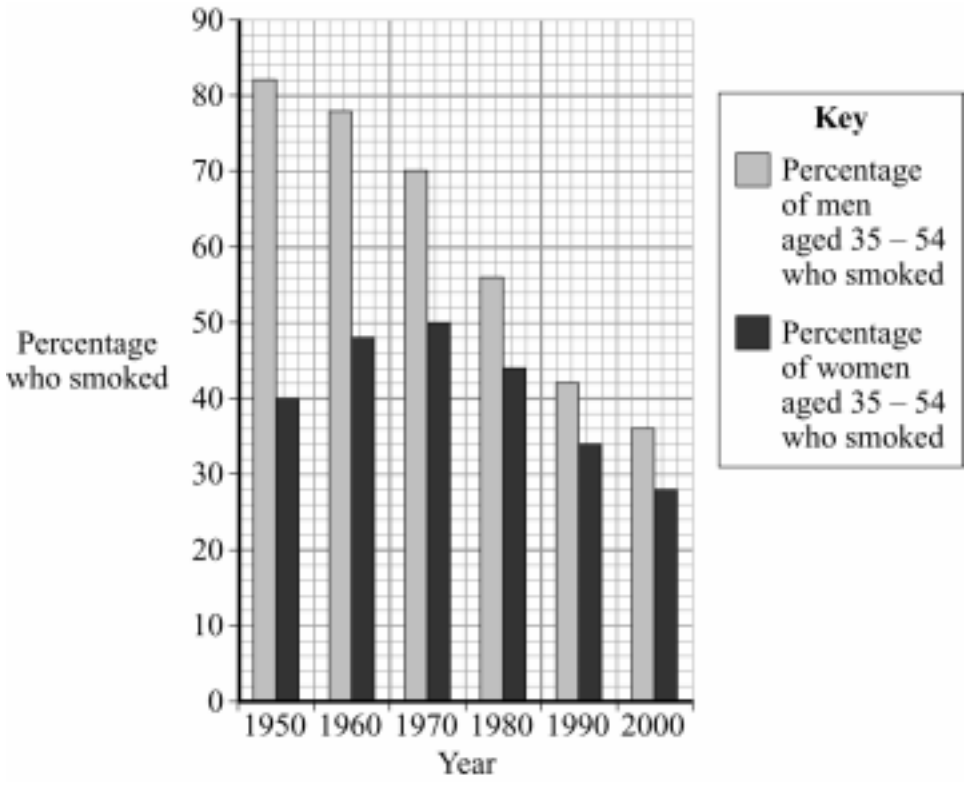
C 275

D 550

Question 3 continues on the next page

Graph 2 shows the percentage of the population who smoked between 1950 and 2000.

Graph 2



3.3 What conclusion can be drawn from the data in **Graphs 1** and **2**?

A Smoking causes lung cancer.

B The more cigarettes you smoke, the more likely you are to get lung cancer.

C The younger you start smoking, the more likely you are to get lung cancer.

D There is a correlation between the percentage of people who smoke and the number of deaths from lung cancer.

3.4 How was the data in **Graphs 1** and **2** collected?

A Scientists carried out telephone surveys.

B Scientists collated information from medical databases.

C Scientists did experiments.

D Scientists did internet searches.

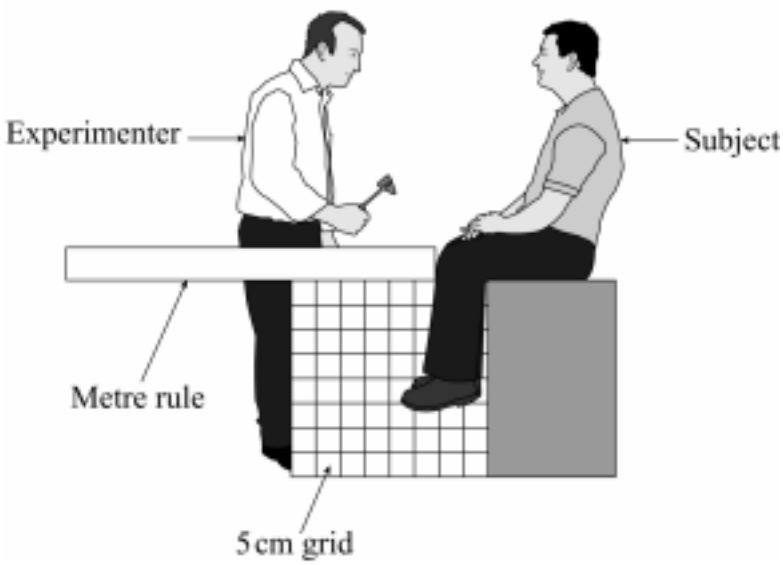
[24]

Turn over for the next question

QUESTION FOUR

When the tendon below the knee is tapped with a hammer, the lower leg jerks upwards in a reflex action. A group of students wanted to find out how the speed of the hammer affected the distance the lower leg moved.

The diagram shows how the experiment was set up.



Each trial was recorded on a video. A frame was taken every 33 milliseconds. The video was then played using single-frame advance. The number of frames for the hammer to move to the knee was found. The faster the speed, the smaller was the number of frames. The video was also used to find the distance moved by the toe.

In each trial, the experimenter held the hammer 20 cm from the subject's knee then hit the subject's tendon. For each trial the experimenter used the hammer at a different speed.

The table shows some of the results.

Trial number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Distance hammer moved to knee (in cm)	20	20	20	20	20	20	20	20	20	20
Number of frames it took the hammer to move to the knee	15	16	12	10	9	8	7	6	2	2
Distance moved by toe (in cm)	0	0	5	5	10	10	10	10	15	15

[26]

4.1 What was the control variable in this experiment?

A The distance moved by the hammer

B The distance moved by the toe

C The number of frames

D The speed of the hammer

4.2 One advantage of using the video to record the results was that . . .

A it took less time to record the results.

B it was easier to work out an average.

C the distance moved by the hammer could be measured more accurately.

D the speed of the hammer could be measured more accurately.

4.3 Which is the best conclusion that can be drawn from the results?

A The faster the hammer moves, the further the foot moves.

B The distance the foot moves is related to the speed of the hammer.

C The speed at which the foot moves is directly proportional to the speed of the hammer.

D The slower the hammer moves, the further the foot moves.

4.4 The precision of the experiment could be improved by . . .

A using a 1 cm grid rather than a 5 cm grid.

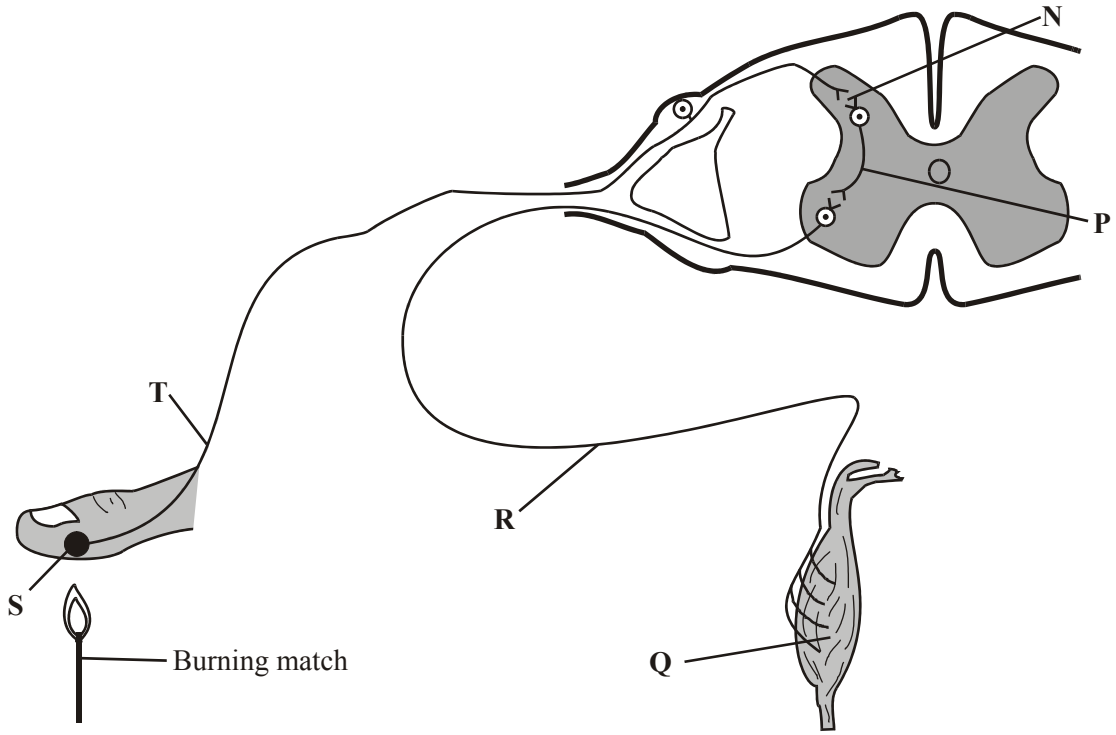
B using a greater range of hammer speeds.

C using a stop watch instead of a video.

D using a tape measure rather than a metre rule.

QUESTION FIVE

A person accidentally puts their hand close to a burning match. Their hand automatically moves away from the flame. The drawing shows the parts involved in this reflex action.



5.1 In this reflex action, the sensory neurone is found at . . .

A **P**

B **R**

C **S**

D **T**

5.2 In this reflex action, the relay neurone is found at . . .

A **P**

B **Q**

C **R**

D **T**

[28]

5.3 In this reflex action, a synapse is found at . . .

A **N**

B **P**

C **Q**

D **S**

5.4 Which of the following describes the path taken by an impulse in this reflex action?

A effector → motor neurone → relay neurone → sensory neurone

B receptor→ sensory neurone → relay neurone → motor neurone

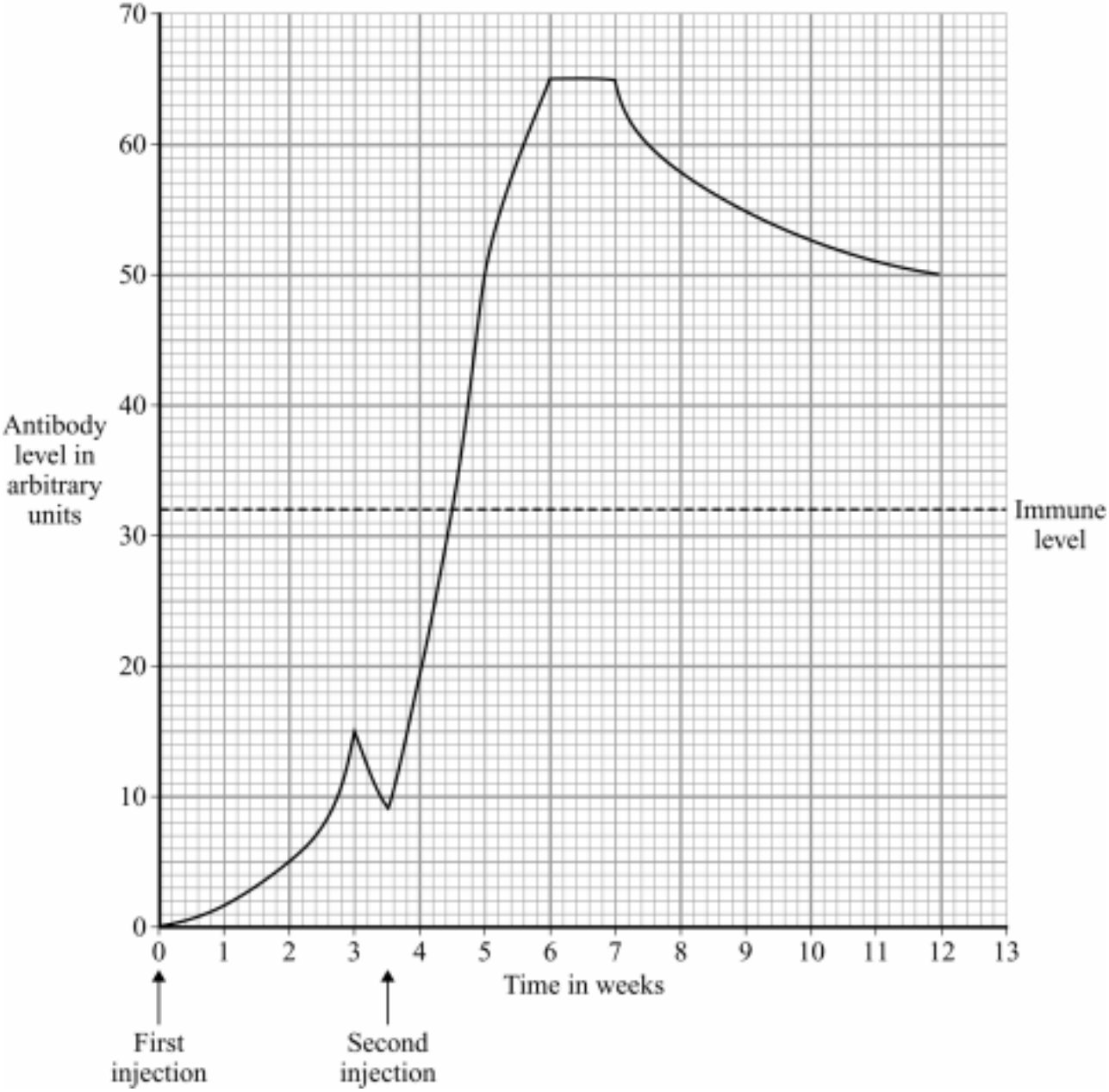
C sensory neurone → motor neurone → relay neurone → synapse

D synapse → effector → relay neurone → sensory neurone

Turn over for the next question

QUESTION SIX

The graph shows the level of antibodies in a person's blood after a first injection and then a second injection (booster dose) a few weeks later.



[30]

6.1 How long after the first injection did it take to reach the immune level?

A 1 week

B 3.5 weeks

C 4.5 weeks

D 6 weeks

6.2 By how many arbitrary units did the antibody level rise after the second injection?

A 15

B 17

C 56

D 65

6.3 We are immune to a virus after the second injection because . . .

A the number of antitoxins stays at a high level.

B the number of antibodies in the body stays at a high level.

C the virus is poisoned.

D the white cells can rapidly produce antibodies if the virus enters the body.

6.4 Antibiotics cannot be used against viruses because . . .

A viruses are too small.

B viruses can mutate.

C viruses live inside living cells.

D viruses produce toxins.

QUESTION SEVEN

Thalidomide is a controversial drug.

7.1 Thalidomide was developed as . . .

A a contraceptive pill.

B a sleeping pill.

C a slimming pill.

D an antibiotic.

7.2 Thalidomide had not been tested for use by . . .

A children.

B heart patients.

C obese people.

D pregnant women.

7.3 Thalidomide caused . . .

A breathing difficulties.

B cancer.

C deformed limbs in some babies.

D heart attacks.

7.4 It has now been fully tested for use in treating . . .

A high blood pressure.

B infertility.

C leprosy.

D obesity.

Turn over for the next question

QUESTION EIGHT

The level of cholesterol in the blood is influenced by the amount and type of fat in the diet.

8.1 Blood cholesterol levels may be reduced by eating . . .

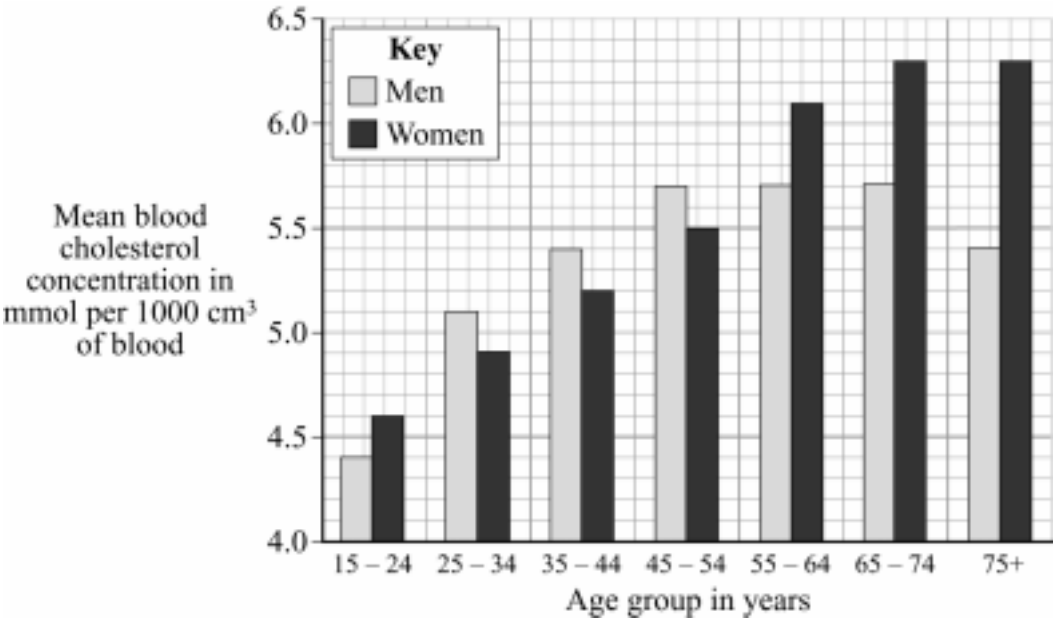
A low density lipoprotein.

B polyunsaturated fat.

C salt.

D saturated fat.

The graph shows the mean blood cholesterol concentrations of men and women in different age groups.



8.2 This data was obtained by measuring the blood cholesterol concentrations of large numbers of people. Why were a large number of people used?

A To calculate a mean

B To find the highest cholesterol level

C To get more reliable data

D To make it a fair test

8.3 From this data, which group of people has the highest risk of developing heart disease?

A Men aged 45 years and over

B Men aged 75 years

C Women aged 65 years and over

D Women aged 75 years

8.4 An ancient Indian natural medicine called Gum Guggal is said by its manufacturer to reduce blood cholesterol concentration. The manufacturer wants to market Gum Guggal in the UK.

What must happen before the Gum Guggal is allowed to be advertised for sale as a cholesterol-reducing drug in the UK?

A It must be tested for its cholesterol level.

B It must be tested for its purity.

C It must be trialled on animals.

D It must be trialled on human volunteers.

Turn over for the next question

QUESTION NINE

The menstrual cycle is controlled by hormones.

9.1 Which hormone stimulates the wall of the uterus to increase in thickness?

A FSH

B LH

C Nicotine

D Oestrogen

9.2 Which hormone stimulates egg release?

A FSH

B LH

C Nicotine

D Oestrogen

9.3 Which organ produces FSH?

A Brain

B Ovary

C Pituitary gland

D Womb

9.4 Oestrogen can be used in contraceptive pills because . . .

A it inhibits FSH production.

B it inhibits LH production.

C it stimulates FSH production.

D it stimulates LH production.

END OF TEST

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT BIOLOGY 1a - FOUNDATION TIER

Question No.	KEY
One	1 – C 2 – A 3 – B 4 – D
Two	1 – D 2 – C 3 – B 4 – A
Three	1 – D 2 – A 3 – B 4 – C
Four	1 – B 2 – C 3 – D 4 – A
Five	1 – B 2 – A 3 – D 4 – C
Six	1 – C 2 – A 3 – B 4 – D
Seven	7.1 – C, 7.2 – D, 7.3 – D, 7.4 – C
Eight	8.1 – D, 8.2 – C, 8.3 – D, 8.4 – B
Nine	9.1 – A, 9.2 – D, 9.3 – B, 9.4 – A
	Overall marks = 36

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT BIOLOGY 1a - HIGHER TIER

Question No.	KEY
One	1 – C 2 – A 3 – B 4 – D
Two	1 – A 2 – B 3 – C 4 – D
Three	3.1 – D, 3.2 – C, 3.3 – D, 3.4 – B
Four	4.1 – A, 4.2 – D , 4.3 – B, 4.4 – A
Five	5.1 – C, 5.2 – A, 5.3 – A, 5.4 – B
Six	6.1 – C, 6.2 – C, 6.3 – D, 6.4 – C
Seven	7.1 – B, 7.2 – D, 7.3 – C, 7.4 – C
Eight	8.1 – B, 8.2 – C, 8.3 – C, 8.4 – D
Nine	9.1 – D, 9.2 – B, 9.3 – C, 9.4 – A
	Overall marks = 36

Surname		Other Names	
Centre Number						Candidate Number				
Candidate signature										

General Certificate of Secondary Education
Specimen Paper

SCIENCE A
Evolution and Environment (Biology 1b)

Date and Time

For this paper you must have:
- a black ball-point pen
- an objective test answer sheet

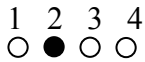
You may use a calculator.

Time allowed: 30 minutes

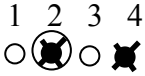
Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Evolution and Environment' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown: 

- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown: 

- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown: 

Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **SIX**.

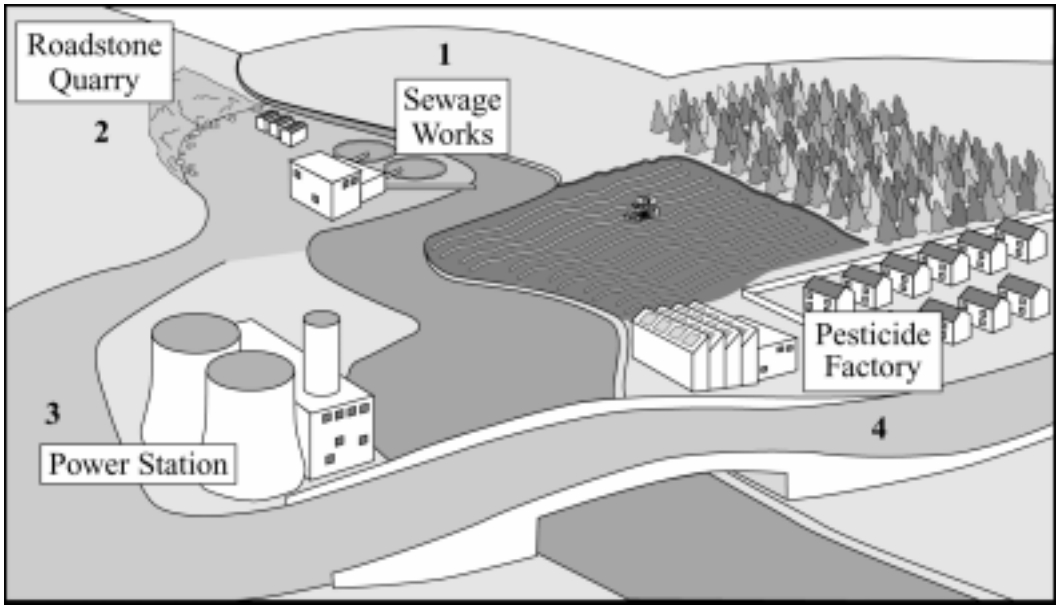
In these questions match the letters with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

The drawing shows some of the ways in which humans affect the environment.



