

Leave blank

1. Complete the table.

Name of compound	Formula of compound	Formula of cation	Formula of anion
magnesium chloride	MgCl ₂	Mg ²⁺	Cl ⁻
lead(II) nitrate		Pb ²⁺	
aluminium sulphate		Al ³⁺	SO ₄ ²⁻
manganese(III) oxide	Mn ₂ O ₃		O ²⁻
calcium phosphate	Ca ₃ (PO ₄) ₂		

(Total 6 marks)

Q1

2. Give the **name** of each of the following substances.

- (a) The gas that occupies about 79% of the air by volume.
(1)
- (b) A dark grey solid that sublimes to form a violet vapour.
(1)
- (c) A non-metallic element that conducts electricity.
(1)
- (d) A yellow element that exists as allotropes.
(1)
- (e) A blue solid that decomposes on heating to evolve a brown gas.
.....
(1)
- (f) The gas that is given off when sodium is added to ethanol.
.....
(1)

(Total 6 marks)

Q2



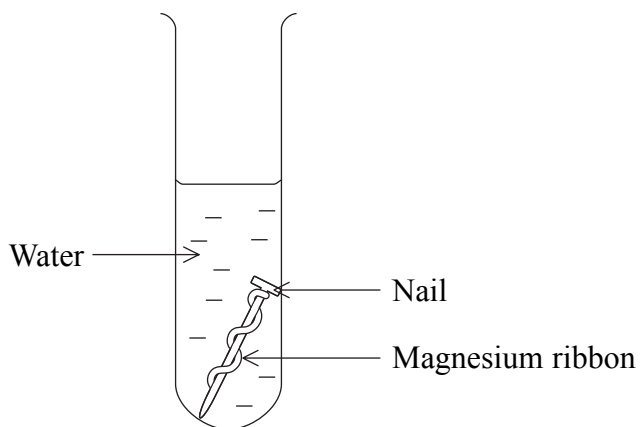
3. (a) State the two conditions required for iron to rust.

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

(b) State two methods which are used to prevent the rusting of iron.

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

(c) The diagram below shows an iron nail in contact with a strip of magnesium ribbon. Explain whether the rate of rusting would be increased, decreased or unchanged by the presence of the magnesium.



The rate of rusting is because

.....
.....
(3)

(Total 6 marks)

Q3



Leave blank

4. Complete the table.

Particle	Number of protons	Number of neutrons	Number of electrons
${}^{65}_{30}\text{Zn}$	30		
${}^{39}_{19}\text{K}^+$		20	
	16	16	18

Q4

(Total 6 marks)

5. Complete the following statements by inserting the names or formulae of the elements or compounds.

(a) When carbon is heated with copper oxide, the products are

..... and
(1)

(b) Two gaseous elements which, on igniting, form a product that is a colourless liquid at room temperature are

..... and
(1)

(c) Hydrogen gas can be prepared in the laboratory by the reaction between dilute

..... and
(1)

(d) When sulphur dioxide is passed into aqueous sodium hydroxide, the products are

..... and
(1)

(e) Chloroethane is formed when ethanol is reacted with

(1)

Q5

(Total 5 marks)



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6. Complete the table to identify the missing reactant needed to make each gas in the laboratory. Give a test that is commonly used to identify the gas.

Gas	Reactant A	Reactant B	Test
ammonia	ammonium chloride		
sulphur dioxide		dilute hydrochloric acid	
chlorine		concentrated hydrochloric acid	

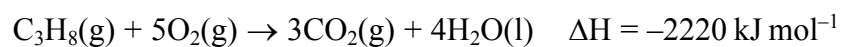
Q6

(Total 6 marks)



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7. The reaction of propane with oxygen is represented by the equation



200 cm³ of propane was mixed with excess oxygen and ignited. Assume all measurements are made at room temperature and atmospheric pressure.

Calculate:

(a) the volume of oxygen that reacted;

.....
(1)

(b) the volume of carbon dioxide produced;

.....
(1)

(c) the heat energy evolved during the reaction.

.....
.....
.....
.....
.....
(3)

(Total 5 marks)

Q7



Leave
blank

8. Write a balanced equation for each of the following reactions.

(a) The formation of carbon monoxide by the incomplete combustion of carbon.

.....
(2)

(b) The formation of sodium carbonate and water from aqueous sodium hydroxide and carbon dioxide.

.....
(2)

(c) The formation of copper, nitrogen and water when copper(II) oxide reacts with ammonia.

