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A217/01

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

ADDITIONAL SCIENCE A

Unit 3 Modules B6 C6 P6 (Foundation Tier)

FRIDAY 20 JUNE 2008

Morning

Time: 40 minutes

Candidates answer on the question paper.
Additional materials (enclosed):
None

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

CUP/T45363

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 42.
- A list of physics equations is printed on page two.
- The Periodic Table is printed on the back page.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	5	
2	4	
3	5	
4	4	
5	5	
6	5	
7	3	
8	3	
9	4	
10	4	
TOTAL	42	

This document consists of **19** printed pages and **1** blank page.

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TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful Relationships

Explaining Motion

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

momentum = mass × velocity

change of momentum = resultant force × time for which it acts

work done by a force = force × distance moved by the force

change in energy = work done

change in GPE = weight × vertical height difference

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

Electric Circuits

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

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

energy transferred = power × time

power = potential difference × current

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

The Wave Model of Radiation

wave speed = frequency × wavelength

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BLANK PAGE

Question 1 starts on page 4.

PLEASE DO NOT WRITE ON THIS PAGE

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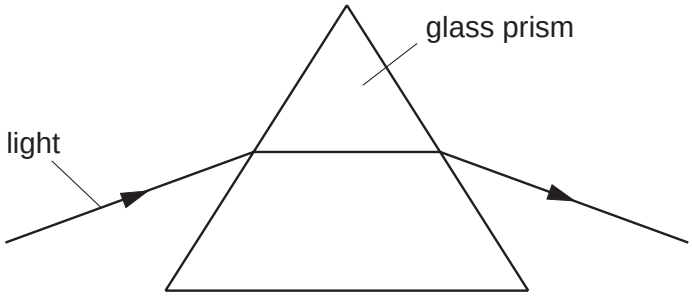
Answer **all** the questions.

1 This diagram shows a beam of light passing through a glass prism.



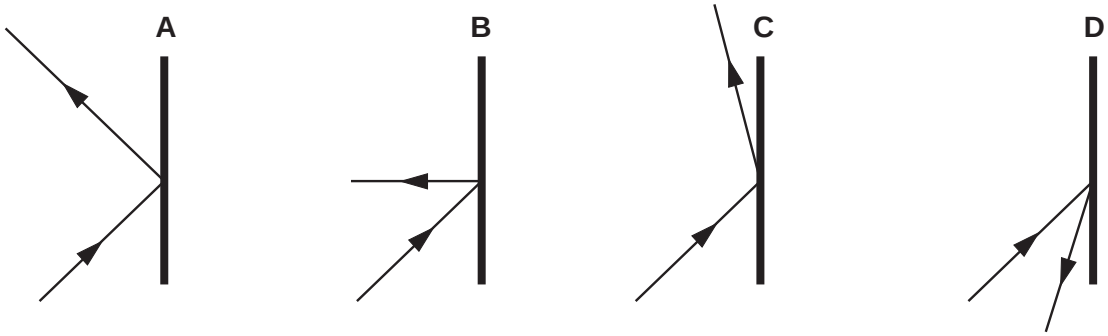
(a) Which **one** property of the light changes as it passes from air into glass?

Put a (ring) around the correct answer.

colour **frequency** **speed**

[1]

(b) Light reflects off a mirror.



Which **one** of these diagrams, **A**, **B**, **C** or **D**, correctly shows light reflecting off a mirror?

answer ..... [1]

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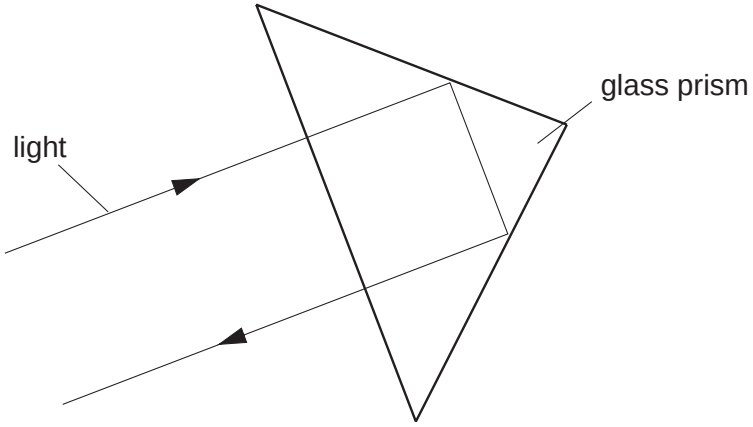
(c) Light can also reflect off the surface of a glass prism.



