

Surname	Centre Number	Candidate Number
Other Names		0



**GCSE**

4493/01

**CHEMISTRY**

**CHEMISTRY 3  
FOUNDATION TIER**

A.M. THURSDAY, 15 May 2014

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	5	
3.	6	
4.	4	
5.	10	
6.	6	
7.	10	
8.	8	
9.	6	
<b>Total</b>	<b>60</b>	

4493  
010001

### ADDITIONAL MATERIALS

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

### INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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.

### INFORMATION FOR CANDIDATES

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

You are reminded of the necessity for good English and orderly presentation in your answers.

Assessment will take into account the quality of written communication (QWC) used in your answer to question **9**.

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

Answer **all** questions.

1. The fire triangle is shown below.



- (a) Describe what the fire triangle shows. [1]

.....

.....

- (b) Use your understanding of the fire triangle to state how each of the following fire-fighting methods work. [3]

Placing a heatproof mat over a beaker that contains burning ethanol

.....

Using water to put out a bonfire

.....

Cutting down trees to provide a fire break in a forest

.....

- (c) A cook notices that a frying pan containing oil has caught fire. He decides to get a fire extinguisher to put the fire out. Choose from the following box the type of fire extinguisher that should **not** be used. [1]

<b>carbon dioxide</b>	<b>foam</b>	<b>powder</b>	<b>water</b>
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Type of fire extinguisher **not** to be used .....

5

2. Ethanol can be used as a fuel. It can be made by the fermentation of sugars using yeast.

The following graph shows the rate of fermentation using different sugars at 25 °C.



(a) Identify the best sugar for producing ethanol and give a reason for your choice. [1]

*Best sugar* .....

*Reason* .....

(b) The following table contains some statements relating to the use of ethanol as a fuel.

It is a renewable resource
Large areas of land required to grow the crops
Produces less soot than petrol when burnt
Engines require modifications to run on ethanol
Produces less heat per litre than petrol
Produces only carbon dioxide and water when burnt

(i) In your opinion, should ethanol be used as a fuel? Give reasons to support your answer. [3]

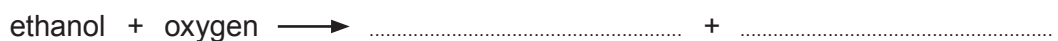
*Opinion (Yes/No)* .....

*Reasons* .....

.....

.....

(ii) Complete the **word** equation for the complete combustion of ethanol. [1]



3. (a) Draw a line from each gas below to the observation made in identifying it. [3]

Gas	Observation
	relights a glowing splint
carbon dioxide	turns flame red
ammonia	turns limewater milky
oxygen	pops with a burning splint
	turns damp red litmus blue

- (b) The following box contains observations made when testing for some common metal ions.

<b>lilac flame</b>	<b>yellow flame</b>	<b>green flame</b>
<b>blue precipitate</b>	<b>brown precipitate</b>	<b>green precipitate</b>
	<b>white precipitate</b>	

Choose from the box the result you would expect for the following tests. [3]

A flame test is carried out on a sample of sodium chloride

.....

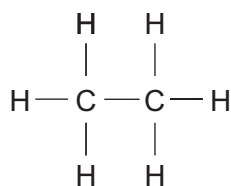
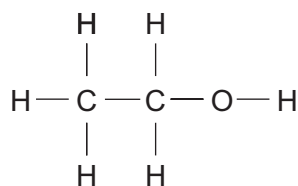
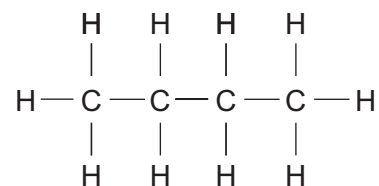
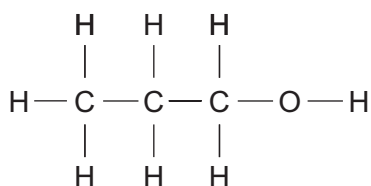
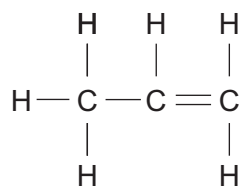
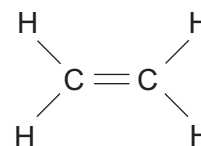
A flame test is carried out on a sample of copper(II) sulfate

.....

Sodium hydroxide solution is added to a solution of iron(III) chloride

.....

4. (a) The structural formulae of some organic compounds are shown below.