Match statements, **A**, **B**, **C** and **D**, with the parts of the drawings **1 – 4**.

A Every year, this place destroys more homes of animals and plants.

B This place causes most water pollution.

C This place produces chemicals that pollute soil.

D This place produces most carbon dioxide.

[40]

QUESTION TWO

These young rabbits look like their parents.

This is because information about characteristics such as fur colour is passed from parents to their young.

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

A Chromosomes

B Genes

C Nucleus

D Sex

Information is passed from parents to their young in …**1**… cells.

Each characteristic, eg fur colour, is controlled by …**2**… .

The structures which carry information for a large number of characteristics are called …**3**… .

The part of the cell which contains these structures is called the …**4**… .

QUESTION THREE

Some substances affect the environment.

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

A Carbon dioxide

B Fertiliser

C Methane

D Sulfur dioxide

The main substance that produces acid rain is …**1**… .

The main substance given off by cars is …**2**… .

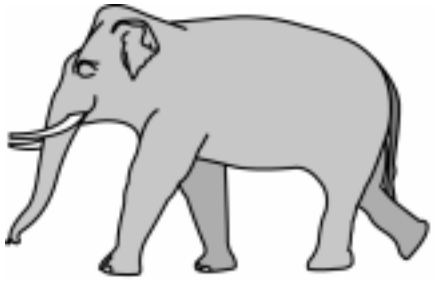
The substance produced mainly by cattle and rice fields is …**3**… .

The substance that may pollute both land and water is …**4**… .

QUESTION FOUR

Animals are adapted to survive in their environments.

The drawings show four animals.



African elephant

Arctic hare

Musk ox

Walrus

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

A A large amount of body fat

B Camouflage

C Increased surface area

D Thick fur

A white coat in the Arctic hare acts as …**1**… .

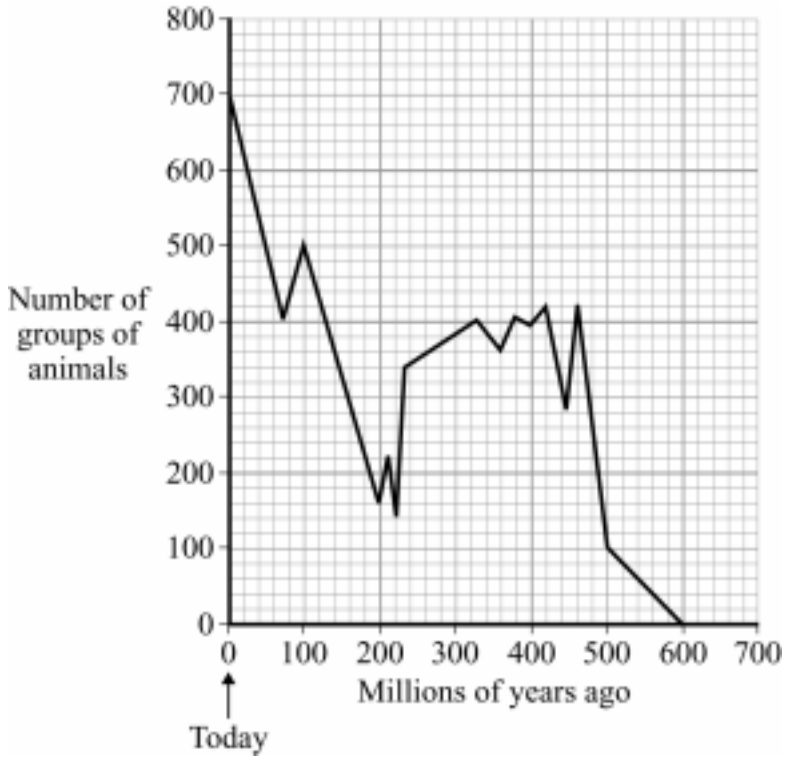
The large ears of an African elephant give it an …**2**… .

The musk ox is insulated by …**3**… .

The walrus is insulated by …**4**… .

QUESTION FIVE

The diagram shows how the number of groups of animals has changed during the history of life on Earth.



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

A 20

B 400

C 500

D 600

Animals first appeared on Earth …**1**… million years ago.

400 million years ago there were …**2**… groups of animals.

It took …**3**… million years for the number of animals to rise to 500.

The proportion of animals that became extinct between 100 and 80 million years ago was …**4**… .

QUESTION SIX

We can now produce animals and plants with characteristics that we prefer.

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

A Splitting apart cells

B Taking cuttings

C Transferring genes

D Using small groups of cells

Plants can be produced cheaply by …**1**… from an older plant.

Tissues culture involves …**2**… from part of an organism.

Genetic engineering involves …**3**… from one organism to another.

Embryo transplantation involves …**4**… from an organism before they specialise.

Turn over for the next question

SECTION B

Questions **SEVEN** to **NINE**.

Each of these questions has four parts.

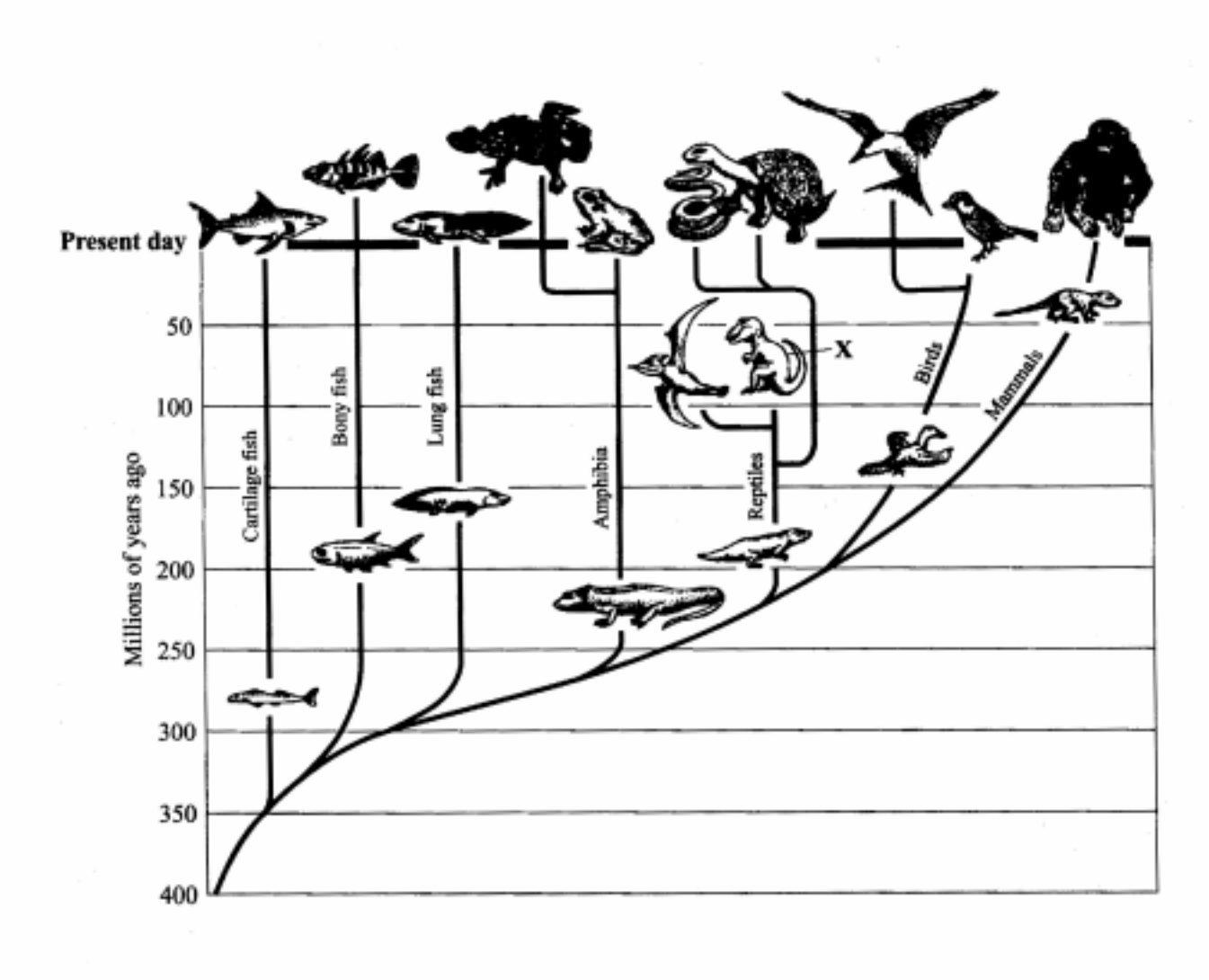
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION SEVEN

The diagram shows a timeline for the evolution of some groups of animals.

All the groups shown below the line for **Present Day** are extinct.



[46]

7.1 Which four groups of animals developed legs?

A Amphibians, reptiles, birds and mammals

B Bony fish, lung fish, amphibians and reptiles

C Cartilaginous fish, bony fish, lung fish and amphibians

D Lung fish, amphibians, reptiles and birds

7.2 Which group of animals, shown in the diagram, evolved first?

A Amphibians

B Bony fish

C Cartilaginous fish

D Lung fish

7.3 The animal, labelled **X**, has been extinct for over 50 million years. How do scientists know that it once lived?

A From blood samples

B From DNA samples

C From fossils

D From stories passed down through generations

7.4 Animals may become extinct because of new . . .

A diseases.

B enzymes.

C hormones.

D rocks.

QUESTION EIGHT

Lichens are simple plants that are easily damaged by air pollution.

The table show how many different species of lichen were recorded at set distances from a city centre.

Distance from city centre in km	Number of species of lichen found in a given area
0	4
2	7
3	10
5	20
6	25
7	40

8.1 The least polluted air is found . . .

A in the city centre.

B 2 km from the city centre.

C 5 km from the city centre.

D 7 km from the city centre.

8.2 What is the relationship, if any, between the number of lichen species and distance from the city centre?

A The number of lichen species is directly proportional to the distance from the city centre.

B The number of lichen species is inversely proportional to the distance from the city centre.

C The number of lichen species is **not** related to the distance from the city centre.

D The number of lichen species is related to the distance from the city centre.

Lichens are also indicators of the age of a forest. The more species of lichen present, the older the forest.

8.3 What would be the best way of collecting data on lichens to compare the ages of two very large forests?

A Examine every tree in the two forests.

B Examine 10 trees from each forest.

C Examine the oldest trees in each forest.

D Examine the trees in one square kilometre of each forest.

8.4 Which computer application would be best for storing results from a survey of lichen in a large number of different forests?

A Communications package

B Database

C Graphics package

D Word processor

.

Turn over for the next question

QUESTION NINE

Professor John Lawton researches into the problem of controlling the spread of bracken. He is waiting for government permission to release the *Conservular* caterpillar which feeds on the bracken. The Secretary of State has to decide whether the *Conservular* caterpillar can be released.

The article printed below describes some of the problems faced by the Secretary of State.

David the caterpillar to bracken's Goliath

Bracken is one of the most widespread and dangerous weeds known to man. Professor Lawton is researching a new method of controlling bracken with *Conservular* caterpillars which could have done the job for nothing.

His research has shown that bracken is the caterpillar's only food. However, can scientists predict what will happen when insects are released into the wild?

Bracken is poisonous – more than 20 000 sheep and 1000 cattle are poisoned by it each year. Its spores can cause hill walkers to develop cancer. Bracken cost £4 m a year to control. It destroys grazing land worth £5 m each year.

The National Farmers Union is concerned about the caterpillar getting out of control. What if it started eating potatoes? However, the caterpillar might help to preserve important habitats for rare animals and plants.

World-wide, scientists are trying to control 94 species of weeds by using insects. Professor Lawson says that there is good control in approximately one-third of these cases.

9.1 A student performs an experiment to find whether caterpillars prefer eating garden ferns to bracken.

What would be the independent variable in this experiment?

A The amount of plant eaten

B The number of caterpillars

C The number of plants

D The types of plant

[50]

9.2 How could the validity of the experiment be improved?

A By increasing the number of caterpillars and the number of plants

B By increasing the number of plants of each type

C By increasing the number of types of caterpillar

D By increasing the number of types of plant

9.3 The Secretary of State might decide **not** to allow the caterpillar to be released. One reason for this could be that . . .

A it would cost too much money.

B it would upset the National Farmers Union.

C it would upset the Ramblers Association.

D there is insufficient scientific evidence about the effects of releasing the caterpillar.

9.4 What will be the effect on hill farms if the Secretary of State decides that the caterpillar should **not** be released?

A Hill farms will become less profitable.

B More ramblers will use the countryside.

C Some hill farms will be turned into forests.

D There will be more grazing land for sheep on hill farms.

END OF TEST

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Foundation Tier starts earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** to **TWO**.

In these questions match the letters with the numbers.

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

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

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Plants can be produced cheaply by …**1**… from an older plant.

Tissue culture involves …**2**… from part of an organism.

Genetic engineering involves …**3**… from one organism to another.

Embryo transplantation involves …**4**… from an organism before they specialise.

QUESTION TWO

The Earth's climate is affected by several factors.

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

A Carbon dioxide

B Energy

C Methane

D Temperature

Deforestation increases the amount of …**1**… in the air.

Growing rice crops increases the amount of …**2**… in the air.

Some gases absorb …**3**… radiated by the Earth.

This causes the Earth's …**4**… to increase.

Turn over for the next question

SECTION B

Questions **THREE** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION THREE

Lichens are simple plants that are easily damaged by air pollution.

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Distance from city centre in km	Number of species of lichen found in a given area
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Turn over for the next question

QUESTION FOUR

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B More ramblers will use the countryside.

C Some hill farms will be turned into forests.

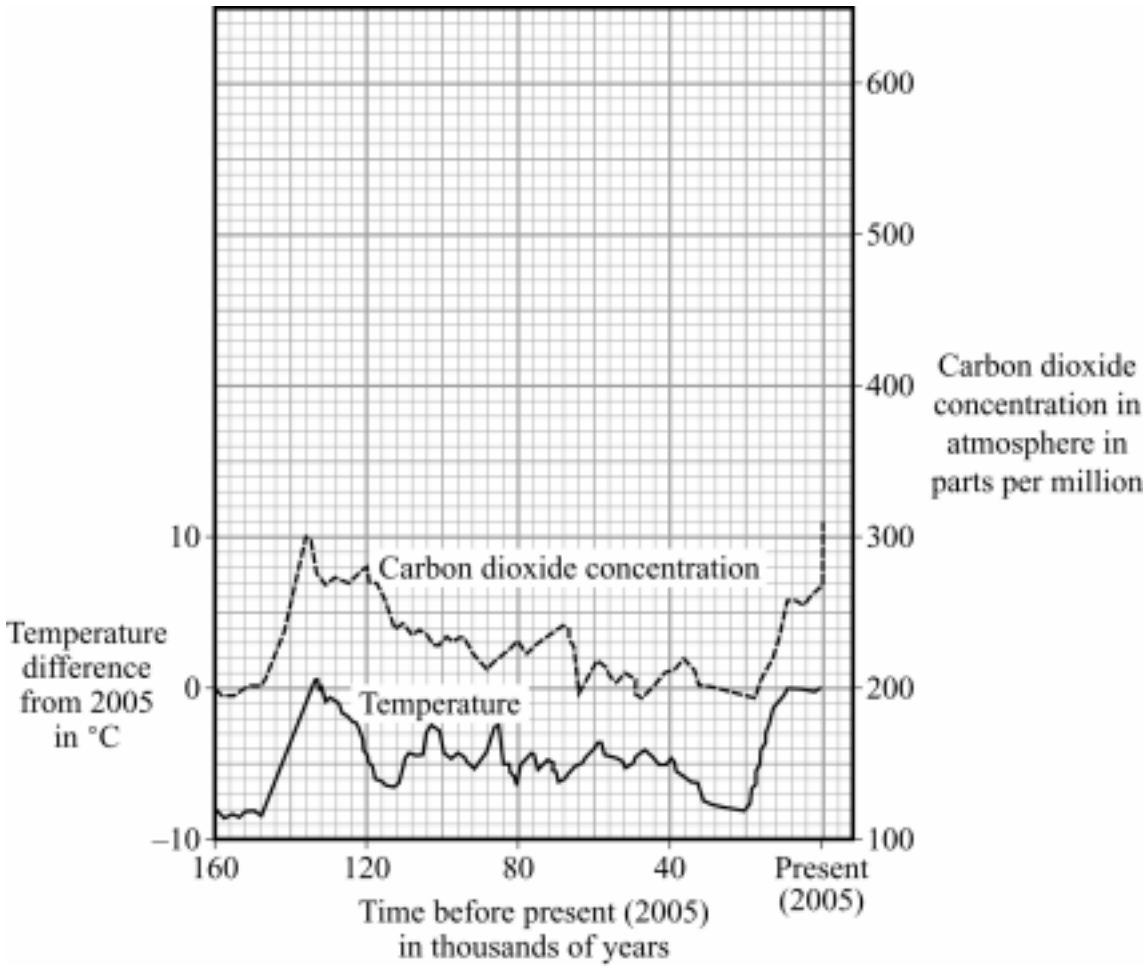
D There will be more grazing land for sheep on hill farms.

Turn over for the next question

QUESTION FIVE

Scientists have analysed air bubbles trapped in ice in Antarctica.

The graph shows some of the data they have collected.



5.1 What was the carbon dioxide concentration 120 thousand years ago?

A 200 parts per million

B 220 parts per million

C 280 parts per million

D 300 parts per million

[58]

5.2 The mean temperature in Antarctica today is – 2 °C. What was the mean temperature in Antarctica 160 thousand years ago?

A 0 °C

B – 1 °C

C – 8 °C

D – 10 °C

5.3 Over the last 160 thousand years, the concentration of carbon dioxide in the atmosphere has . . .

A fallen steadily.

B fluctuated, but shown an overall decrease.

C fluctuated, but shown an overall increase.

D risen steadily.

5.4 The data . . .

A proves that carbon dioxide causes the greenhouse effect.

. **B** shows an exact correlation between carbon dioxide concentration and the air temperature.

C shows partial correlation between carbon dioxide concentration and the air temperature.

D shows that air temperature depends on carbon dioxide concentration.

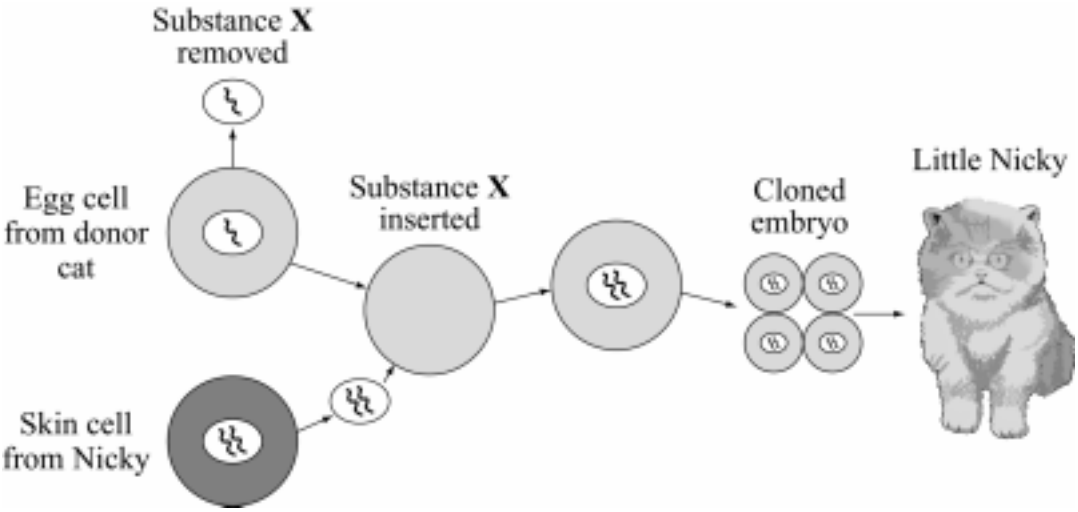
Turn over for the next question

QUESTION SIX

Read the passage below about cloning.

> The first cloned-to-order pet sold in the United States is named Little Nicky, a 9-week-old kitten delivered to a Texas woman saddened by the loss of a cat she had owned for 17 years. The kitten cost its owner $50,000 and was created from substance **X** from her beloved cat, named Nicky, who died last year.
>
> "He is identical. His personality is the same," the owner, Julie, told The Associated Press in a telephone interview. She asked that her last name and home town not be disclosed because she said she fears being targeted by groups opposed to cloning.

The diagram shows how Nicky was cloned.



6.1 Substance **X** is . . .

A carbohydrate.

B DNA.

C fat.

D protein.

[60]

6.2 This technique involves . . .

A asexual reproduction.

B fertilisation.

C mutations.

D sexual reproduction.

6.3 Nicky and little Nicky are identical because they have the same . . .

A cells.

B enzymes.

C genes.

D personality.

6.4 On which grounds are people most likely to object to this technique?

A Economic

B Ethical

C Scientific

D Social

Turn over for the next question

QUESTION SEVEN

Most scientists accept the theory of evolution.

7.1 The theory of evolution states that all living things alive today have evolved from . . .

A chemicals.

B dead organisms.

C meteorites.

D simple life forms.

7.2 Scientists are uncertain about how life began on Earth because . . .

A humans were one of the most recent species to evolve.

B living things first appeared a long time ago.

C the evidence has been destroyed.

D there are religious arguments about it.

7.3 The most likely reason for the extinction of all the dinosaurs is that . . .

A conditions on Earth changed.

B there were too many of them.

C they caught a disease.

D they had too many predators.

7.4 New forms of genes arise by . . .

A asexual reproduction.

B changes to cells.

C mutation.

D sexual reproduction.

There are no questions printed on this page

QUESTION EIGHT

Coastal marshes can provide grazing for cattle and sheep. They also support huge numbers of birds and a wide range of water, plant and animal communities. Some of these communities include nationally rare species.

There has been a dramatic reduction in the extent of the grazing marshes in the estuary of the River Thames in recent years. These grazing marshes are downstream from the capital city, London. The table shows what some of the grazing marshes have been converted into.

