

Surname	Centre Number	Candidate Number
Other Names		0



GCSE – NEW

3410U10-1



S18-3410U10-1

**CHEMISTRY – Unit 1:
Chemical Substances, Reactions and
Essential Resources**

FOUNDATION TIER

WEDNESDAY, 13 JUNE 2018 – MORNING

1 hour 45 minutes

ADDITIONAL MATERIALS

In addition to this examination paper you will need a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page at the back of the booklet, taking care to number the question(s) correctly.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	9	
2.	6	
3.	7	
4.	8	
5.	10	
6.	9	
7.	5	
8.	6	
9.	6	
10.	9	
11.	5	
Total	80	

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INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

Question **8** is a quality of extended response (QER) question where your writing skills will be assessed.

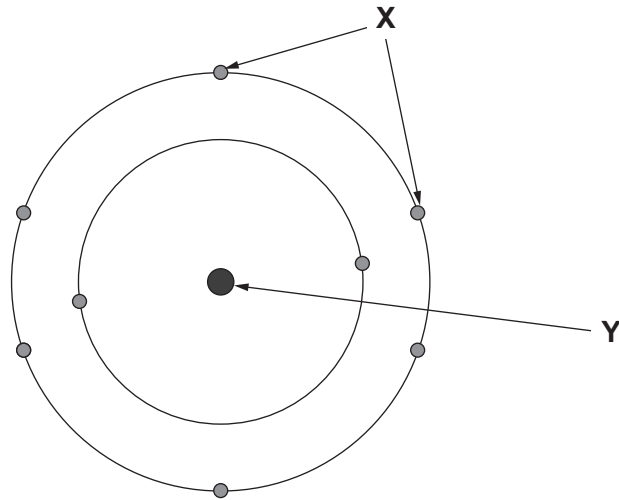
The Periodic Table is printed on the back cover of this paper and the formulae for some common ions on the inside of the back cover.



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Answer **all** questions.

1. (a) The following diagram shows the structure of an atom.



electrons	protons	shells	neutrons	nucleus
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Complete the following sentences using words from the box.

[3]

The particles labelled **X** are called

The part of the atom labelled **Y** is called the

It contains particles called and

- (b) Draw a line from each particle to the charge of that particle.

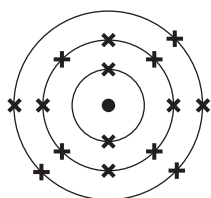
[2]

proton	0
neutron	+1
electron	-1

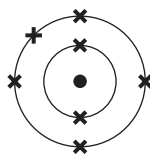


(c) The diagrams below show five different atoms labelled **A-E**.

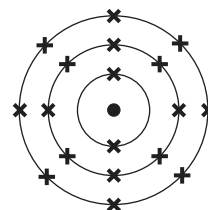
These letters are **not** the chemical symbols for the elements.



