Specimen Paper

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
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10	
11	
12	
13	
14	
15	
16	
TOTAL	

General Certificate of Secondary Education
Foundation Tier

Science A 1
Unit 5

F

For this paper you must have:
- a ruler
- the Chemistry Data Sheet (enclosed)
- the Physics Equation Sheet (enclosed).

You may use a calculator.

Time allowed
- 90 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 16 (c) should be answered in continuous prose. In this question you will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

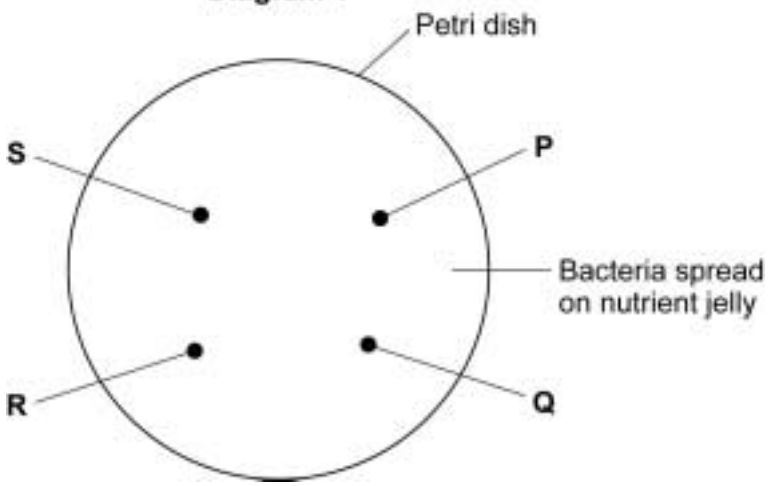
Answer **all** questions in the spaces provided.

Biology Questions

1 Students investigated how well antibacterial mouthwashes worked.
They tested four different mouthwashes, **P**, **Q**, **R** and **S**.

- They spread bacteria on nutrient jelly in a Petri dish.
- They soaked identical discs of filter paper in mouthwashes **P**, **Q**, **R** or **S**.
- They placed the discs on the growing bacteria as shown in **Diagram 1**.
- They covered the Petri dish.
- They incubated the Petri dish for two days.

Diagram 1



1 (a) The nutrient jelly was heated to 120 °C before being poured into the Petri dish.

Why is this necessary?

Tick (✓) **one** box.

Statement	Tick (✓)
To make bacteria grow more quickly.	
To kill microorganisms.	
To make the nutrients dissolve.	

(1 mark)

1 (b) What is the maximum temperature at which bacteria should be incubated in a school laboratory?

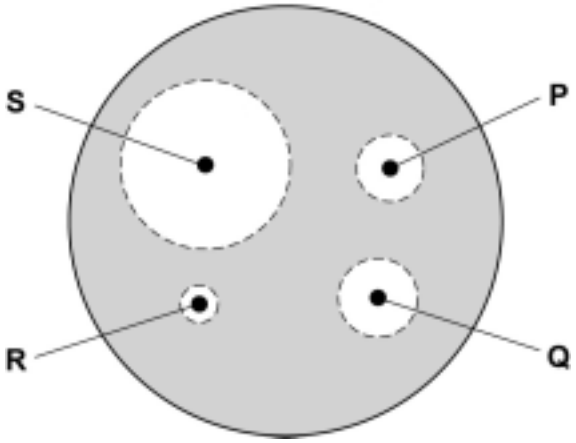
Tick (✓) **one** box.

Temperature	Tick (✓)
15 °C	
25 °C	
37 °C	

(1 mark)

1 (c) **Diagram 2** shows the appearance of the Petri dish after two days.

Diagram 2



Which mouthwash, **P**, **Q**, **R** or **S**, kills most bacteria? ☐

Give **one** reason for your answer.

.....

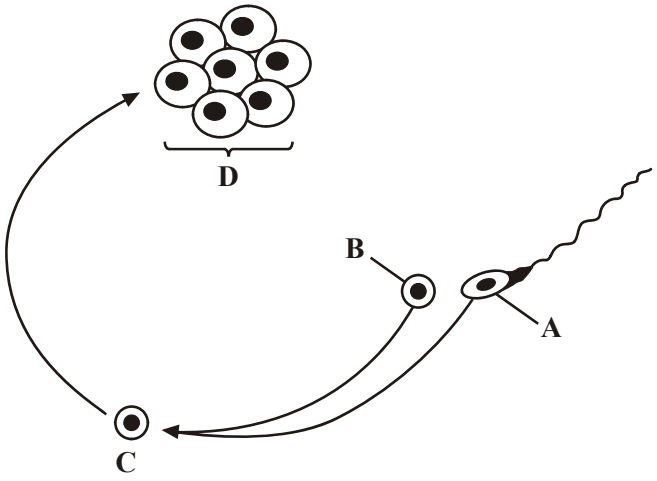
.....

(2 marks)

4

Turn over ▶

2 The diagram shows some of the stages in IVF (in-vitro fertilisation).



2 (a) Use words from the box to name structures **A**, **B**, **C** and **D**.

egg	**embryo**	**fertilised egg**	**ovary**	**sperm**

Structure **A** .....

Structure **B** .....

Structure **C** .....

Structure **D** .....

(4 marks)

2 (b) During IVF, what do the doctors do next with structure **D**?