Some of these statements are true. Others are false.

Write **T** in the box next to each **true** statement and **F** in the box next to each **false** one.

	T (true) or **F** (false)
Some of the light is lost at each reflection.	
The diagram shows total internal reflection.	
The light beams in the prism interfere with each other.	
Once the light gets into the prism it cannot get out again.	

[2]

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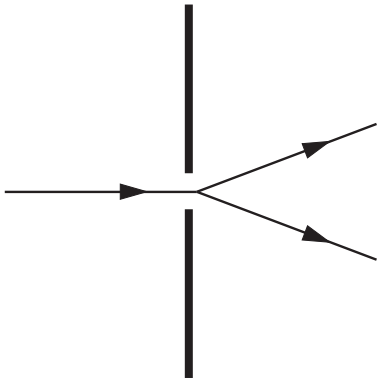
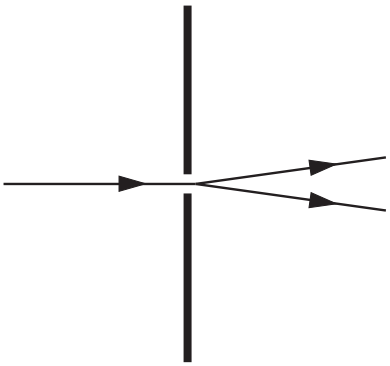
(d) Light diffracts when it passes through a small gap.

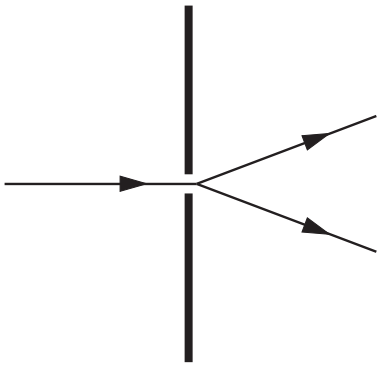


The gap is made smaller.

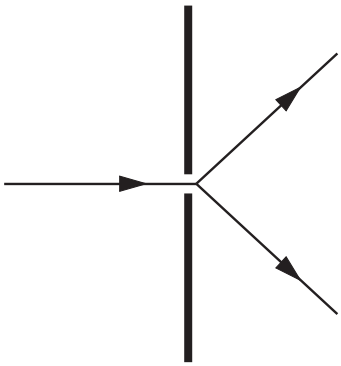
A



B



C



Which diagram, **A**, **B** or **C**, shows what happens when the gap is made smaller?

answer .....[1]

[Total: 5]

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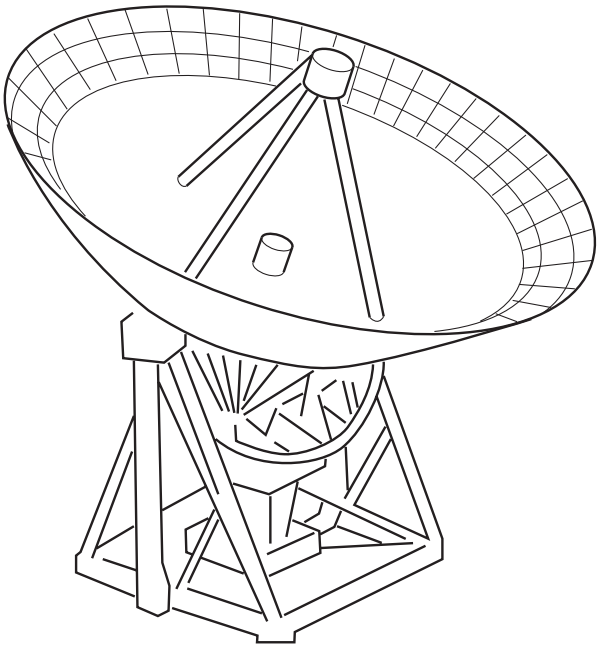
2 Large metal dishes receive radio waves from satellites in space.