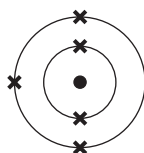
A



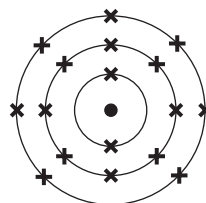
B



C



D



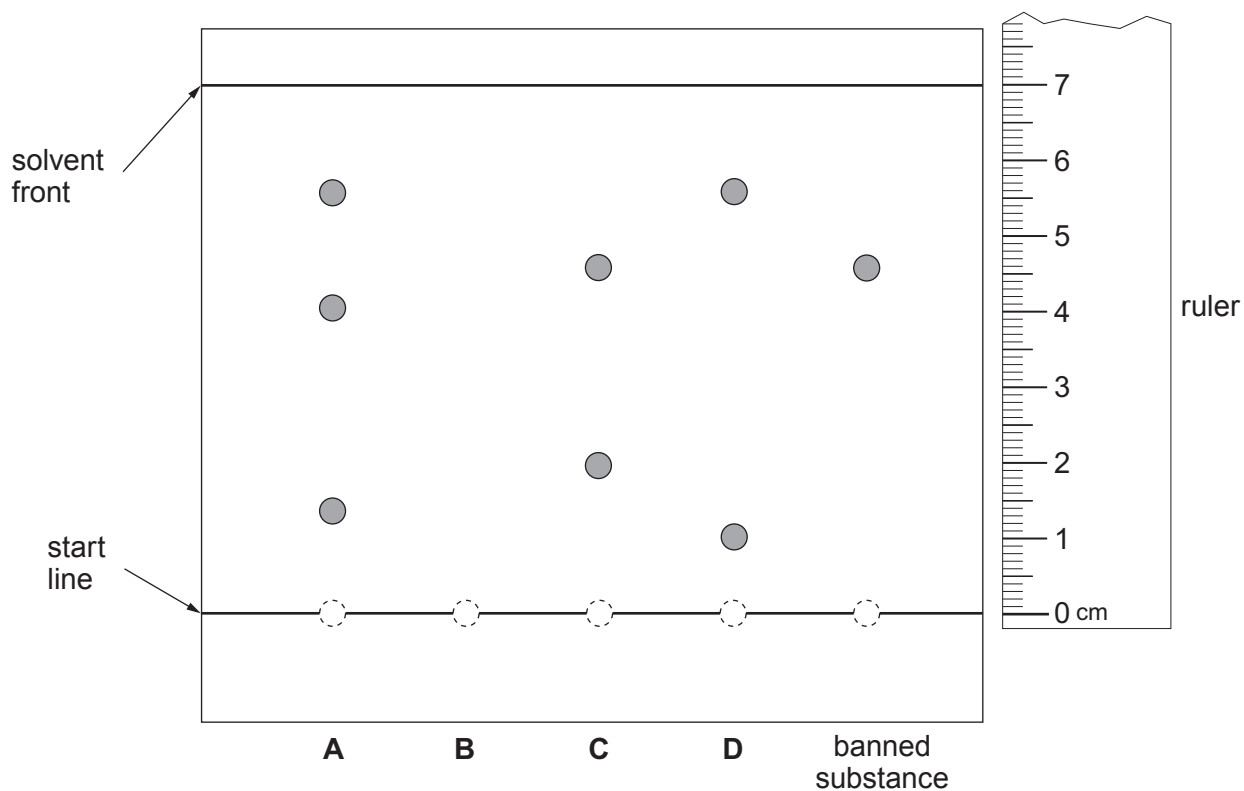
E

Use the letters **A-E** to complete the following sentences.

- (i) The atoms found in Group 5 are and [1]
- (ii) The atom with an atomic number of 7 is [1]
- (iii) The atom that is an inert gas is [1]
- (iv) The atoms found in Period 2 are and [1]



2. A food company was accused of using a banned substance in its sweets. Scientists tested four dyes, **A-D**, to find out if this was true or not. The results are shown below.



- (a) Name the method used.

[1]

.....

- (b) Dye **B** was found to have an R_f value of 0.428.

- (i) Use the following equation to calculate the distance moved by dye **B**.

[2]

$$\text{distance moved by dye B} = R_f \times \text{distance moved by solvent front}$$

Distance moved = cm

- (ii) **Complete the diagram** above to show the position of dye **B**.

[1]



- (c) Identify which dye, **A-D**, contains the banned substance. Give a reason for your answer. [2]

Dye

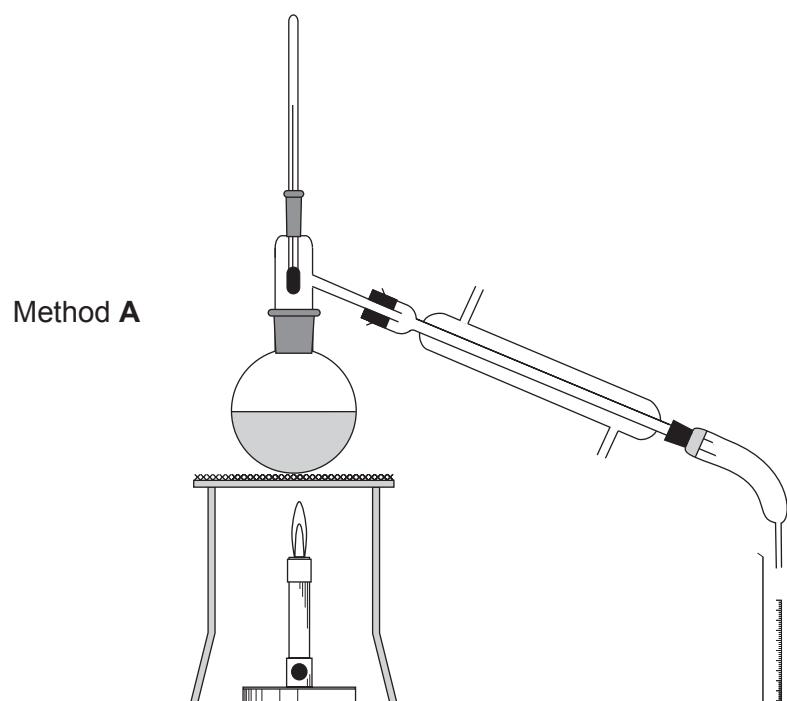
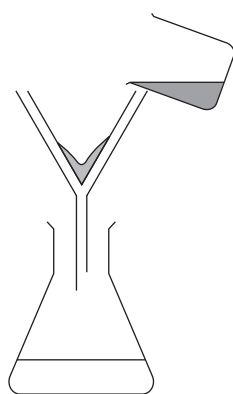
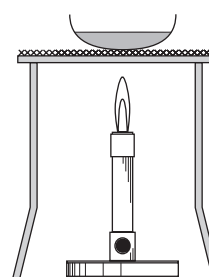
Reason

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3. (a) The diagrams below show three methods of separating mixtures.



- (i) A student was given a solution of sodium chloride. State which method, **A**, **B** or **C**, he could use in order to obtain a sample of pure water from the solution. Explain how the method works. [3]

Method

Explanation

- (ii) 500g of solution was found to contain 43g of sodium chloride. Calculate the percentage of sodium chloride in the solution. [2]

Percentage = %

- (b) Group 7 ions, chloride, bromide and iodide, can be identified using silver nitrate solution.

