

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL SCIENCE A**

A217/01

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)



Candidate
Forename

Candidate
Surname

Centre
Number

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Candidate
Number

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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.

TWENTY FIRST CENTURY SCIENCE 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 Model of Radiation

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

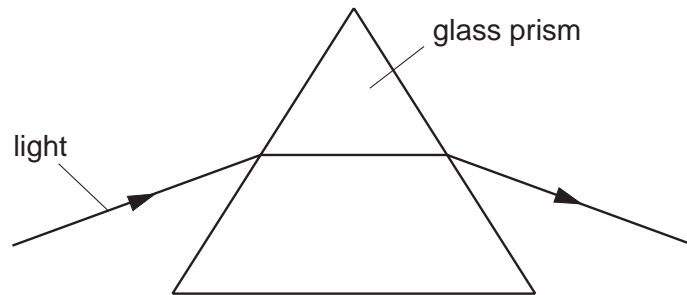
3
BLANK PAGE

Question 1 starts on page 4.

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

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



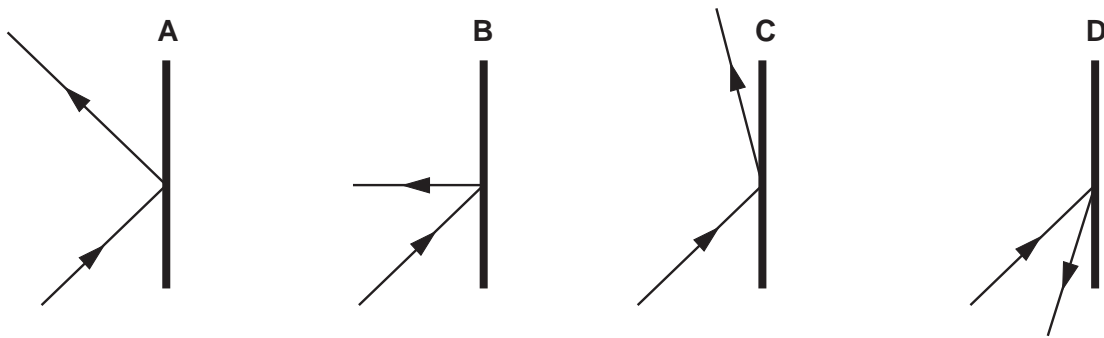
(a) Which **one** property of the light changes as it passes from air into glass?

Put a (ring) around the correct answer.

- colour frequency speed

[1]

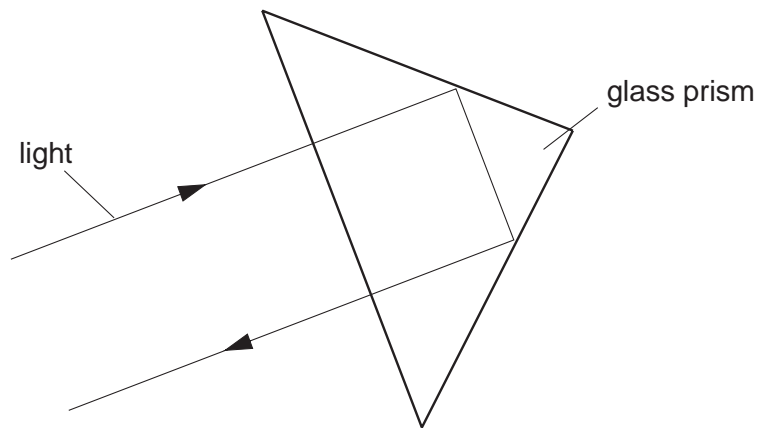
(b) Light reflects off a mirror.



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

answer [1]

(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.

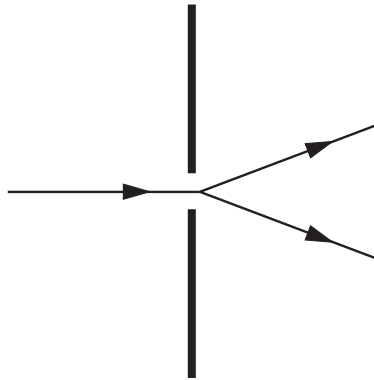
The diagram shows total internal reflection.

The light beams in the prism interfere with each other.

