OCR
RECOGNISING ACHIEVEMENT

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL SCIENCE A
Unit 1 Modules B4 C4 P4
FOUNDATION TIER
THURSDAY 14 JUNE 2007

F **A215/01**

Afternoon
Time: 40 minutes

Calculators may be used.
Additional materials: Pencil
                       Ruler (cm/mm)

Candidate Name

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- A list of physics equations is printed on page 2.
- The Periodic Table is printed on the back page.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	5	
2	5	
3	4	
4	5	
5	5	
6	4	
7	8	
8	3	
9	3	
TOTAL	**42**	

This document consists of **21** printed pages and **3** blank pages.

EQUATIONS

Useful Relationships

Explaining Motion

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change of momentum} = \text{resultant force} \times \text{time for which it acts}$$

$$\text{work done by a force} = \text{force} \times \text{distance moved by the force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

Electric Circuits

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

$$\text{energy transferred} = \text{power} \times \text{time}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

The Wave Motion of Radiation

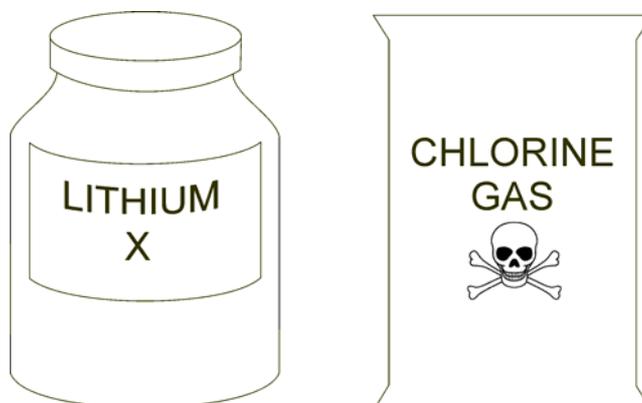$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

BLANK PAGE

Question 1 starts on page 4

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1   Liz does an experiment using lithium and chlorine.

(a)   Liz looks at the hazard labels for each chemical.

(i)   What does the hazard symbol for each chemical mean?
Choose from this list.

flammable

harmful

oxidising

toxic

hazard for lithium …………………………………

hazard for chlorine……………………………………   [2]

(ii)   Draw a straight line from each **chemical** to its correct **safety precautions**.

chemical   **safety precautions**

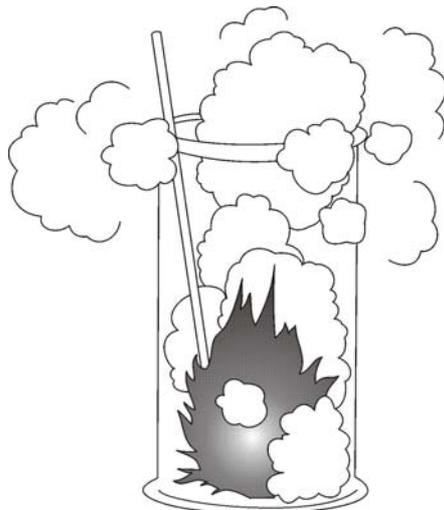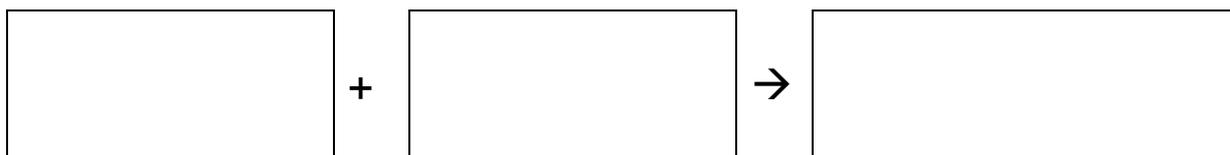|	
	do not breathe it in use a fume cupboard
chlorine gas	
	avoid splashes wear a lab coat
lithium	
	avoid skin contact wear gloves

[2]

(b) Liz puts a piece of hot lithium into a gas jar of chlorine.

