

The Periodic Table of the Elements

1	2	Key										3	4	5	6	7	0	
		relative atomic mass atomic symbol name atomic (proton) number																
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

1
H
hydrogen
1

* 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.



P 3 8 4 3 9 A 0 2 1 2

BLANK PAGE



1. Ethene and propene are alkenes.
Alkenes can be reacted to form polymers.

The table gives some information about ethene and propene and the polymers they form.

alkene	formula of molecule	structure of molecule	name of polymer formed from alkene	repeating unit in polymer
ethene	C_2H_4	poly(ethene)
propene	$ \begin{array}{c} H \quad \quad CH_3 \\ \diagdown \quad \diagup \\ C = C \\ \diagup \quad \diagdown \\ H \quad \quad H \end{array} $	$ \begin{array}{c} H \quad CH_3 \\ \quad \\ -C - C- \\ \quad \\ H \quad H \end{array} $

- (a) Complete the table.

(4)

- (b) Alkenes are unsaturated hydrocarbons.
Explain why alkenes are described as **unsaturated**.

.....
.....

(1)

- (c) Bromine water is orange.
Describe what you would **see** when ethene is shaken with a small amount of bromine water.

.....

(1)

- (d) Ethene can be produced by cracking long chain alkane molecules.
What is meant by **cracking**?

.....
.....
.....

(1)



- (e) Poly(ethene) is waterproof and almost colourless.
Suggest a use for poly(ethene) which depends on these properties.

.....
(1)

- (f) Describe problems that arise when poly(ethene) waste is put in a landfill site.

.....
.....
.....
.....
(2)

Q1

(Total 10 marks)



BLANK PAGE



2. Sodium and potassium are in group 1 of the periodic table.
They are alkali metals.
The electronic configuration of a sodium atom is 2.8.1
The electronic configuration of a potassium atom is 2.8.8.1

- (a) Explain, in terms of the electronic configurations of their atoms, why sodium and potassium have similar reactions.

.....
.....
(1)

- (b) A sodium ion has the formula Na^+ .

- (i) What is an **ion**?

.....
.....
.....
(1)

- (ii) Give the symbol of a potassium ion.

.....
(1)

- (c) Sodium forms salts which are ionic compounds.

- (i) Ionic compounds have high melting points.

Explain why.

.....
.....
.....
.....
(2)

- (ii) Sodium sulphate is a salt.

Sulphate ions have the formula SO_4^{2-} .

Give the formula of sodium sulphate.

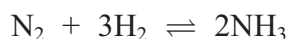
.....
(1)

(Total 6 marks)

Q2



3. Ammonia is produced in industry by the Haber process.
The equation for the reaction is



- (a) 280 tonnes of nitrogen is mixed with the correct amount of hydrogen for complete reaction.

- (i) Calculate the maximum mass of ammonia that could be formed if all of the nitrogen reacted.

(Relative formula masses: $\text{N}_2 = 28$; $\text{H}_2 = 2.0$; $\text{NH}_3 = 17$)

.....

.....

.....

.....

Answer = tonnes
(2)

- (ii) In another reaction, it is calculated that, if all of the nitrogen reacted, 151 tonnes of ammonia would be formed.

When the reaction occurs, only 21.0 tonnes of ammonia is formed.

Calculate the percentage yield of ammonia in this reaction.

.....

.....

.....

Answer = %
(1)

- (b) In the Haber process the reaction is carried out at a pressure of about 200 atm.
In another process, this reaction has been carried out at a much higher pressure of about 1000 atm.

- (i) A higher yield is obtained at 1000 atm than at 200 atm.
Explain why.

.....

.....

.....

.....

(2)



(ii) Suggest a disadvantage of using a pressure as high as 1000 atm in the manufacture of ammonia.

.....

.....

.....

(1)

Q3

(Total 6 marks)



4. Jetpacks can be used to lift people into the air and transport them over short distances. The photographs show a man with a jetpack strapped to his back.



Some jetpacks contain hydrogen peroxide.

The hydrogen peroxide decomposes rapidly to form oxygen and water.

This rapid release of oxygen from the jetpack lifts the person off the ground.

- (a) Write the balanced equation for the decomposition of hydrogen peroxide, H_2O_2 , to oxygen and water, H_2O .

..... (2)

- (b) Draw a dot and cross diagram to show the arrangement of electrons in a molecule of water.
Show outer electrons only.

(2)



- (c) The decomposition of hydrogen peroxide is very slow at room temperature. In a jetpack, silver powder is present to make the reaction much faster. The silver powder remains unchanged at the end of the reaction.

Why does silver make the reaction take place faster?

.....
.....

(1)

- (d) The decomposition of hydrogen peroxide is exothermic.

(i) What is meant by the term **exothermic**?

.....
.....

(1)

(ii) During the reaction, some bonds are broken and some bonds are formed. Explain, in terms of the breaking and forming of bonds, why the reaction is exothermic.

.....
.....
.....
.....

(2)

(Total 8 marks)

Q4

TOTAL FOR PAPER: 30 MARKS

END



BLANK PAGE