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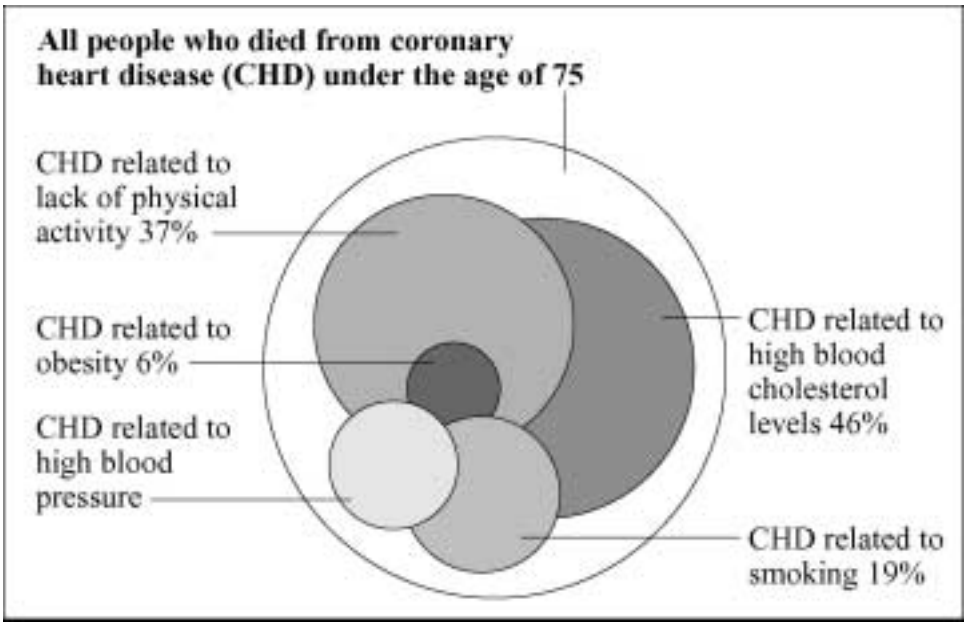
(2 marks)

6

3 The chart below shows factors that are related to death from coronary heart disease (CHD).



Each factor is represented by a circle.
The bigger the circle, the more people are affected by the factor.

3 (a) (i) The data are shown as overlapping circles instead of a bar chart.
The percentage of deaths related to the different factors add up to more than 100 %.

What does this tell you about some of the people who died from CHD?

.....

.....

(1 mark)

3 (a) (ii) **Estimate** the percentage of deaths from CHD related to high blood pressure.

..... %

(1 mark)

3 (b) CHD is affected by hereditary factors.
Give **two** hereditary factors that affect our health.

1. .....

2 .....

(2 marks)

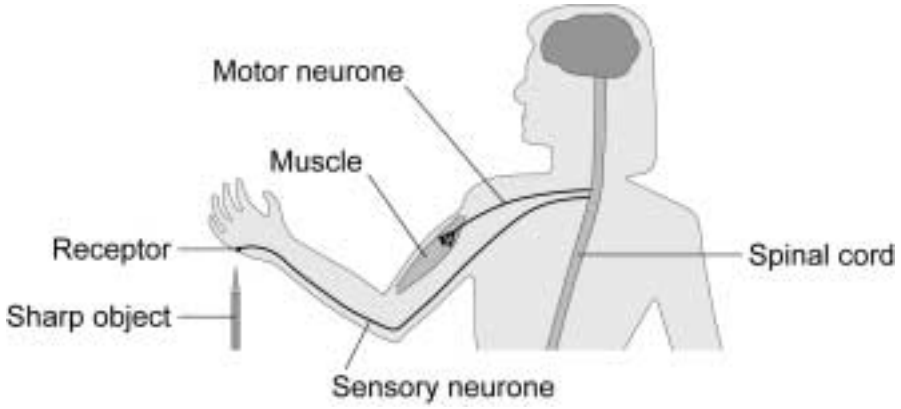
4

Turn over ▶

4 A student accidentally touches a sharp object.

Her hand is immediately pulled away from the object.

The diagram shows the structures involved in this response.



Describe how the structures labelled on the diagram are involved in this reflex action.

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(4 marks)

4

Turn over for the next question

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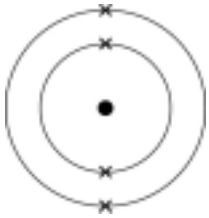
ANSWER IN THE SPACES PROVIDED

Chemistry questions

5 A substance made of only one type of atom is called an element.

5 (a) The diagram represents the structure of an atom.



5 (a) (i) What does the diagram tell you about this atom?

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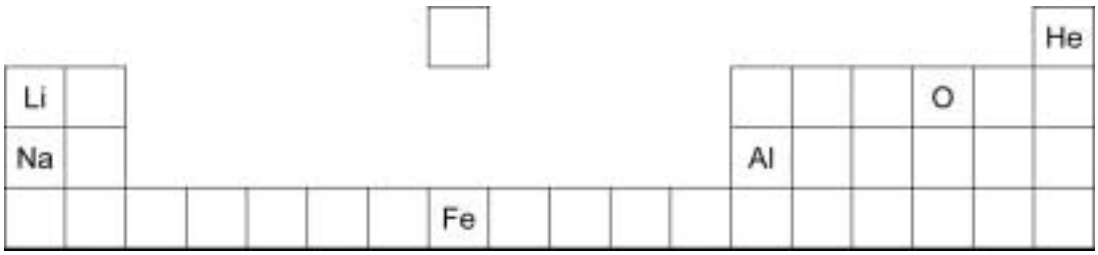
(3 marks)

5 (a) (ii) The atom of a different element has an atomic number of 5 and a mass of 11.
How many neutrons are in this atom?