Converted to	**Mean Annual Rate of Conversion to Other Land Uses (Hectares/Year)**			
	1935–68	**1968–72**	**1972–81**	**1981–89**
Arable (crop-growing)	49	188	90	102
Formal open spaces (parks)	11	30	12	27
Open water	9	9	7	4
Roads and buildings	83	186	142	45
Woodland	3	1	3	2

8.1 How many hectares of marshes were converted into roads and buildings between the years 1968 and 1972?

A 142

B 186

C 744

D 930

8.2 What was the percentage change in the mean annual rate of conversion of marshes to formal open spaces (parks), from the period 1972–81 to the period 1981–89?

A 15.0

B 44.4

C 55.5

D 125.0

8.3 What is the most likely effect on the environment of converting marshes to crop growing?

A More air pollution

B More land pollution

C More water pollution

D More land and water pollution

8.4 What is the most likely effect on plant life of converting marshes to crop growing?

A There are likely to be more plants.

B There are likely to be fewer plants.

C There are likely to be more plant species.

D There are likely to be fewer plant species.

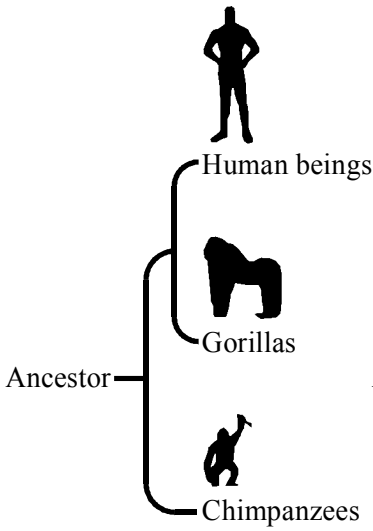
Turn over for the next question

QUESTION NINE

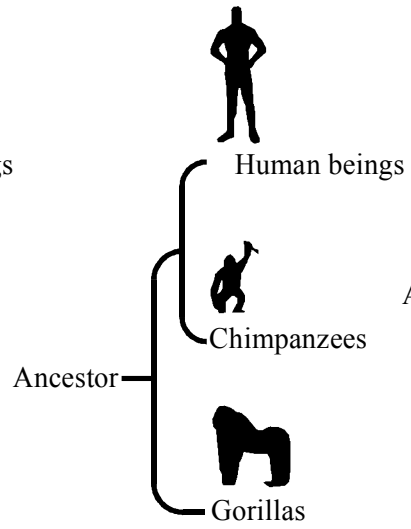
Biologists believe that human beings, gorillas and chimpanzees share a common ancestor. They do not agree as to how this common ancestor evolved into these three species.

The diagram shows three models representing the evolutionary relationship between the three species and the ancestor.

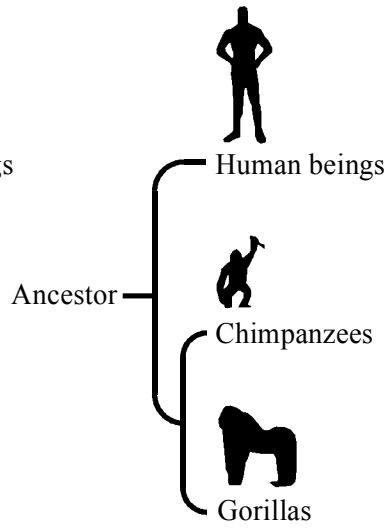
Relationship 1
Human beings and gorillas closely related



Relationship 2
Human beings and chimpanzees closely related



Relationship 3
Chimpanzees and gorillas closely related



The table summarises some of the available evidence concerning the relationship between the three species.

Characteristic	Gorillas	Humans	Chimpanzees	Relationship indicated (if any)
Bones/teeth	Legs shorter than arms	Arms shorter than legs	Legs shorter than arms	**3**
	Large canine teeth	Small canine teeth	Large canine teeth	**2**
	Short thumbs	Long thumbs	Short thumbs	**W**
Soft parts of body	Short head hair	Long head hair	Short head hair	**3**
	Thin buttocks	Fat buttocks	Thin buttocks	**3**
Chromosomes	Total number = **X**	Total number = 46	Total number = 48	**3**
	Structure of chromosomes 5 and 12 differs from other primates	Structure of chromosomes 5 and 12 like other primates	Structure of chromosomes 5 and 12 = **Y**	**3**
	Fluorescence of chromosome Y same as humans	Fluorescence of chromosome Y same as gorilla	Fluorescence of chromosome Y same as other primates	**1**
Molecules	Slight difference from human haemoglobin		Identical to human haemoglobin	**Z**

9.1 What relationship, (**W**), if any, is indicated by thumb length?

A Relationship **1**

B Relationship **2**

C Relationship **3**

D No relationship

9.2 What relationship, (**Z**), if any, is indicated by haemoglobin?

A Relationship **1**

B Relationship **2**

C Relationship **3**

D No relationship

9.3 How many chromosomes, (**X**), does a gorilla have?

A 23

B 46

C 48

D 50

9.4 What is the most likely appearance of chromosomes 5 and 12 in the chimpanzee (**Y**)?

A Identical with human

B Identical with gorilla

C Different from human

D Different from gorilla

END OF TEST

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT BIOLOGY 1b - FOUNDATION TIER

Question No.	KEY
One	1 – B 2 – A 3 – D 4 – C
Two	1 – D 2 – B 3 – A 4 – C
Three	1 – D 2 – A 3 – C 4 – B
Four	1 – B 2 – C 3 – D 4 – A
Five	1 – D 2 – B 3 – C 4 – A
Six	1 – B 2 – D 3 – C 4 – A
Seven	7.1 – A, 7.2 – C, 7.3 – C, 7.4 – A
Eight	8.1 – D, 8.2 – D, 8.3 – D, 8.4 – B
Nine	9.1 – D, 9.2 – A, 9.3 – D, 9.4 – A
	Overall marks = 36

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT BIOLOGY 1b - HIGHER TIER

Question No.	KEY
One	1 – B 2 – D 3 – C 4 – A
Two	1 – A 2 – C 3 – B 4 – D
Three	3.1 – D, 3.2 – D, 3.3 – D, 3.4 – B
Four	4.1 – D, 4.2 – A, 4.3 – D, 4.4 – A
Five	5.1 – C, 5.2 – D, 5.3 – C, 5.4 – C
Six	6.1 – B, 6.2 – A, 6.3 – C, 6.4 – B
Seven	7.1 – D, 7.2 – C, 7.3 – A, 7.4 – C
Eight	8.1 – B, 8.2 – D, 8.3 – D, 8.4 – D
Nine	9.1 – C, 9.2 – B, 9.3 – C, 9.4 – B
	Overall marks = 36

Surname		Other Names	
Centre Number						Candidate Number				
Candidate signature										

General Certificate of Secondary Education
Specimen Paper

SCIENCE A
Products from Rocks (Unit Chemistry 1a)

Date and Time

For this paper you must have:
- a black ball-point pen
- an objective test answer sheet

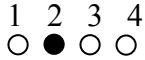
You may use a calculator.

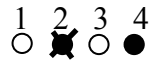
Time allowed: 30 minutes

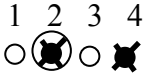
Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Products from Rocks' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown: 

- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown: 

- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown: 

Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **SIX**.

In these questions match the letters with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

The table is about raw materials and substances made from them.

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

A Concrete

B Glass

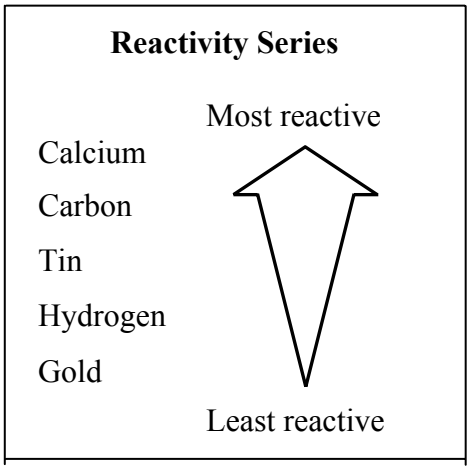
C Limestone

D Slaked Lime

Substance	What we can say about the substance
1	It is made by heating together limestone, sand and soda
2	It is made from cement and used as a building material
3	It is made from quicklime and used to reduce the acidity of soils
4	It is quarried rock used as building material

QUESTION TWO

The diagram shows the reactivity of some elements.



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

A Calcium

B Carbon

C Gold

D Tin

1	A metal that can be extracted from its ore by carbon but not by hydrogen
2	A metal that cannot be extracted from its ore by using carbon
3	A solid non-metal
4	It may be found in the ground as the metal itself

Turn over for the next question

QUESTION THREE

The flow chart shows some of the substances that can be made from limestone.

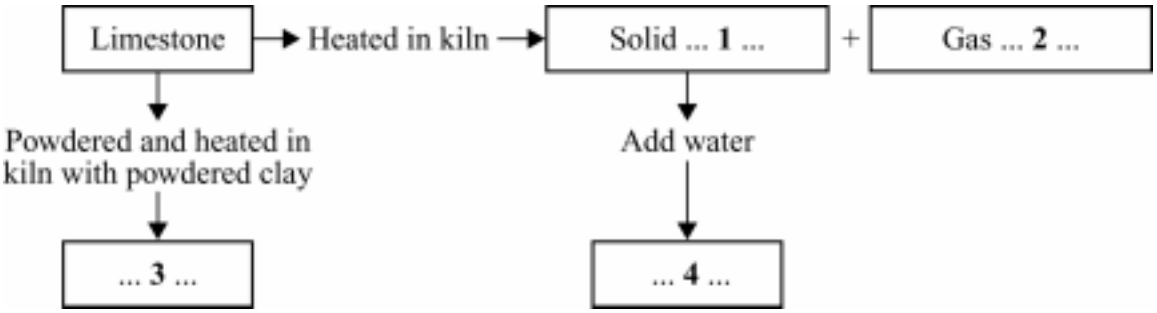
Match words, **A**, **B**, **C** and **D**, with the spaces **1 – 4** in the flow chart.

A Calcium Hydroxide

B Calcium Oxide

C Carbon Dioxide

D Cement



QUESTION FOUR

Atoms join to other atoms to form molecules.

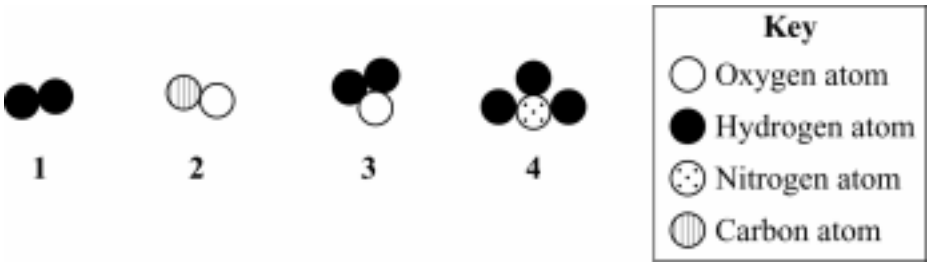
Match formulae, **A**, **B**, **C** and **D**, with the diagrams **1 – 4**.

A CO

B H_2

C H_2O

D NH_3



Turn over for the next question

QUESTION FIVE

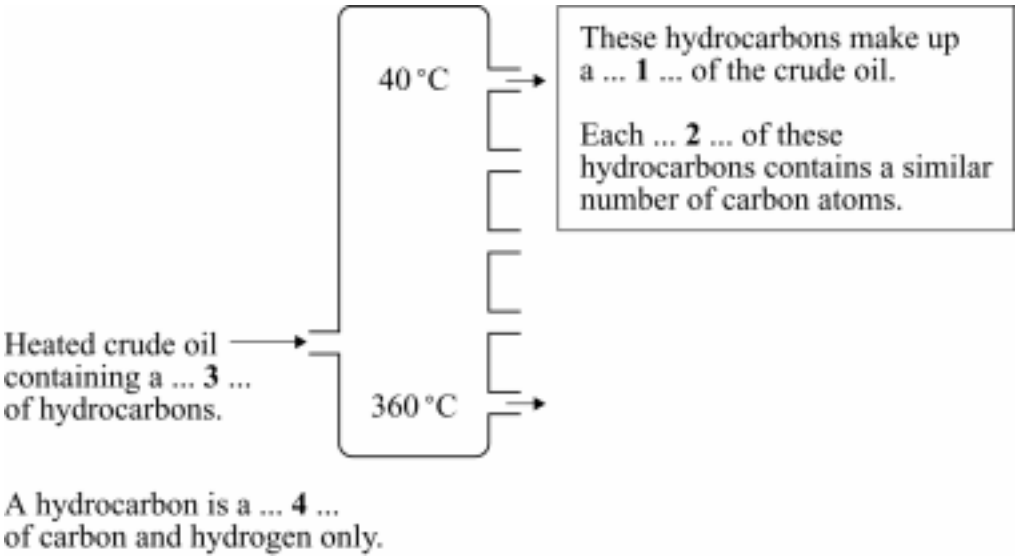
We can get useful products from crude oil.
Match words, **A**, **B**, **C** and **D**, with the labels **1 – 4** on the diagram.

A Compound

B Fraction

C Mixture

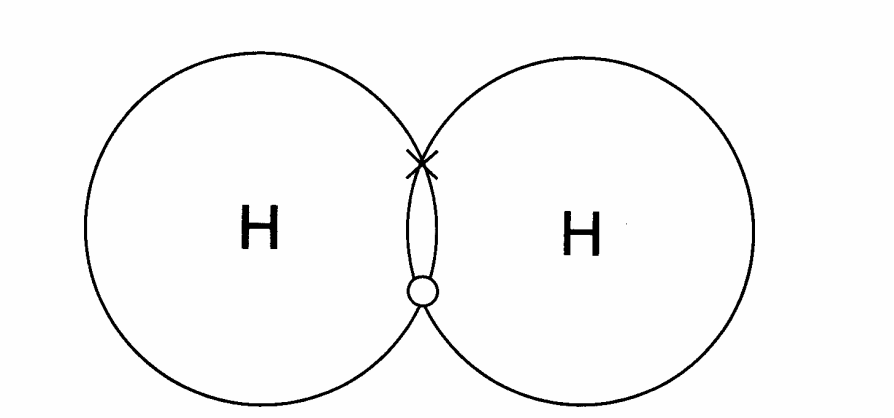
D Molecule



[76]

QUESTION SIX

The diagram shows a molecule of hydrogen.



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

A Bond

B Electron

C Molecule

D Nucleus

Each hydrogen atom has a small, central … **1** … .

The two hydrogen atoms each share an … **2** … .

This sharing forms a chemical … **3** … between the two atoms.

The two joined atoms form a … **4** … .

Turn over for the next question

SECTION B

Questions **SEVEN** to **NINE**.

Each of these questions has four parts.

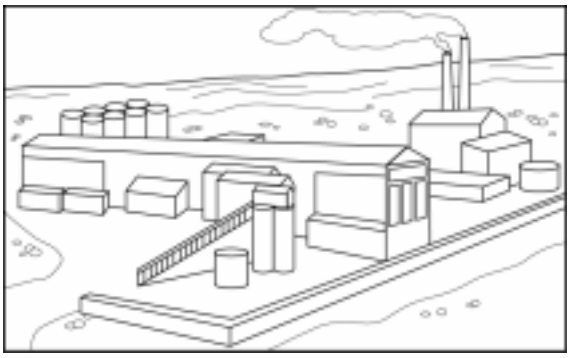
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION SEVEN

Producing cement affects the environment.

The drawing shows a cement works next to a limestone quarry.



7.1 Quarrying limestone affects the environment at this site mainly by causing . . .

A air pollution.

B land pollution.

C visual pollution.

D water pollution.

7.2 Producing cement in the kiln will produce . . .

A air pollution.

B land pollution.

C noise pollution.

D water pollution.

7.3 Producing cement at this site uses . . .

A energy resources only.

B energy resources and renewable materials.

C energy resources and non-renewable materials.

D renewable materials only.

7.4 The cement is transported away from the works by a fleet of lorries.

The lorries cause mainly . . .

A air pollution and land pollution.

B air pollution and noise pollution.

C air pollution and visual pollution.

D air pollution and water pollution.

Turn over for the next question

QUESTION EIGHT

Julie heated some limestone.
The limestone decomposed to form calcium oxide and carbon dioxide.
The limestone was weighed before and after being heated.

The table shows Julie's results.

	Experiment 1	**Experiment 2**
Mass of limestone before heating in grams	2.00	2.00
Mass of limestone after heating in grams	1.12	
Mass lost in grams	0.88	0.90

8.1 Which type of balance would be best for doing this experiment?

A 0 – 100 g measuring to the nearest 0.01 g

B 0 – 100 g measuring to the nearest 0.1 g

C 0 – 500 g measuring to the nearest g

D 0 – 1000 g measuring to the nearest 10 g

8.2 What was the mass of limestone after heating in **Experiment 2**?

A 0.88 g

B 0.90 g

C 1.10 g

D 1.12 g

[80]

8.3 What mass of carbon dioxide was formed in **Experiment 1**?

A 0.88 g

B 0.90 g

C 1.10 g

D 1.12 g

8.4 What is the best conclusion to Julie's experiment?

A Heating 2.00 g of limestone results in a loss in mass of 0.88 g.

B Heating 2.00 g of limestone results in a loss in mass of 0.90 g.

C Heating 2.00 g of limestone results in an average loss of 0.89 g.

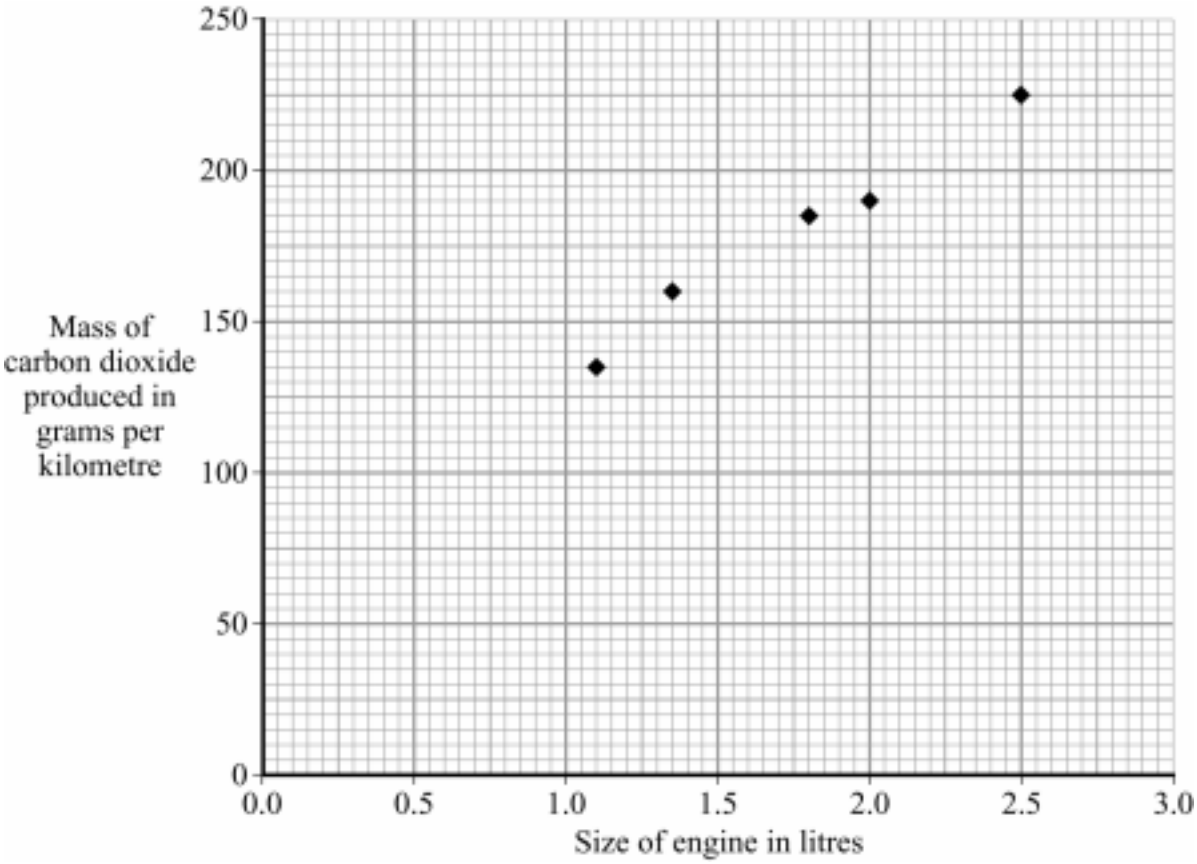
D Heating 2.00 g of limestone results in a different loss in mass each time.

Turn over for the next question

QUESTION NINE

Most cars use either petrol or diesel as fuel.

The graph gives information about the mass of carbon dioxide produced by different sizes of petrol engine.



9.1 What mass of carbon dioxide is produced by a car with a 2.0 litre petrol engine on a 10 km school run?

A 155 g

B 190 g

C 1900 g

D 2350 g

[82]

9.2 What is the best estimate of the mass of carbon dioxide that would be produced by a 1.0 litre petrol engine?

A 60 grams per kilometre

B 125 grams per kilometre

C 140 grams per kilometre

D 170 grams per kilometre

9.3 What is the relationship, if any, between petrol engine size and the mass of carbon dioxide produced?

A They are directly proportional.

B They are inversely proportional.

C There is a correlation between engine size and mass of carbon dioxide produced.

D There is no relationship between the two.

9.4 A 2.0 litre diesel engine produces 156 grams of carbon per kilometre.

What is the best conclusion that can be drawn from this?

A Diesel engines produce less carbon dioxide than petrol engines.

B Petrol engines produce less carbon dioxide than diesel engines.

C The mass of carbon dioxide produced by an engine depends on both the size of the engine and the type of fuel.

D The mass of carbon dioxide produced by an engine depends only on the type of fuel.

END OF TEST

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** and **TWO**

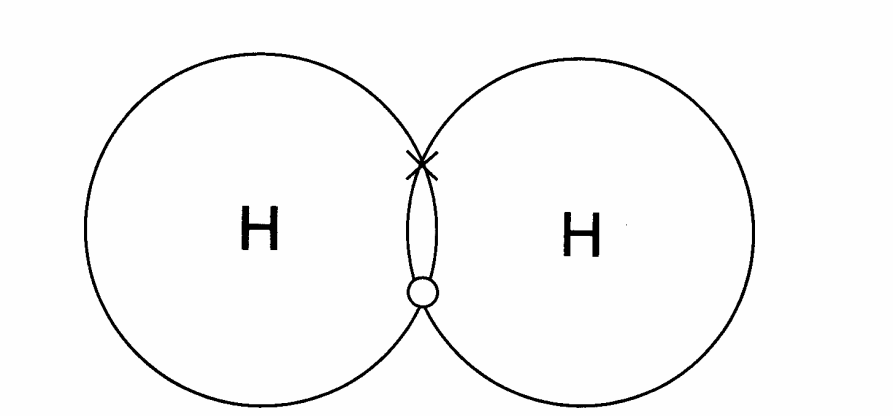
In these questions match the letters with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows a molecule of hydrogen.