Lithium reacts with chlorine to make lithium chloride.

Write a **word equation** for the reaction by filling in the boxes.

	+		**→**

[1]

[Total: 5]

[Turn over

2 This table shows some information about the elements in Group 7 of the Periodic Table at room temperature.

(a) Complete the table by filling in the empty boxes.

		appearance	
element	**formula**	**colour**	**state**
chlorine	Cl_2		gas
bromine	Br_2	orange	
iodine		grey	solid

[2]

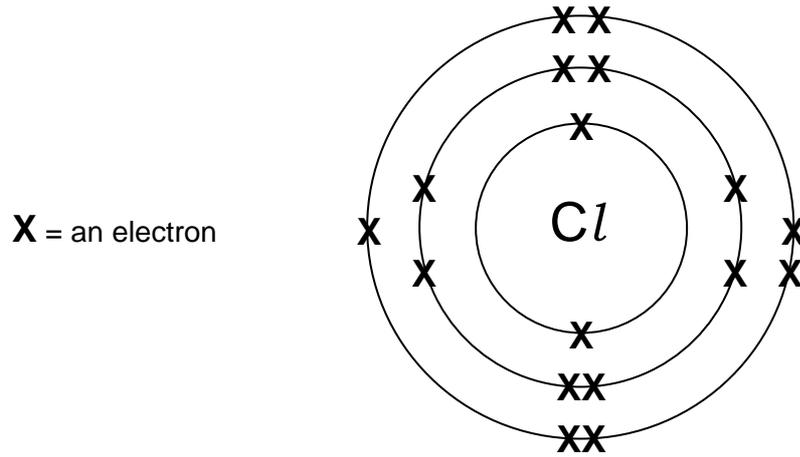**(b)** Complete the sentences by putting a ring around the correct word.

Group 7 elements are all **metals / non-metals**.

Group 7 elements become **more / less** reactive down the group.

Group 7 elements all form **positive / negative / neutral** ions when they react.

[2]

(c) Chlorine atoms contain 17 electrons.

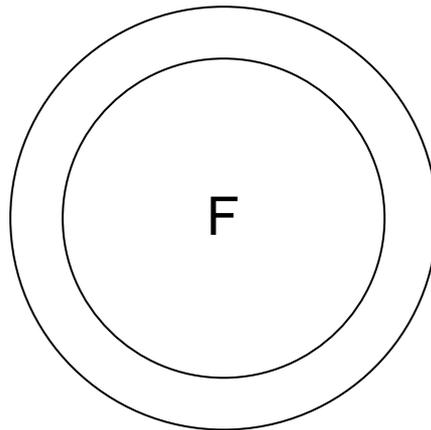**X** = an electron

This diagram shows the arrangement of electrons in a chlorine atom.

Fluorine atoms contain **9 electrons**.

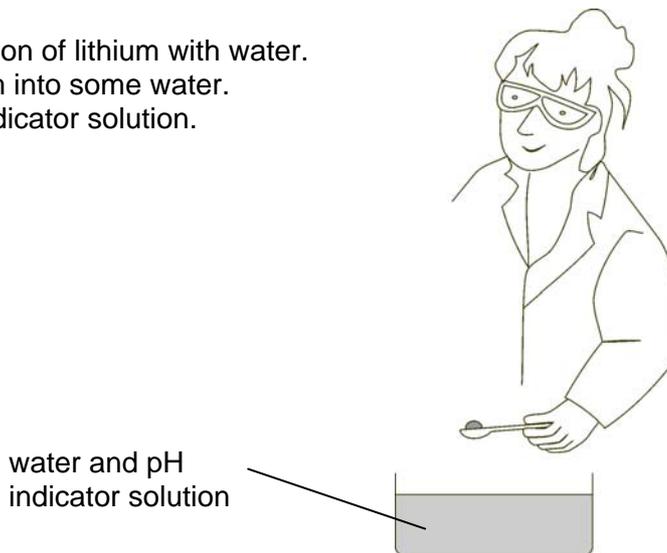Complete the diagram to show the arrangement of electrons in a fluorine atom.