.....

(1 mark)

5 (b) The chemical symbols and positions of six elements in the periodic table are shown.



Draw a straight line from each description to its correct symbol.

Description	Symbol
A metal with a low density that does not corrode easily	Al
It has properties similar to those of sodium, Na	Fe
It is a transition metal	He
It is a noble gas	Li
	O

(4 marks)

8

Turn over for the next question

6 Limestone and the products of limestone have many uses.

6 (a) Limestone is quarried.

Quarrying limestone has impacts that cause environmental problems.

Tick (✓) **two** impacts that cause environmental problems.

Impact of quarrying	Tick (✓)
Puts off tourists	
Causes dust pollution	
Increases jobs	
Increases traffic	

(2 marks)

6 (b) Limestone contains calcium carbonate, $CaCO_3$. When it is heated calcium carbonate produces calcium oxide and carbon dioxide. The word equation for this reaction is:

calcium carbonate ⟶ calcium oxide + carbon dioxide

6 (b) (i) Complete the following sentence.

The reaction when calcium carbonate is heated is called

thermal ..... .

(1 mark)

6 (b) (ii) 100 g of calcium carbonate was heated and produced 56 g of calcium oxide.

Calculate the mass of carbon dioxide produced.

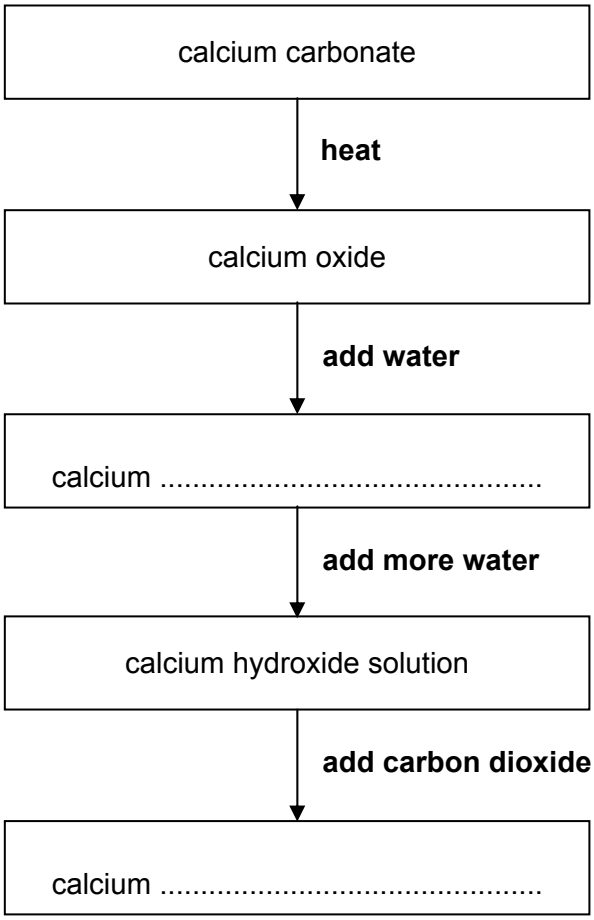
.....

.....g

(1 mark)

6 (c) The flow chart shows the stages in the limestone cycle.

Complete the names of the calcium compounds formed in the flow chart.



(2 marks)

6

Turn over for the next question

7 Useful fuels can be produced from crude oil. Crude oil is a mixture of hydrocarbons.

7 (a) The table shows the boiling points of four of these hydrocarbons.

Hydrocarbon	Boiling point in °C
methane, CH_4	–162
butane, C_4H_{10}	0
pentane, C_5H_{12}	+36
decane, $C_{10}H_{22}$	+175

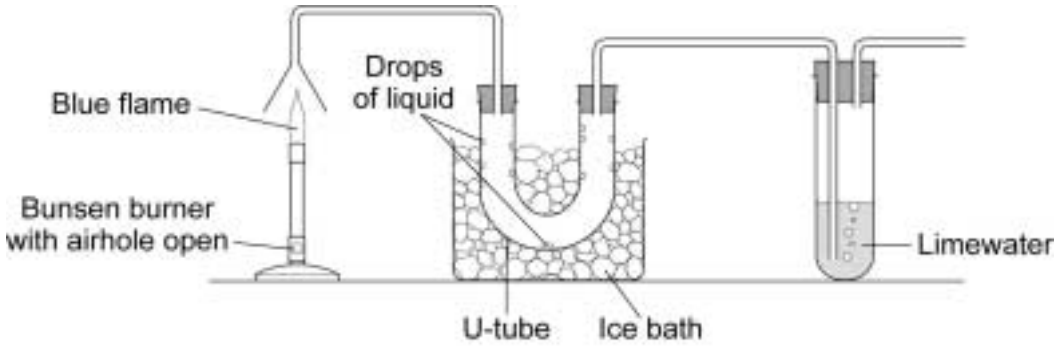
Tick (✓) **two** statements that are correct about these hydrocarbons.

Statement	Tick (✓)
decane has the largest molecules	
pentane is a liquid at 40 °C	
methane and butane are gases at 20 °C	
methane has the highest boiling point	
butane does **not** boil	

(2 marks)

7 (b) Natural gas supplied to homes and schools is mainly methane.

The diagram shows an apparatus to investigate the two substances produced when natural gas burns completely in air.



7 (b) (i) Name the liquid that collects in the U-tube. .....

(1 mark)

7 (b) (ii) Name the gas that turns the limewater cloudy. .....