(a) Here are some reasons why radio waves are used to communicate with satellites in space.

Put ticks (✓) in the boxes next to the **two** correct reasons.

Radio waves are ...

... not absorbed by the atmosphere. ☐

... able to travel through empty space. ☐

... safer than other electromagnetic waves. ☐

... the fastest of the electromagnetic waves. ☐

... more powerful than other electromagnetic waves. ☐

[2]

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

speed **direction** **induction**

amplitude **frequency** **modulation**

Information is put into radio waves by altering their ..... or ..... .

This process is called ..... .

[2]

[Total: 4]

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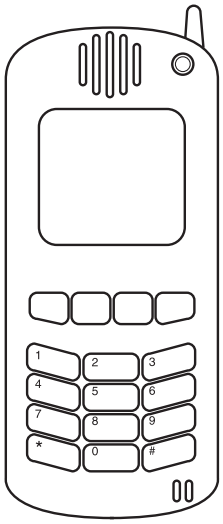
3 A mobile phone transmits sounds as digital signals, using radio waves.



(a) The phone transmits the sound as a code.

Which **two** symbols are used for the code?

Put a (ring) around each of the **two** correct answers.

0 **1** **2** **F** **T**

[1]

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

amplitude **analogue** **frequency**

modulator **pulses** **receiver**

Digital phones are better than ..... phones.

This is because the sound is sent as ..... of radio waves.

These are easily separated from noise at the ..... .

[3]

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(c) Sound and radio are both waves.

Some of their properties are the same.

Other properties are different.

Put a tick (✓) in the box next to the **one** property that is the same for both.

Both radio waves and sound waves ...

... are strongly absorbed by air. ☐

... have the same velocity in air. ☐

... can travel through empty space. ☐

... decrease in intensity as they travel. ☐

[1]

[Total: 5]

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4 Andy is sitting an examination.

He has stored information in his memory.

He retrieves this information during the examination.

(a) Where is memory stored?

Put a (ring) around the correct answer.

cerebral cortex **ear** **eye** **motor nerve** **sensory nerve**

[1]

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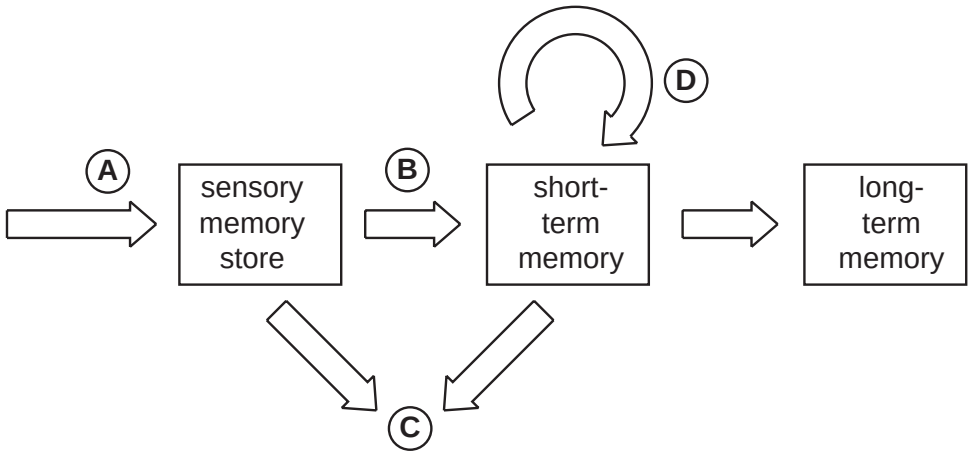
(b) For many years, scientists have tried to model the link between short-term and long-term memory.

