

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
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16	
TOTAL	



General Certificate of Secondary Education
Foundation Tier
June 2015

Science A 1

SCA1FP

F

Unit 5

Friday 5 June 2015 1.30 pm to 3.00 pm

For this paper you must have:

- a ruler
- a calculator
- the Chemistry Data Sheet and Physics Equations Sheet booklet (enclosed).

Time allowed

- 1 hour 30 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 spaces 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 15 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.



J U N 1 5 S C A 1 F P O 1

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ANSWER IN THE SPACES PROVIDED**



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

Biology Questions

1 The nervous system allows humans to detect stimuli and to react to changes in their surroundings.

1 (a) What are the special cells that detect stimuli called?

[1 mark]

Draw a ring around the correct answer.

effectors

receptors

synapses

1 (b) **Table 1** shows information about some sense organs in the human body.

Table 1

Sense organ	Stimulus the sense organ detects	What the sense organ allows humans to do
Ear	changes in body position	to balance
Ear		to hear
Eye	light	
	chemicals	to smell

Complete **Table 1** by filling in the missing information.

[3 marks]

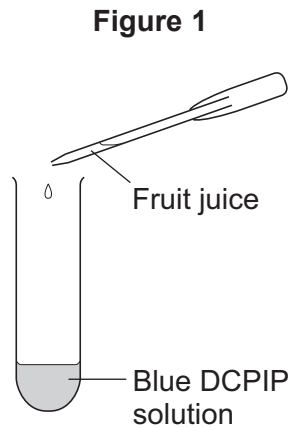
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- 2 Vitamin C is needed in the diet to prevent a deficiency disease called scurvy. Fruits such as oranges contain a lot of vitamin C. A student investigated the amount of vitamin C in four different fruit juices. **Figure 1** shows the method the student used.



DCPIP solution is blue. When vitamin C is added to DCPIP solution the blue colour disappears.

The more vitamin C in a fruit juice, the fewer drops of juice needed to decolourise the DCPIP solution.

The student's results are shown in **Table 2**.

Table 2

Type of fruit juice	Number of drops of fruit juice needed to decolourise DCPIP solution
Apple	More than 30
Grapefruit	9
Orange	11
Lemon	6



2 (a) (i) What was the independent variable in this investigation?

[1 mark]

Tick (✓) **one** box.

The number of drops of fruit juice added

The volume of DCPIP solution

The type of fruit juice

2 (a) (ii) Which fruit juice in **Table 2** contained the most vitamin C?

[1 mark]

.....

2 (b) The food label on a carton of orange juice states that 100 cm³ of juice contains 40 mg of vitamin C.

The recommended daily amount of vitamin C for a woman is 80 mg.

What volume of orange juice would a woman need to drink to give her the recommended daily amount of vitamin C?

[1 mark]

.....

..... cm³

2 (c) Vitamins are needed in a balanced diet.

Name **two** other food groups needed in a balanced diet.

[2 marks]

.....

.....

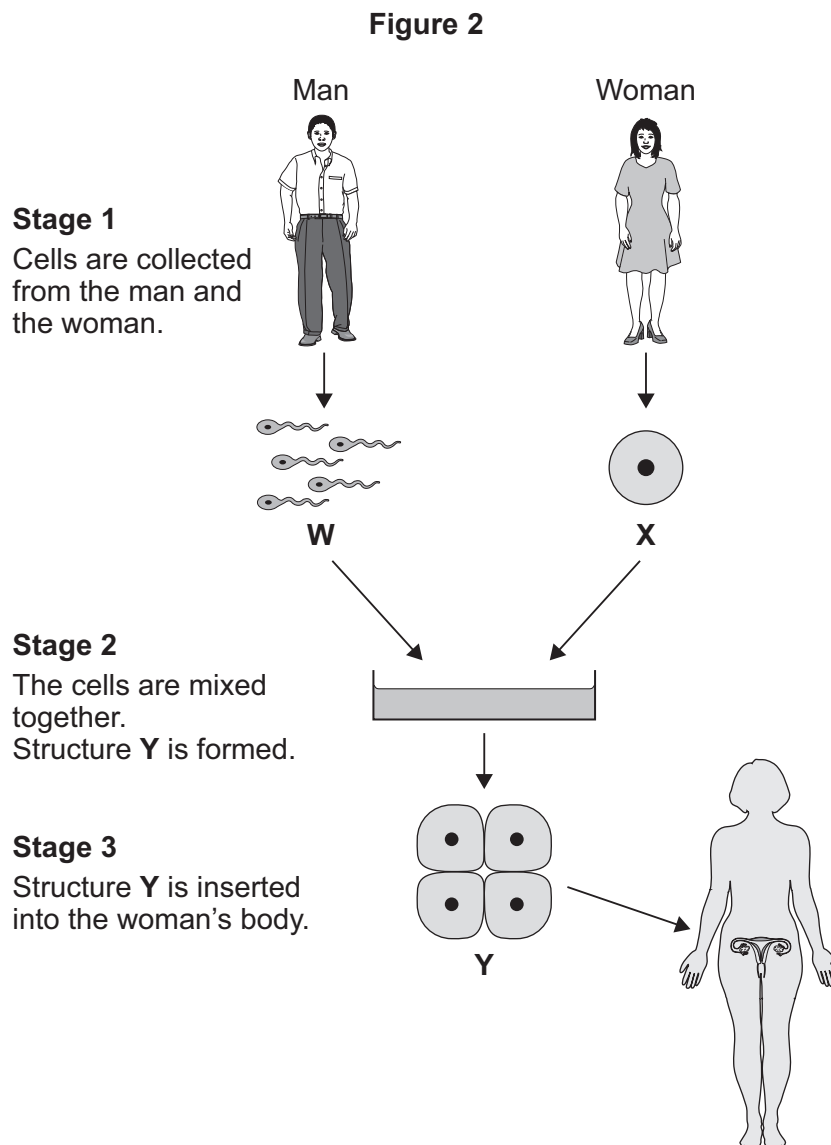
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- 3 A couple wanted to have a baby, but the woman did not become pregnant.
Their doctor suggested IVF treatment.