Complete the following table to show the colours of the precipitates produced by these ions. [2]

Group 7 ion	Colour of precipitate
chloride	white
bromide	
iodide	



4. The following table shows the composition of the atmosphere.

Gas	Chemical formula	Percentage found in the atmosphere (%)
argon	Ar	0.93
carbon dioxide	CO ₂	0.0360
helium	He	0.0005
hydrogen	H ₂	0.00005
methane	CH ₄	0.00017
neon	Ne	0.0018
nitrogen	N ₂	78.08
nitrous oxide	N ₂ O	0.00003
oxygen	O ₂	20.95
ozone	O ₃	0.000004

Use the table to answer parts (a) and (b).

(a) (i) Name **two** gases that occur as single atoms. [1]

.....

(ii) Name **two** elements that occur as molecules. [1]

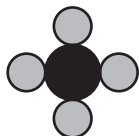
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(iii) Name the gas that has the **lowest** percentage. [1]

.....



- (b) (i) If  represents a carbon atom, name the gases from the table that can be represented by the following diagrams. [2]



.....

- (ii) Use the information in part (i) to draw the diagram for oxygen gas. [1]

- (c) The atmosphere can become polluted by substances known as chlorofluorocarbons (CFCs). One example of a CFC is CH_2ClF .

- (i) State how many hydrogen atoms are present in CH_2ClF . [1]

.....

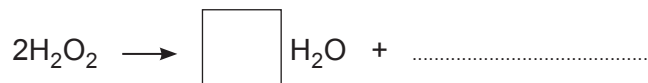
- (ii) Give the **total** number of atoms shown in the formula, CH_2ClF . [1]

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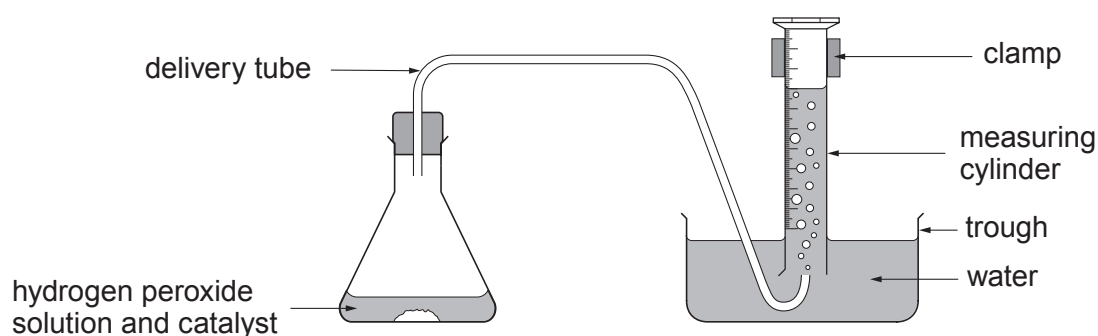


5. Hydrogen peroxide decomposes to give water and oxygen.

(a) Complete the symbol equation to show the reaction taking place. [2]



(b) The rate of decomposition of hydrogen peroxide can be measured using the following apparatus.



The rate was investigated using three different catalysts. The results are shown in the table.

Time (s)	Volume of gas collected (cm ³)		
	Catalyst 1	Catalyst 2	Catalyst 3
0	0	0	0
20	2	20	8
40	4	34	15
60	6	38	23
80	8	40	30
100	10	40	36

(i) State which is the **least** effective catalyst. Give a reason for your answer. [1]