One model which explains this link is shown in the diagram. It is called the multi-store model.



The diagram has four stages in the model labelled **A**, **B**, **C** and **D**.

Complete the table by writing the correct letter, **A**, **B**, **C** or **D**, in the box next to each stage.

stage in the model	letter
environmental stimuli received	
information lost	
processing of information	
rehearsing information	

[2]

(c) Liz has Alzheimer's disease.
She has lost her short-term memory.

Which of these things can she do?

Put ticks (✓) in the boxes next to the **two** correct answers.

remember her childhood ☐

remember what happened yesterday ☐

remember her mother's first name ☐

[1]

[Total: 4]

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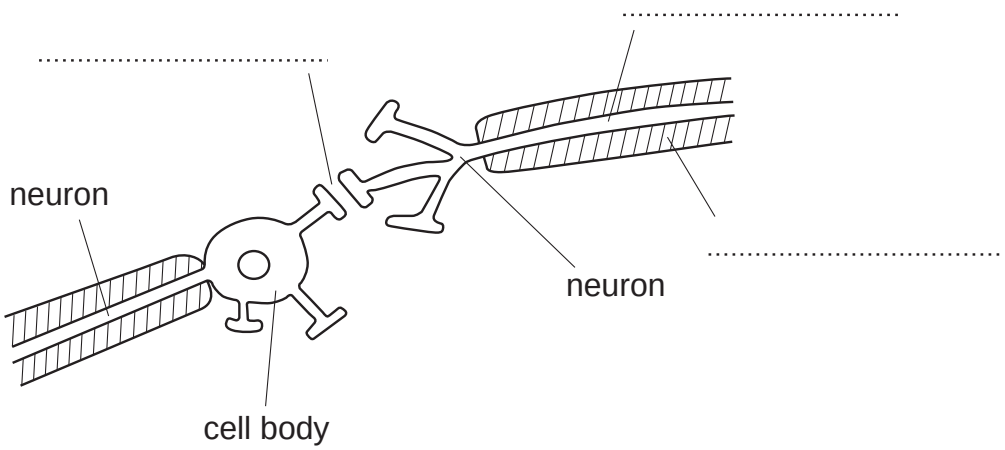
5 Neurons are nerve cells.
The tiny gaps between them are called synapses.



(a) Complete the labelling of the diagram. Choose words from this list.

axon **fatty sheath** **synapse**

[2]

(b) Neurons transmit electrical impulses.

Here are some statements about the effect of the fatty sheath on these impulses.

Put a tick (✓) in the box next to the correct statement.

The fatty sheath ...

... keeps the nerve cell at the best temperature. ☐

... slows down nerve impulses through the axon. ☐

... provides a source of energy for the nerve cell. ☐

... insulates the neuron from other neurons nearby. ☐

[1]

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(c) The structures **A**, **B**, **C**, **D** and **E** are found in a reflex arc.

They are in the wrong order.

A central nervous system (CNS)