(1 mark)

7 (c) Some crude oil contains sulfur. Petrol and diesel fuels are produced from crude oil.

The sulfur must be removed from these fuels before they are burned.

Explain why.

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(2 marks)

6

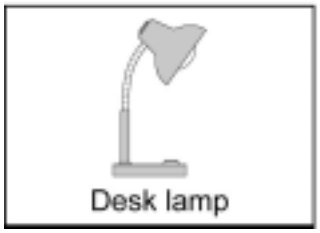
Turn over for the next question

Physics Questions

8 (a) The diagrams in **List A** show three electrical appliances. Each appliance is designed to transfer electrical energy.

Draw **one** straight line from each appliance in **List A** to the useful output energy produced by that appliance in **List B**.

Draw only **three** lines.

List A Appliance	List B Useful energy output
 MP3 player	Light
 Food processor	Sound
 Desk lamp	Electrical
	Kinetic

(3 marks)

8 (b) The diagram shows the energy transformations produced by a TV.

8 (b) (i) Which are the useful energy outputs?

.....

.....

(1 mark)

8 (b) (ii) Use the information in the diagram to calculate the efficiency of the TV.

Write down the equation you use, and then show clearly how you work out your answer.

.....

.....

Efficiency = ...

(2 marks)

8 (b) (iii) What eventually happens to the useful energy transferred by the TV?

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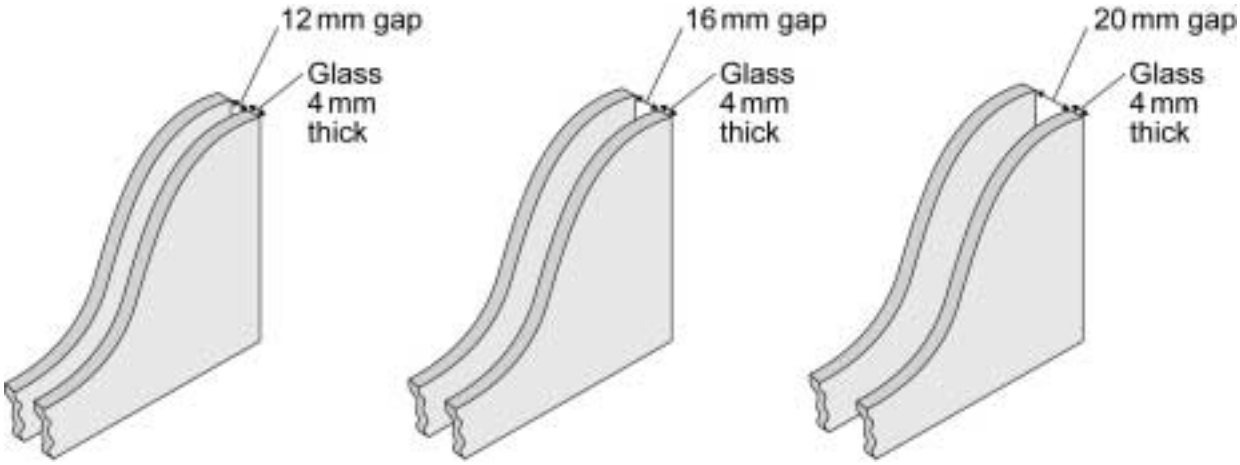
(1 mark)

7

Turn over for the next question

9 The diagrams show the cross-section of three double glazed windows.



The gap between the two sheets of glass can be filled with either air or a mixture of air and argon.

The U-values for different types of double glazed windows, using different types of glass **X** and **Y**, are given in the table.

	Type of window	**12 mm gap**	**16 mm gap**	**20 mm gap**
1	Glass type **X** with air	2.9	2.7	2.8
2	Glass type **X** with air and argon	2.7	2.6	2.6
3	Glass type **Y** with air	1.9	1.8	1.8
4	Glass type **Y** with air and argon	1.6	1.5	1.5

9 (a) Which type of window, **1**, **2**, **3** or **4** is the least energy efficient?

.....

(1 mark)

9 (b) Which windows should be compared to decide if adding argon to the gap improves the energy efficiency of the window?

.....

(1 mark)

9 (c) A householder is going to buy new windows. The sales assistant recommends that the householder buys windows with a 20 mm gap. These windows are much more expensive than those with a 16 mm gap.

It is **not** worth the householder paying the extra cost to buy 20 mm windows rather than 16 mm windows.

Explain this in terms of energy efficiency.

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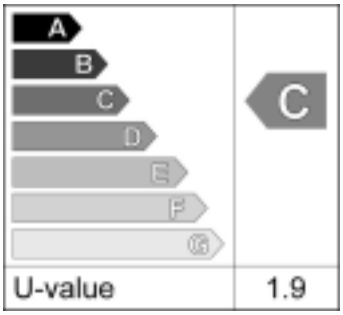
(2 marks)

9 (d) Windows are given an energy rating, from **A** down to **G**. The diagram shows the energy label from one type of double glazed window.



All new double glazed windows must have an energy rating of **C** or above.
Windows having a **C rating** have a U-value of 1.9.

Which windows given in the table would the householder be **unable** to buy?

