

THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0

Group

1	<table border="1"> <tr> <td>1</td> <td>H</td> <td colspan="15"></td> </tr> <tr> <td></td> <td>Hydrogen</td> <td colspan="15"></td> </tr> </table>																1	H																	Hydrogen																4	<table border="1"> <tr> <td>4</td> <td>He</td> <td colspan="15"></td> </tr> <tr> <td></td> <td>Helium</td> <td colspan="15"></td> </tr> </table>																4	He																	Helium															
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2	7	9											11	12	14	16	19	20																																																																																			
	Li	Be											B	C	N	O	F	Ne																																																																																			
	Lithium	Beryllium											Boron	Carbon	Nitrogen	Oxygen	Fluorine	Neon																																																																																			
	3	4											5	6	7	8	9	10																																																																																			
	23	24											27	28	31	32	35.5	40																																																																																			
	Na	Mg											Al	Si	P	S	Cl	Ar																																																																																			
	Sodium	Magnesium											Aluminium	Silicon	Phosphorus	Sulphur	Chlorine	Argon																																																																																			
	11	12											13	14	15	16	17	18																																																																																			
	39	40											70	73	75	79	80	84																																																																																			
	K	Ca											Ga	Ge	As	Se	Br	Kr																																																																																			
	Potassium	Calcium											Gallium	Germanium	Arsenic	Selenium	Bromine	Krypton																																																																																			
	19	20											31	32	33	34	35	36																																																																																			
	86	88											115	119	122	128	127	131																																																																																			
	Rb	Sr											In	Sn	Sb	Te	I	Xe																																																																																			
	Rubidium	Strontium											Indium	Tin	Antimony	Tellurium	Iodine	Xenon																																																																																			
	37	38											49	50	51	52	53	54																																																																																			
	133	137											204	207	209	210	210	222																																																																																			
	Cs	Ba											Tl	Pb	Bi	Po	At	Rn																																																																																			
	Caesium	Barium											Thallium	Lead	Bismuth	Polonium	Astatine	Radon																																																																																			
	55	56											81	82	83	84	85	86																																																																																			
	Fr	Ra											201	204	208	210	210	222																																																																																			
	Francium	Radium											Mercury	Thallium	Bismuth	Polonium	Astatine	Radon																																																																																			
	87	88											80	81	83	84	85	86																																																																																			
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													Francium	Radium	Radium	Radium	Radium	Radium																																																																																			
													87	88	88	88	88	88																																																																																			

Key

Relative atomic mass
Symbol
Name
Atomic number

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1. Some industrial processes involve passing gases over heated solid catalysts. This happens in the manufacture of sulphuric acid in the Contact process.

(a) For the catalysed reaction for the manufacture of sulphuric acid in the Contact process, give the names of:

(i) the TWO reacting gases;

1.

2.

(2)

(ii) the product;

.....

(1)

(iii) the solid catalyst.

.....

(1)

(b) Sulphuric acid is used to make fertilisers.

Explain what fertilisers are used for and the problems that they cause when they are washed into rivers.

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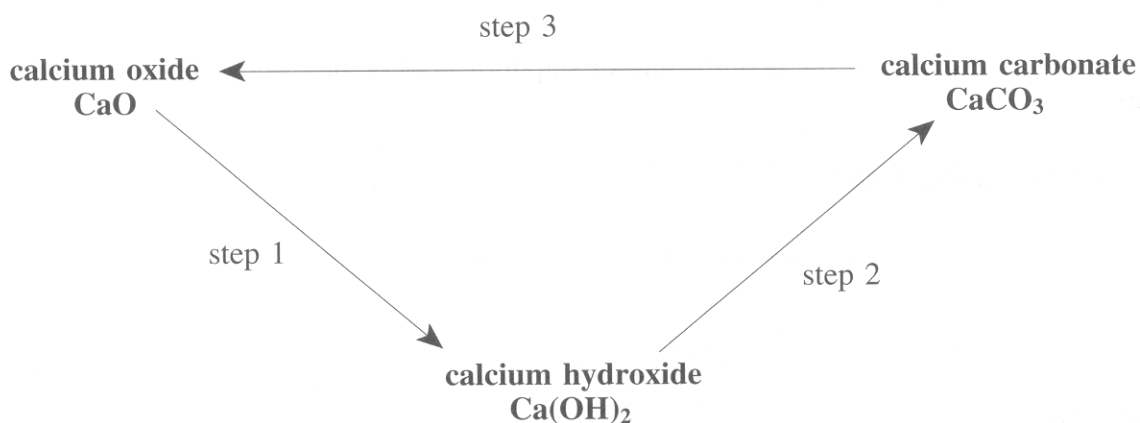
(3)

(Total 7 marks)

QUESTION 1

TURN OVER FOR QUESTION 2

2. The diagram shows three calcium compounds.



(a) (i) Which compound occurs widely in nature?