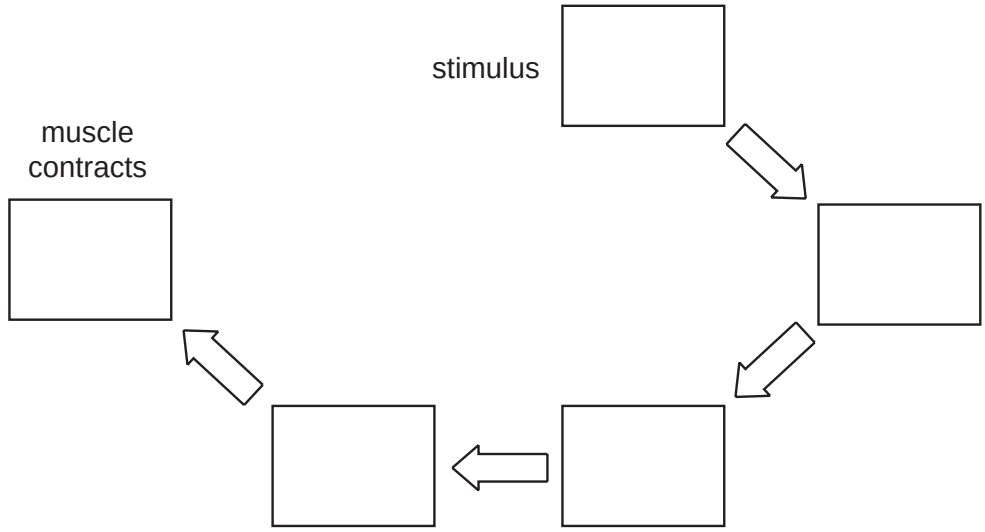
B effectors

C motor neurons

D receptors

E sensory neurons

Write one letter, **A**, **B**, **C**, **D** or **E**, in each box of the diagram to show the correct order.



[2]

[Total: 5]

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6 Like many animals, pond snails use their nervous system to detect and respond to changes in their environment.

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Humans are mammals. Snails are not.

(a) Which **one** of the following structures is found in a human?

Put a ring around the correct answer.

eyes on stalks **shell** **spinal cord**

[1]

(b) Complete the following sentences. They compare pond snails and humans.

Choose words from this list.

complex **involuntary** **unhelpful** **reflexes** **tropisms**

Pond snails use simple ..... to find food.

Humans respond better than snails to a new situation because their behaviour is ..... .

Both humans and snails respond to bright light. This response is ..... .

[2]

(c) The pond snail's nervous system contains both receptors and effectors.

Which cells are effectors, which are receptors, and which are neither?

Put a tick (✓) in the correct box for each type of cell.

type of cell	effectors	receptors	neither effectors nor receptors
muscle cells			
egg cells			
slime-secreting cells			
light-sensitive cells			

[2]

[Total: 5]

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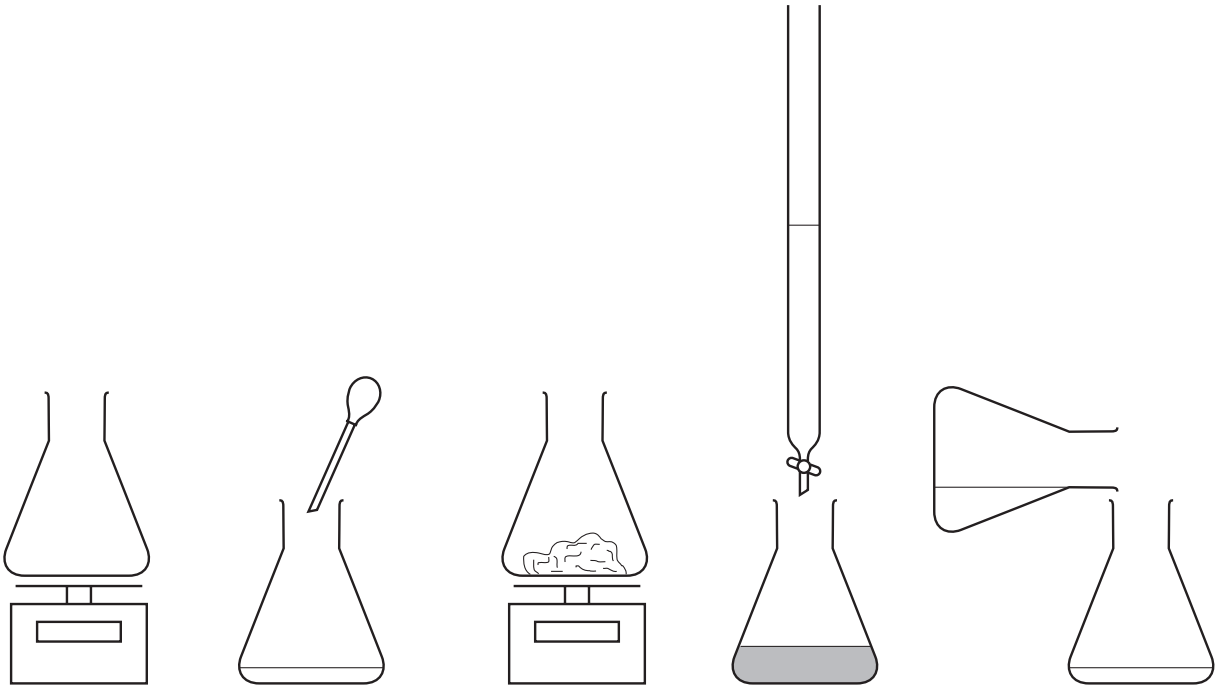
7 Mary wants to analyse a sample of solid alkali.
She carries out a titration.

Here are the steps that she carries out.
They are in the wrong order.



A
find mass of empty flask

B
add indicator to alkali solution

C
find mass of flask with solid alkali

D
add acid from a burette

E
dissolve solid alkali in water

What is the correct order of the steps?

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

A				

[3]

[Total: 3]

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8 Jim reacts some acid with lumps of marble.
Some marble is left at the end of the reaction.

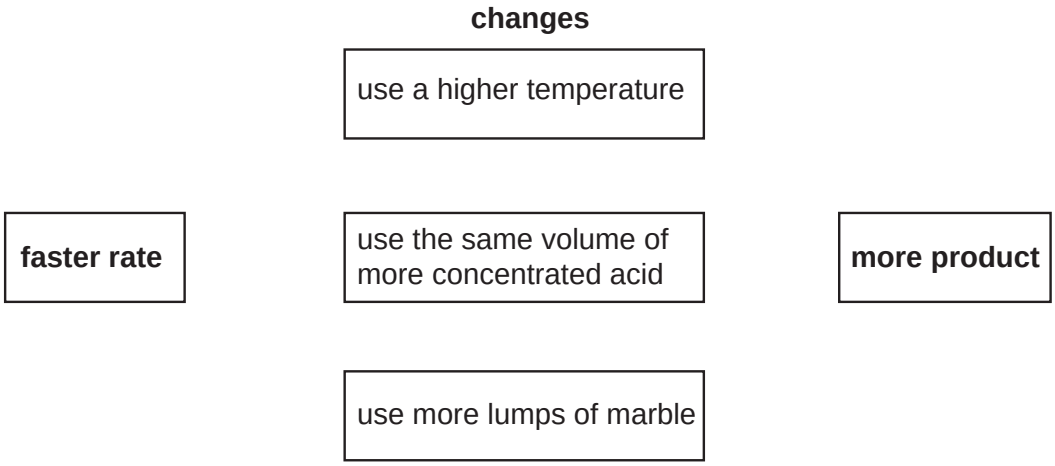
He then repeats the experiment, changing one of the conditions.

Some changes make the reaction go faster.

Some changes make more product.

Draw straight lines from the **faster rate** box to the **changes** which make the reaction faster.

Draw a straight line from the **more product** box to the **change** which makes more product.



[3]

[Total: 3]

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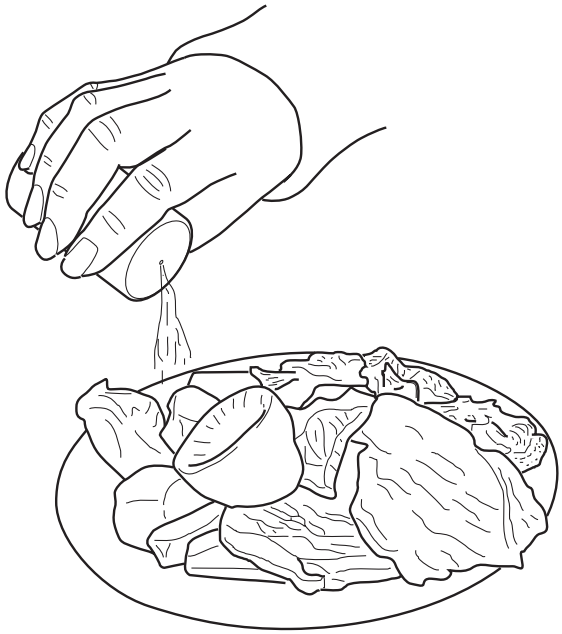
9 This question is about the preparation of salts.