Figure 2 shows some of the stages in IVF treatment.



- 3 (a) Look at **Stage 1** in **Figure 2**.

What are the male sex cells labelled **W** called?

[1 mark]

.....



3 (b) Use information from **Figure 2** to describe what happens during IVF treatment.

[3 marks]

Draw a ring around the correct answer to complete each sentence.

During **Stage 2** cells **W** and **X** join together. This is called

contraception.

fertilisation.

reproduction.

Structure **Y** is formed. Structure **Y** is called

a baby.

an embryo.

an ovary.

In **Stage 3** Structure **Y** is inserted into the woman's

ovary.

pituitary gland.

uterus.

4

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4 **Figure 3** shows a bean plant on its side in the dark.

The plant growth hormone, auxin, collects on the lower side of the root and stem because of gravity.

Figure 3

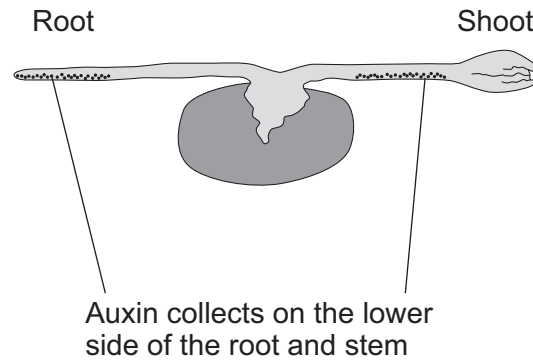
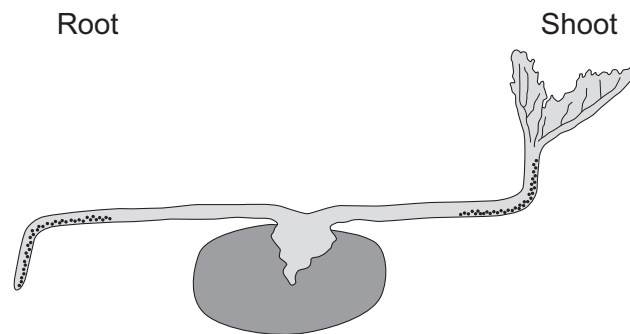


Figure 4 shows how the bean plant grows over the next few days.

Figure 4



4 (a) Roots grow downwards, in the direction of the force of gravity.

Shoots grow upwards, against the force of gravity.

Use information from **Figure 4** to describe how auxin affects the growth of cells in the root and shoot.

Use the correct answer from the box to complete each sentence.

[2 marks]

does not affect	slows down	speeds up
------------------------	-------------------	------------------

In the root, auxin the growth of cells.

In the shoot, auxin the growth of cells.

4 (b) Plants are sensitive to gravity.

Give **one** other stimulus that plants are sensitive to.

[1 mark]

.....

3

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5 Flu is an infectious disease caused by a virus.

Many people in England become infected with the flu virus in winter.

5 (a) Doctors do not prescribe antibiotics to patients with flu.

State why.

[1 mark]

.....

.....

5 (b) A flu vaccine is offered to people with a high risk of having a severe illness if they are infected by the flu virus.

What does a flu vaccine contain?

[1 mark]

Tick (✓) **one** box.

Inactive antibodies

Inactive viruses

White blood cells



5 (c) **Table 3** shows the percentage of people in high-risk groups who had been vaccinated against flu by November in 2013. The data is for England.

Table 3

Group at risk of a severe illness	Percentage (%) of group vaccinated by November in 2013
2-year-old children	31.1
3-year-old children	27.9
People 65 years and older	64.4

Give **one** conclusion from the data in **Table 3**.

Suggest a reason for this.

[2 marks]

Conclusion:

.....

.....