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

A Bond

B Electron

C Molecule

D Nucleus

Each hydrogen atom has a small, central … **1** … .

The two hydrogen atoms each share an … **2** … .

This sharing forms a chemical … **3** … between the two atoms.

The two joined atoms form a … **4** … .

QUESTION TWO

Use words from the list to complete the sentences.

A Condense

B Evaporation

C Fractional distillation

D Fractions

The many hydrocarbons in crude oil may be separated into … **1** … ,

each of which contain molecules with a similar number of carbon atoms,

by … **2** … of the oil and allowing it to … **3** … at a number of different temperatures.

This process is called … **4** … .

Turn over for the next question

SECTION B

Questions **THREE** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION THREE

Julie heated some limestone.
The limestone decomposed to form calcium oxide and carbon dioxide.
The limestone was weighed before and after being heated.

The table shows Julie's results.

	Experiment 1	**Experiment 2**
Mass of limestone before heating in grams	2.00	2.00
Mass of limestone after heating in grams	1.12	
Mass lost in grams	0.88	0.90

3.1 Which type of balance would be best for doing this experiment?

A 0 – 100 g measuring to the nearest 0.01 g

B 0 – 100 g measuring to the nearest 0.1 g

C 0 – 500 g measuring to the nearest g

D 0 – 1000 g measuring to the nearest 10 g

3.2 What was the mass of limestone after heating in **Experiment 2**?

A 0.88 g

B 0.90 g

C 1.10 g

D 1.12 g

3.3 What mass of carbon dioxide was formed in **Experiment 1**?

A 0.88 g

B 0.90 g

C 1.10 g

D 1.12 g

3.4 What is the best conclusion to Julie's experiment?

A Heating 2.00 g of limestone results in a loss in mass of 0.88 g.

B Heating 2.00 g of limestone results in a loss in mass of 0.90 g.

C Heating 2.00 g of limestone results in an average loss of 0.89 g.

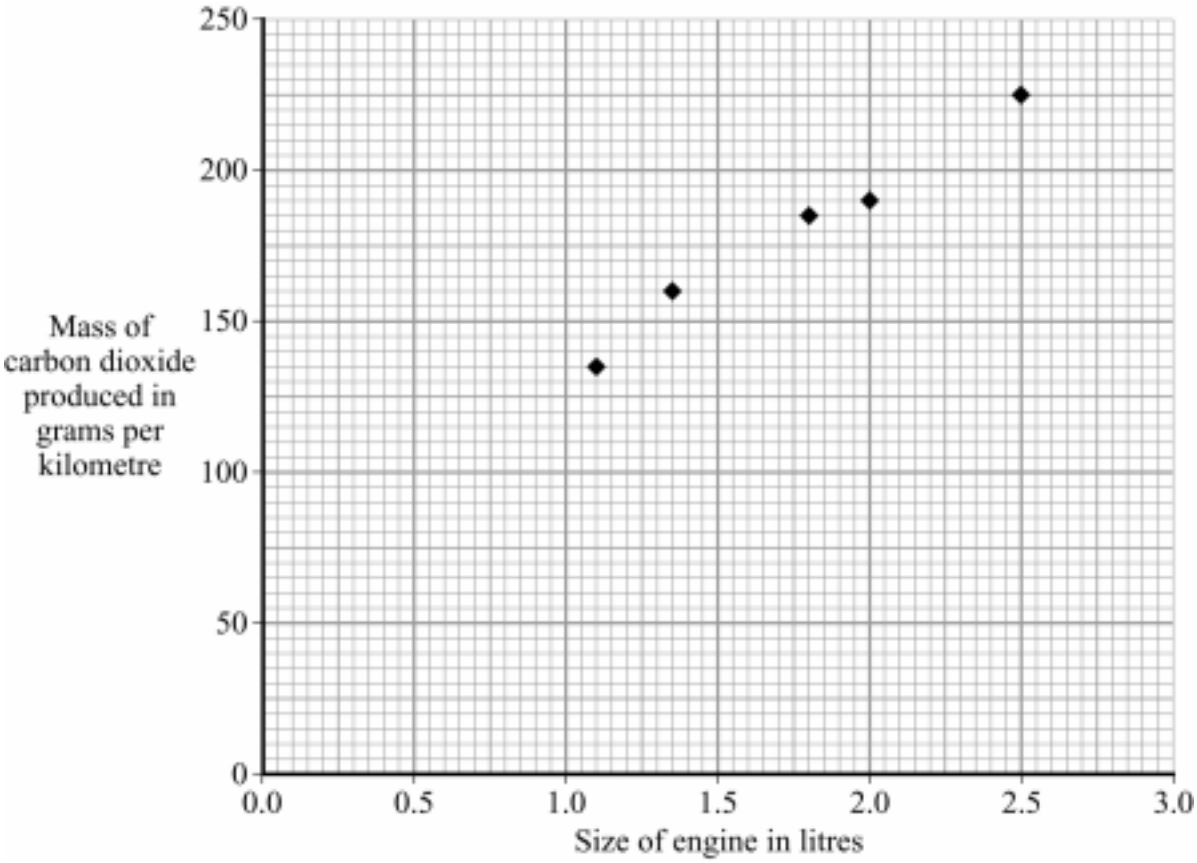
D Heating 2.00 g of limestone results in a different loss in mass each time.

Turn over for the next question

QUESTION FOUR

Most cars use either petrol or diesel as fuel.

The graph gives information about the mass of carbon dioxide produced by different sizes of petrol engine.



4.1 What mass of carbon dioxide is produced by a car with a 2.0 litre petrol engine on a 10 km school run?

A 155 g

B 190 g

C 1900 g

D 2350 g

4.2 What is the best estimate of the mass of carbon dioxide that would be produced by a 1.0 litre petrol engine?

A 60 grams per kilometre

B 125 grams per kilometre

C 140 grams per kilometre

D 170 grams per kilometre

4.3 What is the relationship, if any, between petrol engine size and the mass of carbon dioxide produced?

A They are directly proportional.

B They are inversely proportional.

C There is a correlation between engine size and mass of carbon dioxide produced.

D There is no relationship between the two.

4.4 A 2.0 litre diesel engine produces 156 grams of carbon per kilometre.

What is the best conclusion that can be drawn from this?

A Diesel engines produce less carbon dioxide than petrol engines.

B Petrol engines produce less carbon dioxide than diesel engines.

C The mass of carbon dioxide produced by an engine depends on both the size of the engine and the type of fuel.

D The mass of carbon dioxide produced by an engine depends only on the type of fuel.

Turn over for the next question

QUESTION FIVE

This question is about burning and the products of burning.

5.1 About 20 % of the air is …

A carbon dioxide.

B nitrogen.

C oxygen.

D sulfur dioxide.

5.2 When carbon in a fuel burns in air the reaction can be represented by this word equation:

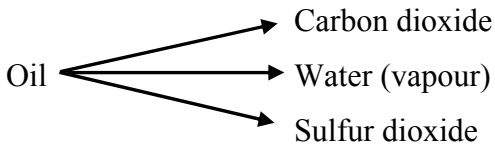
A carbon + oxygen → carbonic acid

B carbon dioxide → carbon + oxygen

C carbon + oxygen → carbon dioxide

D carbon + oxygen → calcium carbonate

5.3 These are the three main substances produced when most fuels are burned:



The products of these reactions are all …

A carbonates.

B hydroxides.

C oxides.

D sulfides.

[90]

5.4 Burning fuels release solid particles which …

A cause acid rain.

B cause global dimming.

C cause global warming.

D cause water pollution.

Turn over for the next question

QUESTION SIX

Alloys often have more useful properties than pure metals.

6.1 Mixtures of metals are called . . .

A alloys.

B catalysts.

C compounds.

D ores.

6.2 One metal mixed with iron to make stainless steel is . . .

A aluminium.

B calcium.

C chromium.

D potassium.

6.3 Low carbon steel is . . .

A easily shaped.

B hard.

C resistant to corrosion.

D resistant to staining.

6.4 Smart alloys . . .

A can adapt to new situations.

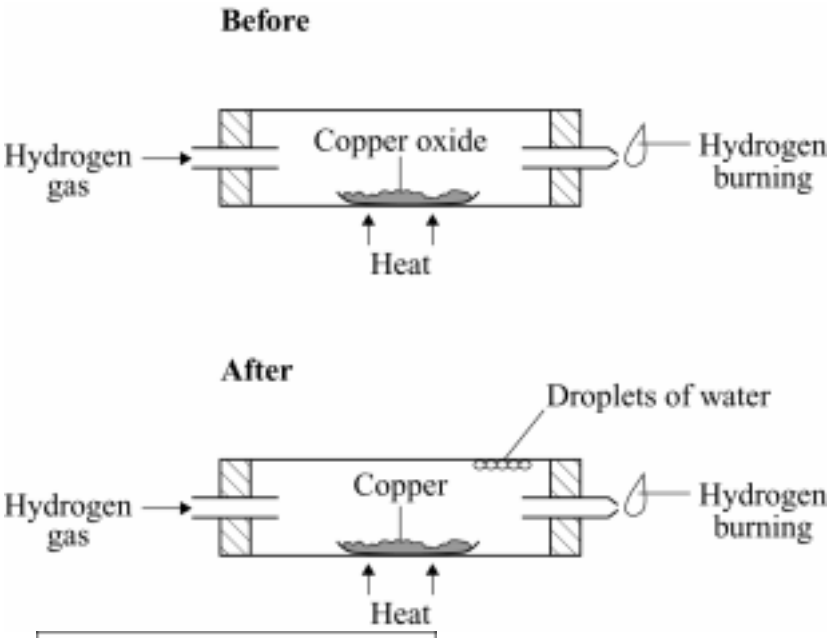
B can easily be bent.

C can resist most chemicals.

D can return to their original shape after being deformed.

QUESTION SEVEN

The drawings show how hydrogen can be used to displace a metal from one of its compounds.



Sodium	Most reactive
Magnesium	
Aluminium	
Carbon	
Zinc	
Iron	
Tin	
Lead	
Hydrogen	
Copper	
Silver	Least reactive

7.1 In the reaction shown, the hydrogen is . . .

A dehydrated.

B neutralised.

C oxidised.

D reduced.

7.2 The symbol equation for the reaction is . . .

A $Cu + H_2 \rightarrow CuO$

B $Cu + H_2 \rightarrow CuO + H_2O$

C $CuO + H_2 \rightarrow Cu + H_2O$

D $CuO + H_2O \rightarrow Cu + H_2$

7.3 Which of these metals could be displaced from its oxide by carbon but not by hydrogen?

A Aluminium

B Lead

C Magnesium

D Sodium

7.4 Which metal cannot be extracted from its oxide using carbon?

A Copper

B Sodium

C Tin

D Zinc

Turn over for the next question

QUESTION EIGHT

Crude oil can be separated into fractions.

Each fraction contains several different hydrocarbons.

Fraction of crude oil	**Number of carbon atoms in each hydrocarbon molecule**
Petrol	$C_4 - C_{12}$
Paraffin	$C_{11} - C_{15}$
Diesel oil	$C_{14} - C_{19}$
Bitumen	C_{50} and upwards

8.1 Crude oil can be separated into fractions by fractional distillation because . . .

A the fractions flow at different rates.

B the fractions have different boiling points.

C the fractions have different colours.

D the fractions have different densities.

8.2 Hydrocarbons with the smallest molecules will be found in . . .

A the bitumen fraction.

B the diesel fraction.

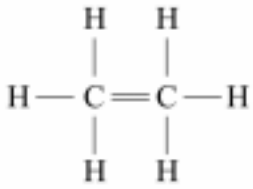
C the paraffin fraction.

D the petrol fraction.

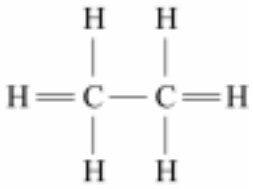
The formula for hydrocarbon **X** is C_2H_6

8.3 The structural formula for hydrocarbon **X** is . . .

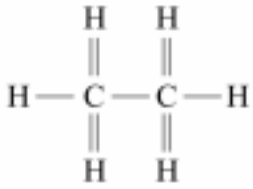
A



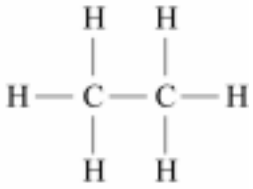
B



C



D



8.4 Which of these hydrocarbons belongs to the same group as hydrocarbon **X**?

A C_3H_8

B C_4H_8

C C_5H_{10}

D C_6H_{12}

Turn over for the next question

QUESTION NINE

Read the information below about recycling metals.

Recycling scrap steel reduces related water pollution, air pollution and mining wastes by about 70%. It takes four times as much energy to make steel from iron ore than from recycled steel.

Recycling cans made from tin-plated steel saves 74% of the energy needed to produce these cans from raw materials. 80% of the tin is recovered from recycled cans.

Every time a tonne of steel is recycled, 2000 kg of iron ore, 500 kg of coal and 20 kg of limestone are conserved.

The recycling process simply involves melting the scrap steel then removing impurities.

9.1 What mass of raw materials is preserved when one tonne of steel is recycled?

A 20 kg

B 500 kg

C 2000 kg

D 2520 kg

9.2 A tin-coated can has a mass of 10 g. 1% of this mass is tin.

How much tin is saved by the recycling of one tin can?

A 0.008 g

B 0.08 g

C 0.8 g

D 8.0g

9.3 In the manufacture of iron, carbon is used to displace oxygen from iron oxide.

Which pollutant gas is formed during this reaction?

A Carbon dioxide

B Nitrogen

C Oxygen

D Sulfur dioxide

9.4 Recycling scrap needs much less energy than making steel from iron ore.

This is because . . .

A iron in iron ore needs to be oxidised.

B iron in scrap iron has already been displaced from its oxide.

C iron in scrap iron only needs to be oxidised.

D there are fewer impurities in scrap iron.

END OF TEST

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT CHEMISTRY 1a - FOUNDATION TIER

Question No.	KEY
One	1 – B 2 – A 3 – D 4 – C
Two	1 – D 2 – A 3 – B 4 – C
Three	1 – B 2 – C 3 – D 4 – A
Four	1 – B 2 – A 3 – C 4 – D
Five	1 – B 2 – D 3 – C 4 – A
Six	1 – D 2 – B 3 – A 4 – C
Seven	7.1 – C, 7.2 – A, 7.3 – C, 7.4 – B
Eight	8.1 – A, 8.2 – C, 8.3 – A, 8.4 – C
Nine	9.1 – C, 9.2 – B, 9.3 – C, 9.4 – C
	Overall marks = 36

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT CHEMISTRY 1a - HIGHER TIER

Question No.	KEY
One	1 – D 2 – B 3 – A 4 – C
Two	1 – D 2 – B 3 – A 4 – C
Three	3.1 – A, 3.2 – C, 3.3 – A, 3.4 – C
Four	4.1 – C, 4.2 – B, 4.3 – C, 4.4 – C
Five	5.1 – C, 5.2 – C, 5.3 – C, 5.4 – B
Six	6.1 – A, 6.2 – C, 6.3 – A, 6.4 – D
Seven	7.1 – C, 7.2 – C, 7.3 – B, 7.4 – B
Eight	8.1 – B, 8.2 – D, 8.3 – D, 8.4 – A
Nine	9.1 – D, 9.2 – B, 9.3 – A, 9.4 – B
	Overall marks = 36

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Surname		Other Names	
Centre Number			Candidate Number				
Candidate signature								

General Certificate of Secondary Education
Specimen Paper

SCIENCE A
Oils, Earth and Atmosphere (Unit Chemistry 1b)

ASSESSMENT and QUALIFICATIONS ALLIANCE

Date and Time

For this paper you must have:
- a black ball-point pen
- an objective test answer sheet

You may use a calculator.

Time allowed: 30 minutes

Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Oils, Earth and Atmosphere' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown: 1 2 3 4
- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown: 1 2 3 4
- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown: 1 2 3 4

Information
- The maximum mark for this paper is 36.

Advice
- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **SIX**.

In these questions match words in the list with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

The drawing shows the layered structure of the Earth.

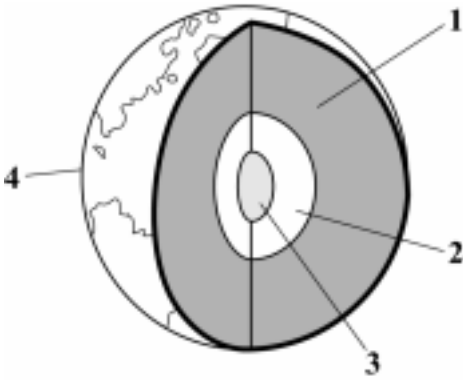
Match words, **A**, **B**, **C** and **D**, with the labels **1 – 4** on the diagram.

A Crust

B Inner core

C Mantle

D Outer Core



QUESTION TWO

The flow diagram shows the reactions of some molecules from crude oil.

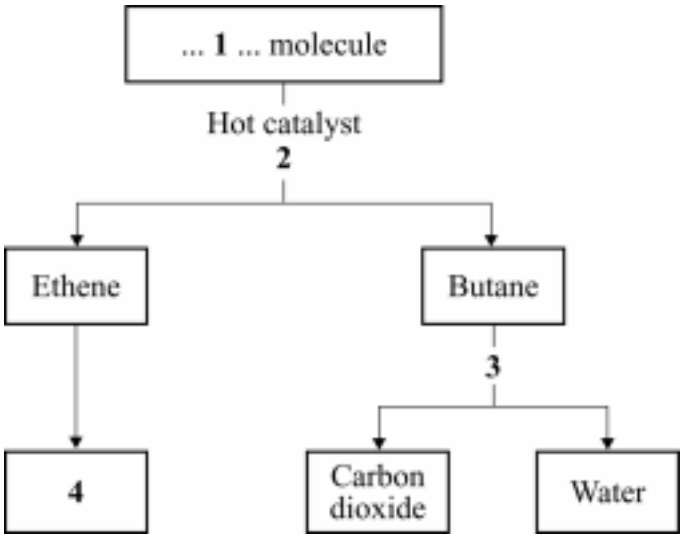
Match words, **A**, **B**, **C**, and **D**, with the labels **1 – 4** on the diagram.

A Burning

B Cracking

C Hydrocarbon

D Poly(ethene)



Turn over for the next question

QUESTION THREE

Plant oils have many uses.

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

A A fuel

B An emulsion

C Energy

D Temperature

Vegetable oil can be burned as …**1**… .

Vegetable oils are useful foods because they contain a lot of …**2**… .

Vegetable oils cook food at a higher …**3**… than water.

In some foods, vegetable oil is mixed with another liquid to form …**4**… .

QUESTION FOUR

The pie charts show the gases in the Earth's early atmosphere and the Earth's present-day atmosphere.

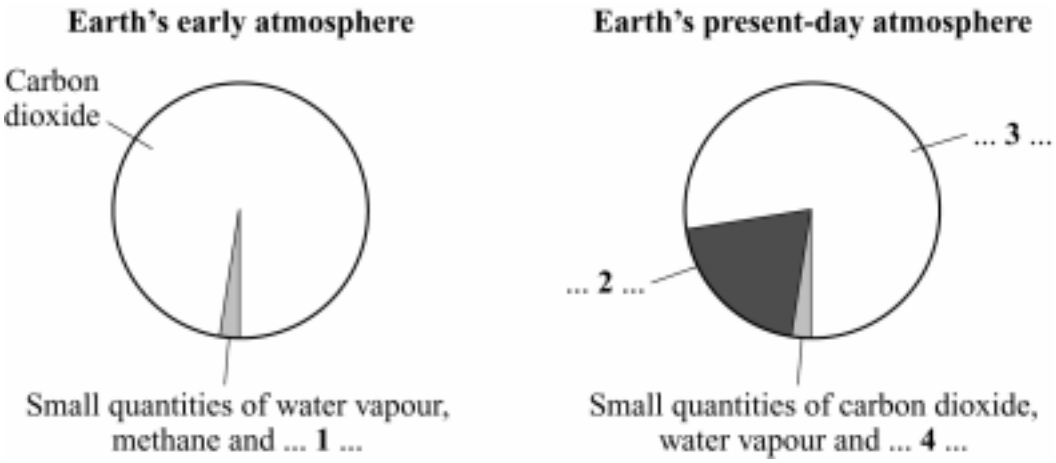
Match words, **A**, **B**, **C** and **D**, with the labels **1 – 4** on the diagram.

A Ammonia

B Nitrogen

C Noble gases

D Oxygen



Turn over for the next question

QUESTION FIVE

This question is about tectonic plates.

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

A Continental drift

B Convection currents

C Radioactive processes

D Volcanic eruptions

Wegener suggested that in the past there was a single, large landmass.

This split up and the smaller landmasses moved apart. We call this process …**1**… .

Tectonic plates move because of …**2**… in the Earth's mantle.

The heat required for this movement to occur comes from natural …**3**… .

At the boundaries between the tectonic plates, there are often …**4**… .

QUESTION SIX

The table gives some information about four different vegetable oils.
Iodine number is the number of unsaturated bonds in a molecule of the oil.
Cetane number is a measure of how easy it is to ignite the oil.
Oils with low cetane numbers do not ignite easily.

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

A The oil which is solid at room temperature

B The oil which would be the hardest to ignite

C The oil with the least double bonds

D The oil with the lowest melting point

	Name of oil	**Melting point in °C**	**Iodine number**	**Cetane number**
1	Olive oil	−12	60	52
2	Palm oil	35	63	65
3	Rapeseed oil	5	100	45
4	Sunflower oil	−18	130	60

Turn over for the next question

SECTION B

Questions **SEVEN** to **NINE**.

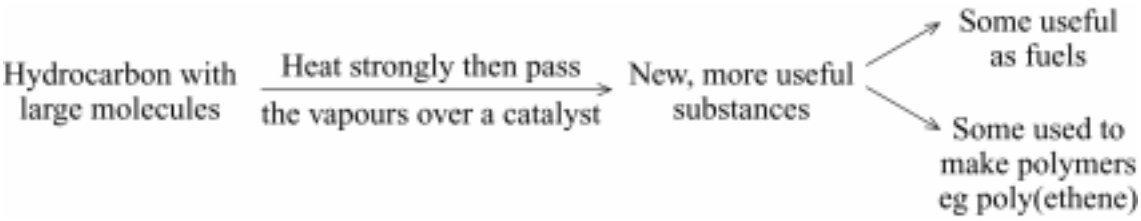
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SEVEN

Hydrocarbons with large molecules can be broken down into more useful substances.