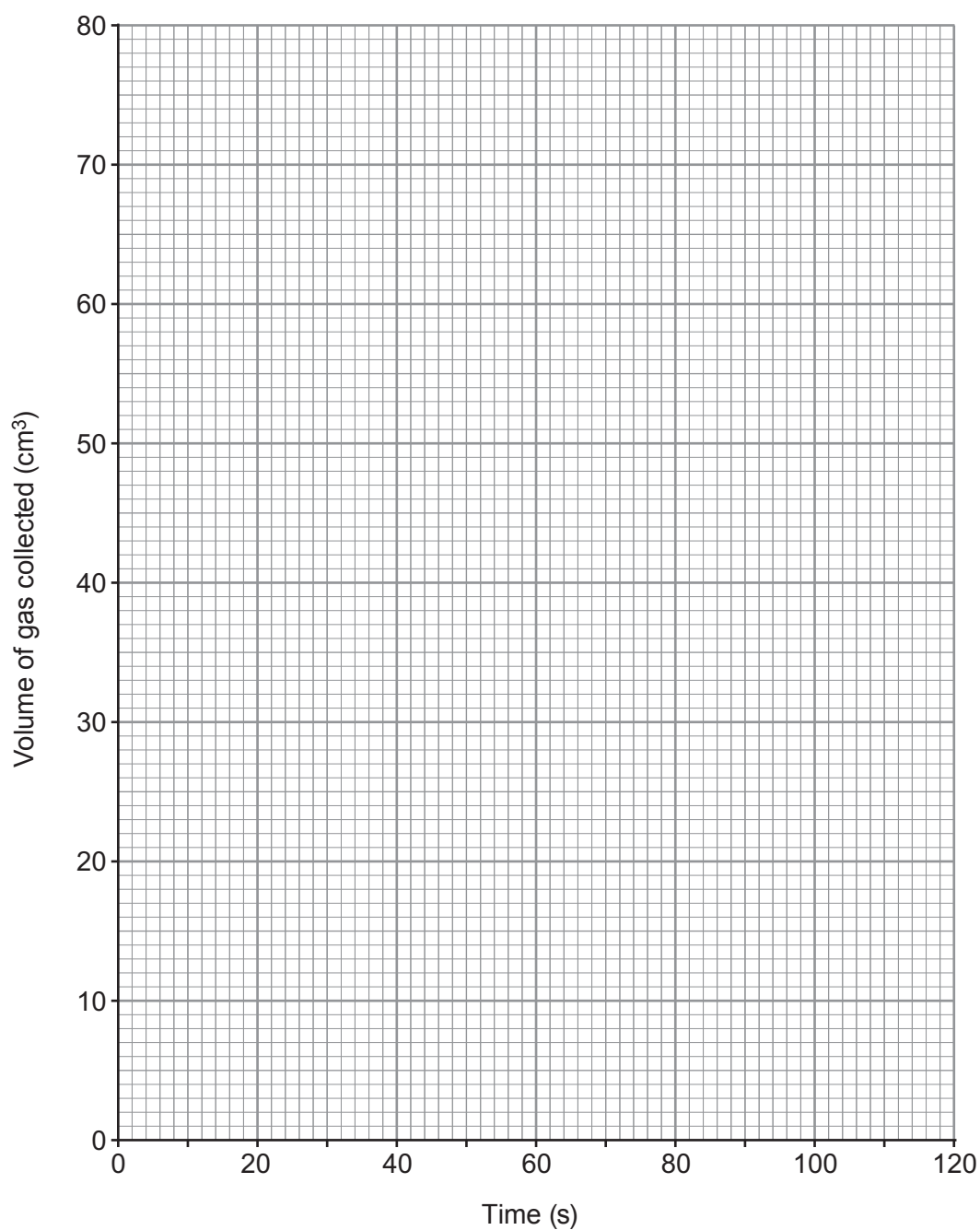
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- (ii) Plot a graph of the volume of gas collected using **catalyst 2**.
Draw a suitable line.

[3]

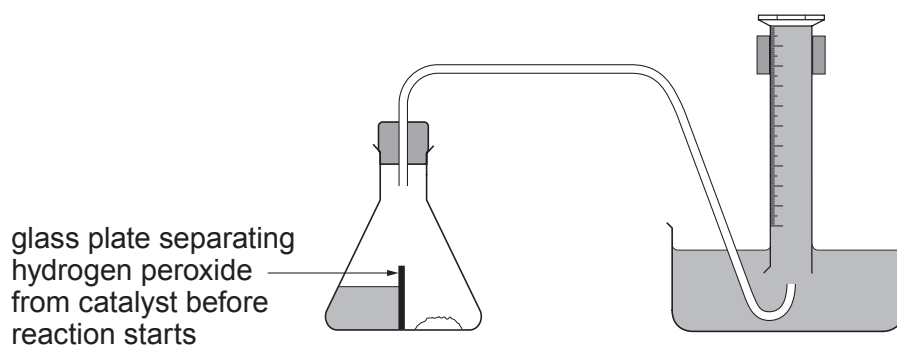


- (iii) **On the same grid**, sketch the graph you would expect to obtain if you added the same amount of catalyst 2 to the same volume of hydrogen peroxide of **twice** the concentration.

[2]



- (iv) Another student claimed that he could collect more accurate results using the following apparatus.



Suggest how this apparatus could improve the accuracy of the results.

[2]

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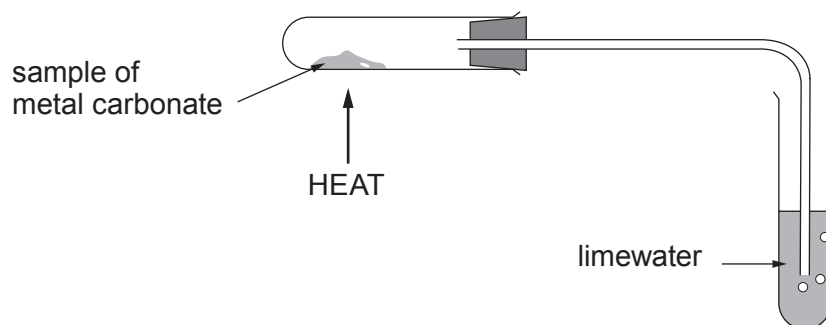
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6. (a) A student investigated the decomposition of three different metal carbonates.

She measured the time taken for limewater to turn milky using the following apparatus.



Three samples of each metal carbonate were tested. Her results are shown in the table.

Metal carbonate	Time taken for limewater to turn milky (s)			
	Sample 1	Sample 2	Sample 3	Mean
copper(II) carbonate	15	25	17	
zinc carbonate	54	52	53	53
calcium carbonate	195	200	190	195

- (i) Calculate the mean time taken for limewater to turn milky on heating copper(II) carbonate. **Show your working.** [2]

Mean time = s



- (ii) I. Place the carbonates in order of stability giving a reason for your answer. [2]

Most stable

.....

Least stable

Reason

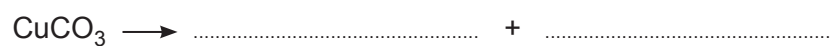
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- II. Explain the order of stability of the carbonates. [1]

.....