..... (1)

(ii) Which compound is present in solution in limewater?

..... (1)

(iii) What state symbol is used to show limewater is a solution?

..... (1)

(iv) Which compound is formed on boiling temporary hard water?

..... (1)

(v) What is added to calcium oxide to carry out step 1?

..... (1)

(vi) How can step 3 be carried out?

..... (1)

(vii) Which step occurs during the test for carbon dioxide?

..... (1)

Leave
blank

(b) Two different white powders are thought to be calcium carbonate and calcium hydroxide.

(i) Describe a test to prove that both powders are calcium compounds.

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

(2)

(ii) Describe a test to find out which one of the powders is calcium carbonate.

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

(2)

(Total 11 marks)

QUESTION 2

TURN OVER FOR QUESTION 3

3. A sample of tap water contains the following dissolved salts:

- calcium hydrogencarbonate
- calcium sulphate
- magnesium sulphate
- potassium chloride
- sodium chloride

Leave
blank

(a) (i) Hard water can be formed when water is in contact with the rock, gypsum.

Which salt in the list is present in gypsum?

..... (1)

(ii) Name TWO other salts in the list which make water hard.

1.

2. (2)

(b) Some methods of treating water are given below.

- A adding chlorine
- B adding a fluoride (fluoridation)
- C adding sodium carbonate
- D boiling the water

Which ONE of the methods (A, B, C or D) removes:

(i) temporary hardness but NOT permanent hardness;

..... (1)

(ii) both temporary hardness **and** permanent hardness?

..... (1)

Leave blank

(c) Ten drops of soap solution are shaken with a sample of hard tap water. The mixture turns cloudy but it does not form a lather. On shaking with ten more drops of soap solution, a lather is formed.

(i) What causes the cloudiness when soap solution is first mixed with this tap water?

..... (1)

(ii) Predict what you would SEE when distilled water is shaken with ten drops of soap solution. Explain your answer.

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

(d) Calcium hydrogencarbonate is formed when water and carbon dioxide are in contact with limestone. This reaction removes carbon dioxide gas from the atmosphere.

(i) Write the word equation for this reaction.

..... (1)

(ii) Plants are also able to remove carbon dioxide from the atmosphere, forming glucose and oxygen gas in the process.

Give the name of this process and state ONE essential condition needed for it to take place.

Process

Condition

..... (2)

(e) If the percentage of carbon dioxide in the Earth's atmosphere increases, the average temperature of the atmosphere may also increase.

What is the name given to this effect?

..... (1)

(Total 12 marks)

QUESTION 3

TURN OVER FOR QUESTION 4

4. (a) A solution of zinc chloride can be prepared by adding excess zinc carbonate to dilute hydrochloric acid. At the end of the reaction, the remaining zinc carbonate is removed by filtration.

(i) Explain why excess zinc carbonate is used.

.....
.....

(1)

(ii) State ONE other zinc **compound** which reacts with dilute hydrochloric acid to form zinc chloride solution.

.....

(1)

(b) Silver chloride can be made by reacting silver nitrate solution with hydrochloric acid.

(i) Write the ionic equation, including state symbols, for this reaction.

.....

(2)

(ii) Explain why pure silver chloride could NOT be made by adding silver carbonate to hydrochloric acid.

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.....

(2)