.....
(2)

(Total 6 marks)

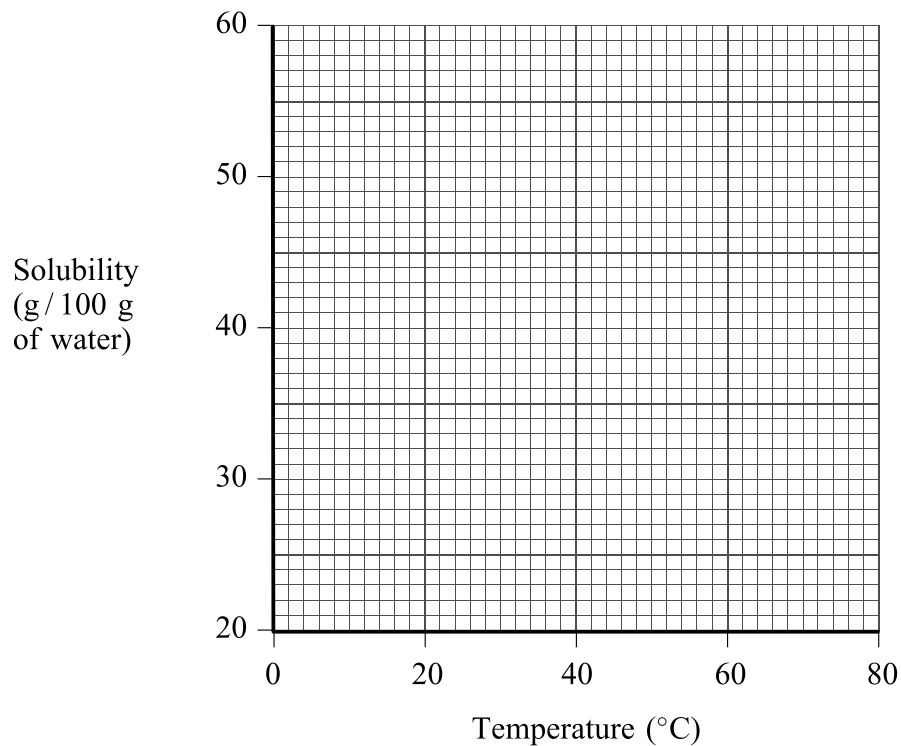
Q8



9. The solubility of potassium chloride at various temperatures is given in the table.

Temperature (°C)	0	20	40	60	80
Solubility (g/100 g of water)	28.4	34.2	40.0	45.8	51.3

(a) Use the grid to plot the solubility curve for potassium chloride.



(2)

(b) What is the solubility of potassium chloride at 30 °C?

.....
(1)

(c) If 45 g of potassium chloride is mixed with 100 g of water at 50 °C, what mass of potassium chloride remains undissolved?

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

(d) What is the minimum temperature at which 25g of potassium chloride dissolves in 50 g of water?

.....
(1)



Leave
blank

- (e) Use the data in the table to calculate the mass of potassium chloride that crystallises when a saturated solution in 100 g of water at 60 °C cools to 20 °C.

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

(2)

Q9

(Total 8 marks)

10. Give the number of:

- (a) electrons in the outer shell of selenium (atomic number = 34);

(1)

- (b) covalent bonds in one molecule of C₂H₅Br;

(1)

- (c) moles of chloride ions that will combine with 1 mole of Ti³⁺ ions;

(1)

- (d) hydrogen atoms in one molecule of the alkane that contains ten carbon atoms;

.....

(1)

- (e) moles of atoms in 2 moles of CO(NH₂)₂;

(1)

- (f) moles of electrons needed to liberate 1 mole of bromine molecules during the electrolysis of molten lead(II) bromide;

(1)

- (g) dm³ occupied by 88 g of carbon dioxide at room temperature and atmospheric pressure.

(1)

Q10

(Total 7 marks)



11. (a) (i) State what is meant by the term **hydrocarbon**.

.....

 (1)

(ii) Explain, in terms of the bonding, the difference between a saturated and an unsaturated hydrocarbon.

Saturated

.....

Unsaturated

.....
 (2)

(b) (i) Draw the displayed formulae of the saturated and unsaturated hydrocarbons containing three carbon atoms.

Saturated

Unsaturated

(2)

(ii) On one of the diagrams above, draw a circle around a carbon atom that has its bonds arranged in a tetrahedral shape.

(1)

(iii) On one of the diagrams above, draw an arrow to a carbon atom where the bonds are directed to the corners of an equilateral triangle.

(1)



Leave
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(c) Give a structural formula to show the organic product formed when:

(i) 1 mole of chlorine reacts with 1 mole of ethene;

(1)

(ii) 1 mole of chlorine reacts with 1 mole of ethane.

(1)

Q11

(Total 9 marks)

11

Turn over



12. Complete the descriptions of the extraction of the following three metals by inserting the missing words or formulae.