.....

- (iii) Complete the following symbol equation for the decomposition of copper(II) carbonate. [2]



- (b) Calculate the relative formula mass, M_r , of copper(II) carbonate, CuCO_3 . [2]

$$A_r(\text{C}) = 12 \quad A_r(\text{O}) = 16 \quad A_r(\text{Cu}) = 63.5$$

$$M_r = \dots$$



7. The following information is taken from some articles about global warming.

Greenhouse gases such as carbon dioxide keep heat close to the Earth's surface making it a suitable temperature for life. Global warming is an increase of the Earth's mean surface temperature due to the overproduction of greenhouse gases by burning fossil fuels such as gas, petrol and oil. Deforestation also contributes to this. With the growth of industry in the 1900s, humans began burning more fossil fuels to run our cars, trucks and factories. There is more carbon dioxide in the atmosphere today than at any point in the last 800,000 years.

The following charts show the mean global temperature every decade since the 1880s, the amount of carbon dioxide in the atmosphere from 1750-2010 and the main sources of carbon dioxide production today.

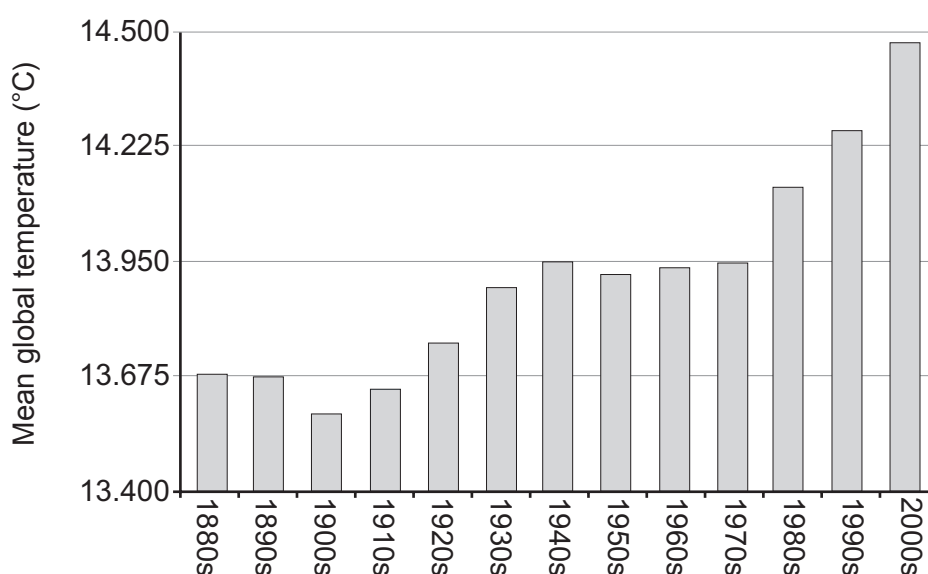


Figure 1

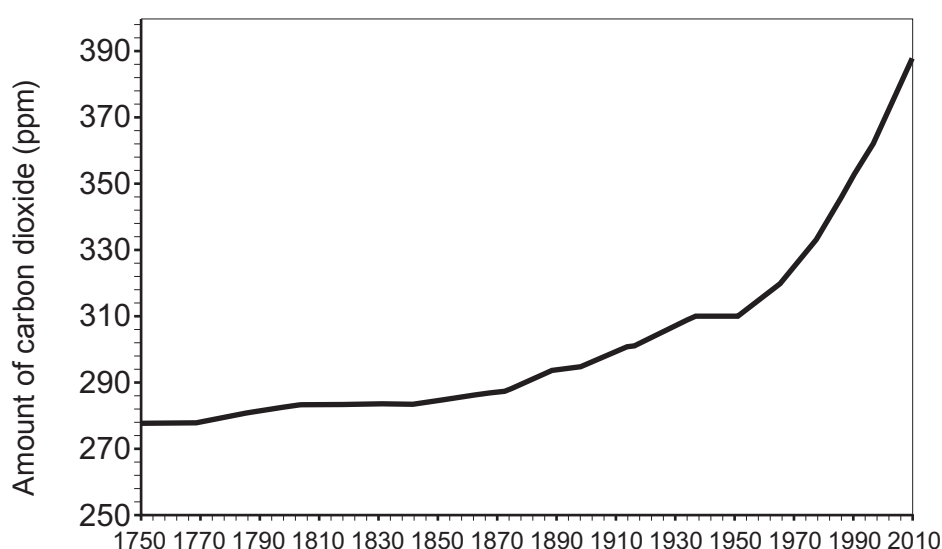


Figure 2



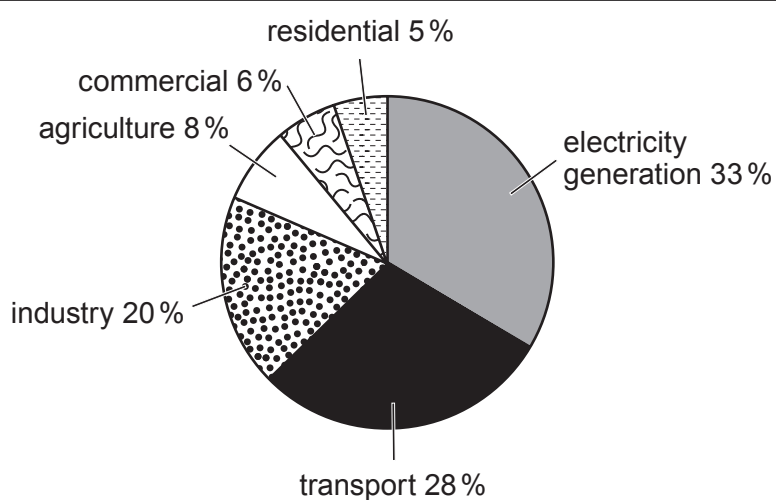


Figure 3

(a) Draw a trend line on **Figure 1**. [1]

(b) Suggest why there was a large rise in the amount of carbon dioxide in the atmosphere after around 1950. [2]