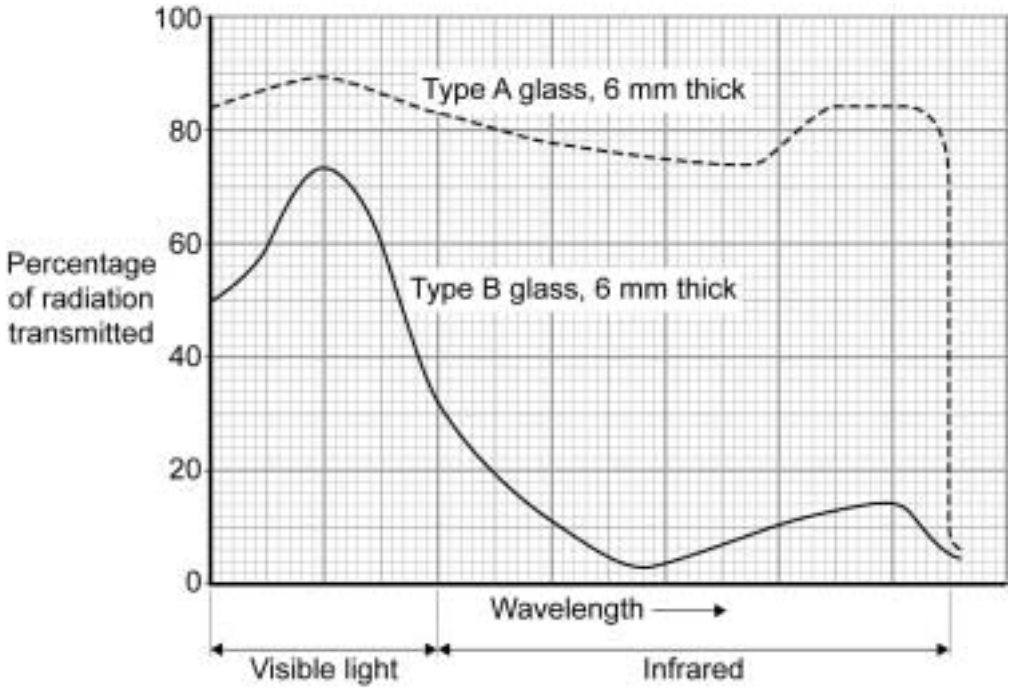
.....

(1 mark)

Question 9 continues on the next page

Turn over▶

9 (e) Glass transmits infrared radiation and visible light. The amount transmitted depends on the type and thickness of the glass. The data from tests on two different types of glass is displayed in the graph below.



A homeowner has a glass conservatory built on the back of the house. The homeowner tells the builder that the inside of the conservatory should stay as cool as possible throughout the summer.

Explain why the builder uses 'Type B' glass for the conservatory.

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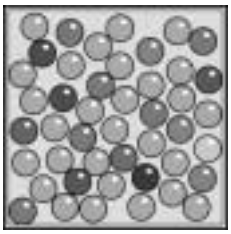
(2 marks)

7

10 Marbles inside a box can be used as a model for the particles in a solid, a liquid or a gas.



Use words from the box to complete the following sentences. Each word can be used once, more than once or not at all.

gas	**liquid**	**solid**

10 (a) The particles in a .....vibrate about fixed positions.

(1 mark)

10 (b) The particles in a .....move at high speed in any direction.

(1 mark)

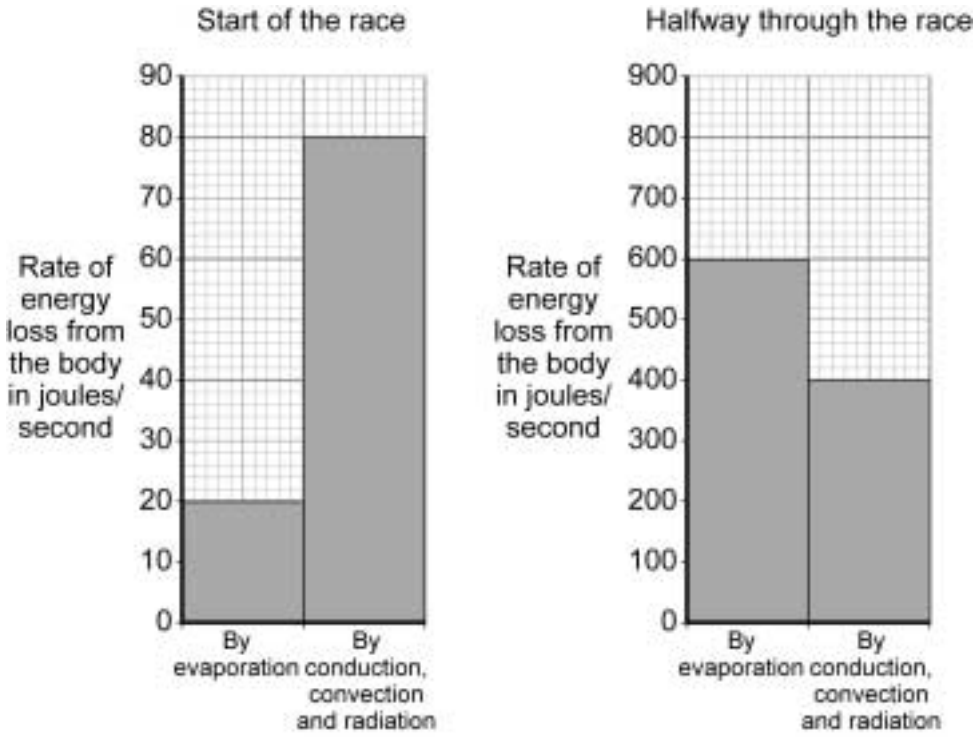
10 (c) The particles in a ..... are arranged in a pattern.

(1 mark)

3

Turn over for the next question

11 The bar charts show the rate of energy loss from the body of a runner at the start of a marathon race and half way through the race.