**A****B****C****D****E****F**

- (i) Give the letters, **A-F**, of **two** alkanes and **two** alcohols. [2]

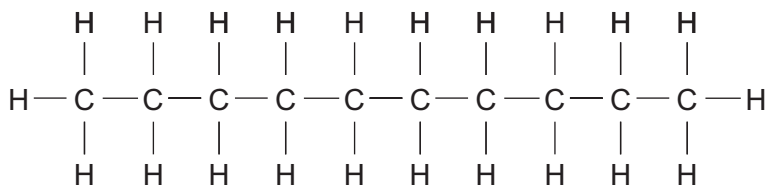
*Alkanes* ..... and .....

*Alcohols* ..... and .....

- (ii) State which compound, **A-F**, has the molecular formula  $\text{C}_3\text{H}_6$ . [1]

.....

- (b) Give the molecular formula of decane. [1]



.....

5. (a) Sulfuric acid is produced by the contact process. The main stages in the process are shown below.

Stage 1: Burning sulfur in air to produce gas **A**

Stage 2: Passing gas **A** over a catalyst at 450 °C to produce gas **B**

Stage 3: Dissolving gas **B** in concentrated sulfuric acid to produce oleum

Stage 4: Diluting oleum to produce sulfuric acid

- (i) Give the names of gases **A** and **B**. [2]

Gas **A** .....

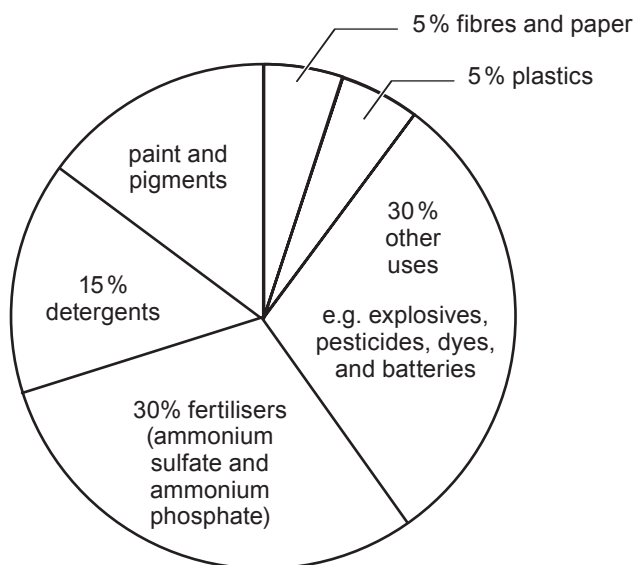
Gas **B** .....

- (ii) Which stage involves a reversible reaction? ..... [1]

- (iii) Give a reason why gas **B** is not dissolved directly in water during stage 3. [1]

.....  
.....

- (b) The following pie chart shows the uses of sulfuric acid.



- (i) Calculate the percentage of sulfuric acid used for making paint and pigments. [2]

Percentage used for making paint and pigments = ..... %

- (ii) One important use of sulfuric acid is in the production of fertilisers. Complete the following **word** equation for the production of ammonium sulfate. [1]

sulfuric acid + ..... → ammonium sulfate

- (iii) This type of fertiliser can be washed into rivers. Explain why this is a cause for concern. [3]