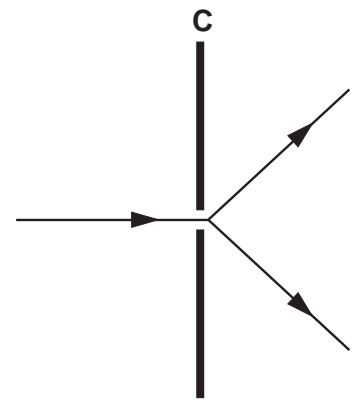
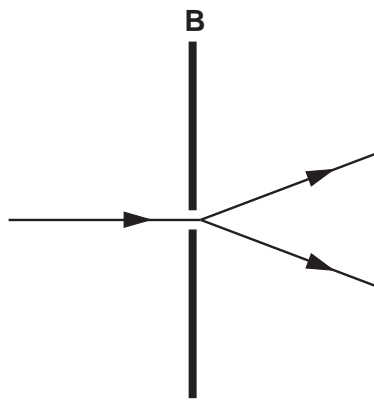
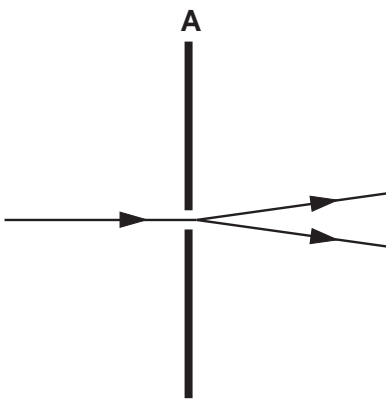
Once the light gets into the prism it cannot get out again.

[2]

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



The gap is made smaller.

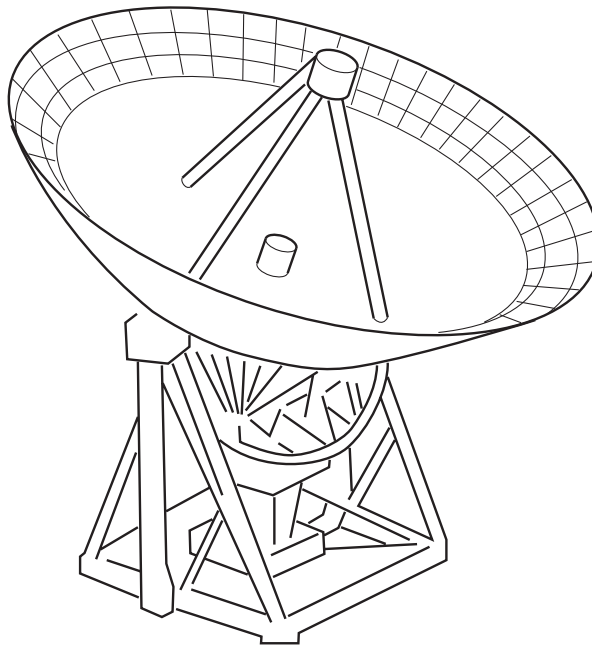


Which diagram, **A**, **B** or **C**, shows what happens when the gap is made smaller?

answer[1]

[Total: 5]

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

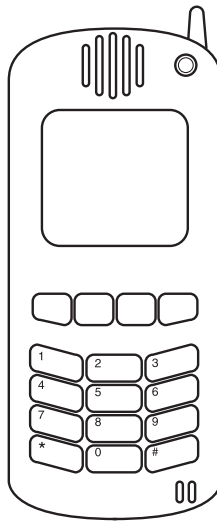
Information is put into radio waves by altering their or

This process is called

[2]

[Total: 4]

- 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]

(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]

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

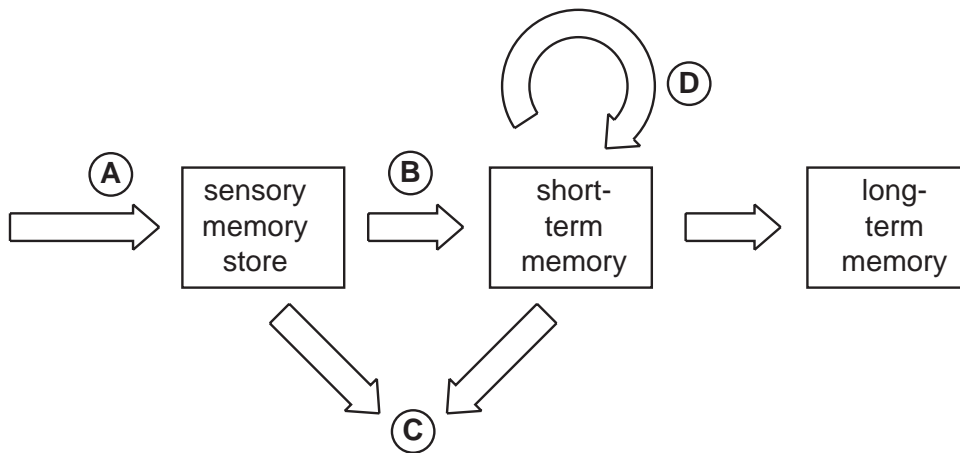
motor nerve

sensory nerve

[1]

(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?