Reason:

.....

.....

4

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Chemistry Questions

- 6 The Mary Rose was a wooden warship. The Mary Rose sank in 1545 but was lifted from the sea bed in 1982. Scientists are now preserving the ship.

Figure 5 shows the Mary Rose being supported on poles. As part of the preservation process, the ship was sprayed with water for a long time.

Figure 5



- 6 (a) (i) **Table 4** gives information about two materials. These materials could have been used to make the poles to support the Mary Rose.

Table 4

Material	Density in g/cm^3	Relative strength	Cost in £ per kg
Steel	7.85	1	4
Titanium	4.51	3.9	4000

Give **two** advantages and **one** disadvantage of using titanium rather than steel.

Use **only** information from **Table 4** to answer this question.

[3 marks]

Advantage 1

Advantage 2

Disadvantage



6 (a) (ii) The preserving process used titanium poles.

Tick (✓) **one** other property of titanium which made titanium a suitable choice for the poles.

[1 mark]

Property	Tick (✓)
Electrical insulator	
High resistance to corrosion	
Shiny	

6 (b) Some metal objects found on the Mary Rose were made of gold or iron.

Draw **one** line from each metal to its usual method of extraction.

[2 marks]

Metal	Method of extraction
Gold	Electrolysis of molten compound
Iron	Mined as the pure metal from the ground
	Reduction of metal oxide with carbon

6 (c) Another metal found on the Mary Rose has the chemical symbol Ag.

Name the metal with the chemical symbol Ag.

Use the Chemistry Data Sheet to help you answer this question.

[1 mark]

.....

Question 6 continues on the next page

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6 (d) The Mary Rose had bronze cannons.

Bronze is an alloy made from two metals, copper and tin.

6 (d) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

compound	mixture	polymer
-----------------	----------------	----------------

An alloy is a of metals.

6 (d) (ii) 88% of a bronze alloy is copper. What percentage of the alloy is tin?

[1 mark]

.....

Percentage of tin = %

6 (d) (iii) Phytomining is used to extract copper from the ground.

What are used in phytomining?

[1 mark]

Draw a ring around the correct answer.

bacteria

fossils

plants

10

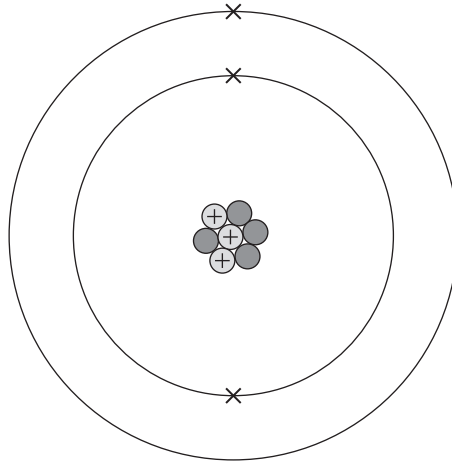


7 (a) The structure in **Figure 6** represents an atom of lithium.

The atom contains three types of particles:

- protons
- neutrons
- electrons.

Figure 6



Describe the atomic structure of lithium.

Use **Figure 6** to help you.

Include in your answer:

- the number of each type of particle
- where in the atom each particle is found.

[4 marks]

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Question 7 continues on the next page

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7 (b) Use the Chemistry Data Sheet to help you answer this question.

Which element is in the same group as lithium?

[1 mark]

Draw a ring around the correct answer.

beryllium

magnesium

sodium

5

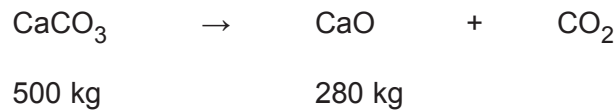


8 Limestone is used to make cement.

8 (a) When cement is made, limestone is strongly heated.

Limestone is mainly calcium carbonate.

The equation shows what happens when 500 kg of calcium carbonate (CaCO_3) is strongly heated.



8 (a) (i) What is the chemical name of CaO ?

[1 mark]

.....

8 (a) (ii) What is the mass of carbon dioxide (CO_2) produced in this reaction?

[1 mark]

Draw a ring around the correct answer.

220 kg

500 kg

780 kg

8 (b) Which of these building materials is made when cement is mixed with sand?