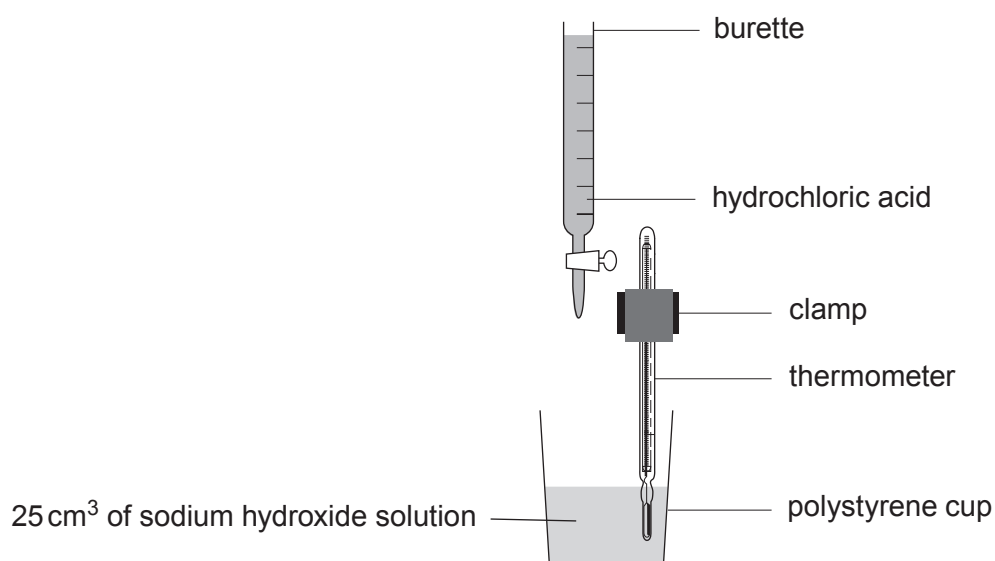
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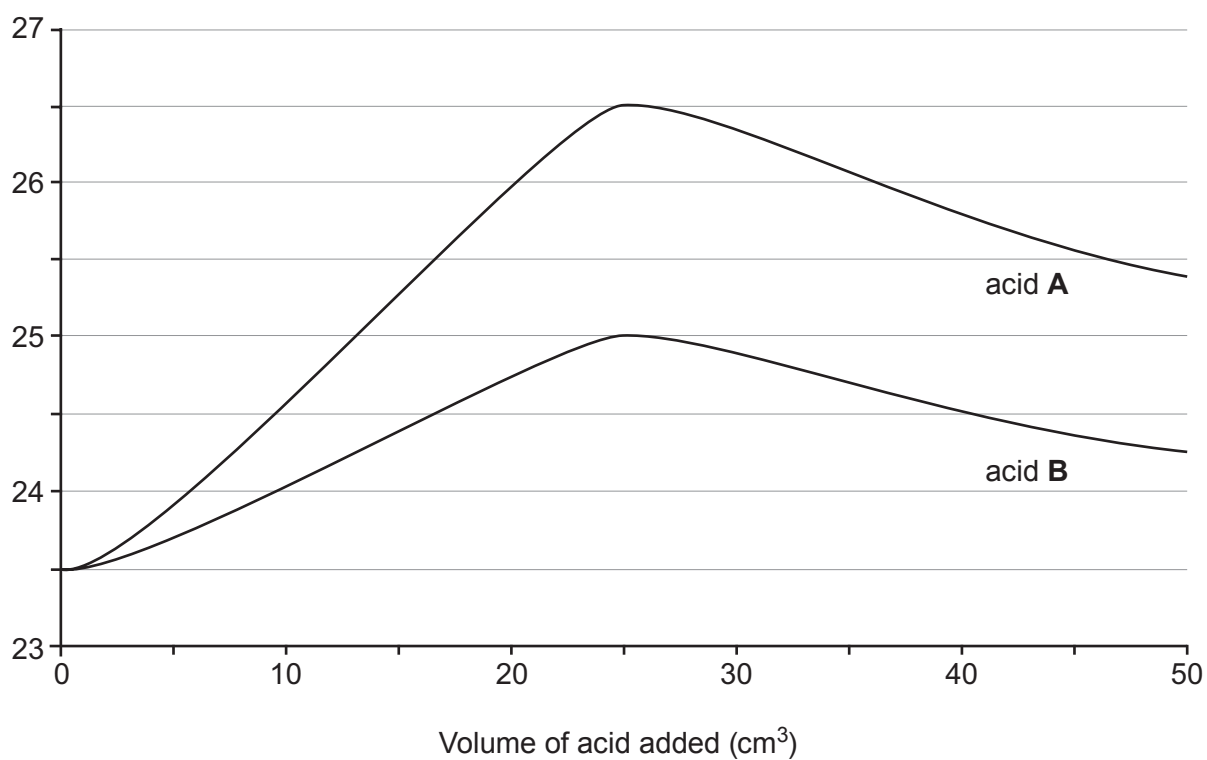
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6. The apparatus below can be used to measure the temperature as a neutralisation reaction takes place.



The graphs below show how the temperature changes when acids **A** and **B** are added separately to 25 cm<sup>3</sup> of sodium hydroxide solution.