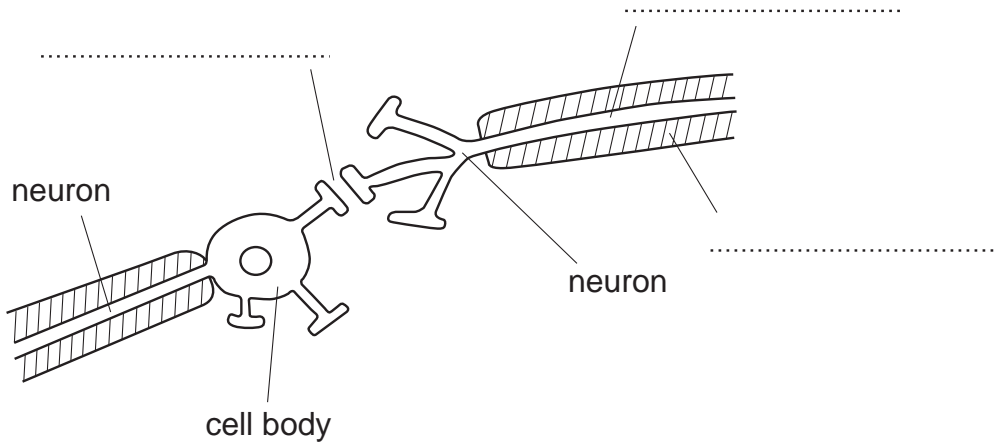
Put ticks (✓) in the boxes next to the **two** correct answers.

- remember her childhood
- remember what happened yesterday
- remember her mother's first name

[1]

[Total: 4]

- 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.

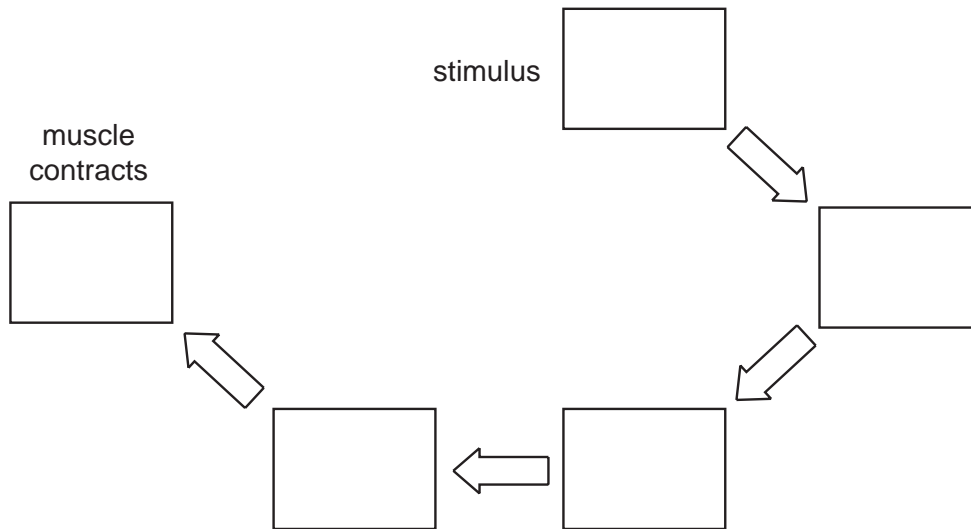
[1]

(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]

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



© Roy Anderson

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.