(a) Zinc can be obtained from the ore, zinc sulphide, by first heating the ore in air to form zinc; this compound is reduced to zinc metal by heating it in a stream of gas. (2)

(b) Chromium can be obtained from its oxide by heating with a metal in the reactivity series. The metal normally used is The equation for the reaction is

$$\text{Cr}_2\text{O}_3 + \dots \rightarrow 2\text{Cr} + \dots$$
 (3)

(c) Aluminium is obtained by the of aluminium oxide dissolved in molten
 Aluminium ions electrons at the cathode; the charge on this electrode is
 The anode is made of The gas liberated at the anode is which then reacts with this electrode to form gas. (7)

(Total 12 marks)

Q12

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13. Identify, by name or formula, each of the substances represented by the letters **A** to **G**.

- (a) An aqueous solution of a silver salt, **A**, was added to a solution of a salt, **B**, and a yellow precipitate, **C**, was formed. When a platinum wire was dipped into solution **B** and held in a Bunsen flame, a brick-red flame was seen.

A is

B is

C is

(3)

- (b) When ammonia gas is mixed with air and passed over a catalyst, **D**, at 900 °C, the ammonia is oxidised to form the gas **E** and steam. **E** is cooled and is then reacted with more air to form a brown gas, **F**. The gas **F** is reacted with water and more air to form the acid **G**.

D is

E is

F is

G is

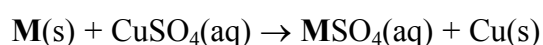
(4)

Q13

(Total 7 marks)



14. 2.38 g of a metal, **M**, was placed in a test tube and an excess of hot copper(II) sulphate solution was added to it and stirred until the reaction stopped. The metal **M** displaced copper from the copper(II) sulphate solution. The copper was filtered off, washed with water and dried in an oven at 100 °C. The dry copper had a mass of 1.27 g. The reaction that occurred is represented by the equation



(a) Explain why a **hot** solution of copper(II) sulphate was used.

.....
(1)

(b) Explain why an **excess** of copper(II) sulphate was used.

.....

(1)

(c) Suggest why the copper was dried at 100 °C rather than at a higher temperature.

.....

(1)

(d) (i) Calculate the number of moles of copper that were formed and hence the number of moles of **M** that were used in the reaction.

.....

(2)

(ii) Calculate the relative atomic mass of **M**.

.....

(1)

(iii) Use the Periodic Table to identify the metal **M**.

.....
(1)



Leave
blank

(e) State the appearance of the metal formed and explain why the blue colour of the solution fades.

.....

.....

(2)

(f) Explain, in terms of electron transfer, why the reaction can be considered to involve both oxidation and reduction.

.....

.....

.....

(2)

Q14

(Total 11 marks)