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(c) Give **one** way in which we are trying to reduce carbon dioxide emissions. [1]

.....

.....

(d) Some people say that changes in carbon dioxide levels are **not** responsible for global warming. Tick (✓) the statement that supports this opinion. [1]

Most carbon dioxide is produced by electricity generation

☐

Between 1900 and 2010 there was a massive increase in industry

☐

The mean global temperature remained constant between 1950 and 1980

☐

The average number of cars per home has increased steadily since the 1980s

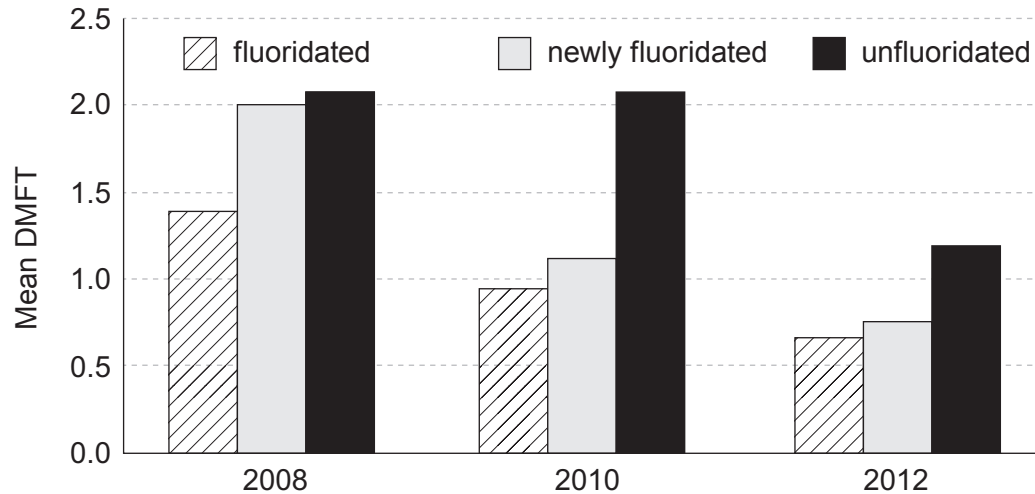
☐

The use of energy efficient appliances has increased since 2000

☐


Examiner
only

8. The following graph shows the mean numbers of decayed, missing and filled teeth (DMFT) in 12 year-olds in three areas of Australia in 2008, 2010 and 2012. One area has been fluoridated for 20 years, one is newly fluoridated and the other is unfluoridated.



Describe what the graph tells us. Use this information and your knowledge of fluoridation to explain why some people support fluoridation of water supplies but others oppose it. [6 QER]

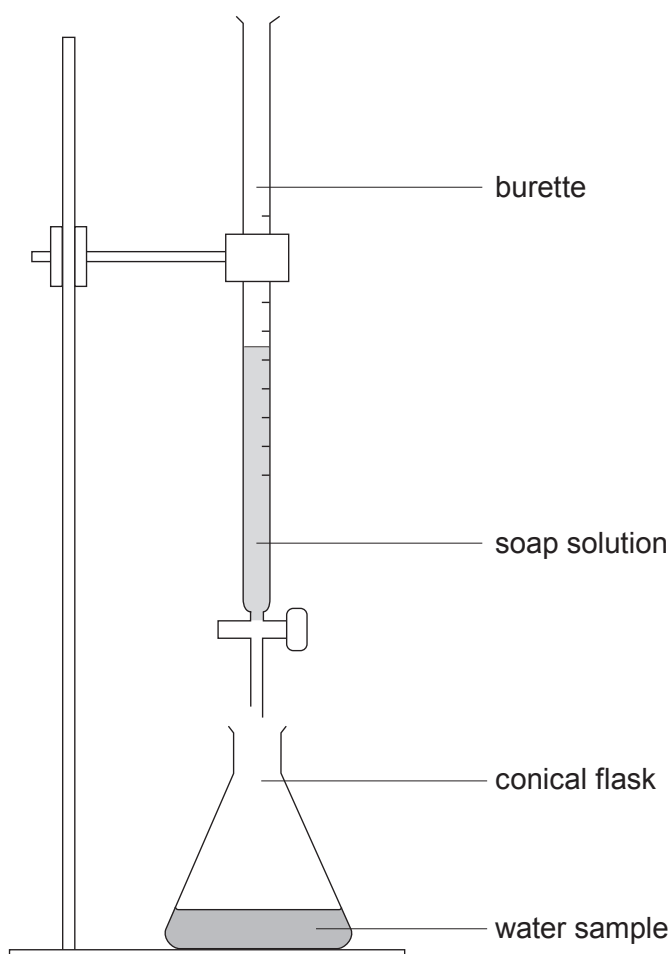


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9. Water samples **A**, **B**, **C** and **D** were tested for hardness using the apparatus shown.