[1]

[Total: 5]

[Turn over

3 This question is about the reaction of lithium with water.
Eve puts a small piece of lithium into some water.
The water contains some pH indicator solution.

water and pH
indicator solution

(a) This chart shows the colours of a pH indicator in **acidic**, **neutral** and **alkaline** solutions.

	acidic solution	neutral solution	alkaline solution
colour of indicator	red	green	blue

When lithium reacts with water, the colour of the pH indicator changes.

What are the colours of the pH indicator before and after the experiment?

colour **before** lithium is added ……………………………

colour **after** lithium reacts ………………………………   [1]

(b) Eve sees bubbles of gas on the lithium.

(i) What is the name of the gas?

Put a ring around the correct answer.

carbon dioxide   chlorine   hydrogen   oxygen

[1]

(ii) Give the name of the **other** product of the reaction between lithium and water.

.... [1]
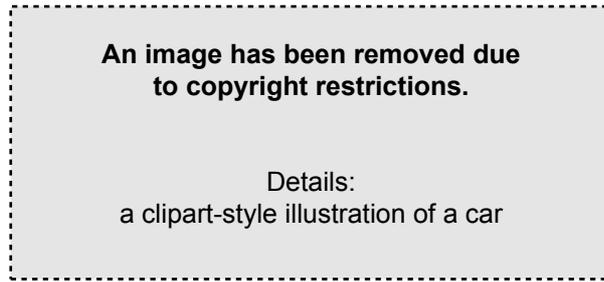
(c) The table shows some information about elements that are similar to lithium.
Complete the table.
Use the Periodic Table (on page 24) to help you.

name	symbol
potassium	
sodium	
	Rb

[1]

[Total: 4]

4   Jake tests the brakes of his car on a long, straight, flat road.

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to copyright restrictions.

Details:
a clipart-style illustration of a car

The graph shows how his speed changes with time when the brakes are applied.

speed (metres per second) vs time (seconds)

Jake decides to start braking
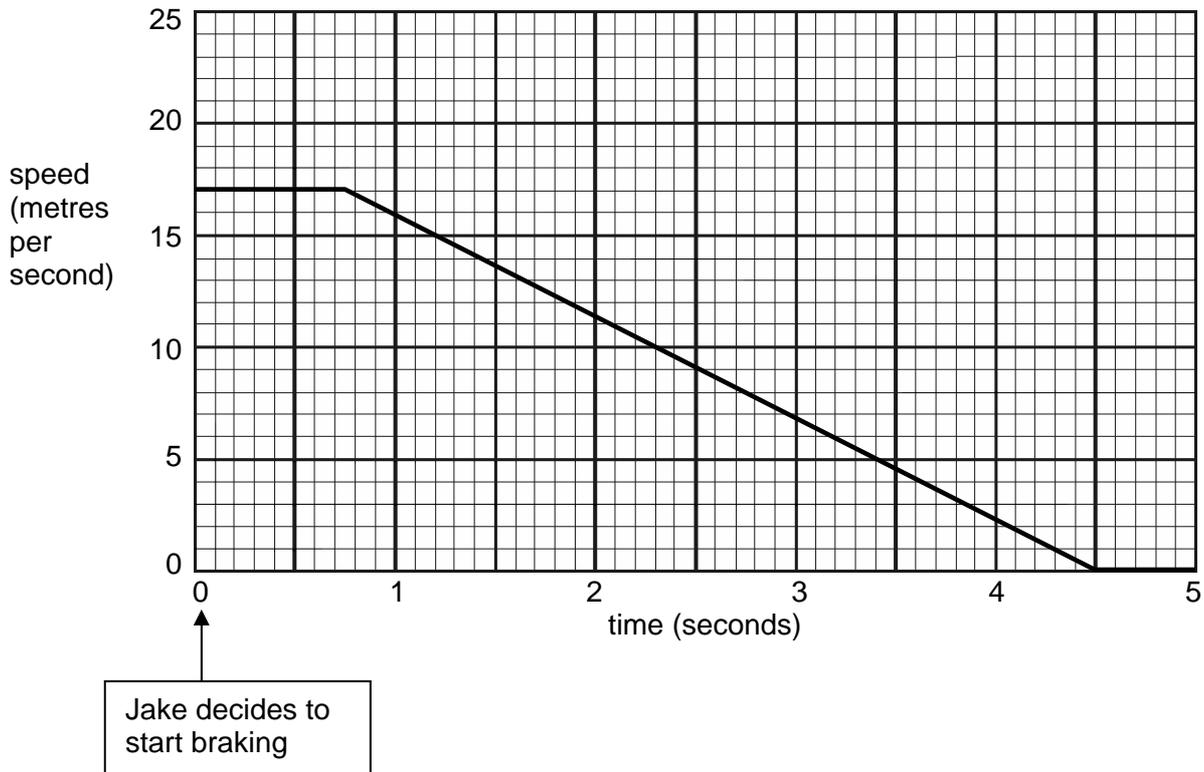
(a)   The graph starts at the time when Jake decides to start braking.