(a) Draw a straight line from each set of **reactants** to the **salt** they form.

reactants	**salt**
sodium hydroxide and hydrochloric acid	magnesium chloride
sodium hydroxide and sulfuric acid	sodium chloride
magnesium hydroxide and hydrochloric acid	sodium sulfate
magnesium oxide and sulfuric acid	magnesium sulfate

[3]

(b) What salt is formed when calcium hydroxide, $Ca(OH)_2$, reacts with hydrochloric acid, HC*l*?

Put a (ring) around the correct answer.

Ca_2Cl **$CaCl$** **$CaCl_2$** **CaO**

[1]

[Total: 4]

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10 Baking powder contains small grains of a solid acid and a solid alkali.
When you put baking powder into water it starts to fizz slightly.

(a) Which **solid acid** could be used to make baking powder?

Put a (ring) around the correct answer.

ethanoic acid

hydrogen chloride

nitric acid

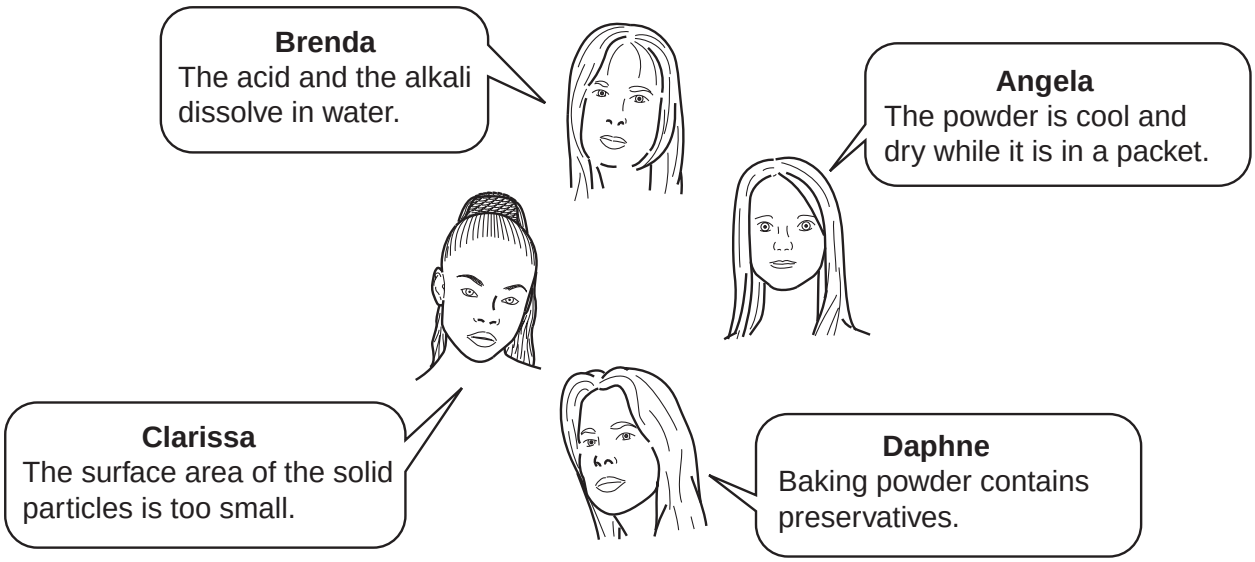
sulfuric acid

tartaric acid

[1]

(b) Baking powder doesn't react until water is added.

Angela discusses reasons for this with her friends.



Who gives the correct reason why the reaction only happens when water is added?

answer .....[1]

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(c) Which particles are produced when an acid dissolves in water?

Put a ring around the correct answer.

H_2 H H^+ OH^-

[1]

(d) When acids react with metals they give off a gas.

Put a ring around the formula of this gas.

H_2 CO_2 O_2 N_2

[1]

[Total: 4]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										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						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

** 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

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