Soap solution was added 1 cm^3 at a time to each sample and the volume required to produce a permanent lather on shaking was recorded. Each sample was tested before and after boiling. The results are shown in the table.

Water sample	Volume of soap solution required (cm^3)	
	Before boiling	After boiling
A	1	1
B	10	10
C	15	1
D	15	8



- (a) (i) State which water sample contains **only** temporary hardness. Explain your answer. [2]

Water sample

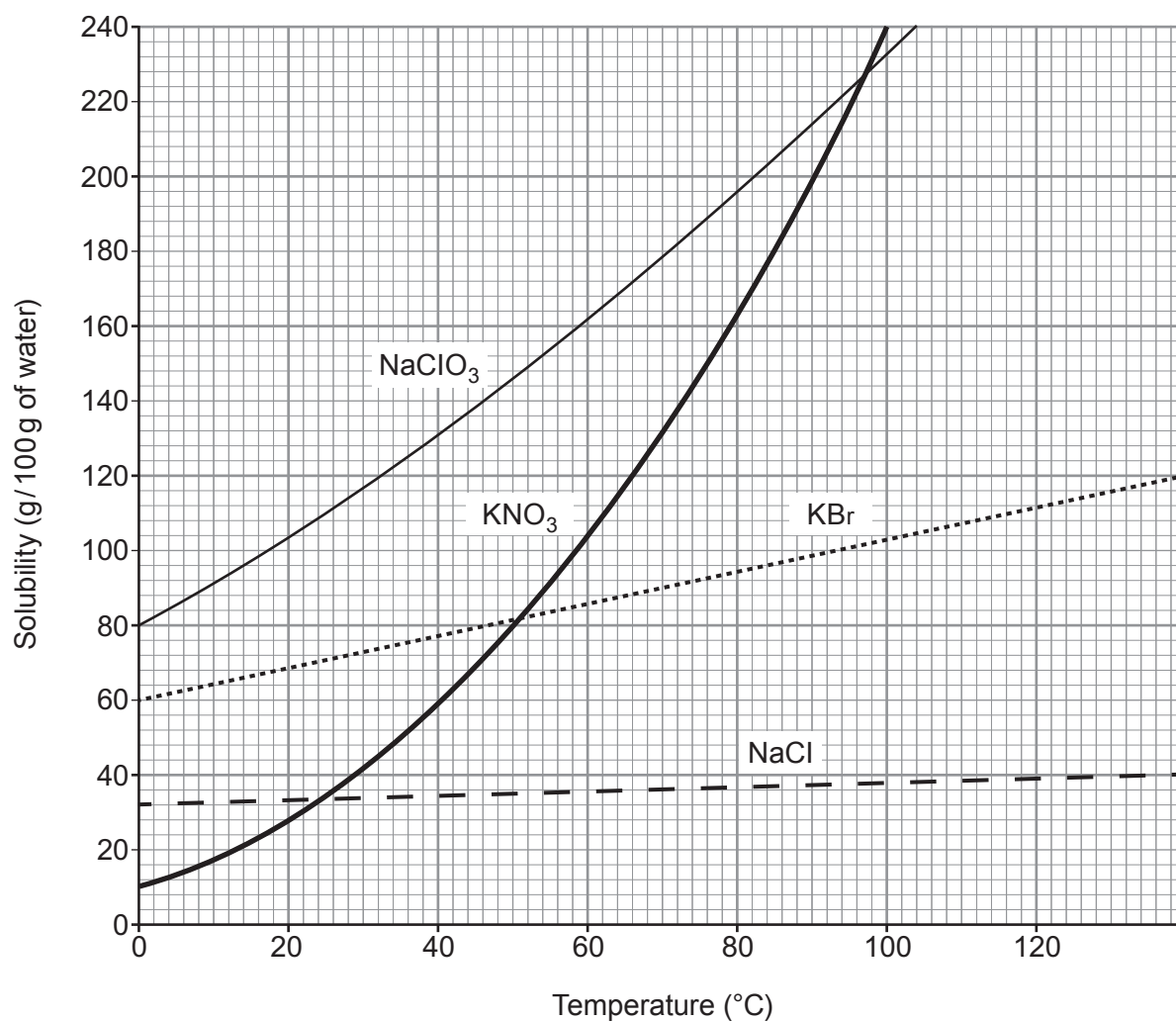
Explanation

- (ii) Give **one** similarity in the composition of temporary and permanent hard water. [1]

- (b) Discuss the benefits and drawbacks of living in a hard water area. [3]



10. The grid below shows the solubility curves for four ionic compounds.



NaClO ₃	sodium chlorate
KNO ₃	potassium nitrate
KBr	potassium bromide
NaCl	sodium chloride