11 (a) It is important that the energy loss by evaporation increases during the race.

Explain why.

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(2 marks)

11 (b) At the end of the marathon the runner covers herself in a silvered space blanket.

Explain how the space blanket helps keep the runner warm.

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(2 marks)

4

Turn over for the next question

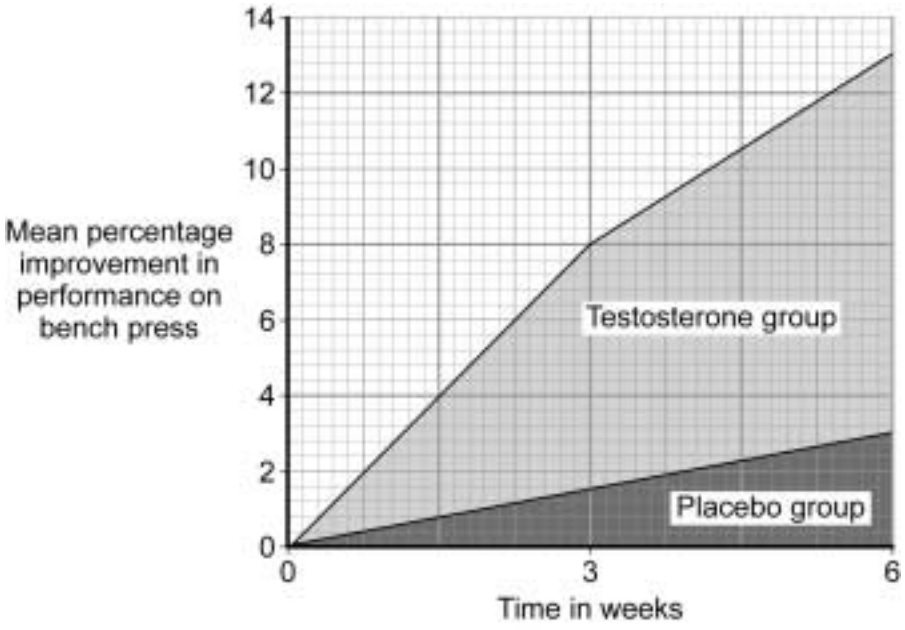
Biology Questions

12 Some athletes use drugs containing the steroid testosterone to improve their performance.

In an investigation:

- scientists monitored the performance of 18 male athletes over a 6 week training programme
- 9 athletes were given weekly injections of testosterone with the dose of 3.5 milligrams per kilogram of body mass, for 6 weeks
- the other 9 athletes were given a placebo
- the athletes' performance on a bench press exercise was measured at 3 weeks and 6 weeks.

The graph shows the results of the investigation.



12 (a) The data would have been better presented as a bar chart.

Give a reason why.

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(1 mark)

12 (b) Suggest what was given as a placebo in this investigation.

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(1 mark)

12 (c) Describe the results of the investigation.

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(2 marks)

12 (d) Most internet advertisements for testosterone state that athletes need to use testosterone for at least 10 weeks to significantly improve performance.

Do the results of this investigation support the statement in the advertisements?

Give **one** reason for your answer.

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(1 mark)

5

Turn over for the next question

13 Many diseases are caused by viruses. Children are given vaccines to protect them against viral disease.

13 (a) Explain how vaccination protects a child against a viral disease.

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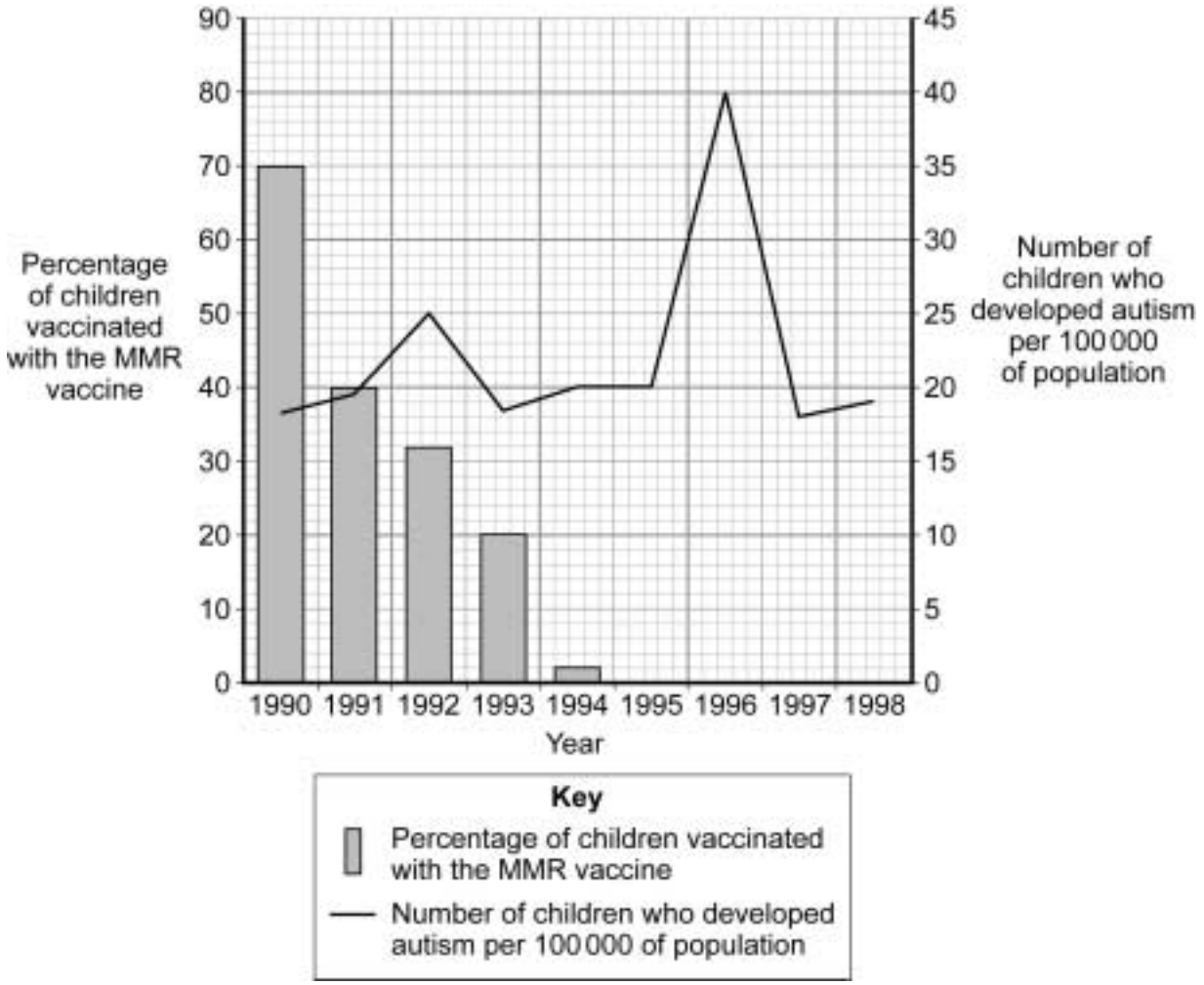
(3 marks)

13 (b) In the 1990s many people thought that the MMR vaccine caused autism in some children. This is why the Japanese government stopped using the MMR vaccine.

The graph gives information about the percentage of Japanese children who developed autism during the 1990s.



The data in the graph support the view that there is **no** link between MMR vaccination and autism.

Explain why.

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(4 marks)

7

Turn over for the next question

Chemistry Questions

14 Copper is found in the Earth's crust as an ore containing copper sulfide. Large areas of land, where this ore was once quarried, are contaminated with low percentages of copper sulfide. Copper would be too expensive to extract from this contaminated land using the traditional method of quarrying and then heating in a furnace.

14 (a) Extracting copper from this land by the traditional method would have a major environmental impact.

Give **two** reasons why.

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(2 marks)

14 (b) One way to extract the copper from land that contains low percentages of copper sulfide is by bioleaching. Bioleaching uses bacteria. The bacteria produce a solution of copper sulfate.

It is possible to get copper from a solution of copper sulfate using scrap iron.

14 (b) (i) It is economical to use scrap iron to get copper.

Give **one** reason why.

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(1 mark)

14 (b) (ii) Iron can be used to get copper from copper sulfate solution.

Explain why.

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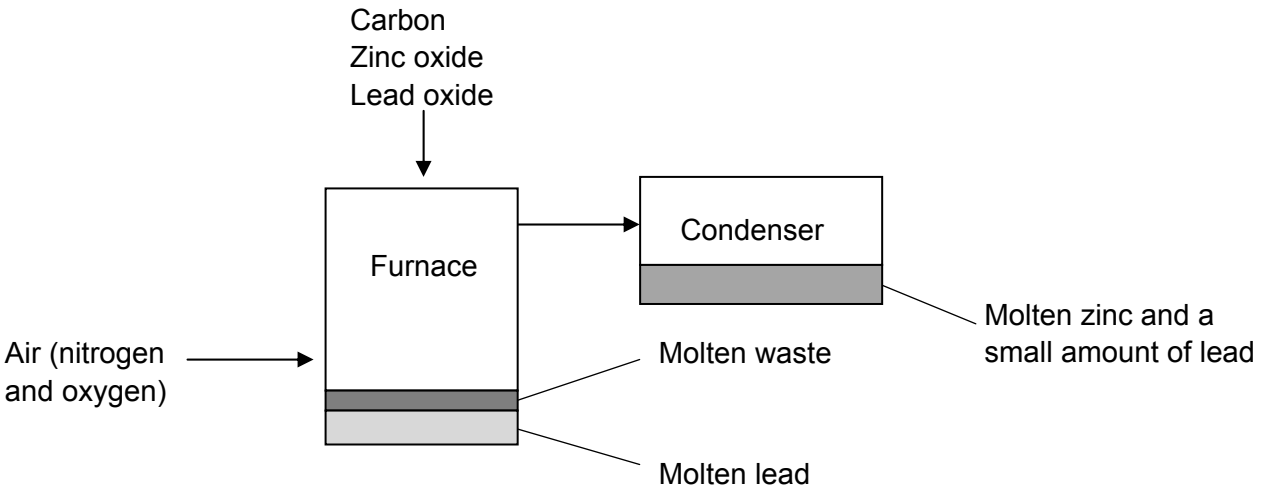
(2 marks)

5

15 Nearly all zinc is obtained from ores that also contain lead. The metals zinc and lead can be extracted by reducing their oxides using carbon.



15 (a) Complete the following sentence.

Zinc oxide is reduced by carbon, which takes away ..... to leave zinc metal. *(1 mark)*

15 (b) The melting points and boiling points of lead and zinc are given in the table.

Metal	**Lead**	**Zinc**
Melting point in °C	328	420
Boiling point in °C	1740	907
Density in g per cm^3	11.34	7.14

The furnace operates at a temperature of 1200 °C.

15 (b) (i) Explain why only lead metal remains in the furnace.

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(2 marks)

15 (b) (ii) Suggest how zinc can be separated from the lead in the condenser.

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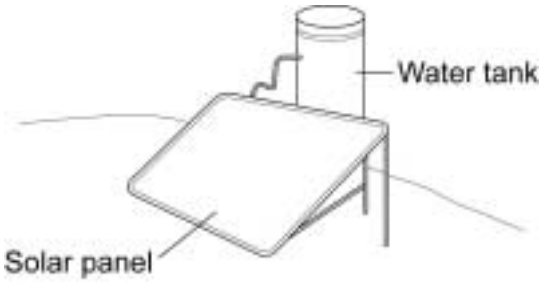
(2 marks)

5

Physics Questions

16 The picture shows one type of solar water heater. Water from the tank is slowly pumped through copper pipes inside the solar panel where the water is heated by energy from the Sun.



16 (a) Each day the average European family uses 100 kg of hot water.
To kill bacteria, the water going into the tank at 20 °C must be heated to 60 °C.

Calculate the energy needed to increase the temperature of 100 kg of water by 40 °C.

Specific heat capacity of water = 4200 J/kg °C.

Write down the equation you use, and then show clearly how you work out your answer.

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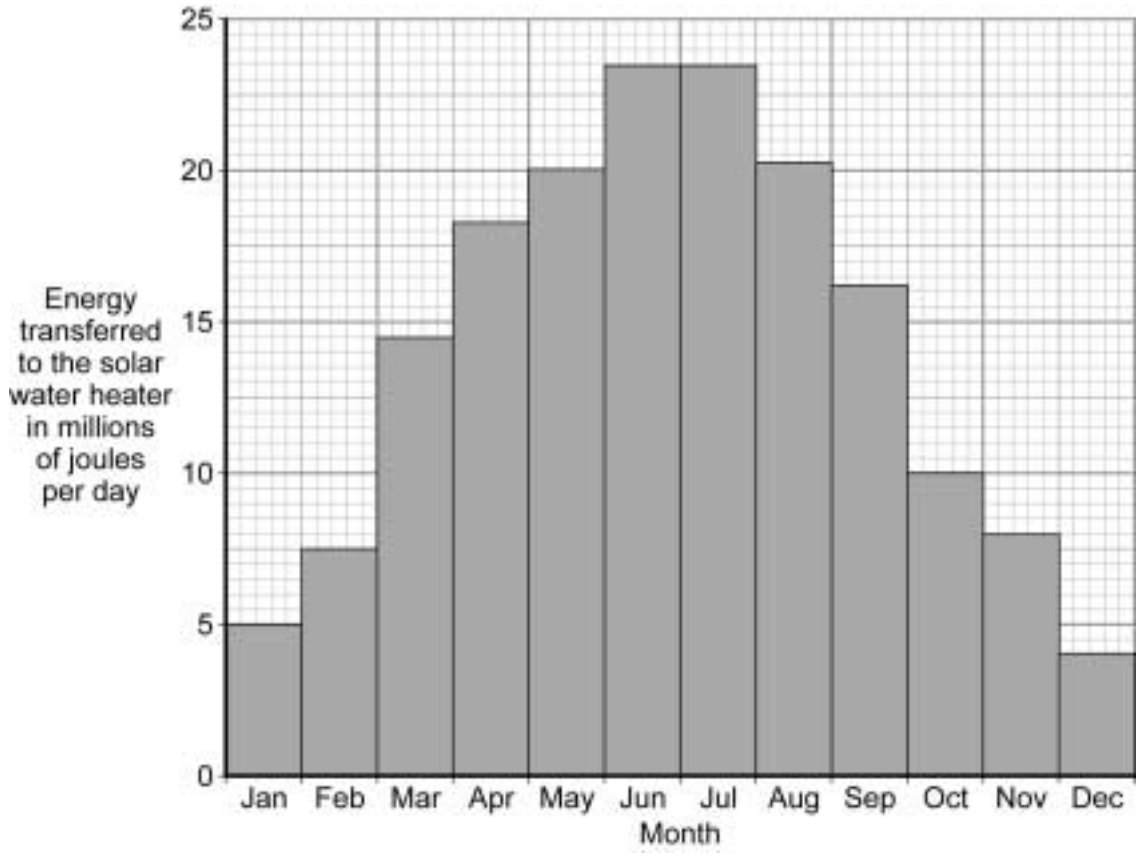
Energy transferred = ... J

(2 marks)

16 (b) The bar chart shows how the amount of solar energy transferred to the water heater varies throughout the year.



How many months each year will there **not** be enough solar energy to provide the hot water used by an average European family?

..... months

(1 mark)

Question 16 continues on the next page

Turn over ▶

16 (c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The water in the tank could be heated by using an electric immersion heater.

Outline the advantages and disadvantages of using solar energy to heat the water rather than using an electric immersion heater.

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(6 marks)

9

END OF QUESTIONS

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GCSE Physics Equations Sheet

Unit 5 F and H

$E = m \times c \times \theta$	E energy transferred m mass θ temperature change c specific heat capacity
$\text{efficiency} = \frac{\text{useful energy out}}{\text{total energy in}} (\times 100\%)$	
$\text{efficiency} = \frac{\text{useful power out}}{\text{total power in}} (\times 100\%)$	
$E = P \times t$	E energy transferred P power t time
$v = f \times \lambda$	v speed f frequency λ wavelength