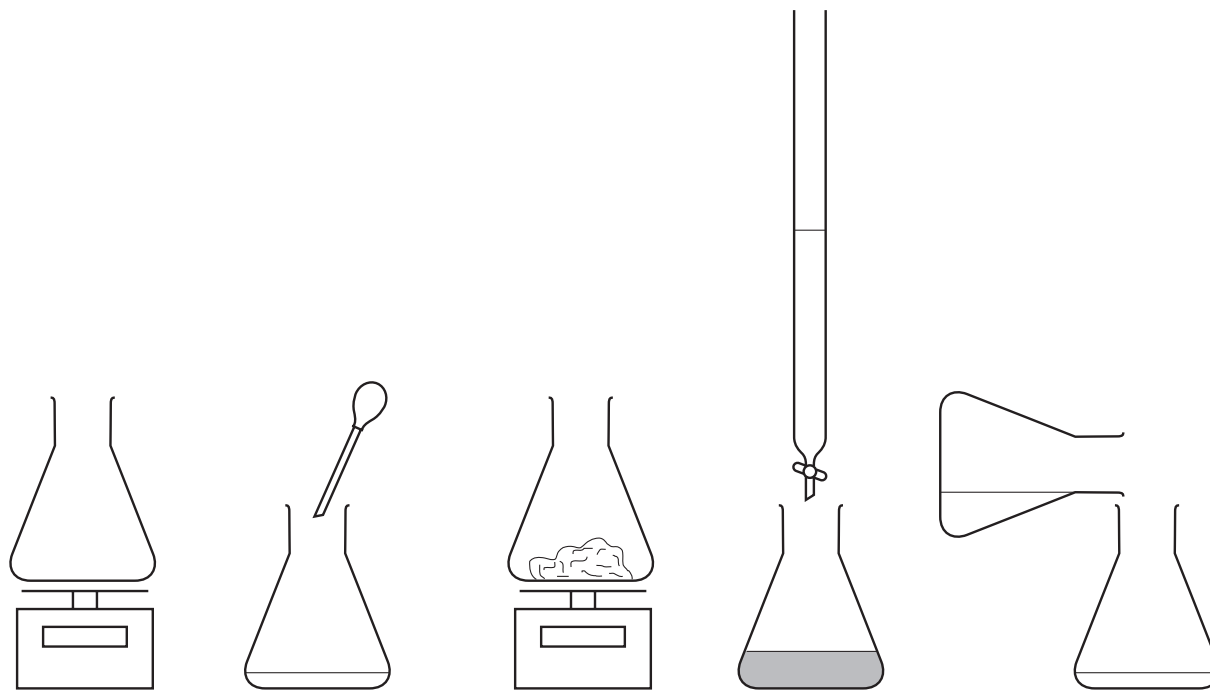
type of cell	effectors	receptors	neither effectors nor receptors
muscle cells			
egg cells			
slime-secreting cells			
light-sensitive cells			

[2]

[Total: 5]

- 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]

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

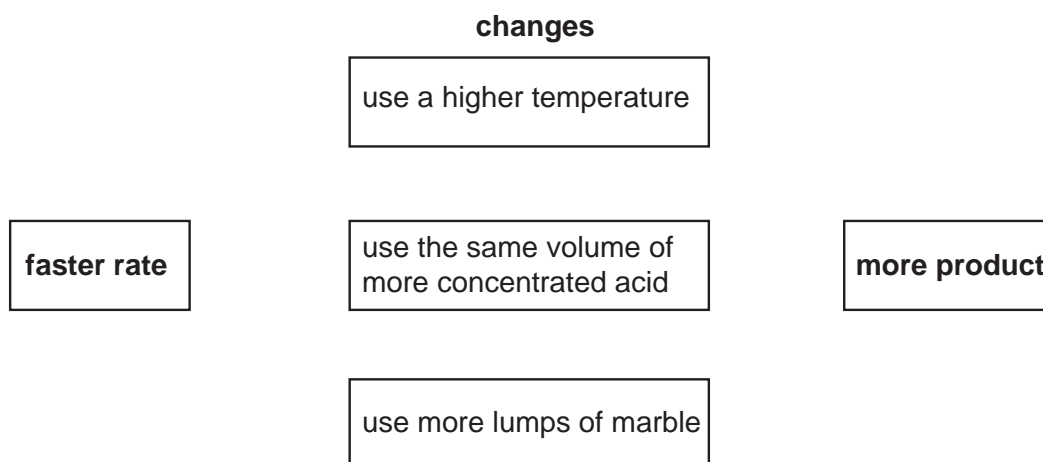
He then repeats the experiment, changing one of the conditions.

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.

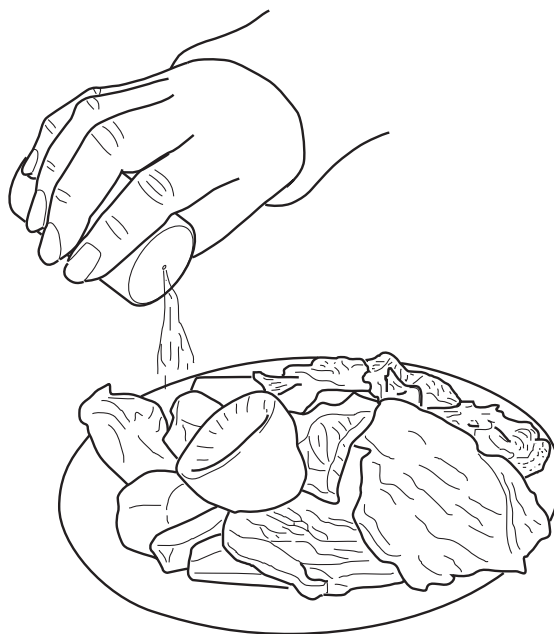
Draw a straight line from the **more product** box to the **change** which makes more product.



[3]

[Total: 3]

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, $\text{Ca}(\text{OH})_2$, reacts with hydrochloric acid, HCl ?

Put a (ring) around the correct answer.

Ca_2Cl CaCl CaCl_2 CaO

[1]

[Total: 4]

- 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.

Brenda
The acid and the alkali dissolve in water.

Angela
The powder is cool and dry while it is in a packet.

Clarissa
The surface area of the solid particles is too small.

Daphne
Baking powder contains preservatives.

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

answer[1]

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

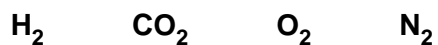
Put a **ring** around the correct answer.



[1]

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

Put a **ring** around the formula of this gas.



[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																						
		<div style="display: flex; justify-content: center; align-items: center; gap: 20px;"> <div style="border: 1px solid black; padding: 2px 5px;">1 H hydrogen 1</div> <div style="border: none; padding: 0 10px;">Key</div> <div style="border: 1px solid black; padding: 2px 5px;">relative atomic mass atomic symbol atomic (proton) number</div> </div>																																									
7	9	23	24	39	40	85	88	133	[223]	[227]	[261]	[262]	[266]	[268]	[271]	[272]	[209]	[210]	[222]																								
Li lithium 3	Be beryllium 4	Na sodium 11	Mg magnesium 12	K potassium 19	Ca calcium 20	Rb rubidium 37	Sr strontium 38	Cs caesium 55	Fr francium 87	La* lanthanum 57	Rf rutherfordium 104	Db dubnium 105	Sg seaborgium 106	Bh bohrium 107	Ds darmstadtium 110	Rg roentgenium 111	Pb lead 82	Po polonium 84	At astatine 85	Rn radon 86																							
133	137	[223]	[226]	[227]	[261]	[262]	[266]	[268]	[271]	[272]	Elements with atomic numbers 112-116 have been reported but not fully authenticated																																
Cs caesium 55	Ba barium 56	La* lanthanum 57	Ra radium 88	Ac* actinium 89	Hf hafnium 72	Ta tantalum 73	W tungsten 74	Re rhenium 75	Os osmium 76	Ir iridium 77	Pt platinum 78	Au gold 79	Hg mercury 80	Tl thallium 81	Pb lead 82	Po polonium 84	At astatine 85	Rn radon 86	Xe xenon 54	Kr krypton 36																							
85	88	133	137	[223]	[226]	[227]	[261]	[262]	[266]	[268]	[271]	[272]	[209]	[210]	[222]	[209]	[210]	[222]	[209]	[210]	[222]																						
Rb rubidium 37	Sr strontium 38	K potassium 19	Ca calcium 20	Y yttrium 39	Zr zirconium 40	Nb niobium 41	Mo molybdenum 42	Tc technetium 43	Ru ruthenium 44	Rh rhodium 45	Pd palladium 46	Ag silver 47	Cd cadmium 48	In indium 49	Sn tin 50	Sb antimony 51	Te tellurium 52	I iodine 53	Xe xenon 54	Kr krypton 36	Ar argon 18																						
27	31	35.5	40	70	73	75	79	80	84	85	86	88	91	93	96	101	103	106	108	112	115	119	122	127	131	133	137	[223]	[226]	[227]	[261]	[262]	[266]	[268]	[271]	[272]							
Al aluminium 13	Si silicon 14	P phosphorus 15	S sulfur 16	Ga gallium 31	Ge germanium 32	As arsenic 33	Se selenium 34	Br bromine 35	Kr krypton 36	Ar argon 18	Ne neon 10	F fluorine 9	O oxygen 8	N nitrogen 7	C carbon 6	B boron 5	He helium 2	Ne neon 10	Cl chlorine 17	S sulfur 16	Br bromine 35	Kr krypton 36	Ar argon 18	Ne neon 10	F fluorine 9	O oxygen 8	N nitrogen 7	C carbon 6	B boron 5	He helium 2	Ne neon 10	Cl chlorine 17	S sulfur 16	Br bromine 35	Kr krypton 36	Ar argon 18	Ne neon 10	F fluorine 9	O oxygen 8	N nitrogen 7	C carbon 6	B boron 5	He helium 2

* 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