(i)   How fast is Jake going when he decides to brake?

……………………………… metres per second   [1]

(ii)   At what time does the car **stop** moving?

……………………………… seconds   [1]

(b) Finish the sentences. Choose words from this list.

energy

force

heat

work

mass

The momentum of the car is reduced by the …………………………… of the brakes.

The ………………………… done by the brakes slows the car down.

[2]

(c) Which arrow, **A**, **B**, **C** or **D**, shows the force which slows down the car?

Draw a (ring) around the correct arrow.

```
                                    C
car moving                          ↑
forward           ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
                  :   An image has been removed   :
         A ◄─     :   due to copyright restrictions.  : ─► B
                  :  Details: a clipart-style illustration of a car :
                  └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
                                    ↓
                                    D
```

[1]

[Total: 5]

[Turn over
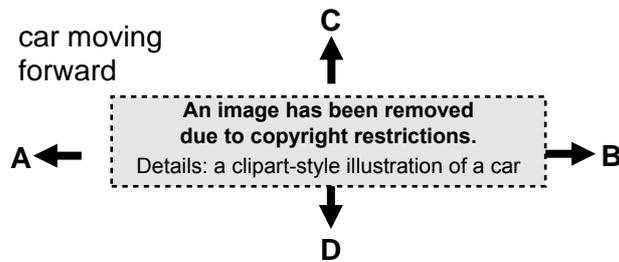
5 Sammi enjoys making parachute jumps.

> An image has been removed due to copyright restrictions.
>
> Details:
> a clipart-style illustration of a parachutist
> with open parachute
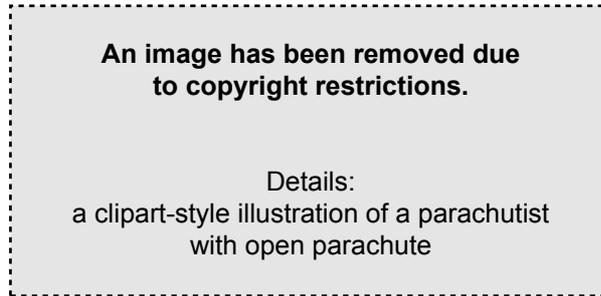
(a) Sammi makes a parachute jump and lands safely on the ground.
The sentences describe how her **velocity** changes.
They are **not** in the correct order.

A It increases.

B It starts at zero.

C It becomes zero.

D It decreases to a constant value.