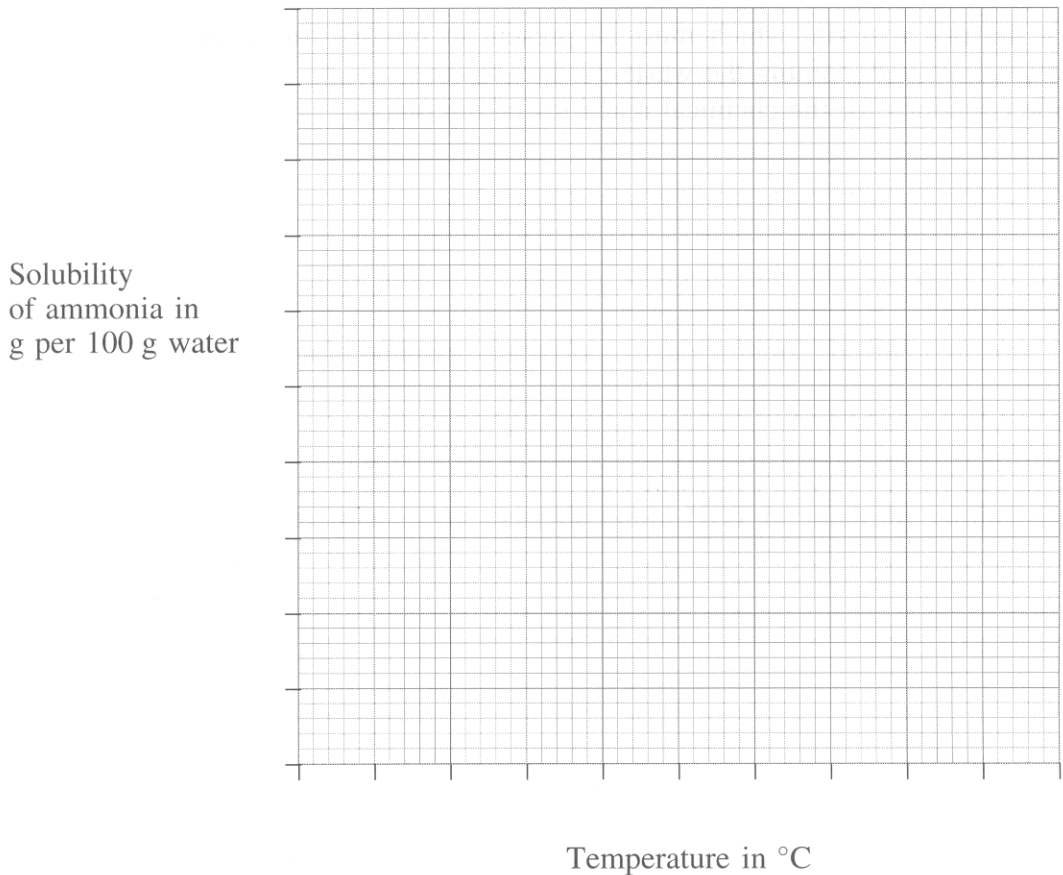
(Total 6 marks)

QUESTION 4

6. The solubility of ammonia gas in water at various temperatures is shown in the table below.

Temperature (°C)	0	10	20	30	40	50
Solubility of ammonia (g per 100 g water)	90.0	69.0	53.0	41.0	31.0	

(a) Plot a graph of solubility against temperature on the grid below and use it to predict the solubility of ammonia at 50 °C.



The solubility of ammonia at 50 °C is g per 100 g water (4)

(b) (i) Suggest how you would obtain ammonia gas from ammonia solution.
.....
..... (1)

Leave
blank

(ii) Draw a diagram to show how you would collect a sample of this gas.

(1)

(c) At 20 °C, a saturated solution of ammonia contains 53.0 g of ammonia in 100 g of water. Calculate the concentration of ammonia (NH₃) in the solution in mol dm⁻³. You should assume that 100 g water has a volume of 100 cm³ and that the volume does not change on dissolving the ammonia. (Relative atomic masses: N = 14; H = 1)

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.....
.....

(3)

(d) At 0 °C, a saturated solution of ammonia contains 90.0 g of ammonia dissolved in 100 g of water. Calculate the volume, measured at 0 °C and atmospheric pressure, of 90.0 g of ammonia. (1 mol of gas occupies 22.4 dm³ at 0 °C and atmospheric pressure.)

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

(2)

(Total 11 marks)

QUESTION 6

TURN OVER FOR QUESTION 7

7. Potassium chloride can be made from potassium hydroxide solution and hydrochloric acid. A titration is used to find the exact volumes of the solutions which react together. In this titration the hydrochloric acid is added to the potassium hydroxide solution.

(a) Name the TWO pieces of apparatus used to measure the volumes of solutions accurately in a titration.

1.

2.

(2)

(b) The reaction is complete when all the potassium hydroxide solution has been neutralised by hydrochloric acid.

How can you tell when you have reached this point?

.....

.....

(2)

(c) The equation for the reaction is



Calculate the maximum mass of potassium chloride which can be made from 11.2 g of potassium hydroxide.

(Relative atomic masses: K = 39; O = 16; H = 1; Cl = 35.5)

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(3)

(Total 7 marks)

TOTAL MARKS 60

QUESTION 7

END