Temperature (°C)

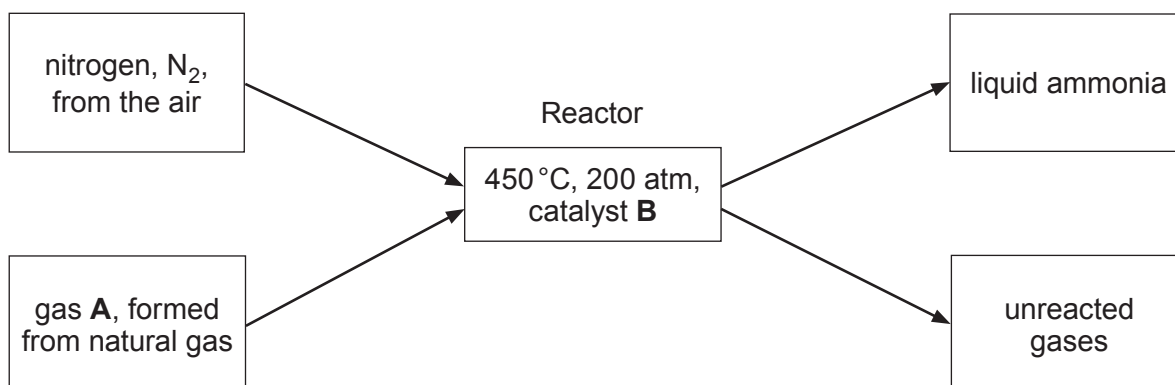




- (a) Use the graphs opposite to find the
- (i) volume of acid required to neutralise the sodium hydroxide solution in both experiments, [1]  
.....
  - (ii) maximum temperature **rise** for acid **B**. [1]  
.....
- (b) State which acid, **A** or **B**, is stronger and give a reason for your answer. [1]
- Stronger acid* .....
- Reason* .....
- .....
- .....
- .....
- .....
- (c) Describe how an indicator could be used to find the exact volume of acid needed for neutralisation. [3]

6

7. Ammonia is produced during the Haber process. The reaction is summarised in the diagram below.



(a) Give the name of gas **A**. ..... [1]

(b) Name catalyst **B** and state why it is used. [2]

.....

.....

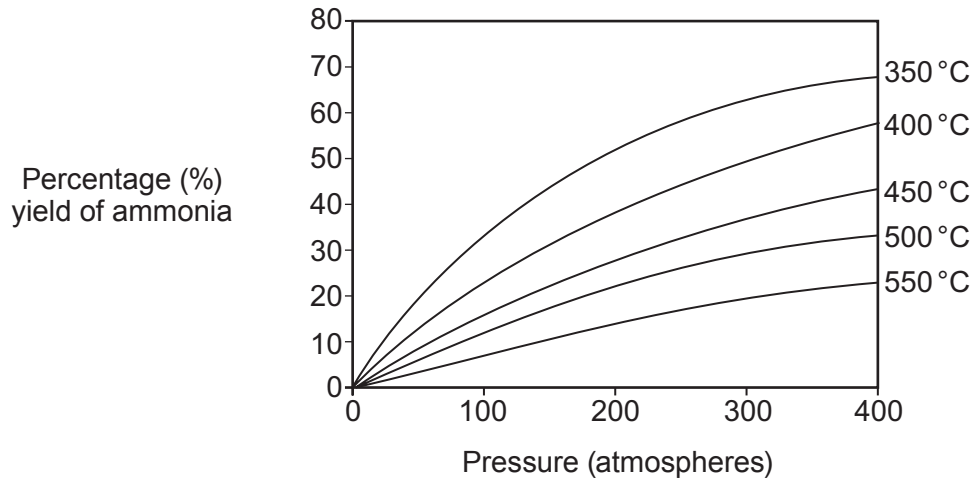
(c) The yield of ammonia is only 28% therefore 72% of the gases remain unreacted.  
Describe what happens to these unreacted gases and state why this is important. [2]

.....

.....

.....

- (d) The following graph shows the effect of temperature and pressure on the yield of ammonia during the Haber process.



Describe how the yield of ammonia varies with temperature and pressure.

[2]

*Temperature*

.....

.....

*Pressure*

.....

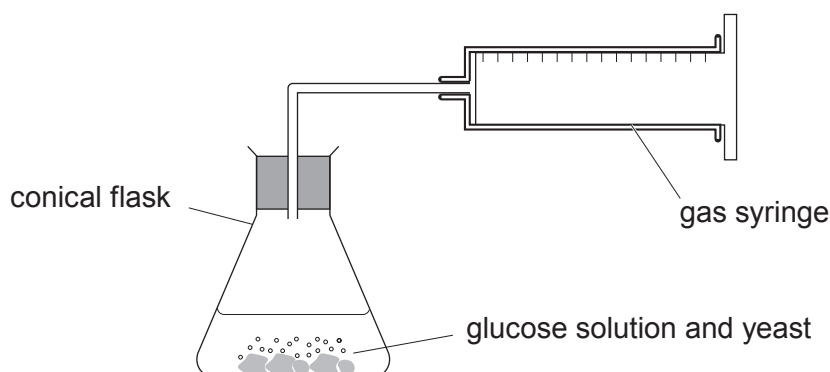
.....