Fill in the boxes to show the correct order. The first one has been done for you.

B			

[1]

(b) When the parachute is open, Sammi falls at a constant velocity.

Here are five statements about Sammi when the parachute is open.

A Her resultant force is zero.

B She is gaining momentum.

C She is losing kinetic energy.

D Her resultant force is upwards.

E She is losing gravitational potential energy.

Which **two** statements are correct if Sammi has a constant velocity?

.... and ....   [2]

(c) Sammi drops through a height of 600m in a time of 30s.

Which is the correct calculation of her average speed?
Put a (ring) around the correct answer.

$$speed = \frac{600}{30} = 20 \text{ m/s}$$

$$speed = 600 \times 30 = 12\ 000 \text{ m/s}$$

$$speed = \frac{30}{600} = 0.05 \text{ m/s}$$

[1]

(d) When Sammi lands on the ground, she bends her knees.

Why does Sammi bend her knees?
Put ticks (✔) in the correct boxes.

this allows her to land more quickly ☐

this reduces the force on her when she lands ☐

this provides an upwards force to slow her down ☐

this increases the time taken for the impact with the ground ☐

[1]

[Total: 5]

[Turn over

6 This question is about a space shuttle taking off.

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Details:
a clipart-style illustration of a
space shuttle taking off

(a) Complete the sentences.
Choose words from this list.

<div align="center">

constant

downwards

energy

upwards

weight

</div>

The direction of the exhaust gas momentum is ……………………………. .

So the force it exerts on the shuttle is …………………………. .

The shuttle speeds up when this force is greater than its ……………………………. .

[3]

(b) Here are three height-time graphs.
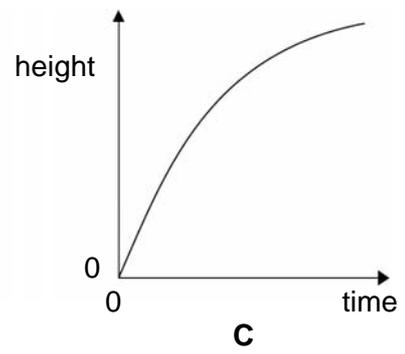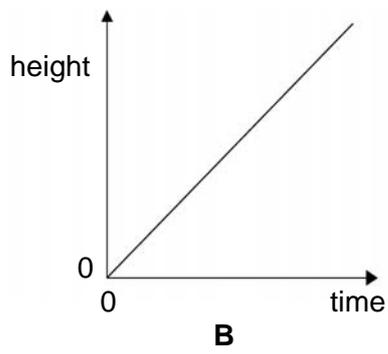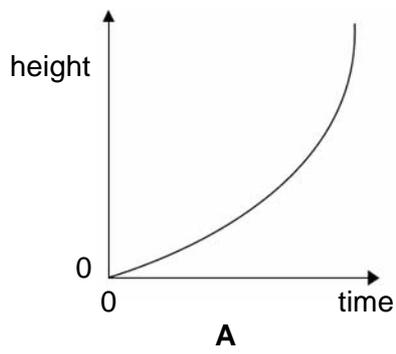
Which **one** shows the shuttle getting faster?

answer .... [1]

[Total: 4]

[Turn over

7 Susan is planning to visit a very hot part of the world. She must be careful not to suffer from heatstroke.

(a) The control of Susan's internal body temperature is in three stages.

A detects a stimulus
B processes information
C produces a response

(i) Which stage, **A**, **B**, or **C**, involves a **receptor**?

answer .... [1]

(ii) Which stage, **A**, **B**, or **C**, involves an **effector**?

answer .... [1]

(b) Which **two** organs in Susan's body contain temperature receptors?

Put a tick (✓) in the **two** correct boxes.

brain ☐

heart ☐

liver ☐

skin ☐

[2]

(c) Small increases in Susan's temperature can bring about changes in her cells.

Complete the table to show the effect of temperature increase on the cell.