7.1 What name is given to this process in which large hydrocarbon molecules are broken down?

A Cracking

B Evaluation

C Oxidation

D Polymerisation

7.2 One use of poly(ethene) is to make . . .

A crates.

B pans.

C plastic bags.

D ropes.

7.3 Burying waste poly(ethene) is not a good way to get rid of it.

This is because . . .

A it does not flow easily.

B it has a high boiling point.

C it is insoluble in water.

D it is not biodegradable.

7.4 When cardboard and paper waste are buried in the ground, they . . .

A are broken down by microorganisms.

B are dissolved by soil water.

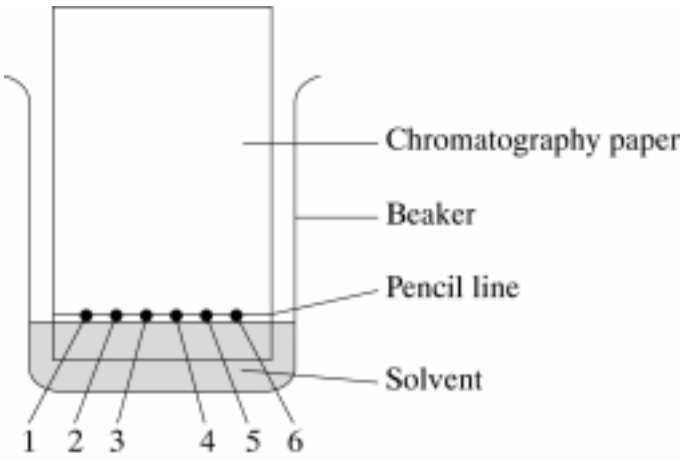
C ignite spontaneously.

D release sulfur dioxide gas.

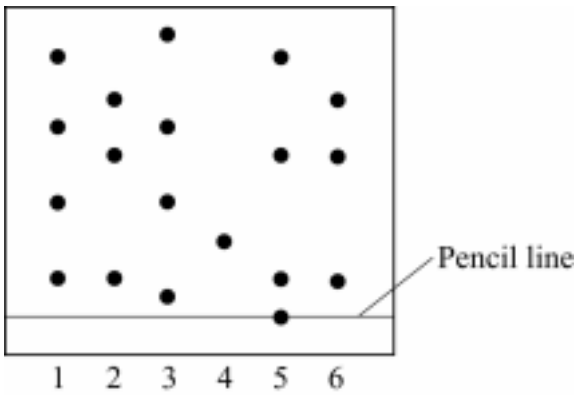
Turn over for the next question

QUESTION EIGHT

Jane used chromatography to investigate the colours used in six different sweets, 1 – 6.
A pencil line was drawn near the bottom of the chromatography paper.
Jane placed a few drops of extract from each of the foods on this line.
The paper was then dipped into some solvent in a beaker.



The diagram below shows the chromatogram obtained at the end of the experiment.



8.1 Which two sweets probably contained the same mixture of dyes?

A 1 and 3

B 1 and 5

C 2 and 6

D 3 and 5

8.2 What is the best conclusion that Jane could draw about sweet 5?

A Sweet 5 contains four dyes.

B Sweet 5 probably contains four dyes.

C Sweet 5 contains at least four dyes.

D Sweet 5 contains a maximum of four dyes.

8.3 Which of the following would give the most accurate measure of the distance moved by a dye?

A A metre rule

B A micrometer

C A pair of dividers and a millimetre rule

D A piece of 2 mm graph paper

8.4 What is the best way of doing a survey to find which children's drinks on sale in the UK contain a particular dye?

A Ask mothers at a local toddler group

B Do an internet search

C Look on the shelves in the local supermarket

D Write to as many food manufacturers as you can find in yellow pages

Turn over for the next question

QUESTION NINE

Read the passage below about cooking with oils.

Cooking at high temperatures can damage oils. The more omega 3 fatty acids in the oil, the less suitable it is for cooking. The heat not only damages the fatty acids, but it can also change them into harmful substances. Hydrogenated oils are often used for cooking. Since these oils have already been "damaged" by chemical processing, they are less likely to be further damaged by heat. The oils that are higher in saturated fats are the most stable when heated. These include peanut oil and olive oil. The more fragile oils are best used at room temperature, like salad dressings.

To preserve the nutritious properties and the flavour of unrefined oils, try the "wet-sauté". Pour around one-fourth of a cup of water in the stir-fry pan and heat just below boiling. Then add the food and cook it a little before adding the oil. Wet-sauté shortens the time oil is in contact with a hot pan. Stir frequently to further reduce the time the oil is in contact with the hot metal. Never heat oils to the smoking point, as this not only damages their fatty acid content but also their taste.

9.1 Heating oils to smoking point . . .

A damages their fatty acid content.

B is best for cooking chips.

C is best for making salad oil.

D turns them into margarine.

9.2 Wet-sauté . . .

A damages oils.

B is best for cooking chips.

C is best for saturated oils.

D is best for unsaturated oils.

9.3 A hydrogenated oil . . .

A contains hydrogen.

B contains only carbon.

C has a better taste.

D is saturated.

9.4 Hydrogenated oils have been ‘damaged’ by chemical processing.

In this processing, . . .

A unsaturated oils are frozen to make them solid.

B unsaturated oils are gently heated with hydrogen in the presence of a catalyst.

C unsaturated oils are heated to a high temperature.

D vapour from unsaturated oils is passed over a hot catalyst.

END OF TEST

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** and **TWO**.

In these questions match the letters with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

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QUESTION TWO

The diagram shows stages in the cracking of hydrocarbons.

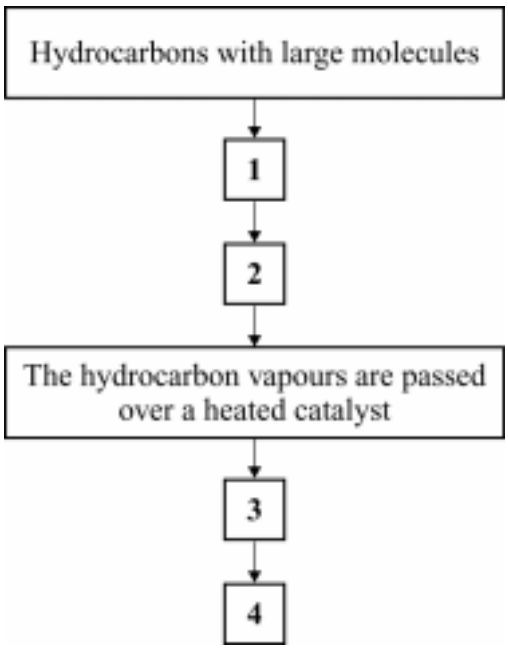
Match words, **A**, **B**, **C**, and **D**, with the spaces **1 – 4**, to describe what happens in this process.

A Hydrocarbons with small molecules

B The hydrocarbons are heated.

C The hydrocarbons are in a vapour state.

D Thermal decomposition of hydrocarbons



Turn over for the next question

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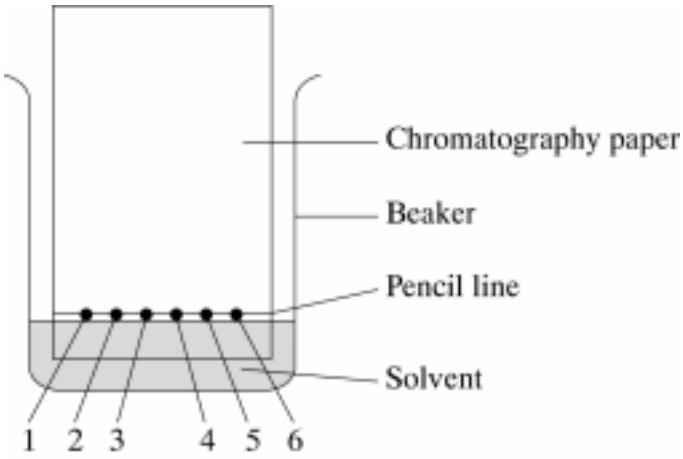

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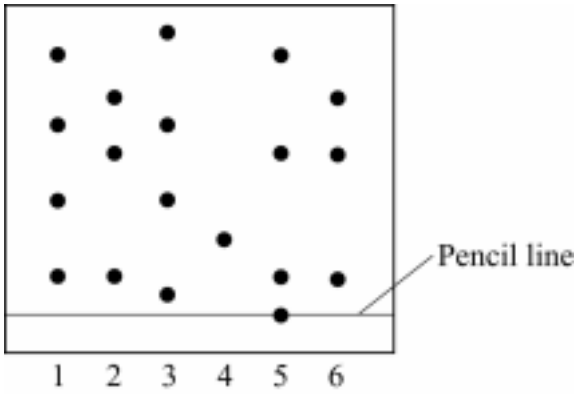

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[120]

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In this processing, . . .

A unsaturated oils are frozen to make them solid.

B unsaturated oils are gently heated with hydrogen in the presence of a catalyst.

C unsaturated oils are heated to a high temperature.

D vapour from unsaturated oils is passed over a hot catalyst.

Turn over for the next question

QUESTION FIVE

A molecule of a hydrocarbon, formula C_6H_{14}, can be cracked to produce two different hydrocarbons with smaller molecules.

$$\underset{\text{Molecule } \mathbf{W}}{C_6H_{14}} \rightarrow \underset{\text{Molecule } \mathbf{Y}}{C_3H_6} + \underset{\text{Molecule } \mathbf{Z}}{C_3H_8}$$

5.1 The large hydrocarbon molecule can be cracked by . . .

A distillation

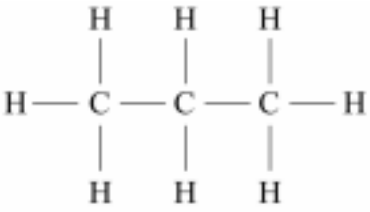
B polymerisation.

C thermal decomposition.

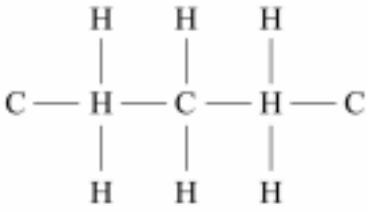
D vaporisation.

5.2 The structural formula for molecule **Z** is . . .

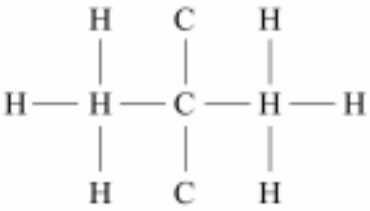
A



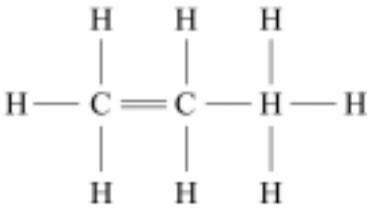
B



C



D



5.3 Which of the three molecules, **W**, **Y** and **Z**, have double bonds?

A Molecules **W** and **Y**

B Molecules **W** and **Z**

C Molecule **W** only

D Molecule **Y** only

5.4 What types of hydrocarbons are molecules **Y** and **Z**?

	Molecule Y	**Molecule Z**
A	saturated	saturated
B	saturated	unsaturated
C	unsaturated	saturated
D	unsaturated	unsaturated

Turn over for the next question

QUESTION SIX

Carbon is an essential part of all living things and it is often circulated in nature in carbon dioxide.

6.1 Carbon dioxide is removed from the atmosphere when it dissolves in sea water to form soluble . . .

A calcium carbonate.

B calcium hydrogencarbonate.

C carbohydrates.

D hydrocarbons.

6.2 The amount of carbon dioxide in the atmosphere is also reduced by . . .

A the activity of plants.

B the destruction of forests.

C the eruptions of volcanoes.

D the weathering of limestone.

6.3 Carbon dioxide is released into the atmosphere from volcanoes following the decomposition of . . .

A carbonate rocks.

B igneous rocks.

C metamorphic rocks.

D sandstone rocks.

6.4 Recently, the balance between the amount of carbon dioxide released into the atmosphere and the amount used up has been disturbed.

This is mainly because of . . .

A burning of increased amounts of fossil fuels.

B increased volcanic activity.

C planting of large areas of forests.

D the operation of more nuclear power stations.

QUESTION SEVEN

The diagram shows the present positions of South America and Africa.
The position of the boundary between the tectonic plates on which they lie is also drawn.

7.1 The patterns of rocks on the east coast of South America and the west coast of Africa are very similar.

This suggests that . . .

A Africa and South America have been moving slowly towards each other.

B Africa and South America were once together and have been moving slowly away from each other.

C Africa has been slowly sliding beneath South America.

D South America has been slowly sliding beneath Africa.

7.2 Tectonic plates are constantly moving.

This movement is caused by . . .

A convection currents.

B the Earth's crust shrinking.

C the gravitational attraction of the Sun.

D the rotation of the Earth.

7.3 The interior of the Earth remains hot because of . . .

A earthquakes.

B friction between the core and the mantle.

C friction between the moving plates.

D natural radioactive processes.

7.4 The plates move with relative speeds of . . .

A a few centimetres a day.

B a few centimetres a week.

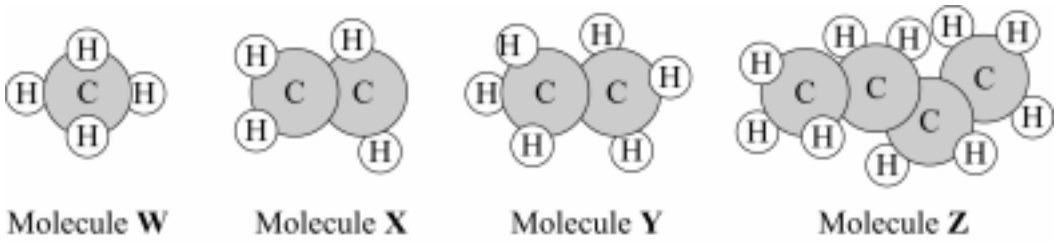
C a few centimetres a month.

D a few centimetres a year.

Turn over for the next question

QUESTION EIGHT

The drawings represent four different hydrocarbon molecules.



8.1 Which molecule is unsaturated?

A Molecule **W**

B Molecule **X**

C Molecule **Y**

D Molecule **Z**

8.2 Which of the following belong to the alkane family?

A Molecules **X** and **Y**

B Molecule **W** only

C Molecules **W**, **X** and **Z**

D Molecules **W**, **Y** and **Z**

8.3 Molecules of **X** can be joined together to form a polymer.

What is the name of the polymer?

A Poly(ethene)

B Poly(vinyl chloride)

C Poly(propene)

D Poly(styrene)

8.4 Molecules can also be represented by chemical formulae.

For example, molecule **W** has one carbon atom and four hydrogen atoms and is represented by the formula CH_4

The chemical formula for molecule **Z** is. . .

A C_4H_8

B $C_{10}H_4$

C C_4H_{10}

D C_4H_{12}

Turn over for the next question

QUESTION NINE

Scientists used to believe that the Earth was cooling. The shrinking core was making the crust wrinkle.

In 1915, Alfred Wegener suggested that all the continents had once been joined together. Later, they had split up and the separate pieces had moved apart.

Few people believed Wegener's theory. Later, new evidence suggested that the crust was divided into plates which could move slowly. This gave support to Wegener's theory.

9.1 How did scientists, who supported the idea that the Earth was cooling, explain the formation of mountains?

A Mountains rose up from the sea bed.

B Mountains were formed by volcanoes.

C The high points of wrinkles formed the mountains.

D The less dense rocks rose above those that were more dense.

9.2 What name was given to Wegener's theory of crustal movement?

A Continental drift

B Continental shrinking

C Mountain building

D Subduction

9.3 Scientists now believe that mountain ranges are formed . . .

A by earthquakes.

B by large-scale movements of the Earth's crust.

C by magma rising from the sea floor.

D by material from the fluid mantle being forced above the crust.

9.4 New mountain ranges replace older mountain ranges which . . .

A are destroyed by earthquakes.

B are destroyed when tectonic plates come together.

C are worn down by weathering and erosion.

D sink back into the mantle.

END OF TEST

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT CHEMISTRY 1b FOUNDATION TIER

Question No.	KEY
One	1 – C 2 – D 3 – B 4 – A
Two	1 – C 2 – B 3 – A 4 – D
Three	1 – A 2 – C 3 – D 4 – B
Four	1 – A 2 – D 3 – B 4 – C
Five	1 – A 2 – B 3 – C 4 – D
Six	1 – C 2 – A 3 – B 4 – D
Seven	7.1 – A, 7.2 – C, 7.3 – D, 7.4 – A
Eight	8.1 – C 8.2 – C 8.3 – C 8.4 – B
Nine	9.1 – A 9.2 – D 9.3 – D 9.4 – B
	Overall marks = 36

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT CHEMISTRY 1b HIGHER TIER

Question No.	KEY
One	1 – C 2 – A 3 – B 4 – D
Two	1 – B 2 – C 3 – D 4 – A
Three	3.1 – C, 3.2 – C, 3.3 – C, 3.4 – B
Four	4.1 – A, 4.2 – D, 4.3 – D, 4.4 – B
Five	5.1 – C, 5.2 – A, 5.3 – D, 5.4 – C
Six	6.1 – B, 6.2 – A, 6.3 – A, 6.4 – A
Seven	7.1 – B, 7.2 – A, 7.3 – D, 7.4 – D
Eight	8.1 – B, 8.2 – D, 8.3 – A, 8.4 – C
Nine	9.1 – C, 9.2 – A, 9.3 – B, 9.4 – C
	Overall marks = 36

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Surname		Other Names	
Centre Number						Candidate Number				
Candidate signature										

General Certificate of Secondary Education
Specimen Paper

AQA
ASSESSMENT and QUALIFICATIONS ALLIANCE

SCIENCE A
Energy and Electricity (Unit Physics 1a)

Date and Time

For this paper you must have:
- a black ball-point pen
- an objective test answer sheet

You may use a calculator.

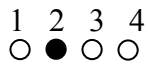
Time allowed: 30 minutes

Instructions

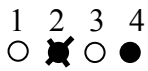
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Energy and Electricity' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

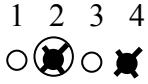
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown:



- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown:



Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **SIX**.

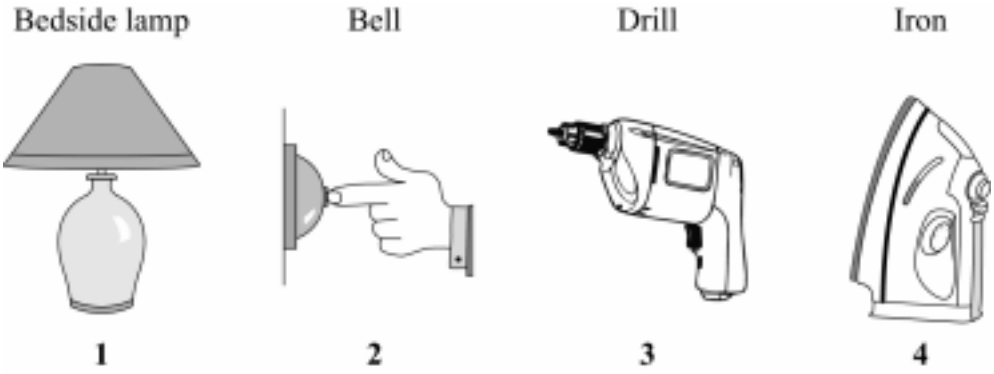
In these questions match the letters with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

The devices shown transfer electrical energy in different ways.



The list gives the useful form of energy the devices are designed to produce.

Match words, **A**, **B**, **C** and **D**, with the devices numbered **1 – 4**.

A Heat (thermal energy)

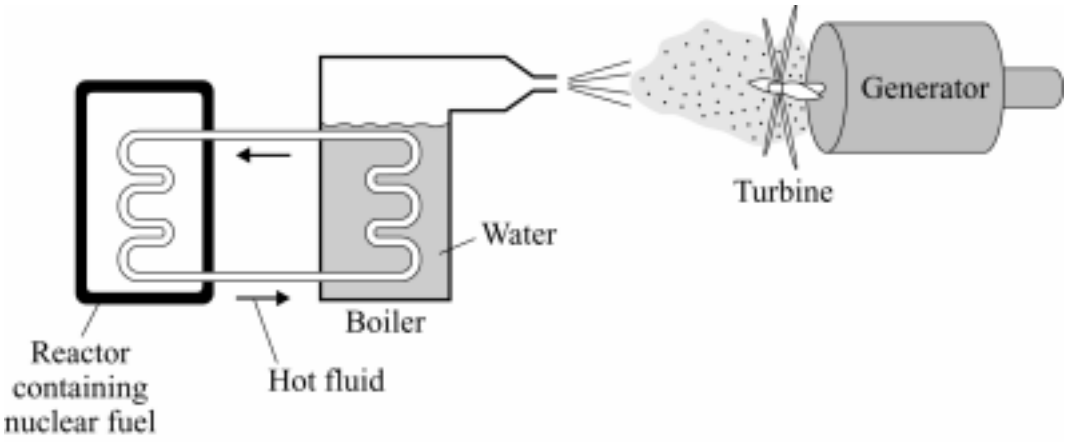
B Light

C Movement (kinetic energy)

D Sound

QUESTION TWO

The diagram shows the main parts of a nuclear power station.



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

A Electricity

B Movement (kinetic)

C Steam

D Uranium

The energy source for this power station is …**1**… .

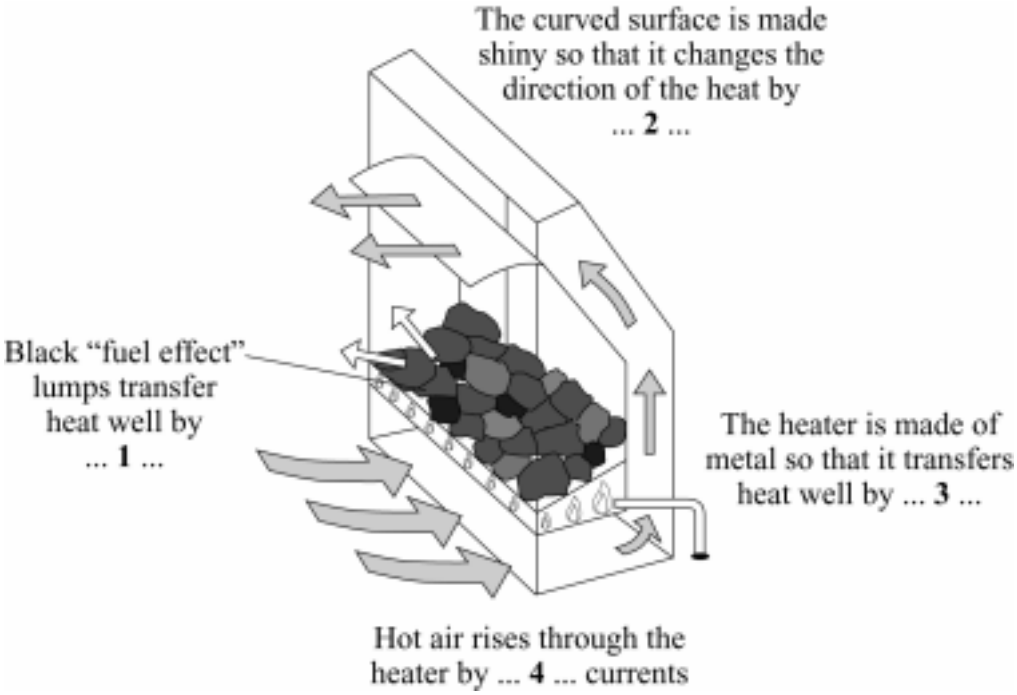
The turbine is driven by …**2**… .

The turbine transfers …**3**… energy to the generator.

The generator transfers energy to homes and factories as …**4**… .

QUESTION THREE

A heater transfers energy to a room in various ways.



Match words, **A**, **B**, **C** and **D**, with the spaces **1 – 4** in the diagram.

A Conduction

B Convection

C Radiation

D Reflection

QUESTION FOUR

If we use renewable energy sources, we will not need to burn so much fossil fuel.
However, capturing renewable energy sources can also cause problems.

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

A Dams (for hydroelectricity)

B Solar cells

C Tidal barrages

D Wind farms

What is used to capture energy	Problem caused
1	Can often be seen from a long way away and look unsightly to some people
2	Destroys muddy areas in river estuaries where wading birds feed
3	Land that could be used for farming or forests is flooded
4	Very high cost for each kilowatt hour of electricity is generated during lifetime

Turn over for the next question

QUESTION FIVE

The energy resource used to generate electricity depends on the location.

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

A Nuclear fuel

B Solar energy

C Tides

D Wind

The best energy resource to use in a submarine which has to spend months under water is …**1**… .

The best energy resource to use in a calculator is …**2**… .

Generators sited on hills in the UK are most likely to use …**3**… .

A power station that includes a barrage across an estuary uses …**4**… .

QUESTION SIX

You may find the following formula useful when answering this question.

$$\text{efficiency} = \frac{\text{useful energy transferred by device}}{\text{total energy supplied to device}}$$

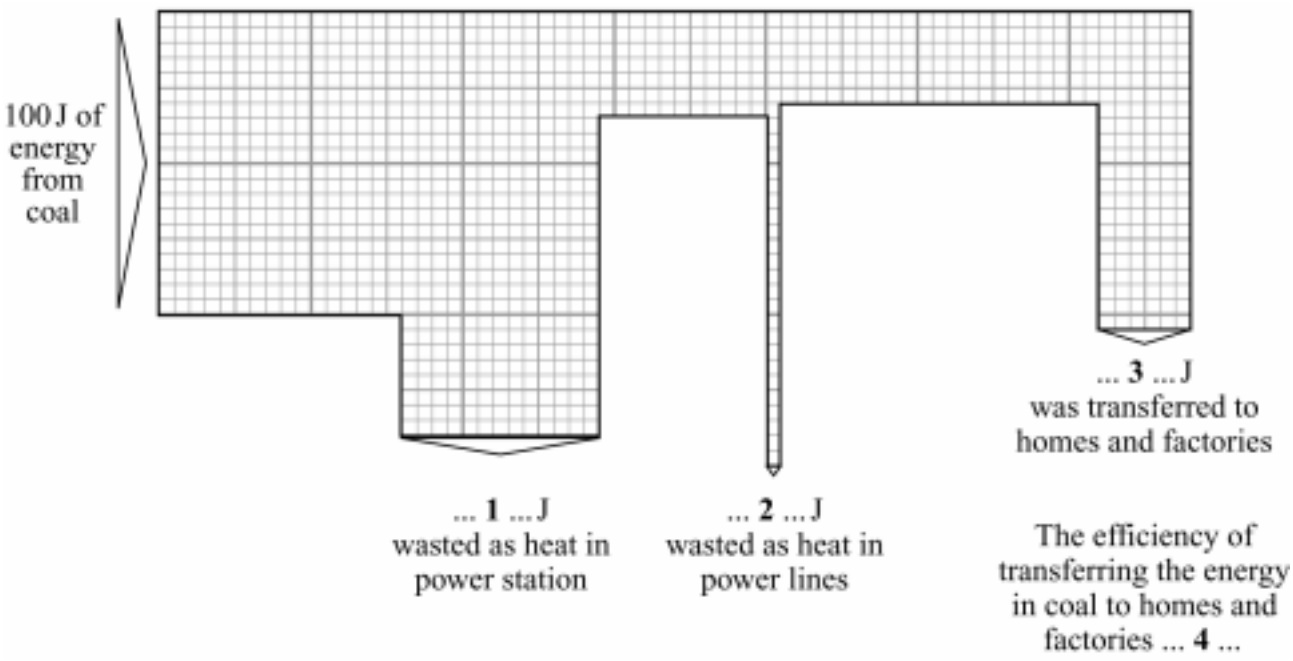
Match numbers, **A**, **B**, **C** and **D**, with the spaces **1 – 4** in the diagram.

A 0.3

B 5

C 30

D 65



SECTION B

Questions **SEVEN** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SEVEN

You may find the following formulae useful when answering this question.

energy transferred = power × time

(kilowatt hour, kWh) (kilowatt, kW) (hour, h)

total cost = number of kilowatt hours × cost per kilowatt hour

The diagram shows the readings on a household electricity meter at the beginning and at the end of a day.

Each kilowatt hour (kWh) of electricity costs 7p.

At the start of the day At the end of the day

7.1 How many kilowatt hours of electricity were used during the day?

A 37

B 47

C 63

D 89

7.2 On the following day, 30 kilowatt hours of electricity were used.

How much would this electricity cost?

A 21p

B 37p

C £2.10

D £21.00

7.3 During one week, a 7.5 kW shower heater was used for 3 hours.

How much energy was transferred by the heater?

A 2.5 kWh

B 4.5 kWh

C 10.5 kWh

D 22.5 kWh

7.4 For how long can a 2 kW kettle be used at a cost of 7p?

A 30 minutes (half an hour)

B 2 hours

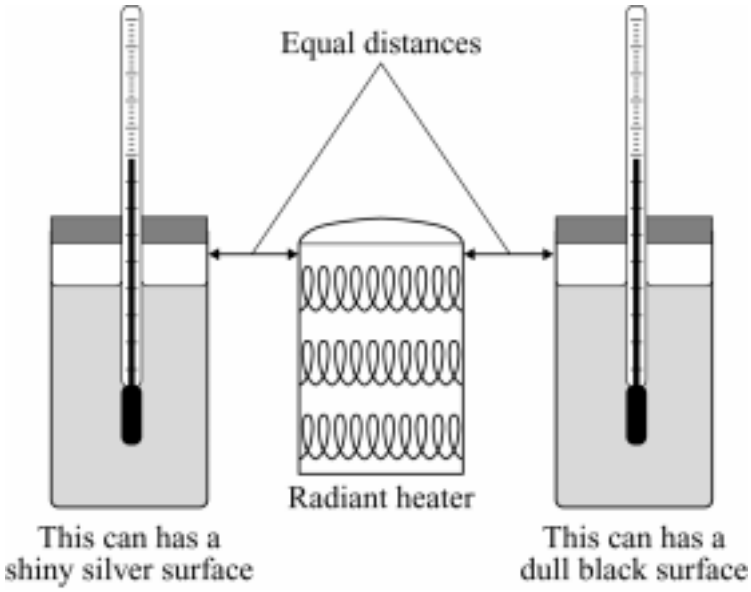
C 3.5 hours

D 5 hours

Turn over for the next question

QUESTION EIGHT

Anne did two experiments on radiation. The apparatus she used is shown in the diagram.



Experiment 1

- Anne put the same volume of cold water into the two cans.
- She then switched on the heater.
- Ten minutes later, she measured the temperature of the water in each can.

Experiment 2

- The student filled both cans with boiling water.
- This time she left the heater off.
- Ten minutes later, she measured the temperature of the water in the two cans.

The table shows her results.

Experiment 1				**Experiment 2**			
Initial temperature of water in °C		**Final temperature of water in °C**		**Initial temperature of water in °C**		**Final temperature of water in °C**	
Shiny silver can	Dull black can	Dull black can	Shiny silver can	Shiny silver can	Dull black can	Dull black can	Shiny silver can
15	15	27	19	100	100	84	95

8.1 Which was an independent variable in the two experiments?

A The final temperature of the water

B The initial temperature of the water

C The time the water was left

D The volume of the water

8.2 Which of these was **not** a control variable in Anne's **Experiment 1**?

A Distance from heater to cans

B Final temperature of water

C Power of radiant heater

D Volume of water

8.3 **Experiment 1** shows that a shiny silver surface . . .

A is a good absorber of radiation.

B is a good conductor of radiation.

C is a good emitter of radiation.

D is a good reflector of radiation.

8.4 **Experiment 2** shows that a dull black surface . . .

A is a good absorber of radiation.

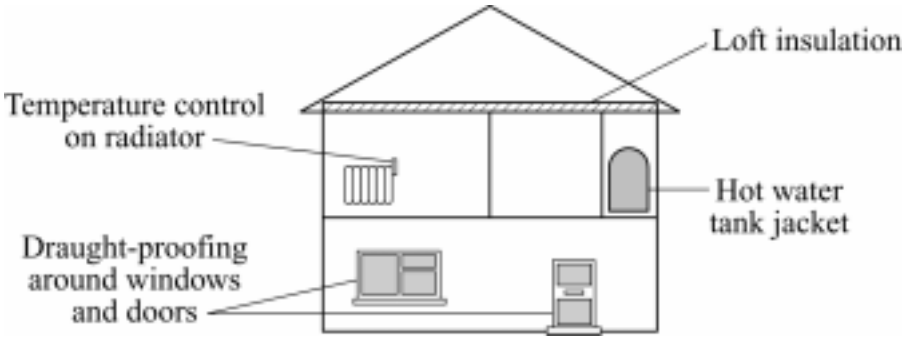
B is a good conductor of radiation.

C is a good emitter of radiation.

D is a good reflector of radiation.

QUESTION NINE

The diagram shows some ways of reducing energy loss from a house.



The table gives information about ways of reducing energy loss from a house.

Method of reducing energy loss	**Cost of fitting**	**Annual saving**
Draught-proofing	£50	£50
Hot water tank jacket	£20	£15
Loft insulation	£200	£50
Temperature controls on radiators	£100	£20

9.1 Which method of reducing energy loss saves money by preventing the house becoming too warm?

A Draught-proofing

B Hot water tank jacket

C Loft insulation

D Temperature controls on radiators

9.2 Which method reduces energy loss by the smallest amount?

A Draught-proofing

B Hot water tank jacket

C Loft insulation

D Temperature controls on radiators

9.3 Which method pays for itself in the shortest time?

A Draught-proofing

B Hot water tank jacket

C Loft insulation

D Temperature controls on radiators

9.4 What is the pay-back time on loft insulation?

A $\frac{1}{4}$ year

B $\frac{1}{2}$ year

C 2 years

D 4 years

END OF TEST

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** to **TWO**.

In these questions match the letters with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

You may find the following formula useful when answering this question.

$$\text{efficiency} = \frac{\text{useful energy transferred by device}}{\text{total energy supplied to device}}$$

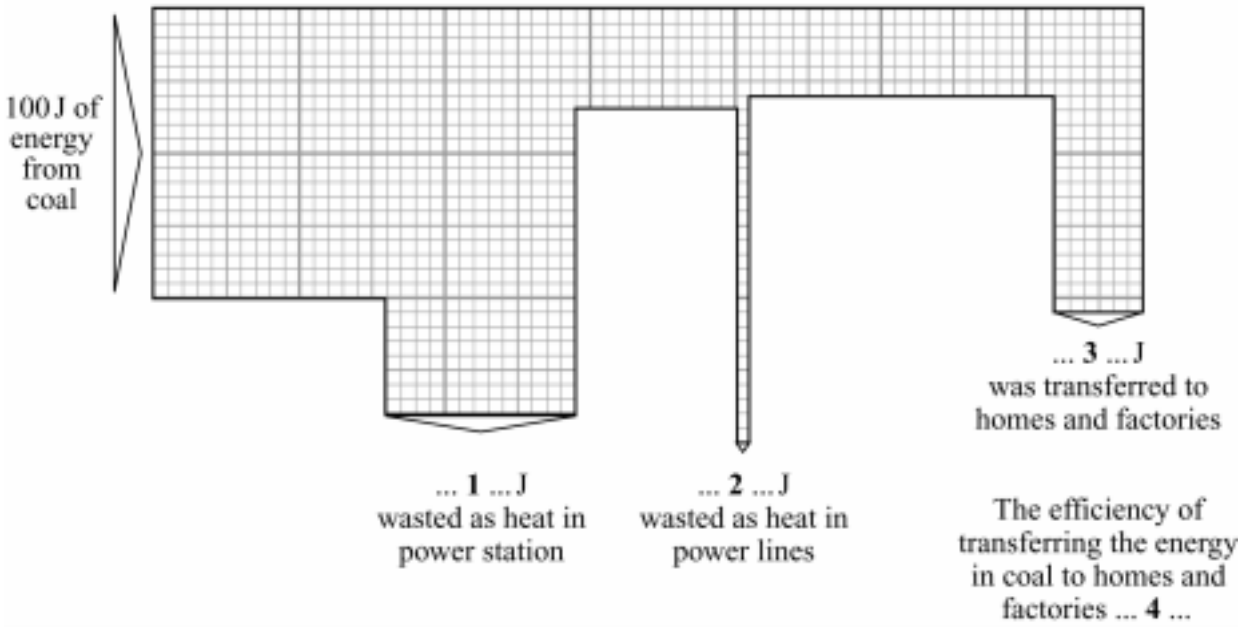
Match numbers, **A**, **B, C** and **D**, with the spaces **1 – 4** in the diagram.

A 0.3

B 5

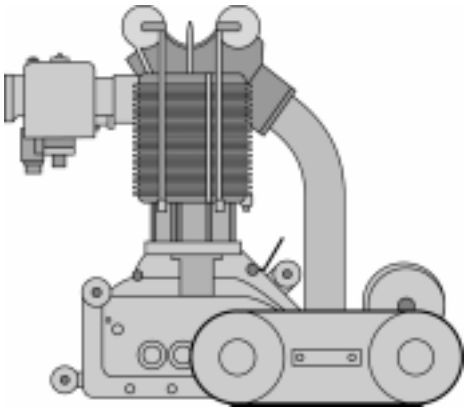
C 30

D 65



QUESTION TWO

The picture shows a motorcycle engine.



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

A Infra red radiation

B Particles

C Surface area

D Temperature

The engine becomes very hot, so it emits mainly …**1**… .

This process does not involve …**2**… .

The higher the …**3**… , the more heat is lost.

To make the loss of heat occur more quickly, the engine has 'fins' to increase its …**4**… .

SECTION B

Questions **THREE** to **NINE**.

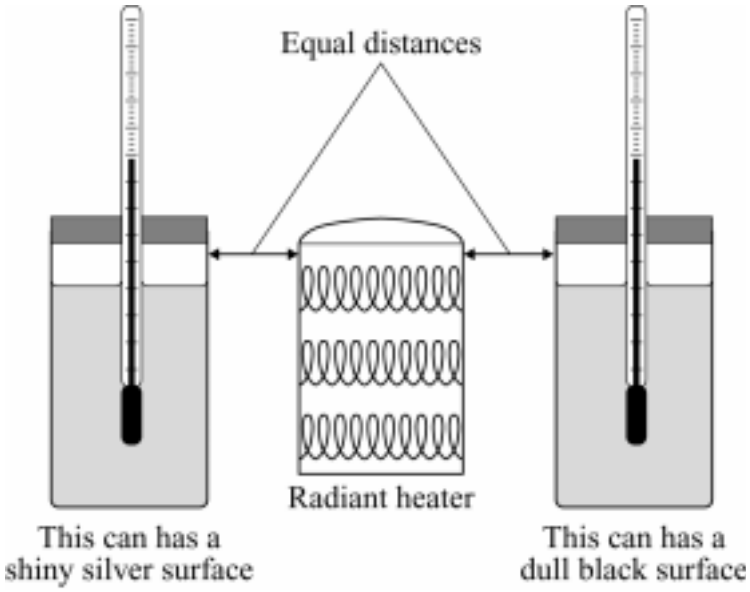
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION THREE

Anne did two experiments on radiation. The apparatus she used is shown in the diagram.



Experiment 1

- Anne put the same volume of cold water into the two cans.
- She then switched on the heater.
- Ten minutes later, she measured the temperature of the water in each can.

Experiment 2

- The student filled both cans with boiling water.
- This time she left the heater off.
- Ten minutes later, she measured the temperature of the water in the two cans.

The table shows her results.

Experiment 1				**Experiment 2**			
Initial temperature of water in °C		**Final temperature of water in °C**		**Initial temperature of water in °C**		**Final temperature of water in °C**	
Shiny silver can	Dull black can	Dull black can	Shiny silver can	Shiny silver can	Dull black can	Dull black can	Shiny silver can
15	15	27	19	100	100	84	95

[150]

3.1 Which was an independent variable in the two experiments?

A The final temperature of the water

B The initial temperature of the water

C The time the water was left

D The volume of the water

3.2 Which of these was **not** a control variable in Anne's **Experiment 1**?

A Distance from heater to cans

B Final temperature of water

C Power of radiant heater

D Volume of water

3.3 **Experiment 1** shows that a shiny silver surface . . .

A is a good absorber of radiation.

B is a good conductor of radiation.

C is a good emitter of radiation.

D is a good reflector of radiation.

3.4 **Experiment 2** shows that a dull black surface . . .

A is a good absorber of radiation.

B is a good conductor of radiation.

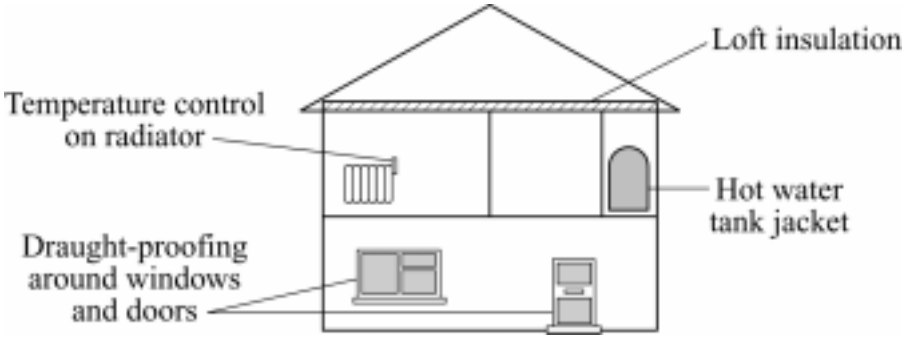
C is a good emitter of radiation.

D is a good reflector of radiation.

.

QUESTION FOUR

The diagram shows some ways of reducing energy loss from a house.



The table gives information about ways of reducing energy loss from a house.

Method of reducing energy loss	**Cost of fitting**	**Annual saving**
Draught-proofing	£50	£50
Hot water tank jacket	£20	£15
Loft insulation	£200	£50
Temperature controls on radiators	£100	£20

4.1 Which method of reducing energy loss saves money by preventing the house becoming too warm?

A Draught-proofing

B Hot water tank jacket

C Loft insulation

D Temperature controls on radiators

4.2 Which method reduces energy loss by the smallest amount?

A Draught-proofing

B Hot water tank jacket

C Loft insulation

D Temperature controls on radiators

4.3 Which method pays for itself in the shortest time?

A Draught-proofing

B Hot water tank jacket

C Loft insulation

D Temperature controls on radiators

4.4 What is the pay-back time on loft insulation?

A $\frac{1}{4}$ year

B $\frac{1}{2}$ year

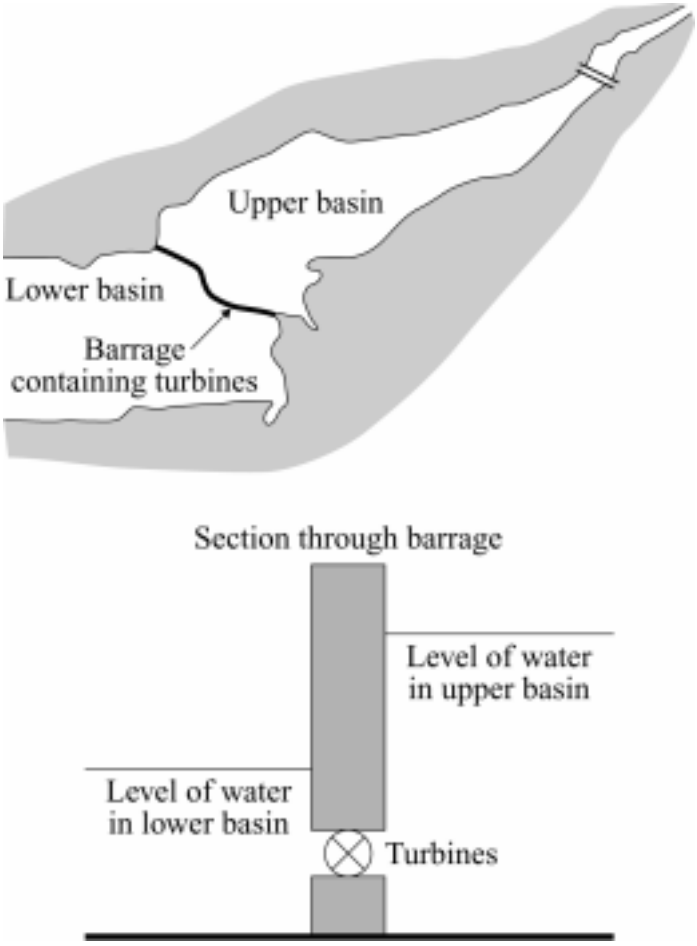
C 2 years

D 4 years

Turn over for the next question

QUESTION FIVE

The diagram shows a tidal barrage used to generate electricity.
Before the barrage was built, the mud flats on the estuary were repeatedly covered with sea water as the tide came in and went out again.
Wading birds feed on organisms that live in mud.



