St Mary's School
CAMBRIDGE

Year 10 Chemistry

Sample Entrance Examination

Time allowed: 30 minutes

Name: _____

Total : 40 marks

INSTRUCTIONS :

- **Spend 30 minutes on this section.**
- **You may use a calculator.**
- **You will need a pencil and ruler.**
- **Work through as many questions as you can, showing all relevant workings.**
- **If you do not understand a question, miss it out and go on to the next one.**
- **When you have done all you can, return to any questions that you may have missed.**
- **When you have finished check your answers**

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.

1 Sort the following materials into the correct column in the table:

air **magnesium oxide** **crude oil** **iron** **oxygen**

Elements	Compounds	Mixtures

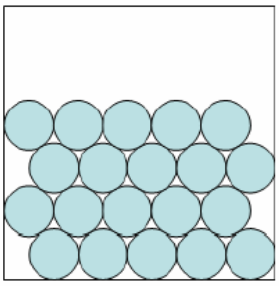
[5]

2 The diagrams below represent elements, compounds and mixtures.

Choose from the following list the best description of each diagram

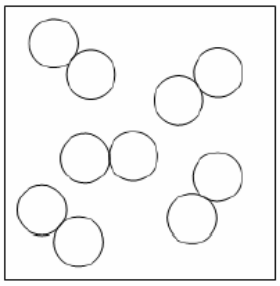
- an element
- a compound
- a mixture of elements and compounds
- a mixture of compounds

A



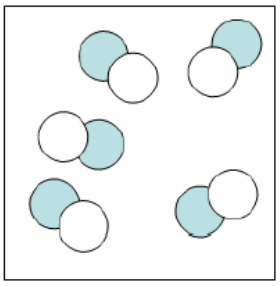
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B



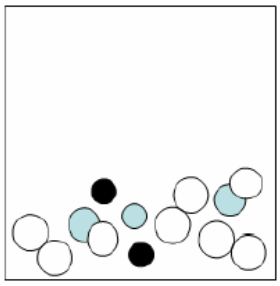
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C



.....

D



.....

[4]

3 a There are three states of matter: solid, liquid and gas.

(i) which state of matter can be most easily compressed?

.....**[1]**

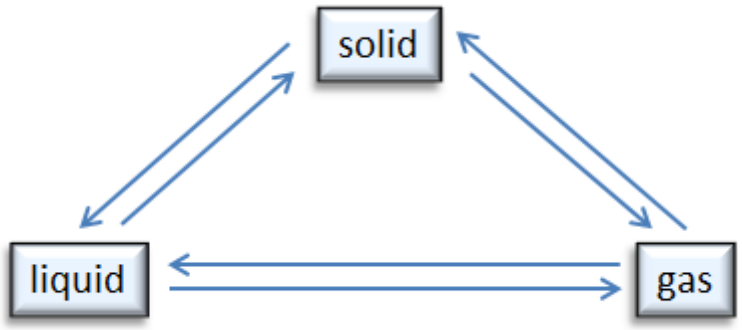
(ii) which state of matter keeps its own shape?

.....**[1]**

(iii) which state of matter takes the shape of the bottom of the container it is in?

.....**[1]**

b Look at the diagram below about that shows how the states of matter can be changed.



(i) What is the name of the process when a **solid** turns into a **liquid**?

.....**[1]**

(ii) What is the name of the process when a **gas** turns into a **liquid**?

.....**[1]**

(iii) What is the name of the process when a **solid** turns into a **gas**?

.....**[1]**

4 This question is about acids and their reactions.

a Universal Indicator solution can be used to show that a solution is acidic, neutral or alkaline.

A student puts a few drops of Universal Indicator solution into pure water in a test tube. She then adds hydrochloric acid until she sees no further colour changes.

Describe the changes in colour that you would expect to see during the student's experiment.

.....

.....

.....

[3]

b Acids can react with alkalis, bases and metals to form salts.

For example **hydrochloric acid** reacts with **sodium hydroxide** to form the salt **sodium chloride**. Water is also produced in this reaction.

Give the names of the salts produced in the following reactions.

i) hydrochloric acid and potassium hydroxide .....

ii) sulfuric acid and magnesium hydroxide .....

iii) sulfuric acid and copper oxide .....

iv) nitric acid and lead carbonate .....

v) hydrochloric acid and zinc .....

[5]

c Acids are often described as **corrosive** or **irritant**.
They have to have hazard symbol on their bottles.

i) Write the word **corrosive** next to the appropriate symbol.
ii) Write the word **irritant** next to the appropriate symbol.

.....

.....

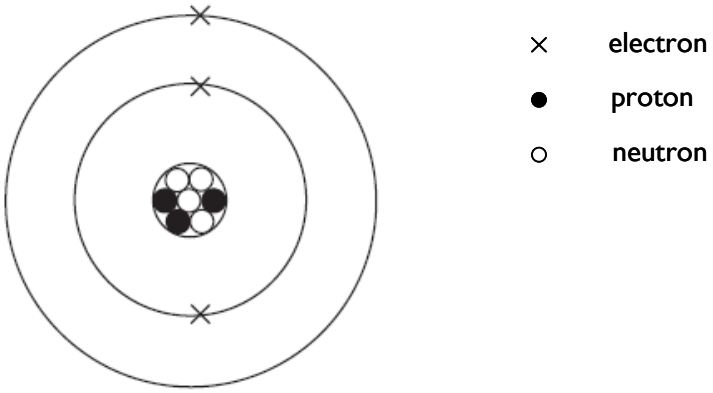
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[2]

5. The diagram shows a lithium atom which has atomic number 3 and mass number 7.



In the space below draw a similar labelled diagram of an atom of boron, showing its electron arrangement and numbers of protons and neutrons. Boron has an atomic number of 5 and a mass number of 11.

[3]

6 The composition of six particles is given in the table.

particle	number of protons	number of neutrons	number of electrons
A	6	8	8
B	8	8	6
C	6	6	8
D	8	6	6
E	6	6	6
F	6	8	6

Choose from the letters A-F in your answers.

a Give the letter of one particle which is neutral. .....

b Give one particle which is a positive ion. .....

c Which particle has the greatest mass? .....

d Give one particle which is an isotope of particle F .....

[4]

7 Six samples of magnesium ribbon were heated in crucibles with a lid and the following results obtained

You are not expected to have done this experiment – it is testing your data analysis and graph drawing skills.

Experiment	Mass of magnesium /g	Mass of magnesium oxide /g	Mass of oxygen combined /g
1	0.12	0.20	0.08
2	0.24	0.40	0.16
3	*	0.60	0.24
4	0.48	0.80	0.32
5	0.60	1.00	*
6	0.72	0.72	0.00

a Complete the above table of results * **[2]**

b In which experiment did the magnesium fail to react?

.....**[1]**

c Using the figures in the table above, plot a graph of the **mass of magnesium oxide** against the **mass of magnesium** use the graph paper on the following page.

[4]

d Use the graph to work out what mass of magnesium oxide should have been produced in experiment 6.

.....**[1]**