Put a tick (✓) in **one** box in **each** row.

cell activity	increases	decreases	stays the same
speed of reaction			
energy of collisions between molecules			
number of molecules in the cell			

[2]

(d) The diagram shows possible changes which take place in Susan's body if she develops heatstroke.

Draw **straight lines** to link up the correct boxes.
The first link has been drawn for you.

increased sweating	reduced dehydration	decreased sweating

exposure to very hot temperatures

or	or	or
decreased sweating	increased dehydration	increased sweating

core body temperature increases

or	or	or
sweating stays the same	no effect	sweating stays the same
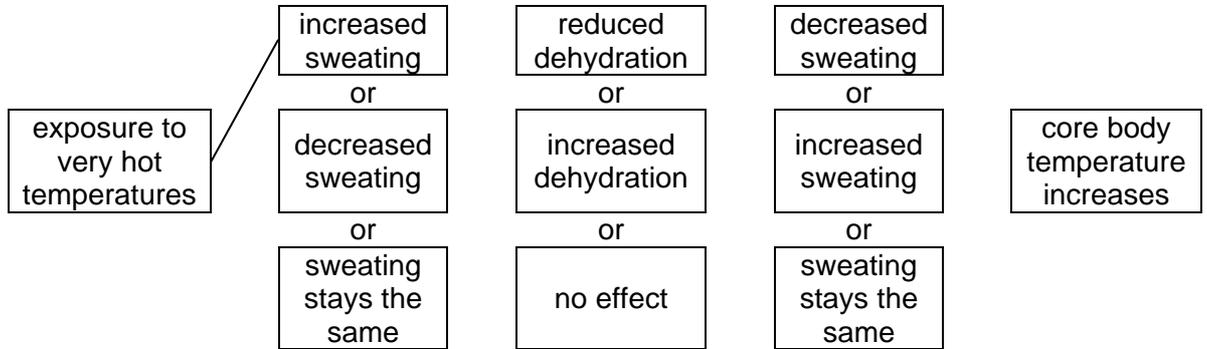
[2]

[Total: 8]

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8 **(a)** David draws three diagrams to show how kidneys work.

molecules filtered out of the blood	molecules absorbed back into the blood	molecules excreted in urine
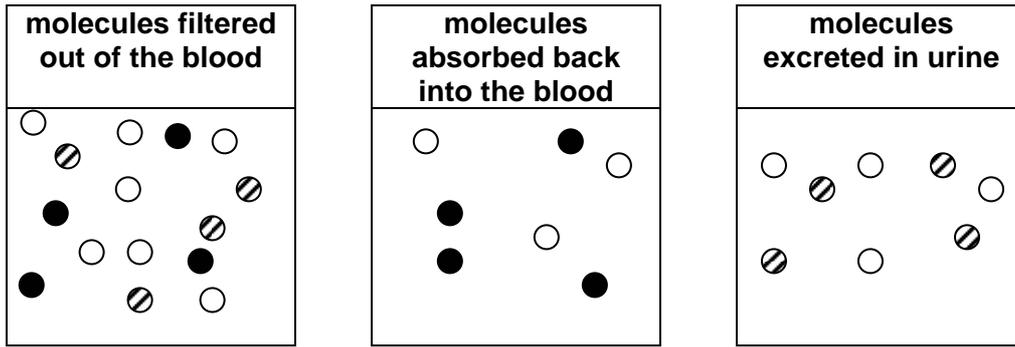
Some of the molecules are absorbed back into the blood and others are excreted in the urine.

Complete the key for David's diagrams.

Choose from the list.

sugar

urea

water

key

● = …………………

○ = …………………

⊘ = …………………

[2]

(b) Where is urine stored in the human body?

Put a ring around the correct answer.

bladder   kidney   liver

[1]

[Total: 3]

[Turn over

**9** Joe is doing an experiment to find out about the movement of **water molecules** across a membrane. He uses two solutions, **A** and **B**.