5.1 As water moves from the lower basin into the upper basin it gains mainly . . .

A electrical energy.

B gravitational potential energy.

C sound energy.

D thermal energy.

5.2 Which is the principal energy transfer as water flows from the upper basin through the turbine?

A Electrical energy to gravitational potential energy

B Electrical energy to kinetic energy

C Gravitational potential energy to kinetic energy

D Kinetic energy to gravitational potential energy

5.3 Compared to a coal-fired power station with a similar generating capacity, a tidal barrage usually . . .

A costs more to build.

B has a more concentrated energy supply.

C has higher fuel costs.

D has higher maintenance costs.

5.4 One disadvantage of this tidal barrage is that . . .

A it cannot be used in summer.

B it has high decommissioning costs.

C its output depends on the weather.

D wading birds lose a food source.

Turn over for the next question

QUESTION SIX

The diagram shows a saucepan on a hotplate.
The saucepan contains soup.
Some heat (thermal energy) is lost through the metal walls of the saucepan to the surroundings.

6.1 The energy spreads through the soup by . . .

A free electrons colliding with ions.

B heat rising.

C the soup contracting and falling as it is heated.

D the soup expanding and rising as it is heated.

6.2 The energy is transferred through the metal walls of the saucepan by . . .

A free electrons colliding with ions.

B heated metal expanding and rising.

C infra red waves passing through the metal.

D the atoms gaining energy and moving faster through the metal.

6.3 The outer walls of the saucepan transfer energy to the surroundings by . . .

A free electrons colliding with ions.

B infra red waves passing through the air.

C metal atoms gaining energy and escaping into the air.

D the air contracting and falling as it is heated.

6.4 The air in contact with the outer walls of the saucepan . . .

A contracts and falls due to decreased density.

B contracts and falls due to increased density.

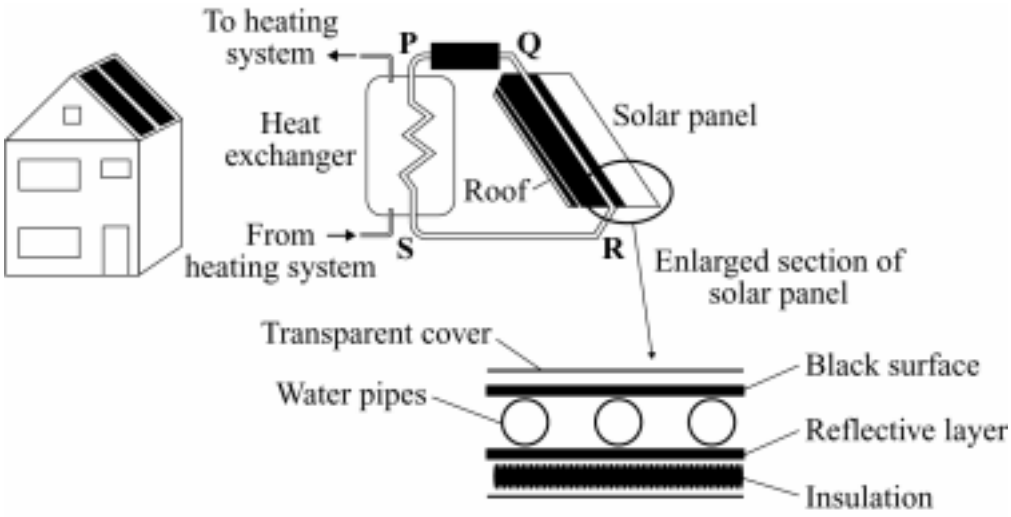
C expands and rises due to decreased density.

D expands and rises due to increased density.

Turn over for the next question

QUESTION SEVEN

Solar panels transfer solar energy to heat water.
This water then moves through a heat exchanger.



7.1 The different layers of the solar panel make the panel transfer solar energy in the most effective way.

Which row of the table, **A**, **B**, **C** or **D**, shows how each layer helps this?

	Black top surface covering water pipes	**Insulation**
A	Absorbs radiant energy	Stops heat conduction to roof
B	Absorbs radiant energy	Protects water pipes from frost
C	Emits radiant energy	Conducts heat to the water pipes
D	Reflects radiant energy	Conducts heat to roof space

7.2 When the system is operating . . .

A the water in tube **PS** becomes colder and moves from **S** towards **P**.

B the water in tube **PS** becomes warmer and moves from **S** towards **P**.

C the water in tube **QR** becomes less dense and moves from **R** towards **Q**.

D the water in tube **QR** becomes more dense and moves from **Q** towards **R**.

7.3 The water pipes are made of long, narrow, copper tubing laid on the underside of the black top surface.

This arrangement ensures that heat energy is . . .

A conducted quickly to the water in the narrow tubing.

B distributed evenly between the top surface and the tubing.

C reflected from the top surface.

D transferred by convection.

7.4 Which design feature is most important for capturing maximum energy from the Sun's radiation?

A Large surface area for the panel

B Short distance between the copper tubing loops

C Well insulated copper tubing

D Wide diameter for the copper tubing

Turn over for the next question

QUESTION EIGHT

An African village is many miles away from a supply of mains electricity.
The Sun shines for at least a few hours nearly every day.
The villagers want a supply of electricity to pump water up from the well for a few hours each day.

The table shows the costs of two different ways of providing the electricity.

	Capital cost	**Capital cost (per kWh*)**	**Fuel cost (per kWh*)**	**Maintenance cost (per kWh*)**
Solar cells	£1000	20p	zero	zero
Petrol generator	£250	10p	20p	10p

[*These costs are averaged out over the 20 years that the equipment is expected to last.]

8.1 Which of the following statements is true?

A A petrol generator has a higher capital cost per kWh.

B A petrol generator has a higher initial capital cost.

C A petrol generator has a higher overall cost per kWh.

D A petrol generator needs less maintenance.

8.2 An advantage of the petrol generator is . . .

A that it has no moving parts.

B that it is cheaper to set up the system in the first place.

C that it will cause less air pollution.

D that it will cost less over a 20 year period.

8.3 A disadvantage of the solar cells for pumping water in the African village is . . .

A that they can work out cheaper over a 20 year period.

B that they have a high initial capital cost.

C that they require no maintenance.

D that they will not work during the night.

8.4 If the solar cells are used in the UK, they will produce only one fifth as much electricity during a 20-year period as they do in the African village.

How much more expensive would each kilowatt hour of electricity from the solar cells then be compared to mains electricity at 8 p per kilowatt hour?

A 2.5 times more expensive

B 5 times more expensive

C 10 times more expensive

D 12.5 times more expensive

Turn over for the next question

QUESTION NINE

Electricity can be generated in various ways.
The main power stations use fossil fuels (coal, oil and gas) or nuclear fuels.
No nuclear power stations have been built in the UK for some years.

9.1 Which one of the following is a valid argument against nuclear power stations?

A For maximum efficiency, they have to be in nearly constant use.

B They have high decommissioning costs.

C They have high fuel costs.

D They produce gases that pollute the atmosphere.

9.2 Some people argue that we should make more use of wind power instead of nuclear or fossil fuel power stations.

Which statement supports this view?

A Fossil fuel and nuclear power stations are needed when the wind drops.

B Large wind farms can be unsightly and noisy.

C Wind farms have zero fuel costs to offset high capital cost.

D Wind farms use large areas of land.

9.3

You may find this formula useful when answering this question.

energy transferred (kilowatt-hour, kWh)	=	power (kilowatt, kW)	×	time (hour)

Using 1 tonne of uranium in a nuclear power station produces 1600 000 000 kWh of energy.
How much uranium would be needed to fuel a 2400 MW nuclear power station for 24 hours?
(1 MW = 1000 kW)

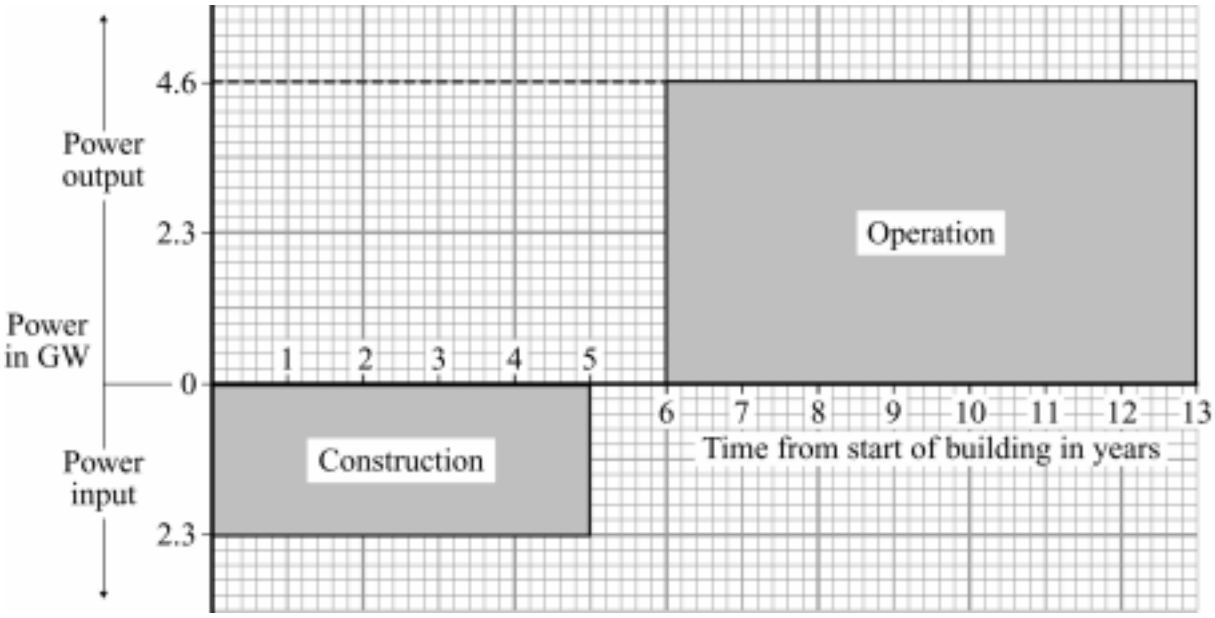
A 0.00036 tonnes

B 0.000625 tonnes

C 0.36 tonnes

D 2.78 tonnes

9.4 Nuclear power stations take a long time to build. Power is used in their construction and initial fuel processing. This, and the power produced by the station, are shown in the graph. The area under the graph represents the energy used or produced in GWh (1 GWh = 1 million kWh).



How many years will pass from the start of building before the power station produces more energy than was used to build it?

A 7 years

B 7.5 years

C 8 years

D 8.5 years

END OF TEST

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT PHYSICS 1a - FOUNDATION TIER

Question No.	KEY
One	1 – B 2 – D 3 – C 4 – A
Two	1 – D 2 – C 3 – B 4 – A
Three	1 – C 2 – D 3 – A 4 – B
Four	1 – D 2 – C 3 – A 4 – B
Five	1 – A 2 – B 3 – D 4 – C
Six	1 – D 2 – B 3 – C 4 – A
Seven	7.1 – A, 7.2 – C, 7.3 – D, 7.4 – A
Eight	8.1 – B, 8.2 – B, 8.3 – D, 8.4 – C
Nine	9.1 – D, 9.2 – B, 9.3 – A, 9.4 – D
	Overall marks = 36

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT PHYSICS 1a - HIGHER TIER

Question No.	KEY
One	1 – D 2 – B 3 – C 4 – A
Two	1 – A 2 – B 3 – D 4 – C
Three	3.1 – B, 3.2 – B, 3.3 – D, 3.4 – C
Four	4.1 – D, 4.1 – B, 4.3 – A, 4.4 – D
Five	5.1 – B, 5.2 – C, 5.3 – A, 5.4 – D
Six	6.1 – D, 6.2 – A, 6.3 – B, 6.4 – C
Seven	7.1 – A, 7.2 – C, 7.3 – B, 7.4 – A
Eight	8.1 – C, 8.2 – B, 8.3 – D, 8.4 – D
Nine	9.1 – B, 9.2 – C, 9.3 – C, 9.4 – D
	Overall marks = 36

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Surname		Other Names	
Centre Number						Candidate Number				
Candidate signature										

General Certificate of Secondary Education
Specimen Paper

SCIENCE A
Radiation and the Universe (Unit Physics 1b)

Date and Time

For this paper you must have:
- a black ball-point pen
- an objective test answer sheet

You may use a calculator.

Time allowed: 30 minutes

Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Radiation and the Universe' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown: 1 2 3 4 ○ ● ○ ○
- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown: 1 2 3 4 ○ ✖ ○ ●
- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown: 1 2 3 4 ○ ⊗ ○ ✖

Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Higher Tier starts on page 16 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **SIX**.

In these questions match the letters with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

We use electromagnetic radiation for many different jobs.

Match words, **A**, **B**, **C** and **D**, with the drawings labelled **1 – 4**.

A Gamma rays

B Infra red waves

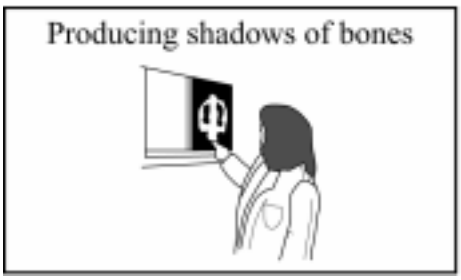
C Ultraviolet waves

D X-rays

1

2

3



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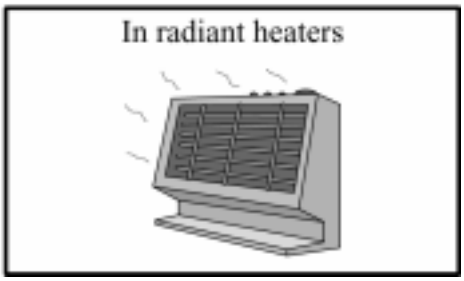


QUESTION TWO

Electromagnetic waves can be grouped into types with different wavelengths.

Match words, **A**, **B**, **C** and **D**, with the spaces **1 – 4** in the table.

A Infra red waves

B Microwaves

C Ultraviolet waves

D X-rays

Increasing wavelength ⟶

gamma rays	**1**	**2**	visible light	**3**	**4**	radio waves

QUESTION THREE

The diagram shows a mobile phone.

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

A A digital

B A microphone

C An analogue

D Microwave radiation

When we talk into the phone, the sound is detected by … **1** … .

Sound is … **2** … signal.

The phone converts this type of signal into … **3** …signal.

The signal is then transmitted from the antenna in the form of … **4** … .

QUESTION FOUR

The table gives information about five radioactive isotopes.

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

A The isotope which does not damage the body from the outside

B The isotope which gives off the most penetrating type of radiation

C The isotope with the longest half-life

D The isotope with the smallest mass

	Isotope	**Type of radiation emitted**	**Half-life**
1	Californium-241	alpha (α)	4 minutes
2	Cobalt-60	gamma (γ)	5 years
3	Hydrogen-3	beta (β)	12 years
4	Strontium-90	beta (β)	28 years

Turn over for the next question

QUESTION FIVE

Electromagnetic radiation can damage our bodies if it is not used correctly.

Match words, **A**, **B**, **C** and **D**, with the words **1 – 4** in the table.

A Infra red radiation

B Microwaves

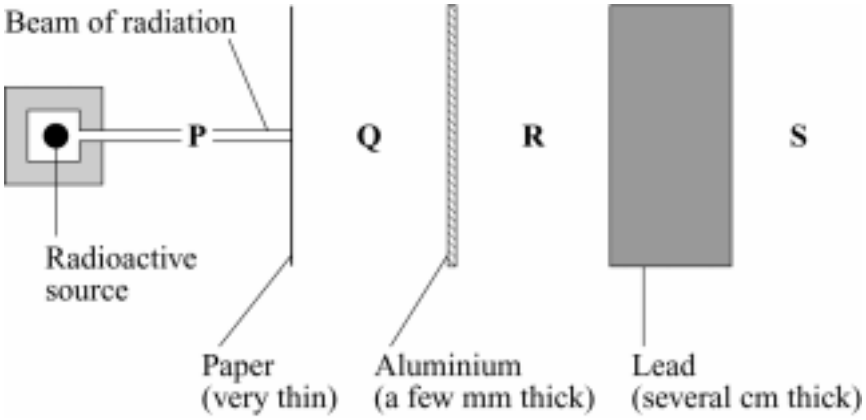
C Ultraviolet radiation

D X-rays

	Damage caused to body
1	Burns
2	Damages cells by heating water inside them
3	Damage to unborn children by causing mutations
4	Skin cancer

QUESTION SIX

A radioactive source gives out a narrow beam of radiation.
Barriers are placed in front of the source as shown in the diagram.



Readings are taken from a radiation detector at **P**, **Q**, **R** and **S**.

These readings are shown in the table.

Position of detector	Reading on detector
P	280
Q	136
R	98
S	0

Match the counts **P**, **Q**, **R** and **S** with the words **1 – 4** in the table.

	Types of radiation
1	Gamma radiation only
2	Gamma radiation and beta particles
3	Gamma radiation, alpha particles and beta particles
4	No radiation

SECTION B

Questions **SEVEN** to **NINE**.

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SEVEN

We have obtained evidence for the origin of the Universe by studying light coming to us from bodies in the Universe.

7.1 From which bodies do we get light that gives evidence for the origin of the Universe?

A Comets

B Galaxies

C Moons

D Planets

7.2 The light coming from these bodies changes wavelength. This change is known as . . .

A blue shift.

B green shift.

C red shift.

D yellow shift.

7.3 This shift shows us that distant galaxies . . .

A are moving away from us.

B are moving in orbits.

C are moving towards us.

D are stationary.

7.4 This shift gives evidence for . . .

A global warming.

B life on other planets.

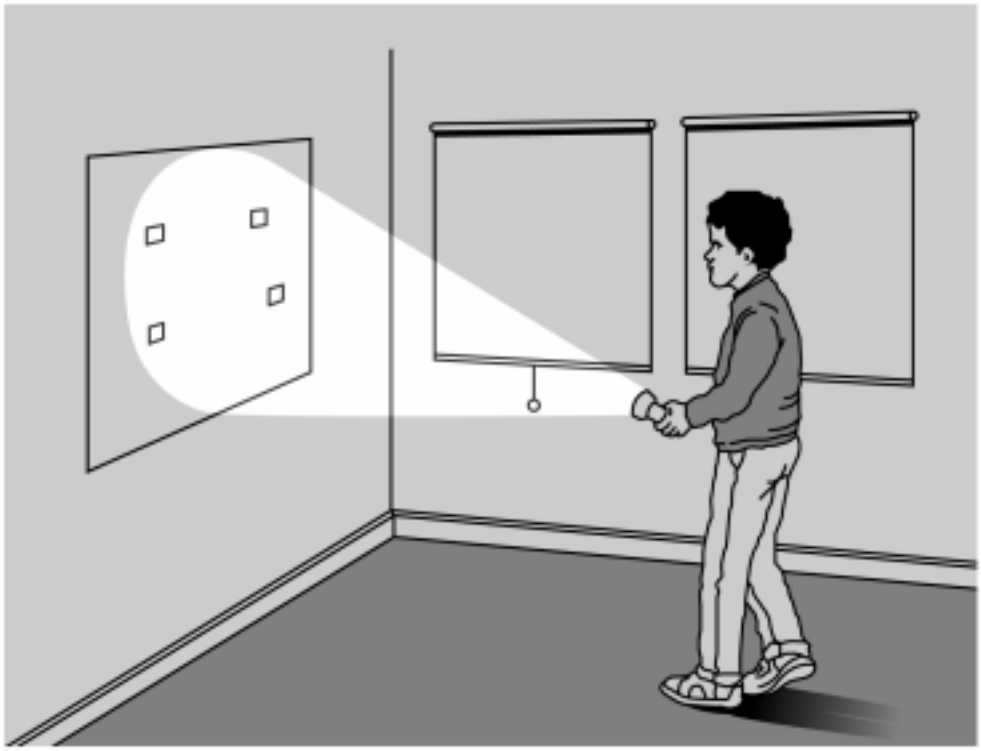
C the Big Bang theory.

D the theory of evolution.

Turn over for the next question

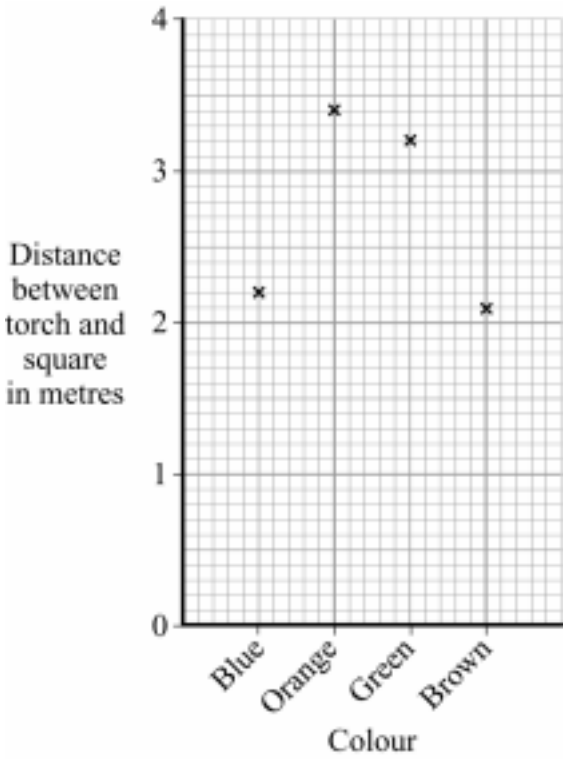
QUESTION EIGHT

To be seen walking along the road on a dark night, it is important to wear clothing which will reflect light from car headlamps. Isaac investigated which colours are best at reflecting light.



- He stuck small squares of different coloured material on to a black card.
- He hung the card at one end of a darkened laboratory.
- He switched on his torch and moved towards the coloured squares.
- When he could clearly see a coloured square, he measured the distance between the torch and that coloured square with a measuring tape graduated to 2 cm.
- He then repeated the technique to find the distance for the other coloured squares.

The graph shows Isaac's results.



8.1 Which of these colours would it be best to use for a reflective coat?

A Blue

B Brown

C Green

D Orange

8.2 Why did Isaac do the investigation in a darkened room?

A Because colours show up better in torchlight

B Because reflective clothing is used at night

C So that only the light from the torch lit up the coloured squares

D To make it a fair test

8.3 Which of the following is a control variable in this experiment?

A The distance between the torch and the board

B The length of time the torch was switched on

C The colour of the coloured squares

D The size of the coloured squares

8.4 Isaac could have got more reliable results by using . . .

A a light meter.

B a metre rule graduated to 1 mm.

C a stop clock.

D binoculars.

Turn over for the next question

QUESTION NINE

Read the passage below about mobile phones.

> The number of mobiles in Britain has doubled to 50 million since the first government-sponsored report in 2000. The number of children aged between five and nine using mobiles has increased fivefold in the same period.
>
> Four studies have caused concern.
> A Swedish study suggests that heavy mobile users are more likely to get cancer in the ear and brain.
> A Dutch study suggests that there are changes in brain function in heavy mobile phone users. A German study found some evidence of an increase in cancer around transmitter masts.
> An EU study has shown evidence of cell damage from waves similar to those transmitted by mobile phones.
>
> A British scientist, Sir William Stewart, said, "All of these studies have yet to be replicated but we can't dismiss them out of hand. If there was a health risk it would have a greater effect on the young than on older people".

9.1 How has the number of mobile phones used by children aged between five and nine changed since 2000?

A It has doubled.

B It has risen fivefold.

C It has risen by 50 million.

D It has risen to 50 million.

9.2 What is a possible effect of waves from mobile phone masts on people living near them?

A Cancer

B Changes in brain function

C Non-malignant brain tumours

D Non-malignant ear tumours

9.3 Why has Sir William advised that children under eight should not use mobile phones?

A Mobile phones affect the brain.

B Mobile phones cause brain tumours.

C Mobile phones cause cancer.

D Mobile phones might have a greater effect on young people than on older people.

9.4 The link between mobile phones and health risk . . .

A cannot be proved.

B has been proved.

C needs research results to be replicated to be more certain.

D will never be proved.

END OF TEST

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** and **TWO**

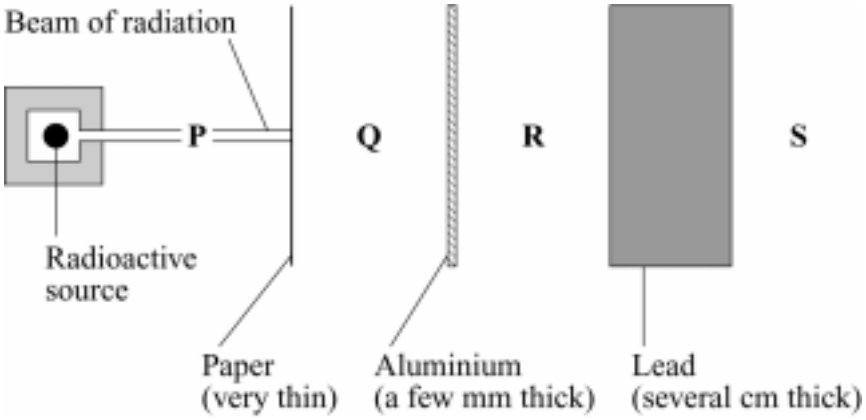
In these questions match the letters with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

A radioactive source gives out a narrow beam of radiation.
Barriers are placed in front of the source as shown in the diagram.



Readings are taken from a radiation detector at **P**, **Q**, **R** and **S**.

These readings are shown in the table.

Position of detector	Reading on detector
P	280
Q	136
R	98
S	0

Match the counts **P**, **Q**, **R** and **S** with the words **1 – 4** in the table.

	Types of radiation
1	Gamma radiation only
2	Gamma radiation and beta particles
3	Gamma radiation, alpha particles and beta particles
4	No radiation

QUESTION TWO

The table gives types of electromagnetic waves.

Match wavelengths, **A**, **B**, **C** and **D**, with the words **1 – 4** in the table.

A 0.0005 mm

B 0.1 mm

C 10 cm

D 1000 m

	Electromagnetic wave
1	Infra red
2	Light
3	Microwaves
4	Radio

SECTION B

Questions **THREE** to **NINE**.

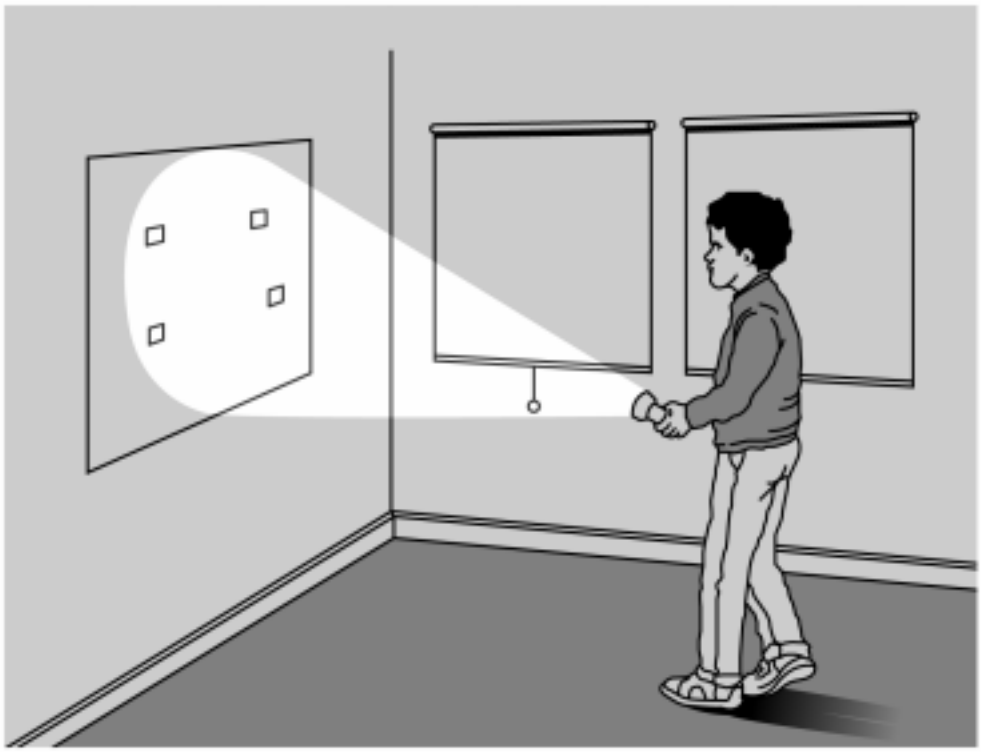
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

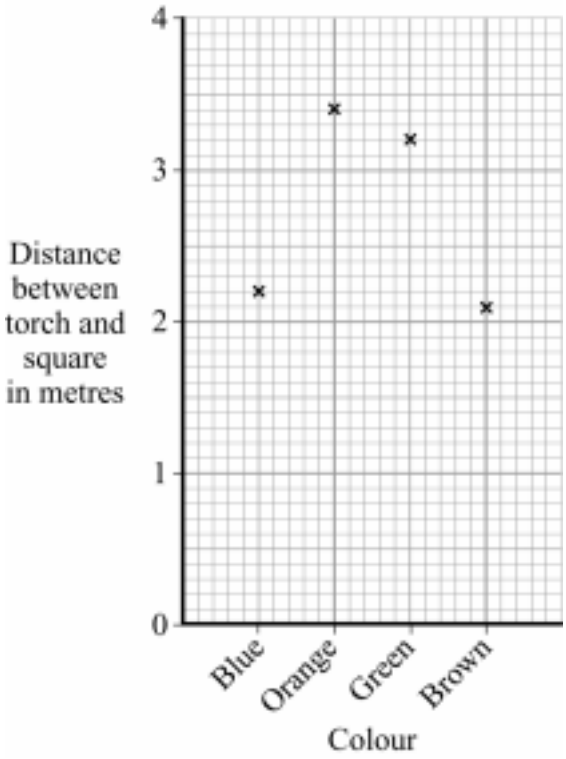
QUESTION THREE

To be seen walking along the road on a dark night, it is important to wear clothing which will reflect light from car headlamps. Isaac investigated which colours are best at reflecting light.



- He stuck small squares of different coloured material on to a black card.
- He hung the card at one end of a darkened laboratory.
- He switched on his torch and moved towards the coloured squares.
- When he could clearly see a coloured square, he measured the distance between the torch and that coloured square with a measuring tape graduated to 2 cm.
- He then repeated the technique to find the distance for the other coloured squares.

The graph shows Isaac's results.



3.1 Which of these colours would it be best to use for a reflective coat?

A Blue

B Brown

C Green

D Orange

3.2 Why did Isaac do the investigation in a darkened room?

A Because colours show up better in torchlight

B Because reflective clothing is used at night

C So that only the light from the torch lit up the coloured squares

D To make it a fair test

3.3 Which of the following is a control variable in this experiment?

A The distance between the torch and the board

B The length of time the torch was switched on

C The colour of the coloured squares

D The size of the coloured squares

3.4 Isaac could have got more reliable results by using . . .

A a light meter.

B a metre rule graduated to 1 mm.

C a stop clock.

D binoculars.

Turn over for the next question

QUESTION FOUR

Read the passage below about mobile phones.

> The number of mobiles in Britain has doubled to 50 million since the first government-sponsored report in 2000. The number of children aged between five and nine using mobiles has increased fivefold in the same period.
>
> Four studies have caused concern.
> A Swedish study suggests that heavy mobile users are more likely to get cancer in the ear and brain.
> A Dutch study suggests that there are changes in brain function in heavy mobile phone users. A German study found some evidence of an increase in cancer around transmitter masts.
> A EU study has shown evidence of cell damage from waves similar to those transmitted by mobile phones.
>
> A British scientist, Sir William Stewart, said, "All of these studies have yet to be replicated but we can't dismiss them out of hand. If there was a health risk it would have a greater effect on the young than on older people".

4.1 How has the number of mobile phones used by children aged between five and nine changed since 2000?

A It has doubled.

B It has risen fivefold.

C It has risen by 50 million.

D It has risen to 50 million.

4.2 What is a possible effect of waves from mobile phone masts on people living near them?

A Cancer

B Changes in brain function

C Non-malignant brain tumours

D Non-malignant ear tumours

4.3 Why has Sir William advised that children under eight should not use mobile phones?

A Mobile phones affect the brain.

B Mobile phones cause brain tumours.

C Mobile phones cause cancer.

D Mobile phones might have a greater effect on young people than on older people.

4.4 The link between mobile phones and health risk . . .

A cannot be proved.

B has been proved.

C needs research results to be replicated to be more certain.

D will never be proved.

Turn over for the next question

QUESTION FIVE

A smoke detector uses the radioactive element americium.
Americium gives radiation in the form of alpha particles.

Diagram 1 shows the position of the smoke detector in a room.

Diagram 2 shows the warning label at the back of the smoke detector.

Diagram 1

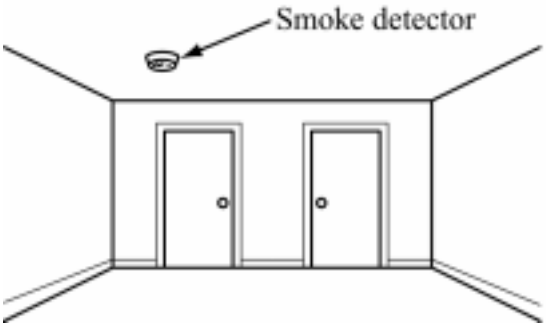
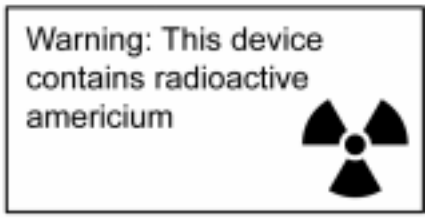


Diagram 2



5.1 The radiation from the americium in the smoke detector will not harm people in the room because . . .

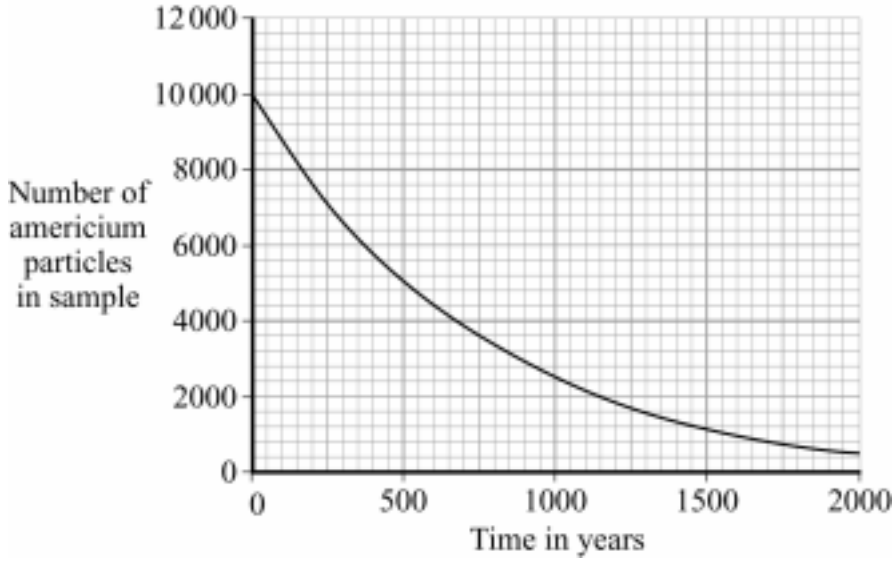
A alpha particles cannot cause mutations.

B alpha particles cannot damage human cells.

C alpha particles do not cause ionisation.

D alpha particles travel only a few centimetres in air.

The graph shows how the number of americium particles inside a source changes with time.



5.2 How long does it take for the number of americium particles to fall to 2500?

A 500 years

B 1000 years

C 1500 years

D 2000 years

5.3 What proportion of the americium particles were left after 500 years?

A one eighth

B one quarter

C a half

D three quarters

5.4 The battery in the smoke detector needs to be changed regularly, but the americium never needs to be changed. This is because . . .

A americium has a very long half-life.

B americium only gives off weak radiation.

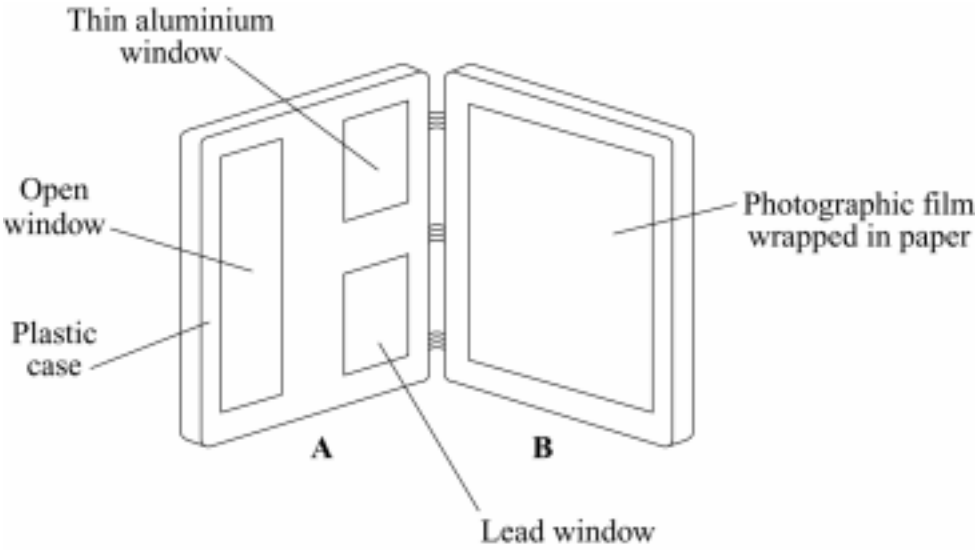
C long-life batteries cannot be used in smoke alarms.

D radiation is stronger than electricity.

Turn over for the next question

QUESTION SIX

The diagram shows a film badge worn by people who work with radioactive materials.
The badge has been opened.
The badge is used to measure the amount of radiation to which the workers have been exposed.



The detector is a piece of photographic film wrapped in paper inside part **B** of the badge.
Part **A** has "windows" as shown.

6.1 Which type(s) of radiation can pass through the open window and affect the film.

A Alpha radiation only

B Alpha radiation and beta radiation

C Beta radiation and gamma radiation

D Gamma radiation only

6.2 Which type(s) of radiation can pass through the lead window and affect the film.

A Alpha radiation only

B Alpha radiation and beta radiation

C Beta radiation and gamma radiation

D Gamma radiation only

6.3 Alpha radiation consists of . . .

A electrons only.

B helium nuclei.

C neutrons only.

D protons only.

6.4 Beta radiation consists of . . .

A electrons only.

B helium nuclei.

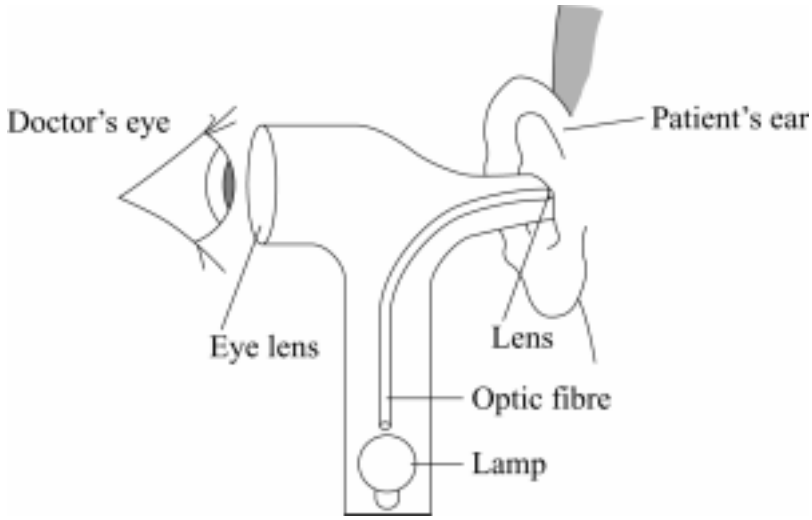
C neutrons only.

D protons only.

Turn over for the next question

QUESTION SEVEN

Doctors use endoscopes to examine the inside of the body. Endoscopes contain optical fibres.



7.1 The light wave stays inside the fibre…

A because it is absorbed.

B because it is an analogue wave.

C because it is a digital wave.

D because it is reflected.

7.2 Which other type of radiation is commonly used to transmit information along optical fibres?

A Gamma

B Infra red

C Microwaves

D Ultraviolet

7.3 A signal which varies continually in amplitude is known as . . .

A a digital signal.

B a musical signal.

C a noisy signal.

D an analogue signal.

7.4 Digital signals are less prone to interference than analogue signals because . . .

A only analogue signals get weaker as they travel.

B only analogue signals need to be amplified.

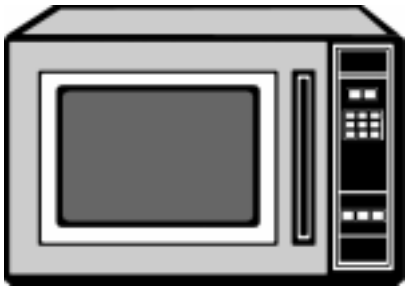
C only analogue systems pick up noise.

D only digital systems can ignore noise.

Turn over for the next question

QUESTION EIGHT

Microwave ovens can be used to heat many types of food.



8.1 When microwaves are absorbed by water in the food, the energy from the microwave is converted into . . .

A electrical energy.

B kinetic energy.

C light energy.

D sound energy.

8.2 Microwaves can be dangerous to humans because they cause . . .

A cells to heat up.

B ionisation.

C mutations.

D skin cancer.

8.3 Microwaves travel at a speed of 300 million m/s. Their wavelength is 0.03 m.

What is the frequency of these microwaves?

A 1 million Hz

B 10 million Hz

C 1 000 million Hz

D 10 000 million Hz

8.4 What speed do gamma rays travel at?

A A higher speed than microwaves

B A lower speed than microwaves

C The same speed as microwaves

D It is impossible to measure the speed of gamma rays.

Turn over for the next question

QUESTION NINE

9.1 Scientists are able to look at distant galaxies and planets due to technological advances.

Which instrument has helped them look the farthest into the Universe?

A Ground-based Observatories

B Hubble Telescope

C Space Probes

D Space Shuttle

9.2 Measurements of light from seven nearby stars were made. Red shift was observed in all the measurements.

What does this evidence suggest about the stars?

A All the stars measured are moving away from the Earth.

B All the stars measured are moving towards the Earth.

C None of the stars are moving relative to the Earth.

D Some stars could be moving towards the Earth and some could be moving away from the Earth.

9.3 Which of the following statements gives the best reason for the Big Bang theory being an accepted scientific theory?

A A group of people met together and decided to make it a theory.

B Distant galaxies were observed to be moving away from Earth.

C Edwin Hubble was an honest man.

D There is no other way to explain the formation of the Universe.

9.4 Why is the Big Bang theory the most accepted theory of how the Universe was formed?

A It has been proven correct by using mathematical models.

B It has not been revised or changed by scientists for many years.

C It is based on a combination of scientific and religious facts.

D It is the simplest explanation of the current scientific data.

END OF TEST

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT PHYSICS 1b - FOUNDATION TIER

Question No.	KEY
One	1 – C 2 – A 3 – D 4 – B
Two	1 – D 2 – C 3 – A 4 – B
Three	1 – B 2 – C 3 – A 4 – D
Four	1 – A 2 – B 3 – D 4 – C
Five	1 – A 2 – B 3 – D 4 – C
Six	1 – R 2 – Q 3 – P 4 – S
Seven	7.1 – B, 7.2 – D, 7.3 – A, 7.4 – C
Eight	8.1 – D, 8.2 – C, 8.3 – D, 8.4 – B
Nine	9.1 – A, 9.2 – A, 9.3 – D, 9.4 – C
	Overall marks = 36

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT PHYSICS 1b - HIGHER TIER

Question No.	KEY
One	1 – R 2 – Q 3 – P 4 – S
Two	1 – B 2 – A 3 – C 4 – D
Three	3.1 – D, 3.2 – C, 3.3 – D, 3.4 – B
Four	4.1 – A, 4.2 – A, 4.3 – D, 4.4 – C
Five	5.1 – D, 5.2 – B, 5.3 – C, 5.4 – A
Six	6.1 – C, 6.2 – D, 6.3 – B, 6.4 – A
Seven	7.1 – D, 7.2 – B 7.3 – D, 7.4 – D
Eight	8.1 – B, 8.2 – A, 8.3 – D, 8.4 – C
Nine	9.1 – B, 9.2 – A, 9.3 – B, 9.4 – D
	Overall marks = 36