- (a) (i) Give the temperature at which the solubility of potassium nitrate and potassium bromide is the same. [1]

..... °C

- (ii) Calculate the mass of solid potassium nitrate that would form if a saturated solution in 200 g of water were cooled from 100 °C to 20 °C. [3]

Mass = g

- (iii) Suggest why a student may be surprised at the temperature range shown on the solubility curves. [1]

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- (b) (i) Give the symbols of the **ions** of Group 1 elements present in the compounds shown on the grid. [1]

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- (ii) Explain how these ions are formed from their atoms. [2]

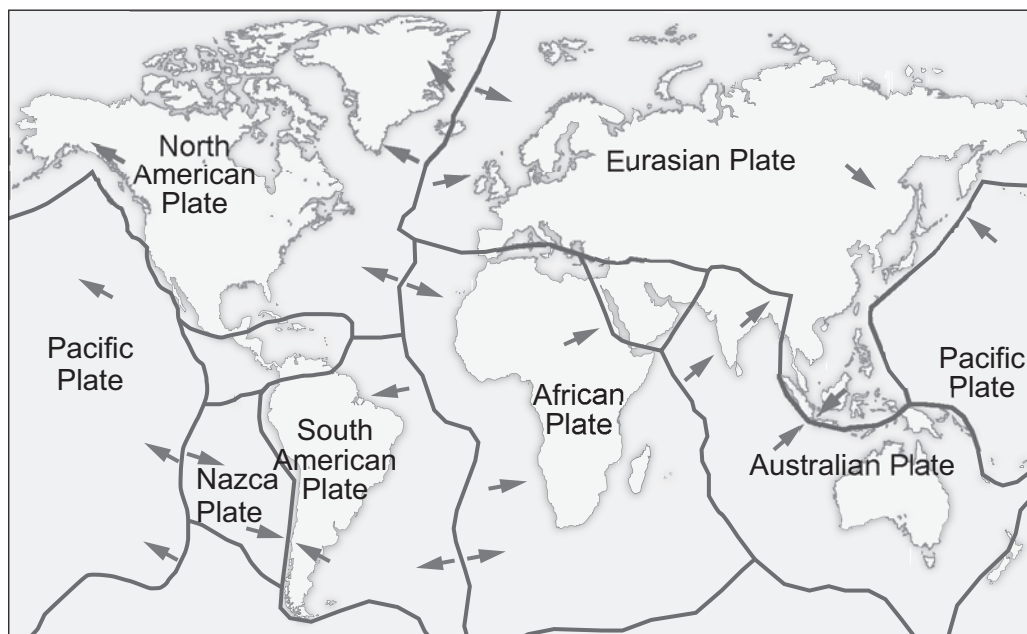
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- (c) Potassium nitrate reacts with aluminium hydroxide to produce aluminium nitrate and potassium hydroxide.

Balance the symbol equation for the reaction taking place. [1]



11. The following diagram shows some of the Earth's tectonic plates and the direction in which they move.



- (a) The boundary between the Nazca and South American plates is a destructive plate boundary. Describe what happens at a destructive boundary. [2]

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.....

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- (b) Draw a cross (✕) on the diagram to show a constructive plate boundary. Describe what happens at this boundary. [2]

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- (c) State **one** effect of plates sliding past each other. [1]

.....

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
aluminium	Al^{3+}	bromide	Br^-
ammonium	NH_4^+	carbonate	CO_3^{2-}
barium	Ba^{2+}	chloride	Cl^-
calcium	Ca^{2+}	fluoride	F^-
copper(II)	Cu^{2+}	hydroxide	OH^-
hydrogen	H^+	iodide	I^-
iron(II)	Fe^{2+}	nitrate	NO_3^-
iron(III)	Fe^{3+}	oxide	O^{2-}
lithium	Li^+	sulfate	SO_4^{2-}
magnesium	Mg^{2+}		
nickel	Ni^{2+}		
potassium	K^+		
silver	Ag^+		
sodium	Na^+		
zinc	Zn^{2+}		





2



Group



2

0

$$\frac{1}{\text{Hydrog}} \frac{1}{\text{H}}$$

⁹Be
Beryllium

 ^{65}Zr Zr zin

227
Ac
Actinium

Key

Ar	Symb	Name	Z
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relative atomic mass

name	atomic number
Hydrogen	1
Helium	2
Lithium	3
Boron	5
Carbon	6
Nitrogen	7
Oxygen	8
Fluorine	9
Neon	10
Sodium	11
Magnesium	12
Aluminum	13
Silicon	14
Phosphorus	15
Sulfur	16
Chlorine	17
Argon	18
Potassium	19
Calcium	20
Scandium	21
Titanium	22
Vanadium	23
Chromium	24
Manganese	25
Iron	26
Cobalt	27
Nickel	28
Copper	29
Zinc	30
Gallium	31
Germanium	32
Arsenic	33
Selenium	34
Bromine	35
Krypton	36
Rubidium	37
Strontium	38
Yttrium	39
Zirconium	40
Niobium	41
Molybdenum	42
Technetium	43
Ruthenium	44
Rhodium	45
Palladium	46
Silver	47
Cadmium	48
Indium	49
Mercury	80