They contain different concentrations of sugar molecules and water molecules.

Joe draws two diagrams of the apparatus.
They show the heights of the two solutions at the start of the experiment and after 1 hour.

level at the start   **level after 1 hour**
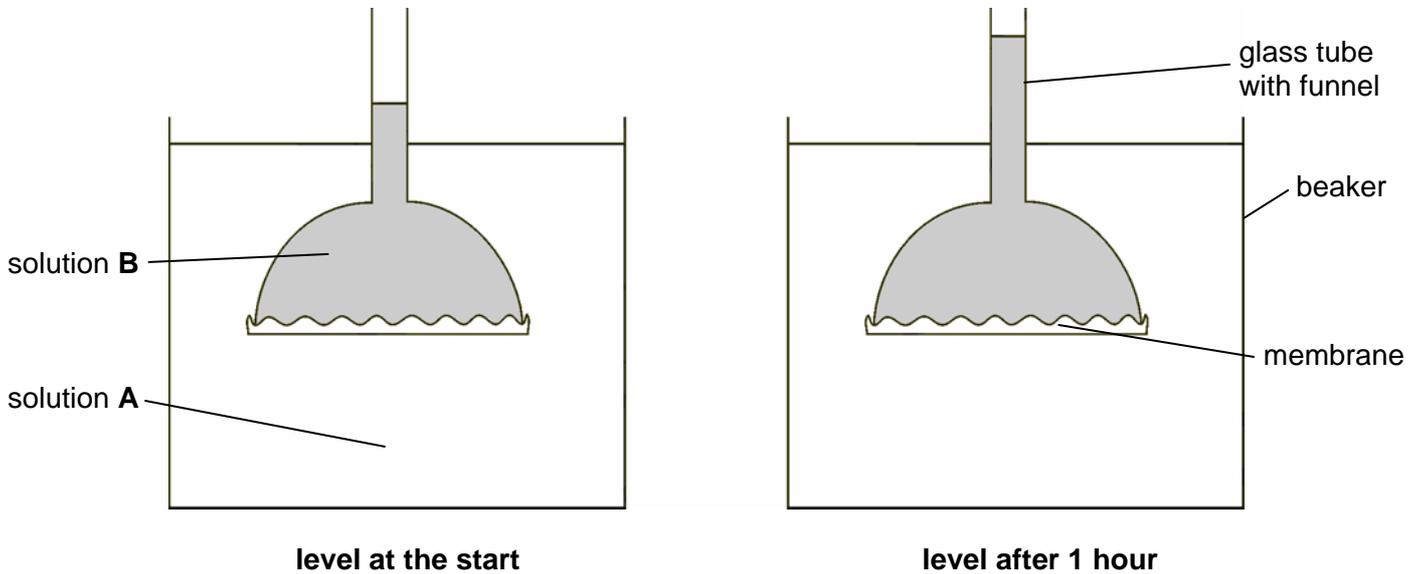
(a) Here are statements about the difference in concentration of sugar in solutions **A** and **B**, at the **start** of the experiment.

Put a ⟨ring⟩ around the correct statement.

A **greater than** B   B **greater than** A   A **the same as** B

[1]

(b) The choice of membrane used in Joe's experiment was important.

What is the best way to describe this membrane?

Put a tick (✓) in the correct box.

not permeable   ☐

fully permeable   ☐

partially permeable   ☐

[1]

(c) Joe wanted to get the height of sugar solution **B** down to its original level.

What should he do to solution **A**?

Put a tick (✓) in the correct box.

add more sugar ☐

add more water ☐

add more solution ☐

remove some solution ☐

[1]

[Total: 3]

END OF QUESTION PAPER

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The Periodic Table of the Elements

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

Example:

1
H
hydrogen
1

1	2											3	4	5	6	7	0
																	4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111							

Elements with atomic numbers 112-116 have been reported but not fully authenticated

The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.