- (e) Write a balanced **symbol** equation for the production of ammonia.

[3]



8. A pupil investigated the effect of temperature on the rate of fermentation using the apparatus shown below.



The experiment was carried out three times at five different temperatures. The volume of gas collected after 10 minutes was recorded each time. The results are shown below.

Temperature (°C)	Volume of gas collected after 10 minutes (cm <sup>3</sup> )			
	1	2	3	Mean
20	9	8	7	8
30	38	40	32	39
40	52	53	54	53
50	35	32	33	33
60	12	11	12	12

- (a) Suggest why the circled value is considered to be anomalous.

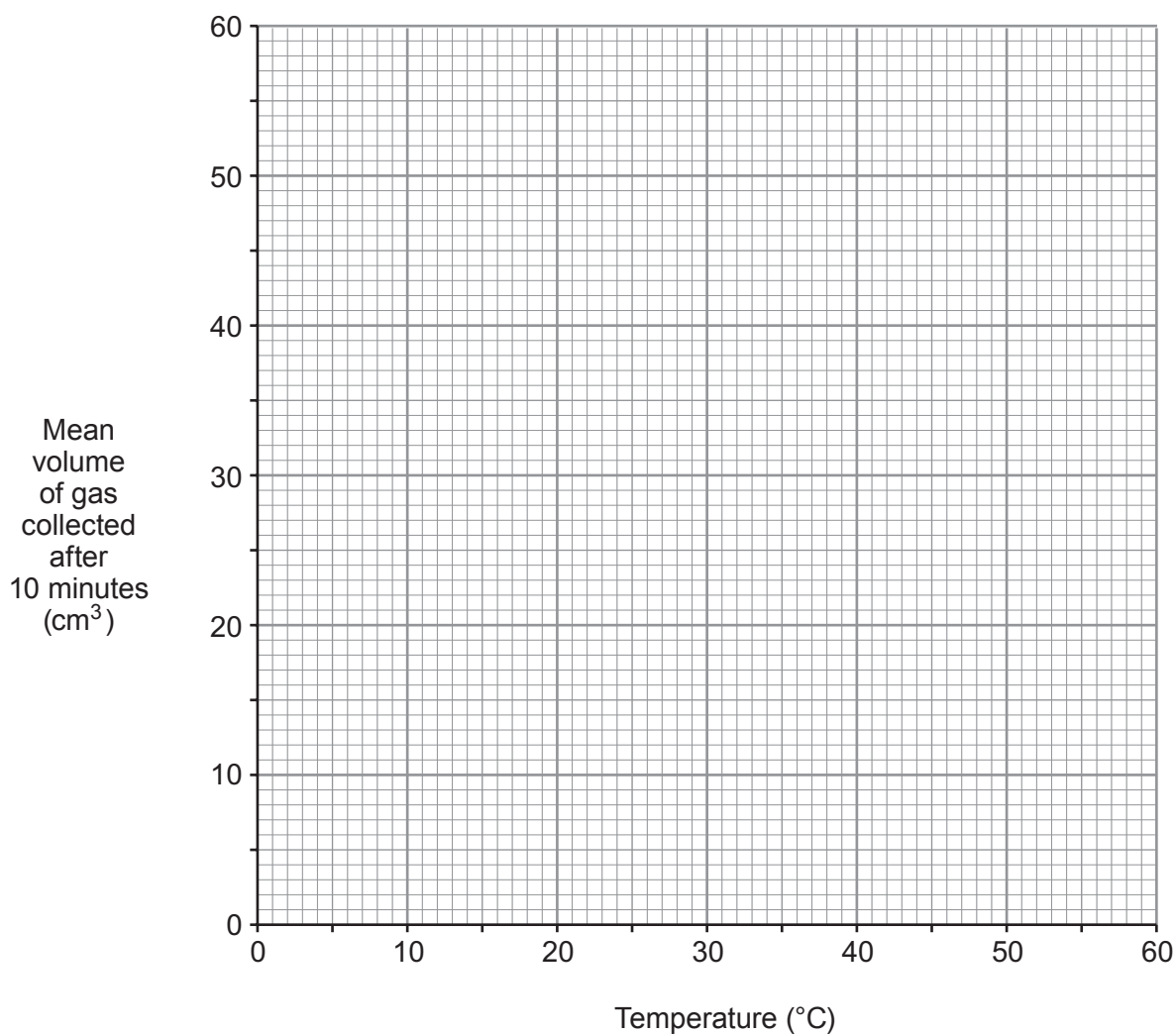
[1]

.....