TOTAL FOR PAPER: 100 MARKS

END



THE PERIODIC TABLE

Period	1	2	3	4	5	6	7	0																																																																																																																																																																																																																																																																																																																																																				
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14	Si	Silicon	28																																																																																																																																																																																																																																																																																																																																																									
15	P	Phosphorus	31																																																																																																																																																																																																																																																																																																																																																									
16	S	Sulphur	32																																																																																																																																																																																																																																																																																																																																																									
17	Cl	Chlorine	35.5																																																																																																																																																																																																																																																																																																																																																									
18	Ar	Argon	40																																																																																																																																																																																																																																																																																																																																																									
19	K	Potassium	39																																																																																																																																																																																																																																																																																																																																																									
20	Ca	Calcium	40																																																																																																																																																																																																																																																																																																																																																									
21	Sc	Scandium	45																																																																																																																																																																																																																																																																																																																																																									
22	Ti	Titanium	48																																																																																																																																																																																																																																																																																																																																																									
23	V	Vanadium	51																																																																																																																																																																																																																																																																																																																																																									
24	Cr	Chromium	52																																																																																																																																																																																																																																																																																																																																																									
25	Mn	Manganese	55																																																																																																																																																																																																																																																																																																																																																									
26	Fe	Iron	56																																																																																																																																																																																																																																																																																																																																																									
27	Co	Cobalt	59																																																																																																																																																																																																																																																																																																																																																									
28	Ni	Nickel	59																																																																																																																																																																																																																																																																																																																																																									
29	Cu	Copper	63.5																																																																																																																																																																																																																																																																																																																																																									
30	Zn	Zinc	65																																																																																																																																																																																																																																																																																																																																																									
31	Ga	Gallium	70																																																																																																																																																																																																																																																																																																																																																									
32	Ge	Germanium	73																																																																																																																																																																																																																																																																																																																																																									
33	As	Arsenic	75																																																																																																																																																																																																																																																																																																																																																									
34	Se	Selenium	79																																																																																																																																																																																																																																																																																																																																																									
35	Br	Bromine	80																																																																																																																																																																																																																																																																																																																																																									
36	Kr	Krypton	84																																																																																																																																																																																																																																																																																																																																																									
37	Rb	Rubidium	86																																																																																																																																																																																																																																																																																																																																																									
38	Sr	Strontium	88																																																																																																																																																																																																																																																																																																																																																									
39	Y	Yttrium	89																																																																																																																																																																																																																																																																																																																																																									
40	Zr	Zirconium	91																																																																																																																																																																																																																																																																																																																																																									
41	Nb	Niobium	93																																																																																																																																																																																																																																																																																																																																																									
42	Mo	Molybdenum	96																																																																																																																																																																																																																																																																																																																																																									
43	Tc	Technetium	99																																																																																																																																																																																																																																																																																																																																																									
44	Ru	Ruthenium	101																																																																																																																																																																																																																																																																																																																																																									
45	Rh	Rhodium	103																																																																																																																																																																																																																																																																																																																																																									
46	Pd	Palladium	106																																																																																																																																																																																																																																																																																																																																																									
47	Ag	Silver	108																																																																																																																																																																																																																																																																																																																																																									
48	Cd	Cadmium	112																																																																																																																																																																																																																																																																																																																																																									
49	In	Indium	115																																																																																																																																																																																																																																																																																																																																																									
50	Sn	Tin	119																																																																																																																																																																																																																																																																																																																																																									
51	Sb	Antimony	122																																																																																																																																																																																																																																																																																																																																																									
52	Te	Tellurium	128																																																																																																																																																																																																																																																																																																																																																									
53	I	Iodine	127																																																																																																																																																																																																																																																																																																																																																									
54	Xe	Xenon	131																																																																																																																																																																																																																																																																																																																																																									
55	Cs	Caesium	133																																																																																																																																																																																																																																																																																																																																																									
56	Ba	Barium	137																																																																																																																																																																																																																																																																																																																																																									
57	La	Lanthanum	139																																																																																																																																																																																																																																																																																																																																																									
58	Ce	Cerium	140																																																																																																																																																																																																																																																																																																																																																									
59	Pr	Praseodymium	141																																																																																																																																																																																																																																																																																																																																																									
60	Nd	Niodymium	144																																																																																																																																																																																																																																																																																																																																																									
61	Pm	Promethium	145																																																																																																																																																																																																																																																																																																																																																									
62	Sm	Samarium	150																																																																																																																																																																																																																																																																																																																																																									
63	Eu	Europium	152																																																																																																																																																																																																																																																																																																																																																									
64	Gd	Gadolinium	157																																																																																																																																																																																																																																																																																																																																																									
65	Tb	Terbium	159																																																																																																																																																																																																																																																																																																																																																									
66	Dy	Dysprosium	163																																																																																																																																																																																																																																																																																																																																																									
67	Ho	Holmium	165																																																																																																																																																																																																																																																																																																																																																									
68	Er	Erbium	167																																																																																																																																																																																																																																																																																																																																																									
69	Tm	Thulium	169																																																																																																																																																																																																																																																																																																																																																									
70	Yb	Ytterbium	173																																																																																																																																																																																																																																																																																																																																																									
71	Lu	Lutetium	175																																																																																																																																																																																																																																																																																																																																																									
72	Hf	Hafnium	179																																																																																																																																																																																																																																																																																																																																																									
73	Ta	Tantalum	181																																																																																																																																																																																																																																																																																																																																																									
74	W	Tungsten	184																																																																																																																																																																																																																																																																																																																																																									
75	Re	Rhenium	186																																																																																																																																																																																																																																																																																																																																																									
76	Os	Osmium	190																																																																																																																																																																																																																																																																																																																																																									
77	Ir	Iridium	192																																																																																																																																																																																																																																																																																																																																																									
78	Pt	Platinum	195																																																																																																																																																																																																																																																																																																																																																									
79	Au	Gold	197																																																																																																																																																																																																																																																																																																																																																									
80	Hg	Mercury	201																																																																																																																																																																																																																																																																																																																																																									
81	Tl	Thallium	204																																																																																																																																																																																																																																																																																																																																																									
82	Pb	Lead	207																																																																																																																																																																																																																																																																																																																																																									
83	Bi	Bismuth	209																																																																																																																																																																																																																																																																																																																																																									
84	Po	Polonium	210																																																																																																																																																																																																																																																																																																																																																									
85	At	Astatine	210																																																																																																																																																																																																																																																																																																																																																									
86	Rn	Radon	222																																																																																																																																																																																																																																																																																																																																																									
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Key

Atomic number
Symbol
Name
Relative atomic mass