[1 mark]

Draw a ring around the correct answer.

clay

mortar

stone

Question 8 continues on the next page

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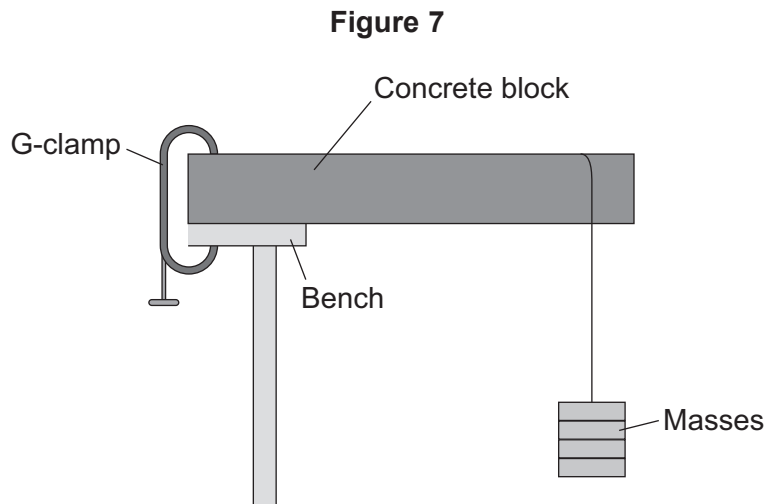


8 (c) Cement is used to make concrete.

A student investigated the strength of 1 kg concrete blocks.

The student used different masses of cement to make each concrete block.

Figure 7 shows the apparatus the student used to test the strength of the 1 kg concrete blocks.



The student tested each concrete block by adding masses until the block broke.

The student's results are shown in **Table 5**.

Table 5

Mass of cement in g	Mass needed to break the block in kg
200	1.2
300	2.7
400	3.7
500	4.2
600	4.5
700	4.6
800	4.6
900	4.6



8 (c) (i) Give **two** conclusions using the data from **Table 5**.

[2 marks]

.....

.....

.....

.....

8 (c) (ii) Suggest **one** way the student could improve the investigation.

[1 mark]

.....

.....

6

Turn over for the next question

Turn over ►



Physics Questions

9 (a) A washing machine washes dirty clothes and then spins the clothes to remove some of the water.

9 (a) (i) Use the correct words from the box to complete the sentence.

[2 marks]

chemical

electrical

kinetic

sound

When the washing machine spins the clothes,
energy is transferred into useful energy.

9 (a) (ii) Name **one** type of energy the washing machine wastes when spinning the clothes.

[1 mark]

.....

9 (a) (iii) What eventually happens to all the wasted energy?

[1 mark]

Tick (✓) **one** box.

The wasted energy is transferred to the clothes.

The wasted energy is transferred to the surroundings.

The wasted energy is trapped and is re-used.



9 (b) (i) **Table 6** shows information about two different washing machines, **A** and **B**.

Table 6

	Washing machine A	Washing machine B
Cost to buy	£269	£249
Maximum wash load	8 kg	7 kg
Energy transferred in one wash cycle	0.7 kWh	1.2 kWh
Water used in one wash cycle	48 litres	50 litres

Use the information in **Table 6** to give **one** advantage and **one** disadvantage of washing machine **A** compared with washing machine **B**.

[2 marks]

Advantage

.....

Disadvantage

.....

9 (b) (ii) A household uses washing machine **B** five times each week.

Washing machine **B** transfers 1.2 kWh of electrical energy during each wash cycle.

Calculate the cost of using washing machine **B** each week.

The cost of one kilowatt-hour of electricity is 15p.

[2 marks]

.....

.....

Cost = p.

8

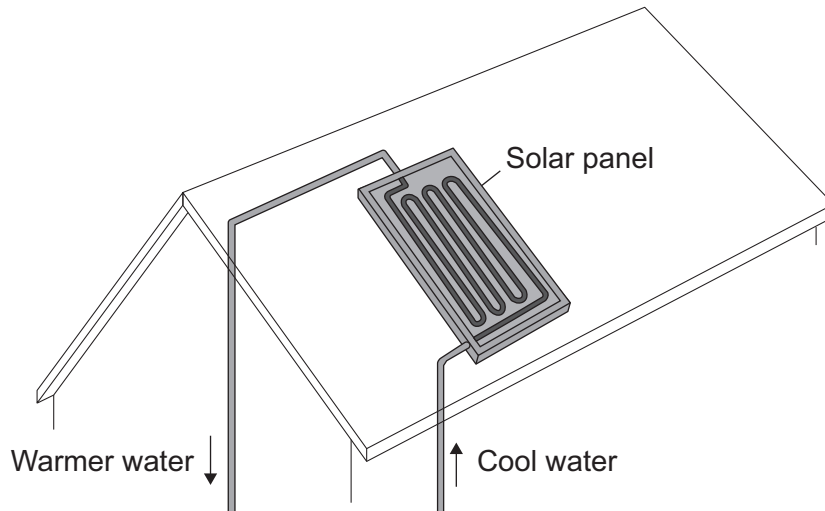
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10 Solar panels can heat water for use in a home.

Figure 8 shows a solar panel on the roof of a house.

Figure 8



10 (a) The solar panel is designed to transfer as much energy to the water as possible.

10 (a) (i) Draw a ring around the correct answer to complete the sentence.

[1 mark]

The solar panel is black to increase energy transferred to the water by

conduction.

convection.

infrared radiation.

10 (a) (ii) Draw a ring around the correct answer to complete the sentence.

[1 mark]

Solar panels usually have a large surface area so that more energy can be

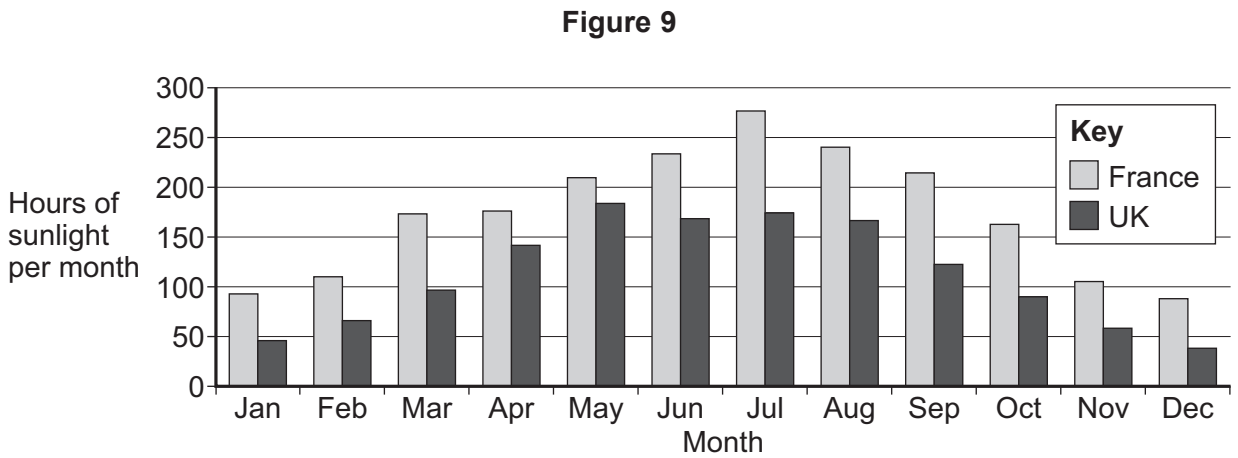
absorbed.

emitted.

reflected.



10 (b) Figure 9 shows the hours of sunlight each month for one year in France and in the UK.



Solar panels are used more in France than in the UK.

Use **Figure 9** to explain why.

[2 marks]

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Question 10 continues on the next page

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10 (c) The solar panel heats 200 kg of water each day. On one day it increases the temperature of the water by 50 °C.

The specific heat capacity of water is 4200 J/kg °C.

Calculate the energy needed to increase the temperature of 200 kg of water by 50 °C.

Use the correct equation from the Physics Equations Sheet.

[3 marks]

Tick (✓) the correct unit.

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Energy =

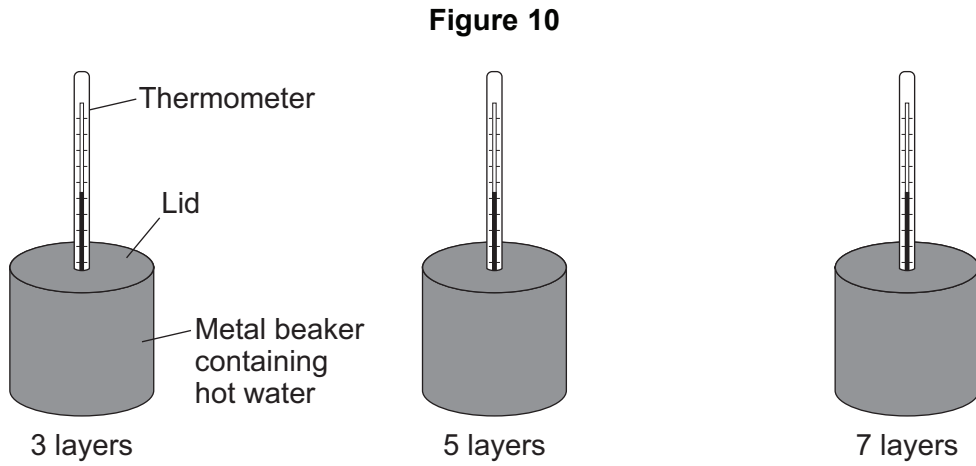
	Tick (✓)
joules	
seconds	
watts	

7



- 11 A student investigated the effect of insulation on how quickly hot water cools.

Figure 10 shows the apparatus the student used. He added a different number of layers of insulation around each beaker.



The student measured the temperature of the water every minute for 10 minutes as the water cooled.

- 11 (a) State **one** variable the student should control during the investigation.

[1 mark]

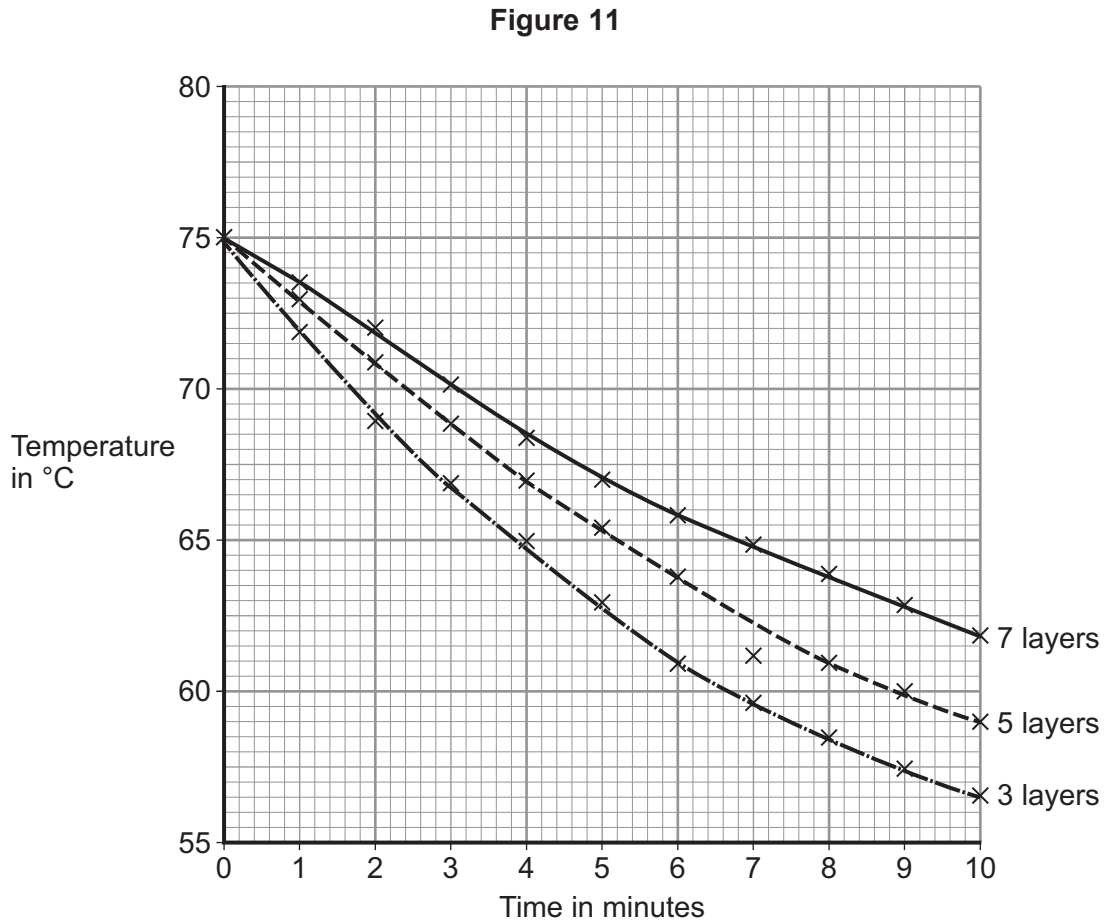
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11 (b) Figure 11 shows a line graph of the results.



What conclusion should the student make from **Figure 11** about the effect of the number of layers of insulation?

[1 mark]

.....

.....

11 (c) (i) There is **one** anomalous result. Draw a ring around this result on **Figure 11**.

[1 mark]

11 (c) (ii) Suggest what the student might have done to cause this anomalous result.

[1 mark]

.....

.....



11 (d) (i) Draw a ring around the correct answer to complete the sentence.

[1 mark]

Energy is transferred through the wall of the metal beaker by the process of

conduction.

convection.

infrared radiation.

11 (d) (ii) All materials are given a U-value.

Draw a ring around the correct answer to complete the sentence.

[1 mark]

The U-value measures how good the material is at

absorbing.

emitting.

insulating.

6

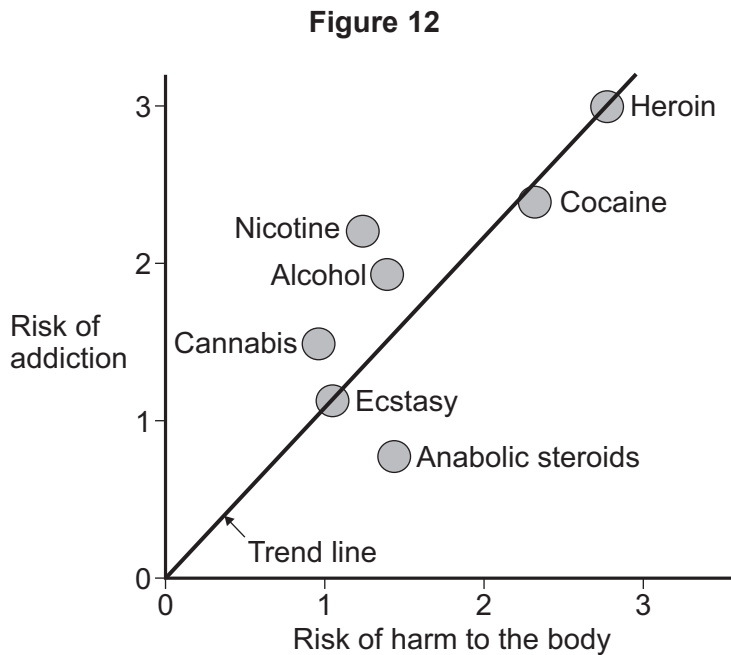
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Biology Questions

12 Figure 12 shows the risk of addiction and risk of harm to the body for some drugs.



12 (a) (i) Name **two** legal recreational drugs shown in **Figure 12**.

[1 mark]

.....

.....

12 (a) (ii) The overall impact of legal drugs on health is much greater than the impact of illegal drugs.

Use information from **Figure 12** and your own knowledge to give **two** reasons for this.

[2 marks]

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12 (b) A student concluded that as the risk of addiction to a drug increases, the risk of harm to the body increases.

12 (b) (i) Give **one** piece of evidence from **Figure 12** that supports this conclusion.

[1 mark]

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12 (b) (ii) Give **one** piece of evidence from **Figure 12** that does **not** support this conclusion.

[1 mark]

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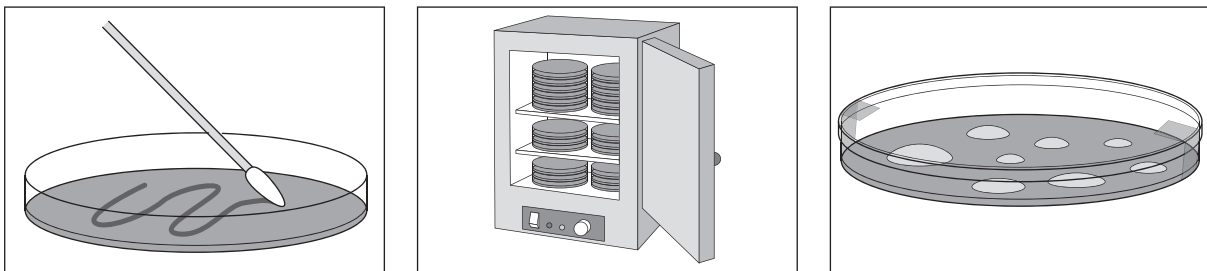
13 Five students investigated which areas of school were most contaminated with microorganisms.

Each student took samples from surfaces in different parts of the school using sterile cotton buds. They streaked each cotton bud across a sterile agar plate, then fastened the lid on with tape.

The students put the agar plates in an incubator for two days and then counted how many bacterial colonies had grown on each agar plate.

Figure 13 shows the procedure.

Figure 13



13 (a) In school laboratories agar plates should be incubated at a maximum temperature of 25 °C.

13 (a) (i) Give **one** reason for using 25 °C as a maximum temperature to incubate agar plates in a school laboratory.

[1 mark]

.....

.....

13 (a) (ii) In industrial laboratories higher temperatures are used to incubate agar plates.

Give **one** reason why.

[1 mark]

.....

.....



13 (b) The number of bacterial colonies that grew on each agar plate is shown in **Table 7**.

Table 7

Surface sampled	Number of colonies that grew on each agar plate					Mean number of colonies
Laboratory bench	7	10	7	9	8	8.2
Gym exercise mat	21	17	20	25	28	22.2
Computer keyboard	11	15	17	13	18	14.8
Canteen service area	6	9	8	8	8	7.8

13 (b) (i) What is the range for the mean number of colonies?

[1 mark]

.....

13 (b) (ii) Give **one** conclusion that can be made from the data in **Table 7**.

Suggest an explanation for this conclusion.

[2 marks]

.....

5

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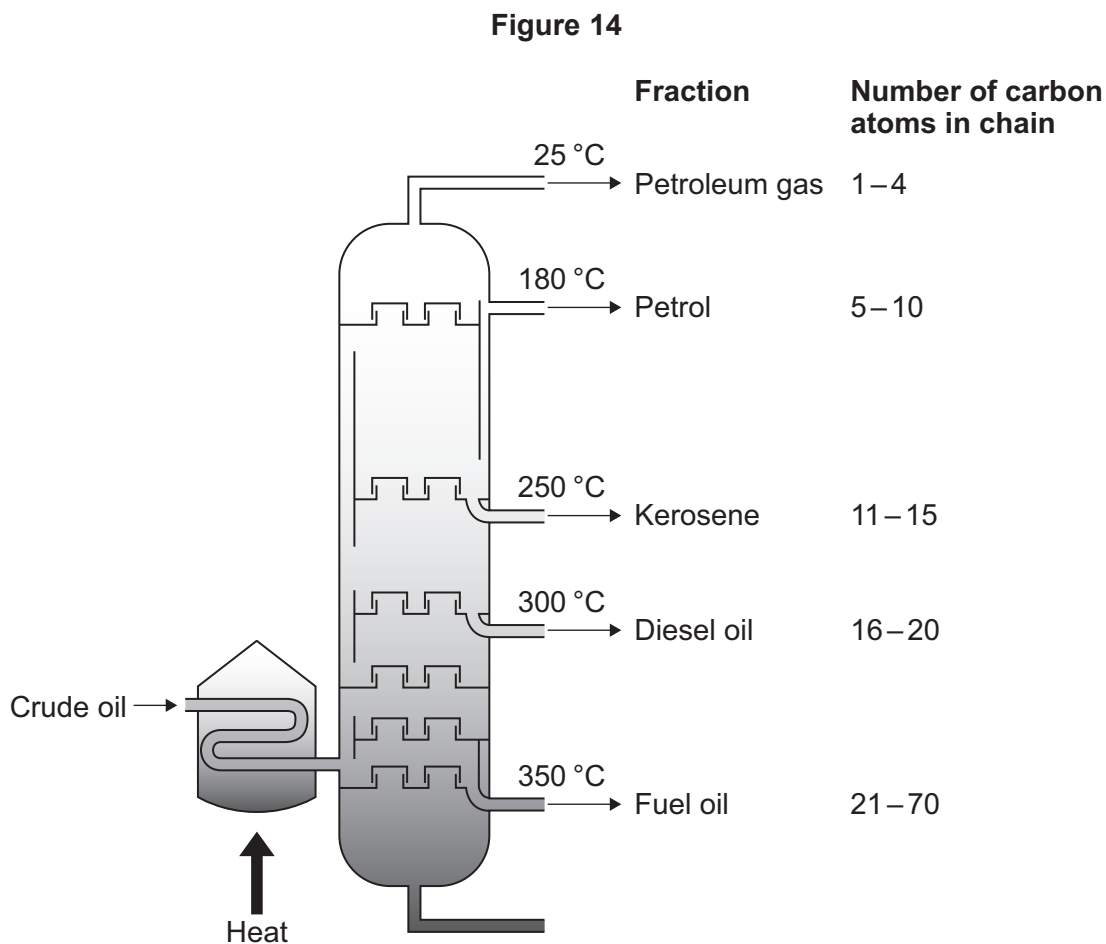


Chemistry Questions

14 Many fuels are produced from crude oil.

14 (a) Crude oil is separated into fractions by distillation in a fractionating column.

Figure 14 shows a fractionating column.



14 (a) (i) Describe how crude oil is separated into fractions by fractional distillation.

[3 marks]

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14 (a) (ii) Some properties of hydrocarbons change as the size of the molecules increases.

Describe the trends in boiling point and viscosity as the number of carbon atoms in the molecule increases.

[2 marks]

Boiling point

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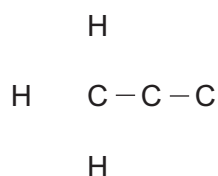
Viscosity

.....

14 (b) LPG (liquefied petroleum gas) is a fuel. LPG contains propane (C_3H_8).

14 (b) (i) Complete the displayed (structural) formula for propane.

[1 mark]



14 (b) (ii) Burning fuels releases energy. Name **two** products formed when LPG is burnt.

[2 marks]

.....

.....

14 (b) (iii) Some cars are now designed to use LPG as a fuel. LPG is about 50p per litre cheaper than petrol.

Suggest **one** reason why most car owners use cars designed to use petrol and not LPG as a fuel.

[1 mark]

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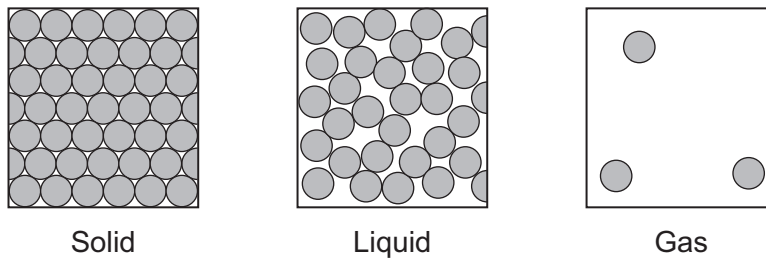


Physics Questions

15 In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Figure 15 shows the arrangement of particles in a solid, a liquid and a gas.

Figure 15



Use **Figure 15** and your own knowledge to compare solids, liquids and gases in terms of their particles.

You should include information about the arrangement, movement and energy of the particles.

[6 marks]

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Extra space

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16 Figure 16 shows a woman filling her bathroom sink with hot water.

Figure 16



16 (a) The mirror changes from being dry to being covered with small drops of water.

Name the process causing this change on the mirror.

[1 mark]

.....



- 16 (b)** The woman dries herself with a towel. She hangs the wet towel in the bathroom to dry.
Figure 17 shows two places she could hang the towel.

Figure 17



The towel will dry faster if it is hung from the unheated towel rail instead of the towel ring.

Explain why.

[2 marks]

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END OF QUESTIONS



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Question 6 Figure 5: Photograph of Mary Rose © Peter Titmuss / Alamy

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