.....

- (b) Plot a graph of the **mean** volume of gas collected against temperature on the grid opposite.

[2]



- (c) State what conclusions can be drawn from the graph. [2]

.....

.....

.....

.....

- (d) Write a **word** equation for the reaction taking place. [2]

.....  $\longrightarrow$  ..... + .....

- (e) Yeast produces a catalyst that allows this reaction to take place. Name the **type** of catalyst produced by yeast. [1]

.....



## FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	$\text{Al}^{3+}$	Bromide	$\text{Br}^-$
Ammonium	$\text{NH}_4^+$	Carbonate	$\text{CO}_3^{2-}$
Barium	$\text{Ba}^{2+}$	Chloride	$\text{Cl}^-$
Calcium	$\text{Ca}^{2+}$	Fluoride	$\text{F}^-$
Copper(II)	$\text{Cu}^{2+}$	Hydroxide	$\text{OH}^-$
Hydrogen	$\text{H}^+$	Iodide	$\text{I}^-$
Iron(II)	$\text{Fe}^{2+}$	Nitrate	$\text{NO}_3^-$
Iron(III)	$\text{Fe}^{3+}$	Oxide	$\text{O}^{2-}$
Lithium	$\text{Li}^+$	Sulfate	$\text{SO}_4^{2-}$
Magnesium	$\text{Mg}^{2+}$		
Nickel	$\text{Ni}^{2+}$		
Potassium	$\text{K}^+$		
Silver	$\text{Ag}^+$		
Sodium	$\text{Na}^+$		
Zinc	$\text{Zn}^{2+}$		

# PERIODIC TABLE OF ELEMENTS

1 2 3 4 5 6 7 0

Group

		<table border="1" style="margin: auto;"> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">H</td> <td colspan="10"></td> </tr> <tr> <td colspan="2" style="text-align: center;">Hydrogen</td> <td colspan="10"></td> </tr> </table>										1	H											Hydrogen												<table border="1" style="margin: auto;"> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">He</td> </tr> <tr> <td colspan="2" style="text-align: center;">Helium</td> </tr> </table>		4	He	Helium	
1	H																																								
Hydrogen																																									
4	He																																								
Helium																																									
7	Li	9	Be											19	F	20	Ne																								
Lithium		Beryllium												Fluorine		Neon																									
23	Na	24	Mg											35	Cl	40	Ar																								
Sodium		Magnesium												Chlorine		Argon																									
39	K	40	Ca	45	Sc	48	Ti	51	V	52	Cr	55	Mn	56	Fe	59	Co	64	Ni	65	Zn	70	Ga	73	Ge	75	As	79	Se	80	Br	84	Kr								
Potassium		Calcium		Scandium		Titanium		Vanadium		Chromium		Manganese		Iron		Cobalt		Nickel		Zinc		Gallium		Germanium		Arsenic		Selenium		Bromine		Krypton									
86	Rb	88	Sr	89	Y	91	Zr	93	Nb	96	Mo	99	Tc	101	Ru	103	Rh	106	Pd	108	Ag	112	Cd	115	In	119	Sn	122	Sb	127	I	131	Xe								
Rubidium		Strontium		Yttrium		Zirconium		Niobium		Molybdenum		Technetium		Ruthenium		Rhodium		Palladium		Silver		Cadmium		Indium		Tin		Antimony		Tellurium		Iodine		Xenon							
133	Cs	137	Ba	139	La	179	Hf	181	Ta	184	W	186	Re	190	Os	192	Ir	195	Pt	197	Au	201	Hg	204	Tl	207	Pb	209	Bi	210	At	222	Rn								
Caesium		Barium		Lanthanum		Hafnium		Tantalum		Tungsten		Rhenium		Osmium		Iridium		Platinum		Gold		Mercury		Thallium		Lead		Bismuth		Polonium		Astatine		Radon							
223	Fr	226	Ra	227	Ac											223	Fr	226	Ra	227	Ac																				
Francium		Radium		Actinium												Francium		Radium		Actinium																					

Key:

