NAME **INDEX NUMBER**

SCHOOL **DATE**

STRUCTURE OF THE ATOM, PERIODIC TABLES AND CHEMICAL FAMILIES

1. 1989 Q1a

(i) An element **X** has atomic number 3, relative atomic mass 6.94 and consist of two isotopes of mass numbers 6 and 7. What is the mass number of the more abundant isotope of **X**? Give a reason for your answer.

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(ii) Complete the following table

Mass number of isotope	Number of neutrons	Number of electrons

2. 1989 Q 13

The atomic number of an element **Y** is 18

(i) Write down its electronic arrangement

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(ii) Give one use of element **Y**

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3. 1989 Paper 1A Q 33

(a)The table below shows the atomic numbers of elements of the periodic table represented by letter J to Q.

The letters are not the actual chemical symbols for the elements

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Element	J	K	L	M	N	P	O	Q
Atomic number	3	7	8	9	10	12	13	14

(i) Select two elements which belong to:

I The same period of the periodic table

(1 mark)

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II The same group of the periodic table

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(ii) Select the element which

(1 mark)

I Will form a divalent union

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II Reacts most vigorously with water

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(b) The boiling points of some chloride are shown in the table below:

Group	I	II	III	IV	V	VI	VII
Chloride	LiCl	Chloride of W	BCl_3	CCl_4	NCl_3	OCl_2	FCl
B.P. (^{0}C)	1350	487	12	77	71	2	-101
Chloride	Nacl	$Mgcl_2$	$AlCl_3$	Chloride of X	PCL_3	SCl_2	Cl_2
B.P. (^{0}C)	1465	1418	Sublimes at 180	57	74	59	-35

(i) What is the most likely formulae for the chlorides of W and X?

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(ii) Select two chlorides from the table which are the most ionic. Explain why the two elected chloride are the most ionic.

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(iii) Would you expect group VIII elements of the periodic table to form chlorides? Explain the answer
(1 mark)

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5. 1990 Q 1

Metal p is a group 2 element in the periodic table and it lies below Q in the same group

(a) Explain how the reactivity of metal P and Q with bromine compares (1 mark)

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(b) Given that the atomic number of Q is 12, determine the atomic number of P. Show how you arrive at your answer
(2 marks)

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6. 1990 Paper 1 A Q 11

Element E has atomic number 15.

(a) Write the electron arrangement for an atom E
(1 mark)

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(b) Explain why E forms a chloride which is a liquid of low boiling point

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7. 1991 Q 2

The table below gives some information about elements represented by letters B, C, D and E. Study the information and answer the questions that follow:

Element	Atomic radii (nm)	Melting Point ^{0}C
B	0.152	180
C	0.186	98
D	0.231	64
F	0.244	39

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(i) Would these elements form part of group or period? Explain.
(2 marks)

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(ii) What does the trend in melting points suggest about the nature of the elements

(1 mark)

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8. 1991 Paper 1 A Q 8

Element J whose atomic numbers is 31 has two isotopes. The table below shows the mass numbers and the relative abundance for each isotope

Mass number	Relative abundance (%)
69	60.4
71	39.6

(a) Determine the number of neutrons in the isotope with mass 69 (1 mark)

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(b) Calculate the relative atomic mass of element J
(2 marks)

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9. 1991 Q 30

Study the data in the table below and answer the questions that follow. The letters do not represent actual symbols of the elements

Element	Atomic No.	M.P.^{0}(C)	B.P. ^{0}(C)	Ionic radius (nm)
A	11	98	890	0.095
B	12	650	1110	0.065
C	13	660	2470	0.050
D	14	1410	2360	0.41
E	15	44.2, 590	280	0.034 0.212
F	16	113 119	445	0.184
G	17	-101	-35	0.181
H	18	-189	-186	

(a)(i)Write electronic arrange for the atoms represented by letters B and F

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(ii) State the nature of the oxides of the elements represented by B and F

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(b) Why does the element represented by letter E have two values of melting point?

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(c) Explain the following observations in terms of structure and bonding

(i) There is an increase in boiling point from A to C

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(ii) Element D has a high boiling point

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(iii) There is a decrease in boiling point E to H

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(d) Explain the difference in ionic radius between elements represented by letters A and G

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(e) Write the formulae and the electronic arrangement of the two ions E whose ion radius are shown in the table

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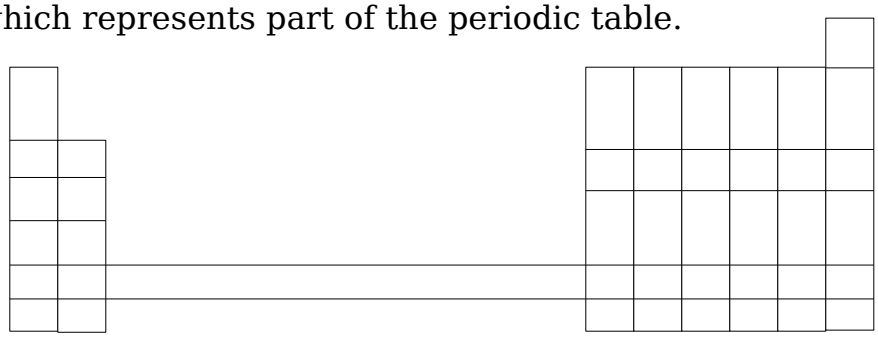
10. 1992 Q 1

Study the information below and answer the questions that follow.
Letters W, X and Y represent elements in the periodic table but not the actual symbols of the elements

W has atomic number 8, while X has atomic symbols of the elements

Y is in the same period with X and reacts with W to form an ionic compound Y, W

(a) Place elements W and X in their correct positions in the grid below which represents part of the periodic table.



(b) Write electronic configuration for of the ions in compound Y, W

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11. 1993 Paper 1A Q 1

An element X has atomic number 30 while element Y has atomic number 8

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(a) Write the electron arrangement for X
(1 mark)

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(b) What type of bond would be formed when X and Y react
(1 mark)

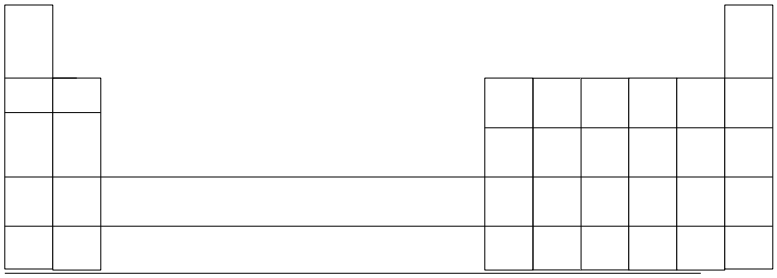
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12. 1993 Q 23

(a) The grid given below represents part of periodic table. Study it and answer the questions that follow. The letters are not the actual symbols of the elements



(i) Which element will require the least amount of energy to remove one of outermost electrons?
(1 mark)

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(ii) Select the most reactive non-metal
(1 mark)

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(iii) Which of the elements has the greatest tendency of forming covalent compounds Explain?
(2 marks)

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(iv) What name is given to the family of elements to which elements O, T & V belong?
(1 mark)

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(v) An element W has atomic number 15. Indicate the position of W on the grid

(1 mark)

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(vi) Explain why the atomic radius of S is smaller than that of R.

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13. 1994 Q 1

Complete the table below

Isotope	Number of		
	Protons	Neutrons	Electrons
59 27			

14. 1995 Paper 1A Q 1

The electron arrangement of ions X^{3+} and Y^{2-} are 2, 8 and 2, 8, 8 respectively

(a) Write the electron arrangement of the elements X and Y
(2 marks)

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(b) Write the formula of the compound that would be formed between X and Y

(1 mark)

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15. 1995 Paper 1 A Q 12

With reference to its atomic number of one, explain why hydrogen can be placed in either group I or VII of the period table

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16. 1996 Q6, 15

6. The table below shows some properties of substances E, F, G and H

Substance	Action with water	Melting point	Thermal conductivity
E	Un reactive	High	Poor
F	Reactive	High	Poor
G	Unreactive	High	Good
H	Unreactive	Low	Good

Select the substance that would be most suitable

a) For making a cooking pot

(1 mark)

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b) As a thermal insulator

(1 mark)

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15. The table below gives the atomic numbers of elements W, X, Y and Z. The letters do not represent the actual symbols of the elements.

Element	W	X	Y	Z
Atomic number	9	10	11	12

(a) Which one of the elements is less reactive? Explain

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(b) (i) Which two elements would react most vigorously with each other? (1 mark)

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(ii) Give the formula of the compound formed when the elements in b (i) above react

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17. 1997 Paper 1A Q 23

An element Y has the electronic configuration 2.8.5

(a) Which period of the periodic table does the element belong? (1 mark)

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(b) Write the formula of the most suitable anion formed when element Y ionizes

(1mark)

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(c) Explain the difference between the atomic radius of element Y and its ionic radius

(1 mark)

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18. 1997 Q 3 PP2

(a) Study the information in the table below and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Atomic number	Melting point of element	Formula of chloride	Melting point of chloride
G	11	98	GCI	801
H	12	650	HCl_2	715
J	14	1410	JCl_4	-70
K	16	113	K_4Cl_2	-80
L	20	851	LCl_2	780

(i) Which elements are metals? Give a reason
(2 marks)

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(ii) Write the formula of the compound formed when element H reacts with element
(1 mark)

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(iii) Explain why the melting point of J is higher than that of K
(2 marks)

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(iv) What is the oxidation state of J in its chloride?
(1 mark)

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(v) How does the:
-Melting point of the fluoride of G compare with that of its chloride?
Explain (2 marks)

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-Reactivity of H and L with water compare? Give an explanation (2 marks)

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19. 1998 Paper 1B Q 7

Study the information given in the table below and answer the questions that follow. The letters do not represent the actual symbols of the elements

Element	Atomic number	Boiling point (K)
S	3	1603
T	13	2743
U	16	718
V	18	87
W	19	1047

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(a) Select the elements, which belong to the same

(i) Group

(1 mark)

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(ii) Period

(1 mark)

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(b) Which element

(i) Is in gaseous state at room temperature? Explain
(Take room temperature to be 298K)
(2 marks)

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(ii) Does not form oxide?
(1 mark)

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(c) Write the

(i) Formula of the nitrate of element T

(1 mark)

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(ii) Equation for the reaction between elements S and U

(1 mark)

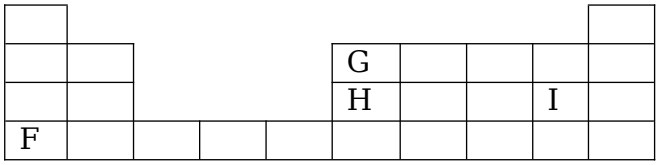
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20. 1998 Q 15

The grid below shows part of the periodic table. The letters do not represent the actual symbols of the elements



a. Select the

i. Element which has the largest atomic radius
(4 marks)

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ii. Most reactive metal
(4 marks)

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iii Most reactive non-metal
(4 marks)

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b. Show on the grid the position of the element J which form J^{2-} ions with electronic configuration 2.8.8

21. 1998 Paper 1A Q 26

The table below gives the energy required to remove the outermost electron for some group I elements.

Element	I	II	III	IV
Energy $Kjmol^{-1}$	494	418	519	376

Arrange the elements in the order of their reactivity starting with the most reactive

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(2 marks)

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22. 1999 Q 7

Write the formula of sulphide of an element C, whose atomic number is 5. (C is not the actual symbol of the element)

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23. 1999 Q 3a-d PP2

Study the information in the table below and answer the questions that follow. The letters do not represent the symbols of the elements.

Element(C)	Atomic number	Melting point
L	11	97.8
M	13	660
N	14	1440
Q	17	401
R	19	63.7

a) Write the electrons arrangement for the atom formed by elements and M and Q

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b) Select an element which is

i) The most reactive non – metal

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ii) A poor conductor of electricity

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c) In which period of the periodic table does elements R below.

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d) Element R lodes its outermost electron more readily than I. Explain

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24. 2000 Q 5

The information below relates to elements S, T, U and X. (The letters do not represent the actual symbols of the elements)

(i) T displaces X from an aqueous solution containing ions of X

(ii) Hydrogen gas reduces heated oxide of S but does not reduce the heated oxide of x

(iii) U liberates hydrogen gas form cold water but T does not.

(a) Write an equation for the reaction between T and the ions of X (both T and x are in group II of the periodic table)

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(b) Arrange the elements in order of their increasing reactivity

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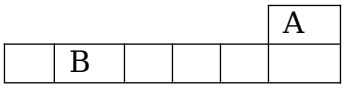
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25. 2000 Q 1 PP2

The grid given below represents part of the periodic table. Study it and answer the questions that follow. (The letters do not represent the actual symbols of the elements)





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	C		D			E		
	F							

(i) What name is given to the group of elements to which C and F belong?

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(ii) Which letter represents the element that is the least reactive?
(2 marks)

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(iii) What type of bond is formed when B and react?
(2 marks)

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(iv) Write the formula of the compound formed when element D and oxygen gas react

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(vi) On the grid indicate with a tick the position of element G which is in the third
period of the periodic table and forms G^{3-} ions.

26. 2001 Q 3

The electronic structures for elements represented by letters A, B,C and D are A 2.8.6 B. 2.8.2. C.2.8.1. D.2.8.8

(a) Select the element which forms:

i. A double charged cation
(1 mark)

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ii. A soluble carbonates
(1 mark)

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(b) Which elements have the shortest atomic radius
(1 mark)

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27. 2001 Q 13

The information in the table below relates to elements in the same group of the periodic table. Study it and answer the question that follows:

Element	Atomic size
G1	0.19
G2	0.23
G3	0.15

Which element has the highest ionization energy? Give a reason
(3 marks)

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28. 2001 Q 6a PP2

Study the information in the table below and answer the questions that follow

(The letters do not represent the actual symbols of the elements).

Element	Electronic Configuration	Ionization energy $kjmol^{-1}$
P	2.1	**519**
Q	2.8.1	**494**
R	2.8.8.1	**418**

(i) What is the general name given to the group in which elements P,Q and R belong?

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(ii) What is meant by ionisation energy?

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(iii) Explain why element P has the highest ionization energy

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(iv) When a piece of element Q is placed on water, it melts and hissing sound is
produced as it moves on the surface of the water. Explain these observations.

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29. 2002 Q 1

Name one property of neon that makes it possible to be used in electric lamps

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30. 2002 Q 2

Oxygen and sulphur belong to group (V) of the periodic table. Explain why there is a big difference in their melting points (melting point of oxygen is – 216^0C while that of sulphur is 44^0C.

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31. 2002 Q 3, 5

3. The oxides of elements A and B have the properties shown in the table below. (The letters do not represent the actual symbols of the elements).

A	B
aqueous at room temperature	Solid at room temperature
Dissolves in water to form an acidic solution	Dissolves in water to form an alkaline solution

5. (a) Write the electronic configuration of calcium (atomic number 20) and Beryllium (atomic number 4)

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(b) Why is calcium more reactive than beryllium?

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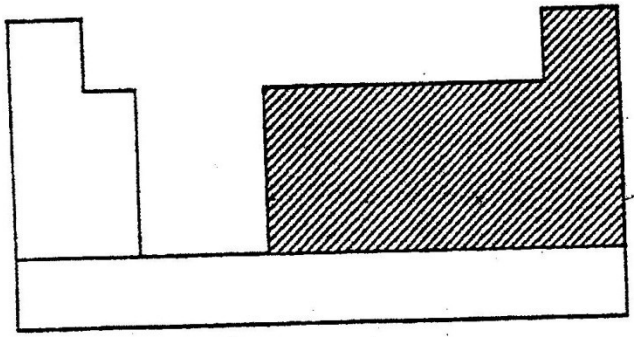
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32. 2003 Q 1a, b (i) PP2

a) The chart below is an outline of part of the periodic table.



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With the help of vertical and horizontal lines, indicate the direction of increasing metallic nature of the elements.

(2 marks)

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Which types of elements are represented in the shaded area?

(1 mark)

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b) i) Element A is the same group of the periodic table as chlorine.

ii) Write the formula of the compound formed when A reacts with potassium metal.

(1 mark)

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33. 2003 Q 2

Study the information in the table and answer the questions that follow

Ion	Electronic arrangement	Ionic radius
Na^+	2.8	0.095
K^+	2.8.8	0.133
Mg^{2+}	2.8	0.065

Explain why the ionic radius of

(1 mark)

K^+ is greater than that of Na^+

Mg^{2+} is smaller than that of Na^+

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34. 2003 Q 10

An oxide of element F has the formula F_2O_5 (1 mark)

(a) Determine the oxidation state of F

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(b) In which group of the periodic- table is element F
(1 mark)

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35. 2003 Q 24

Explain why the reactivity of group (vii) elements decreases down the group

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36. 2004 Q 3

The table below the first ionization energies of elements B and C.

Element	Ionisation energy KJ mol^{-1}
B	494
C	736

What do these values suggest about the reactivity of B compared to that of C?

Explain

(2 marks)

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37. 2004 Q 16

Four metal F, G, H and J were each separately added to cold water, and steam. The table below is a summary of the observations made and the formulae of the hydroxides formed.

Metal	Cold water	Hot water	Steam	Formula of Hydroxide
F	Reacts slowly	Reacts fast	Reacts very fast	F(OH)2
G	No reaction	No reaction	No reaction	-
H	Fast	Reacts very fast	Reacts explosively	HOH
J	No reaction	Reacts slowly	Reacts fast	J(OH)2

a) Which two elements are likely to be in the same group of the periodic table?

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b) Arrange the metals in the order of their reactivity starting with the most reactive
(2 marks)

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38. 2004 Q 20

State two factors which determine the stability of an isotope.
(2 marks)

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39. 2004 Q 1a PP2

a) The table below shows properties of chlorine, bromine and iodine.

Element	Formula	Colour and state room temperature	Solubility
Chlorine	Cl_2	i).....	Soluble
Bromine	Br_2	Brown liquid	ii).....
Iodine	I_2	iii)	Slight soluble

Complete the table by giving the missing information in (i),(ii) and (iii)
(3 marks)

40. 2005 Q 6

Use the information in the table below to answer the questions that follow.

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(The letters do not represent the actual symbols of the elements)

Element	B	C	D	E	F
Atomic number	18	5	3	5	20
Mass number	40	10	7	11	40

a) Which two letters represent the same element? Give a reason.
(2 marks)

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b) Give the number of neutrons in an atom of element D
(1 mark)

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41. 2005 Q 16

The table below gives some information about elements I, II, III and IV which are in the same group of the periodic table. Use the information to answer the questions that follows.

Element	First Ionisation energy ($kjmol^{-1}$)	Atomic Radius (nm)
I	520	0.15
II	500	0.19
III	420	0.23
IV	400	0.25

State and explain the relationship between the variations in the first ionization energies and the atomic radii.
(3 marks)

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42. 2005 Q 4a,b

(a) An atom Q can be represented as

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$^{52}_{24}Q$

What does the number 52 represent? (1 mark)

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(b) Study the information in the table below and answer the equations that follow

(Letters are not the actual symbols of the elements)

Element	Electronic Arrangement of stable ion	Atomic Radius (nm)	Ionic Radius (nm)
N	2.8.8	0.197	0.099
P	2.8.8	0.099	0.181
R	2.8	0.160	0.065
S	2.8	0.186	0.095
T	2	0.152	0.068
U	2.8	0.072	0.136

(i) Write the formula of the compound formed when N reacts with P. (atomic numbers are
N = 20; P = 17)
(1 mark)

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(ii) Identify the elements which belong to the third period of the periodic table. Explain
(2 marks)

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(iii) Which of the element identified in b (ii) above comes first in the third period? Explain
(2 marks)

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(iv) Select two elements which are non- metals (1 mark)

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43. 2006 Q 5

The atomic numbers of elements C and D are 19 and 9 respectively. State and explain the electrical conductivity of the compound CD in:

(a) Solid state (1 ½ marks)

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(b) Aqueous state. (1 ½ marks)

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44. 2006 Q 12

The table below shows the relative atomic masses and the percentage abundance of the isotopes L1 of element L.

	Relative atomic mass	% abundance
L_1	62.93	69.09
L_2	64.93	30.91

(3 marks)

Calculate the relative atomic mass of element L.

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45. 2007 Q3a, 8

3a. Both chlorine and iodine are halogens.

a) What are halogens?

(1 mark)

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8. Explain why there is general increase in the first ionization energies of the

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elements in period 3 of the periodic table from left to right.
(2 marks)

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46. 2007 Q 25b

(b) Give a reason why helium is increasingly being preferred to hydrogen in weather balloons.

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47. 2007 Q 26

The table below shows the number of valence electrons of the element P, Q and R.

Element	P	Q	R
Number of valence electrons	3	5	2

a) Explain why P and R would not be expected to form a compound.
(1 mark)

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b) Write an equation to show the effect of heat on the carbonate of R
(1 mark)

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c) Write the formula for the most stable ion or q.
(1 mark)

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48. 2008 Q 7

a) What are isotopes?
(1 mark)

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b) Determine the number of neutrons in $^{18}_{8}O$.
(1 mark)

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49. 2008 Q 11

The table below gives atomic numbers of elements represented b the letters A,
B, C and D.

Element	A	B	C	D
Atomic number	15	16	17	20

Use the information to answer the questions that follow.

a) Name the type of bonding that exists in the compound formed when A and D react
(1 mark)

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b) Select the letter which represents the best oxidizing agent. Give a reason for your answer.
(2 marks)

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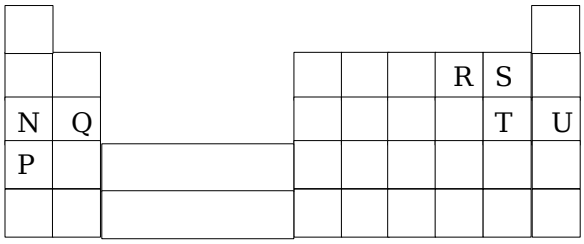
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50. 2008 Q 18

The grid below is part of the periodic table. Use it to answer the questions that follow, (the letters are not the actual symbols of the elements).



a) Indicate on the grid the position of an element represented by letter V whose atomic number is 14.
(1 mark)

b) Select a letter which represents a monoatomic gas?
(1 mark)

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51. 2009 Q 1

The ionization energies for three elements A,B and C are shown in the table below.

Element	A	B	C
Ionisation energy (kj /mole)	519	418	498

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(a) What is meant by ionization energy?
(1 mark)

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(b) Which element is the strongest reducing agent? Give a reason
(2 marks)

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52. 2009 Q 3

The atomic number of sulphur in the following:
(2 marks)

(a) H_2S .....

(b) SO_3^{2-} .....

53. 2009 Q 6

An isotope of element E has 34 neutrons and its mass number is 64.E forms a cation with 28 electrons. Write the formula of the cation indicating the mass and atomic numbers.
(1 mark)

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54. 2010 Q 4a PP2

a) 50cm^3 of 1M copper (II)sulphate solution was placed in a 100cm^3 plastic beaker. The
temperature of the solution was measured. Excess metal A powder was added to the solution, the mixture stirred and the maximum temperature was repeated using powder of metals **B** and **C**. The results obtained are given in the table below:

	A		**B**	**C**
Maximum temperature (°C)		26.3	31.7	22.0
Initial temperature (^{0}C)		22.0	22.0	22.0

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i. Arrange the metal **A, B, C** and copper in order of reactivity starting with the least reactive. Give reasons for the order.
(3 marks)

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ii. Other than temperature change, state one other observation that was made when the most reactive metal was added to the copper (II) sulphate solution. (1 mark)

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55. 2011 Q 5a, b (i-iii) PP2

a) Other than their location in the atom, name two other differences between

an electron and a proton.

(2 marks)

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b) The table below gives the number of electrons, protons and neutrons in

particles **A,B,C,D,E,F,** and **G**

Particle	Protons	Electrons	Neutrons
A	6	6	6
B	10	10	12
C	12	10	12
D	6	6	8
E	13	10	14
F	17	17	18
G	8	10	8

i) Which particle is likely to be a halogen? (1 mark)

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ii) What is the mass number of E? (1 mark)

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iii) Write the formula of the compound formed when E combines with G? (1 mark)

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56. 2011 Q 22

The table below gives some properties of three elements in group (VII)

of the periodic table. Study it and answer the questions that follow.

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Element	Atomic No.	Melting Point (^{0}c)	Boiling Point (^{0}c)
Chlorine	17	-101	-34.7
Bromine	35	-7	58.8
Iodine	53	114	184

a) Which element is in liquid form at room temperature? Give a reason.

(1 mark)

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b) Explain why the boiling point of iodine is much higher than that of chlorine.

(2 marks)

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57. 2011 Q 24

The table below gives the number of electrons, protons and neutrons in

Substances X,Y and Z.

Substance	Electrons	Protons	Neutrons
X	10	10	10
Y	10	8	10
Z	8	8	8

a) Which letter represents an ion? (1 mark)

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b) Which of the substances are isotopes? Give a reason.
(2 marks)

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58. 2011 Q 31

What name is given to elements which appear in group (II) of the periodic table?

(1 mark)

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59. 2012 Q4 P1

The table below shows properties of some elements **A, B, C and D** which belong to
the same period of the periodic table. The letters are not the actual symbols of the
elements.

Element	**A**	**B**	**C**	**D**
MP (oC	1410	98	-101	660
Atomic radii (nm)	0.117	0.186	0.099	0.143
Electrical conductivity	Poor	Good	No conductor	Good

(a) Arrange the elements in the order they would appear in the period. Give a reason
(2 marks)

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(b) Select the metallic element which is the better conductor of electricity. Give a reason

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60. 2012 Q14 P1

Distinguish between ionisation energy and electronic affinity of an element. (2 marks)

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61. 2012 Q27 P1

(a) The electronic arrangement of the ion of element Q is 2.8.8. If the formula of the ion is Q^{3-}, state the group and period to which Q belongs,

Group:

(½ mark)

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Period:

(½ mark)

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(b) Helium, neon and argon belong to group 8 of the periodic table. Give :

(i) The general name of these elements;

(1 mark)

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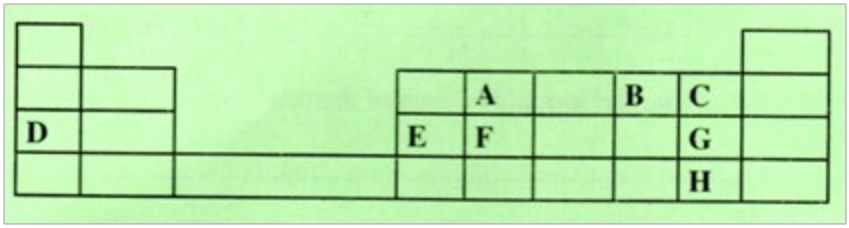
(ii) One use of these elements
(1 mark)

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63. 2012 Q2 P2

The grid below is part of the periodic table. Use it to answer the questions that follow. (the letters are not the actual symbols of the elements).



(a) Which is he most reactive non-metallic element shown in the table?
Explain (2 marks)

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(b) (i) Write the formula of the compound formed when element A reacts with element B
(1 mark)

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(ii) Name the bond type in the compound formed in b (i) above
(1 mark)

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(c) (i) What is the name given to the group of elements where, **C**,**G** and **H** belong?

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(ii) Write an equation for the reaction that occurs when **C** in gaseous form is passed through a solution containing ions of element **H** (1 mark)

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(d) The melting points of elements **F** and **G** are 1410^0C and -101 respectively. In terms of structure and bonding, explain why there is a large difference in the melting points of **F** and **G.** (2 marks)

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(e) **D** forms two oxides. Write the formula of each of the two oxides. (1 mark)

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(f) **J** is an element that belongs to the 3rd period of the periodic table and a member of the alkaline earth elements. Show the position of **j** in the grid (1 mark)

NAME **INDEX NUMBER**
SCHOOL **DATE**

STRUCTURE AND BONDING

1. 1989 Q 6

The table below gives the distance between atoms (bond lengths) in halogen molecules and the energies required to break the bonds (bond energies) between the atoms.

Molecule	Bond length (nm)	Bond Energy (KJ Mol^{-1})
Cl – Cl	0.20	240
Br – Br	0.23	195
I – I	0.26	150
At – At	0.29	

(i) Predict the energy required to break the At – At bond

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(ii) What is the relationship between bond length and bond energy for the halogen molecules?

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2. 1989 P1 A Q 8

A solid compound has a giant Ionic Structure. State and explain whether the compound has electricity in the solid state.

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3. 1989 Q 33c

(c) Using dots (.) and crosses (X) to represent outermost elections, draw a diagram to show the bonding CCl.

4. 1991 P1A Q 21

Using dot (.) and crosses (X) to represent electrons, draw a diagram which shows the bonding in phosphate molecule, PH_3 (Atomic numbers: p = 15, H = 1) (1 mark)

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5. 1993 Q 13

In terms of structure and bonding, explain why graphic conducts electricity while diamond does not
(2 marks)

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6. 1993 Q 23c

(c) Study the information given in the table below and answer the questions that follow: -

Formula of compound	NaCl	$MgCl_2$	$AlCl_3$	$SiCl_4$	PCl_3	SCl_2
B.P. (^0C)	1470	1420	Sublimes at 180^0C	60	75	60
M.P. (^0C)	800	710		-70	-90	-80

(i) Give two chlorides that are liquids at room temperature. Give a reason for the answer
(2 marks)

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(ii) Give a possible reason why $AlCl_3$ has a much lower melting point that $MgCl_2$ although both Al and Mg are metals
(1 mark)

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(iii) Which one of the chlorides would remain in liquid state for the highest temperatures range? Show you arrive at your answer (2 marks)

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8. 1994 P1A Q 14

When an electric current was passed through two molten substances M and N in

different containers, the observations in the table below were made.

Molten M	Conducts an electric current and is not decomposed
Molten N	Conducts an electric current and a gas is formed at one of the electrodes

Suggest the type of bonding present in substance M and N

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9. 1994 Q 1 P2

The table below gives elements represented by letters T, U, V, W, X, Y and their atomic numbers

Element T	U	V	W	X	Y
Atomic number 12	13	14	15	16	17
Electron arrangement					

Use the information in the table to answer the questions below:

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(a) Complete the above table giving the electron arrangement of each of the elements

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(b) In which period of the periodic table do these elements belong? Give a reason

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(c) How does the atomic radius v compare with that of X? Explain

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(d) Give the formula of the compound that could be formed between U and W

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(e) What type of bonding will be present in a compound formed between T and Y? Explain

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(f) Arrange the species T,T,T, in increasing order of size

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(g) Which of the ions X^{2+} and X^{2-} is the most stable? Explain

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(h) Give the formula of:

(i) An acidic oxide formed when one of the elements in the table is heated in air

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(ii) A basic oxide formed when one of the elements in the table is heated in air

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10. 1996 Q 5

a) Using dots (.) and crosses (x) to represent electrons draw diagram to represent `

the bonding in:

(i) NH_3 (ii) NH_4^+

(1 mark)

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b) State why an ammonia molecule (NH_3) can combine with H+ to form NH_4^+

(Atomic numbers: N=7 and H=1)

(1 mark)

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11. 1996 Q 11

Complete the table below.

Species	Number of neutrons	Electrons
H		

12. 1996 Q 4 P2

Study the table below and answer the questions that follow:

Element	Atomic number	Relative atomic mass	Melting point (°C)
Aluminium	13	27.0	
Calcium	20	40.0	850
Carbon		12.0	3730
Hydrogen		1.0	-259
Magnesium	12	24.3	650
Neon	10		-249
Phosphorous	15	31.0	44.2 (white)
Sodium		23	590 (red)

a) Complete the table by filling in this missing atomic numbers and atomic mass.

(2 marks)

b) Write the electron arrangement for the following ions

(2 marks)

Ca^+

P^{3+}

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c) What is the melting point of hydrogen in degrees Kelvin?
(1 mark)

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d) Which of the allotropes of phosphorous has a higher density? Explain
(2 marks)

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e) The mass numbers of three isotopes of magnesium are 24, 25 and 26. What is the mass number of the most abundant isotope of magnesium? Explain

(2 marks)

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f) Give the formula of the compound formed between aluminium and carbon. (1 marks)

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g) Explain the difference in the melting points of magnesium and sodium. (2 marks)

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12. 1998 Q 5

The table below shows some properties of substances C, D and E. Study it and answer the questions that follow.

Substance	M.P (0C)	Solubility in water	Electrical solid state	Conductivity molten state.
E	-39	Insoluble	Good	good
D	1610	Insoluble	Poor	poor
E	801	Soluble	Poor	good

Select substance

a) With a giant molecular structure

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b) That is not likely to be an element

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13. 1998 Q 10

An ion of phosphorous can be represented as $^{31}_{15}P^{3-}$

Draw a diagram to show the distribution of the electrons and the composition of the nucleus of the ion of phosphorous.

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14. 1998 Q 11

Diamond and graphite are allotropes of carbon. In terms of structure and bonding

Explain the following.

(a) Diamond is used in drilling through hard rocks

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(b) Graphite is used as a lubricant

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15. 1998 Q 7d

Study the information given in the table below and answer the questions that follow.

The letters do not represent the actual symbols of the elements

Element	Atomic number	Boiling point
S	3	1603
T	13	2743
U	16	718
V	18	87
W	19	1047

(d) What type of bond would exists in the compound formed when U and T react?

Give a reason for your answer

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16. 1999 Q 6

What type of bond is formed when lithium and fluorine react? Explain (Atomic numbers: Li = 3 and F = 9)

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17. 1999 Q 25

When solid magnesium carbonate was added to a solution of hydrogen chloride in methylbenzene, there was no apparent reaction. On addition of water to the resulting mixture, there was vigorous effervescence. Explain these observations

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18. 1999 Q 3e P2

Study the information in the table below and answer the questions that follow.

The letters do not represent the symbols of the elements.

Element(C)	Atomic number	Melting point
L	11	97.8
M	13	660
N	14	1440
Q	17	401
R	19	63.7

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e) Using dots(.) and crosses (x) to represent outermost electrons show bonding in the
compound formed elements N and Q.

19. 2000 Q 16

Compound Q is a solid with a giant ionic structure. In what form would the
compound conduct an electric current

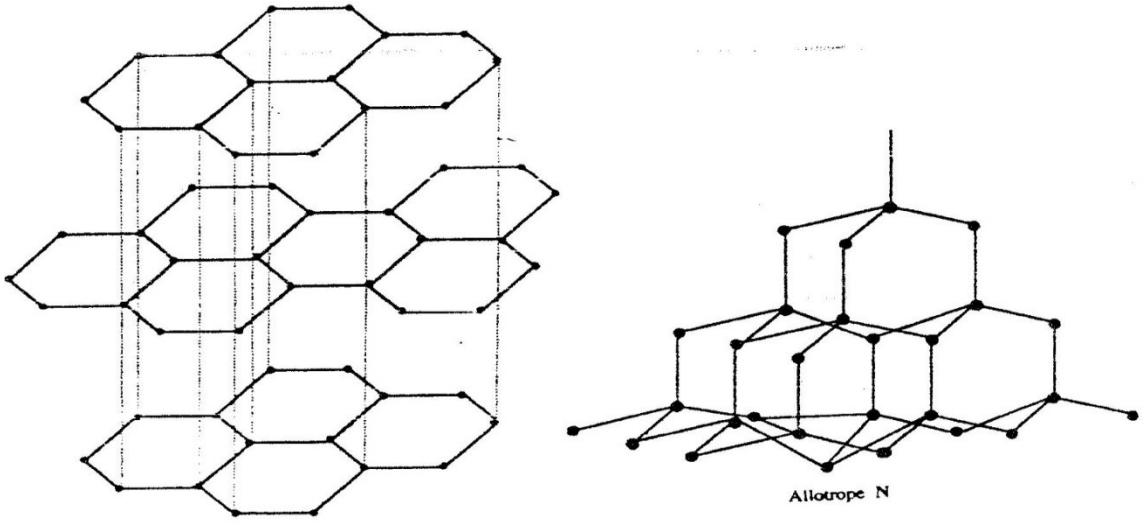
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20. 2000 Q 6a P2

(a)The following diagrams show the structures of two allotropes of carbon.
Study them and answer the questions that follow



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(i) Name allotrope

M .....

N.....

(ii) Give one use of N

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(iii) Which allotrope conducts electricity? Explain

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21. 2001 Q 23

The table below shows the properties of substances K, L, M and N the substances which are likely to be:

Substances	Reaction with oxygen at 25	Melting point	Conductivity Solid	Molten
K	Unreactive	Low	Poor	Good
L	Reactive			
M	Unreactive	High	Good	Good
N	Unreactive	Low	Good	Good

a) Copper

metal.....

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b) Magnesium

chloride.....

22. 2002 Q 16

With reference to iodine, distinguish between covalent bonds and Van Der Waals forces

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23. 2002 Q 20

The table below gives some information about the electrical conductivity and the likely bonding in substances N,P and Q. Complete the table by inserting the missing information the spaces numbered I, II and III

Substance	Likely type of bonding present	Electrical solid	Conductivity
N	Metallic	I.....	Conducts
P	II.....	Does not conduct	Conducts
Q	III	Does not conduct	Does not conduct

24. 2003 Q 1b P2

b) i) Element A is the same group of the periodic table as chlorine.

Write the formula of the compound formed when A reacts with

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potassium metal.
(1 mark)

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ii) What type of bonding exists in the compound formed in (b) (i) above?

Give a reason for your answers.
(3 marks)

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25. 2004 Q 6

Both diamond and graphite have giant atomic structures. Explain why diamond is hard while graphite is soft.
(3 marks)

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26. 2005 Q 4

Using dots (.) and crosses(x) to represent electrons, show bonding in the compounds
formed when the following elements react: (Si = 14, Na = 11 and Cl = 17) (1 mark)

a) Sodium and chlorine (1 mark)

b) Silicon and chlorine (1 mark)

27. 2005 Q 4c P2

(c)The table below gives some properties of substances I, II, III, and IV.

Study it and answer the questions that follow

Substance	Electrical conductivity		M.P (^{0}C)	B.P (^{0}C)
	Solid	Molten		
I	Does not conduct	Conducts	801	1420
II	Conducts	Conducts	650	1107
III	Does not conduct	Does not conduct	1700	2200
IV	Does not conduct	Does not conduct	113	440

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(i) What type of bonding exists in substances I and II
(2 marks)

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(ii) Which substance is likely to be sulphur? Explain
(2 marks)

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28. 2006 Q 20

a) Distinguish between a covalent bond and a co-ordinate bond
(2 marks)

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b) Draw a diagram to show bonding in an ammonium ion.
(1 mark)

29. 2006 Q 3a,b P2

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a) Distinguish between isotopes and allotropes.
(2 marks)

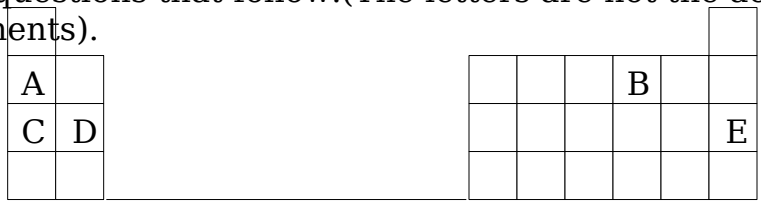
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b) The chart below is part of the periodic table. Study it and answer the questions that follow.(The letters are not the actual symbols of the elements).



i) Select the element in period three which has the shortest atomic radius. Give a reason for you answer.
(2 marks)

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ii) Element F has the electronic structure, 2.8.18.4 on the chart above; indicate the position of element F.
(1 mark)

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iii) State one use of the elements of which E is a member.
(1 mark)

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30. 2007 Q 3b

b) In terms of structure and bonding, explain why the boiling point of chlorine is lower than that of iodine.
(2 marks)

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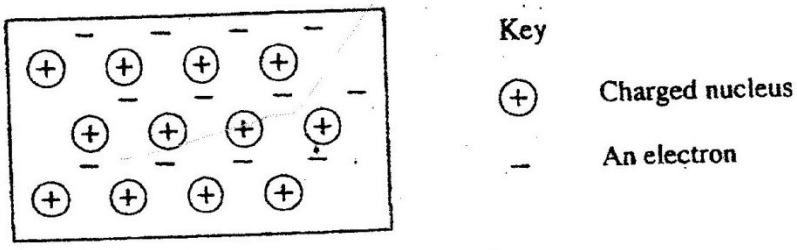
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31. 2007 Q 29

The diagram below is a section of a model of the structure of element T.



a) State the type of bonding that exists in T.
(1 mark)

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b) In which group of the period table does element T belong? Give a reason. (2 marks)

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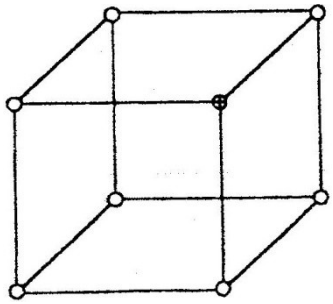
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32. 2007 Q 5a-c P2

(a) The diagram below represents part of the structure of a sodium chloride crystal. The position of one of the sodium ions in the crystal is shown as ⊕



(i) On the diagram, mark the position of the other three sodium ions
(2 marks)

(ii) The melting and boiling points of sodium chloride are 801^0C and 1413^0C
respectively. Explain why sodium chloride does not conduct electricity at 25^0C,
but does so at temperatures between 801^0 C and 1413^0C
(2 marks)

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(b) Give a reason why ammonia gas is highly soluble in water
(2 marks)

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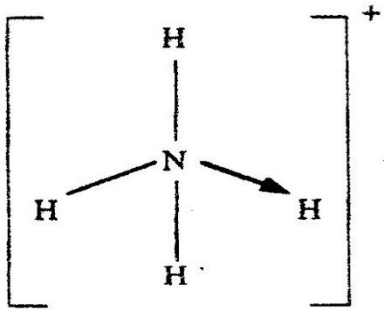
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(c) The structure of an ammonia ion is shown below:



Name the type of bond represented in the diagram by N → H
(1 mark)

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33. 2008 Q 2b P2

b) The table below gives information about elements $A_1A_2A_3$, and A_4

Element	Atomic Number	Atomic Radius (nm)	Ionic radius (nm)
A_1	3	0.134	0.074
A_2	5	0.090	0.012
A_3	13	0.143	0.050
A_4	17	0.099	0.181

(i) In which period of the periodic table is element A_2? Give a reason
(2 marks)

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(ii) Explain why the atomic radius of:
I A_1 is greater than that of A_2;

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II A_4 is smaller than its ionic radius
(2 marks)

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(iii) Select the element which is in the same group as A_3
(1 mark)

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(iv) Using dots (.) and crosses(x) to represent outermost electrons. Draw a diagram to show the bonding in the compound formed when A_1 reacts with A_4
(1 mark)

34. 2009 Q 6a, c P2

(a) Study the table below and complete it.
(W^- and X^{4+} are not the actual symbols of the icons)

Ion	Number of Protons	Number of neutrons	Mass Number	Electron Arrangement
W^-		20		2.8.8
X^{4+}	14		28	

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(c) The atomic numbers of Na and Mg are 11 and 12 respectively. Which of the element
has higher ionization energy? Explain
(2 marks)

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35. **2009 Q 5**

In terms of structure and bonding, explain why the melting point of oxygen is much lower than that of sodium.
(3 marks)

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36. **2009 Q 8**

Using dots (.) and crosses (X) ,show bonding in:

(a) The compound formed when nitrogen reacts with fluorine.
(Atomic numbers F= 9, N=7)

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(b) Sodium oxide (Atomic numbers Na = 11,O= 8)

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37. **2010 Q 14**

Using electrons in the outermost energy level, draw the dot (**.**) and cross (x) diagram for the molecules H_2O and C_2H_4. (H = 1, C = 6, O = 8)

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(2 marks)

i) H_2O

ii) C_2H_4

b) The formula of a complex ion is $Zn(NH_3)_4^{2+}$. Name the type of bond that is likely to exist between zinc and ammonia in the complex ion.

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38. **2010 Q 27**

The atomic numbers of phosphorus, sulphur and potassium are 15, 16 and 19 respectively. The formulae of their ions are P^{3-}, S^{2-} and K^+. These ions have the same number of electrons.

Write the electron arrangement for the ions.

(1 mark)

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a) Arrange the ions in the order of increasing ionic radius starting with the smallest. Give a reason for the order.
(2 marks)

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39. 2010 Q 3 P2

Use the information in the table below to answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Atomic number	Melting point (^{0}C)
R	11	97.8
S	12	650.0
T	15	44.0
U	17	-102
V	18	-189
W	19	64.0

a) Give the reasons why the melting point of:

i) S is higher than that of R
(1 mark)

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ii) V is lower than that of U
(2 marks)

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b) How does the reactivity of W with chlorine compare with that of R with chlorine? Explain,
(2 marks)

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c) Write an equation for the reaction between T and excess oxygen
(1 mark)

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d) When 1.15g of R was reacted with water, 600cm^3 of gas was produced. Determine the relative atomic mass of R. (Molar gas volume = 24000cm^3) (3 marks)

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e) Give one use of element V
(1 mark)

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40. 2011 Q 5b(iii-vii) P2

b) The table below gives the number of electrons, protons and neutrons in particles
A, B, C, D, E, F and G.

Particle	Protons	Electrons	Neutrons
A	6	6	6
B	10	10	12
C	12	10	12
D	6	6	8
E	13	10	14
F	17	17	18
G	8	10	8

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iii) Write the formula of the compound formed when E combines with G. (1 mark)

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iv) Name the type of bond formed in (iii) above (1 mark)

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v) How does the radii of C and E compare? Give a reason. (2 marks)

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vi) Draw a dot (.) and cross (x) diagram for the compound formed between A and
F.
(1 mark)

vii) Why would particle B not react with particle D?
(1 mark)

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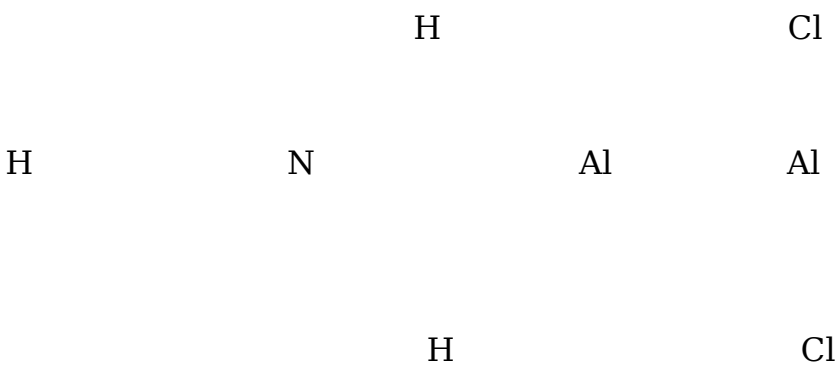
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41. 2011 Q 28

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The diagram below shows the bonding between aluminum chloride and ammonia.



a) Name the types of bonds that exist in the molecule.
(1 mark)

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b) How many electrons are used for bonding in the molecule?
(1 mark)

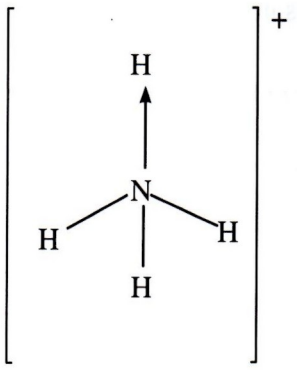
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42. 2012 Q7 P1

Ammonium ion has the following structure:



Label on the structure

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(a)Covalent bond; (1 mark)

(b) Coordinate (dative) bond, (1 mark)

NAME **INDEX NUMBER**
SCHOOL **DATE**

SALTS

1. 1989 Q 34b,c

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(a) Explain how sodium carbonate can be used to soften hard water.
(Use ionic equations where necessary).
(3 marks)

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(b) Give one other commercial use of sodium carbonate, besides softening of hard water.
(1 mark)

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2. 1989 PP1A QUESTION 7

What would be observed when aqueous sodium hydroxide is added to aqueous lead
(II) nitrate?

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3. 1989 PP1A QUESTION 18

P. Q and R are solutions of lead nitrate, sodium chloride and magnesium
Sulphate (not in that order) Use the following information to identify P and Q

(i) When drops of barium chloride solutions are added to separate portions of P, Q and R, a white P is formed

(ii) When dilute hydrochloric acid is added to separate portions of Q and R, a white precipitate is observed in R but Q remains clear.
(1 mark)

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4. 1991 PP1A QUESTION 27

The following is a procedure that was used to obtain the solubility of a salt Q in water at 25^0C. Study it and answer the questions that follow.

Salt Q was dissolved in warm distilled water until no more could dissolve. The mixture was then cooled to 250C and allowed to settle.

A dry evaporating dish and dry watch glass were weighted. Some of the solution was decanted into the dish, covered with the watch glass, and then weighed.

The solution was evaporated to dryness over a mall flame. This residue, the dish and the watch glass were weighted. The residue was then heated repeatedly until a constant mass was obtained. The results below were obtained.

Mass of dish + Watch glass = 50.60g
Mass of solution + dish + watch glass = 80.6g
Mass of residue + dish + watch glass = 62.60g

(i) What is the purpose of a watch glass in such an experiment? (1 Mark)

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(ii) Why should the heating be continued until a constant mass is obtained

(1 Mark)

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(iii) Calculate the mass of the solution
(1 Mark)

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(iv) Calculate the mass of the residue
(1 Mark)

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(v) Calculate the mass of the water
(1 Mark)

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(vi) Calculate the solubility of salt Q in g per 100g of water at 250C (2 Marks)

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5. 1992 PP1A QUESTION 15

Explain how you would distinguish between a carbonate and a sulphite using a dilute acid and red litmus paper.

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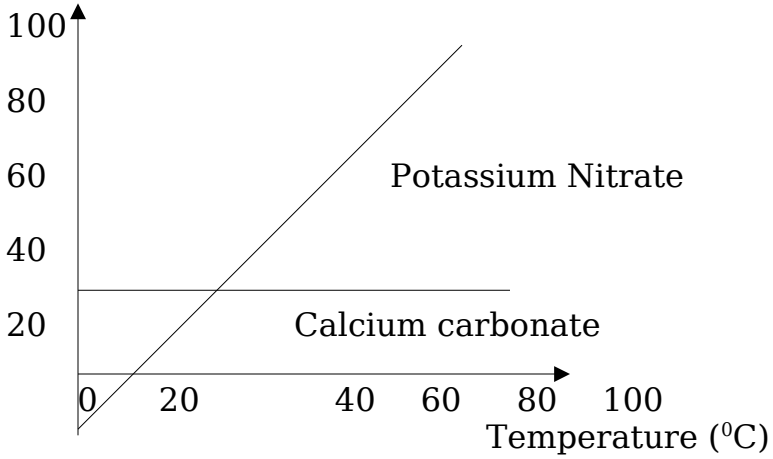
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6. 1994 PP1A QUESTION 30

Study the solubility curves below and answer the questions that follow.



(a) At what temperature would equal amounts of potassium nitrate and calcium ethanoate dissolve in 100g of water?

(1 Mark)

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(b) Explain how you would prepare a saturated solution containing 80g of potassium nitrate in distilled water.

(1 Mark)

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(c) A student added 30g of Calcium ethanoate to 100g of boiling water and noticed that not all of it dissolved. Explain what would happen if the student cools the mixture with stirring up to a temperature of 10^0c (1 Mark)

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7. 1995 PP1A QUESTION 21

The table below shows how solubility of some substances in water varies with temperature.

Substance	Change of solubility with temperature (g/100cm^3 of water) 0^0C 20^0C 40^0C 60^0C			
W	0.334	0.16	0.097	0.0058
X	27.60	34.0	40.0	45.5
Y	35.70	36.0	36.6	37.3

Which of the above substances is likely to be a gas? Explain. (2 Marks)

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8. 1995 PP1A QUESTION 25

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Describe how the following reagents can be used to prepare lead Sulphate,

Solid potassium sulphate, solid lead carbonate, dilute nitric acid, and distilled water
(2 marks)

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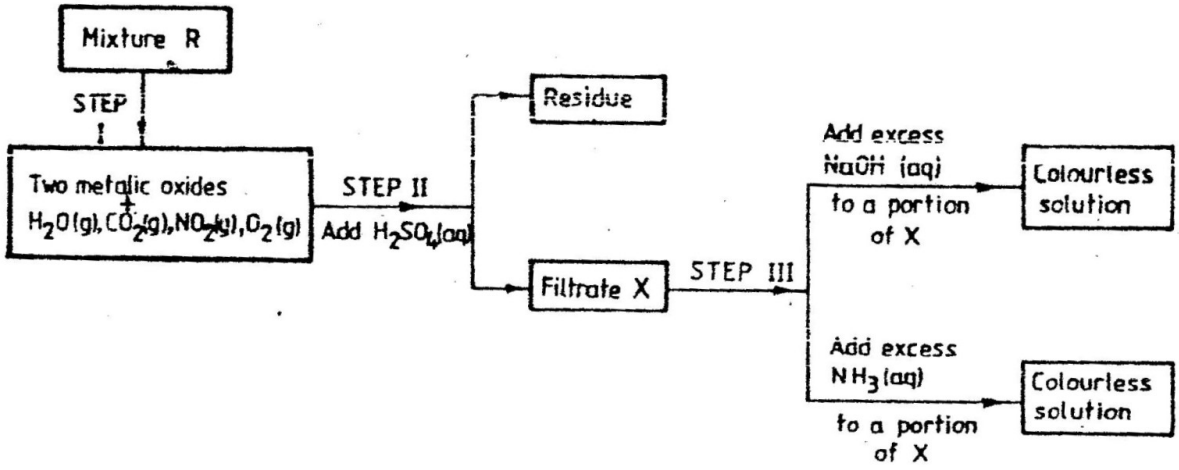
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9. 1995 PP1B Q 5

The flow charts below show an analysis of a mixture R that contains two salts. Study the analysis and answer the questions that follow.



(a) (i) What condition is necessary for the process in step I to take place? (1 mark)

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(ii) Draw a labelled diagram for the set-up that could be used to separate the mixture formed in step II
(2 marks)

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(iii) Write ionic equation for the reaction between the cation in filtrate X and aqueous ammonia.
(1 mark)

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(iv) What observation would indicate the presence of $NO_{2\,(g)}$ in step I

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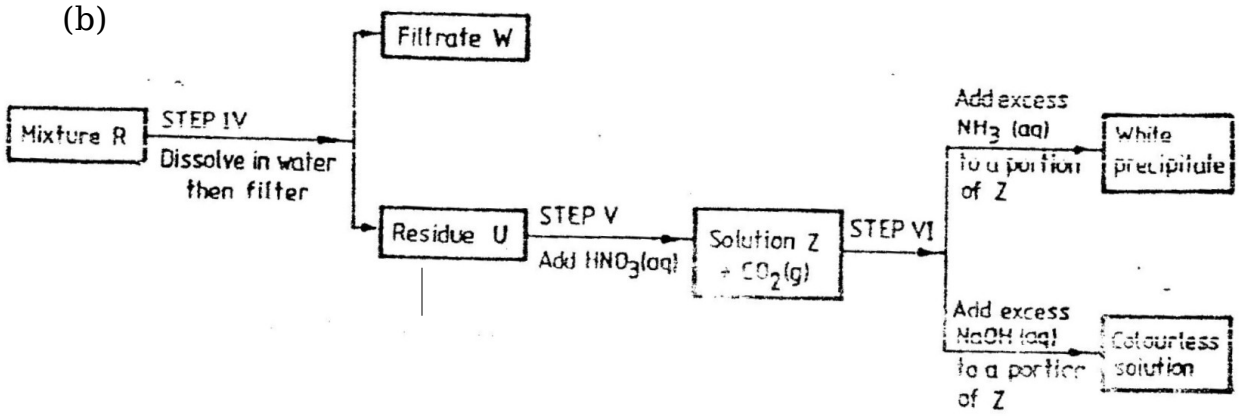
(v) State how water vapour, in step I could be identified.
(1 mark)

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(b)



(i) What conclusion can be drawn from step iv only? Explain?
(2 marks)

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(ii) Write the formula of an anion present in the residue U. Explain
(2 marks)

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(iii) Suggest the identity of the cation present in solution z.
(1 mark)

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(c) Name the two salts present in the mixture R.
(2 marks)

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10. 1996 PP1B Q 6

a) Give the name of each of the processes described below which takes place
when salts are exposed to air for some time.

i) Anhydrous copper sulphate becomes wet
(1 mark)

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ii) Magnesium chloride forms an aqueous solution
(1 mark)

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iii) Fresh crystals of sodium carbonate, $Na_2CO_3.\ 10H_2O$
(1 mark)

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b) Write the formula of the complex ion formed in each of the reactions described below.

(i) Zinc metal dissolves in hot alkaline solution

(1 mark)

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(ii) Copper hydroxide dissolves in excess ammonia solution.

(1 mark)

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(c) A hydrated salt has the following composition by mass. Iron 20.2% Oxygen 23.0%, sulphur 11.5%, water 45.3 %. Its relative formula mass is 278.

(i) Determine the formula of the hydrated salt..

(3 marks)

(Fe=56, S=32; O = 16, H =1)

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(ii) 6.95gm of the hydrates salt were dissolved in distilled water and the total volume made to 250 cm^3 of solution. Calculate the concentration of the salt.

solution in moles per litre

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11. 1998 PP1A QUESTION 2

Study the information in the table and answer the question below the table

Substance	Solubility g/100g water
A	1.26×10^{2}
B	1.09×10^{-2}

Describe how a solid sample of substance A could be obtained from a solid mixture of A and B.

(2 marks).

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12. 1998 PP1A QUESTION 19

Describe how a solid sample of lead (ii) chloride can be prepared using the following reagents. Dilute nitric acid, and lead carbonate (2 marks)

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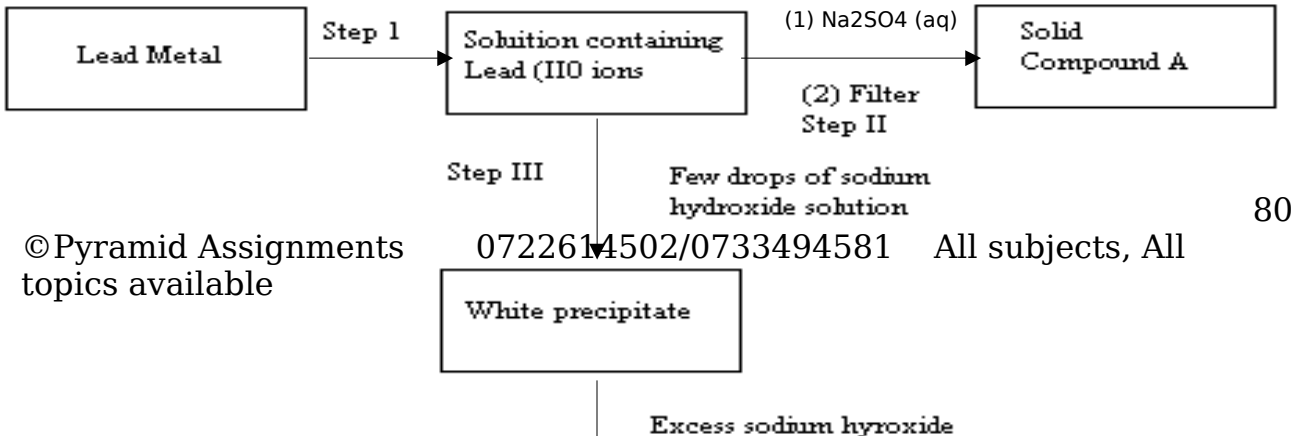
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13. 1999 PP1A Q 2

Study the flow chart below and answer the questions that follow



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(a) Name:

(i) The reagent used in step I

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(ii) Compound A

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(b) Write an ionic equation for the reaction is step IV

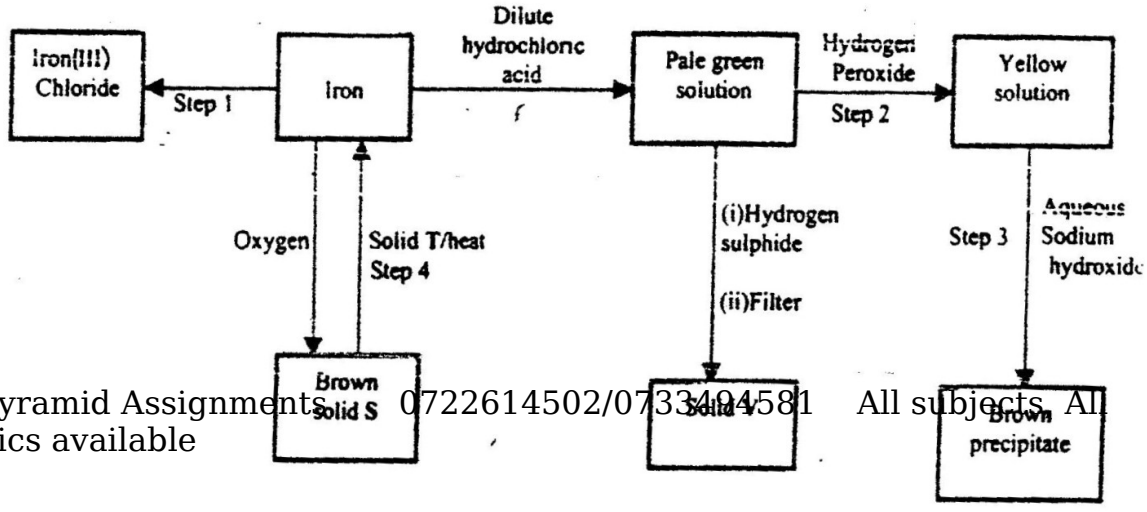
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15. 1999 PP1B Q 4

a) The flow chart below shows a sequence of reactions starting with.Study and answer the questions that follow.



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i) Name the reagent and state the condition for the reaction in step.

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ii) Give the names of the following

i) Solid S .....

ii) Solid V .....

iii) Solid T .....

iii) Give reasons for the colour change in step 2

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iv) Write an ionic equation for the reaction which takes place in step 3.

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v) Name one other substance that could be used instead of sodium hydroxide in step III.

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b) In an experiment 3.36g of iron fillings were added to excess aqueous copper (II) sulphate. Calculate the mass of copper that was deposited. Cu = 63.5, Fe = 56.0

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16. 1999 PP1A QUESTION 3

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State and explain the observations that would be made when a few drops of concentrated Sulphuric acid are added to a small sample of hydrated copper (II) sulphate. (2 Marks)

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17. 1999 PP1A QUESTION 8

The table below shows the solubility of a salt at various temperatures.

Temperature (0C)	Solubility g/100g water
0	36
40	30
80	25
110	20

What would happen if a sample of a saturated solution of the salt at 40^0C is heated to 80^0C?
(2 Marks)

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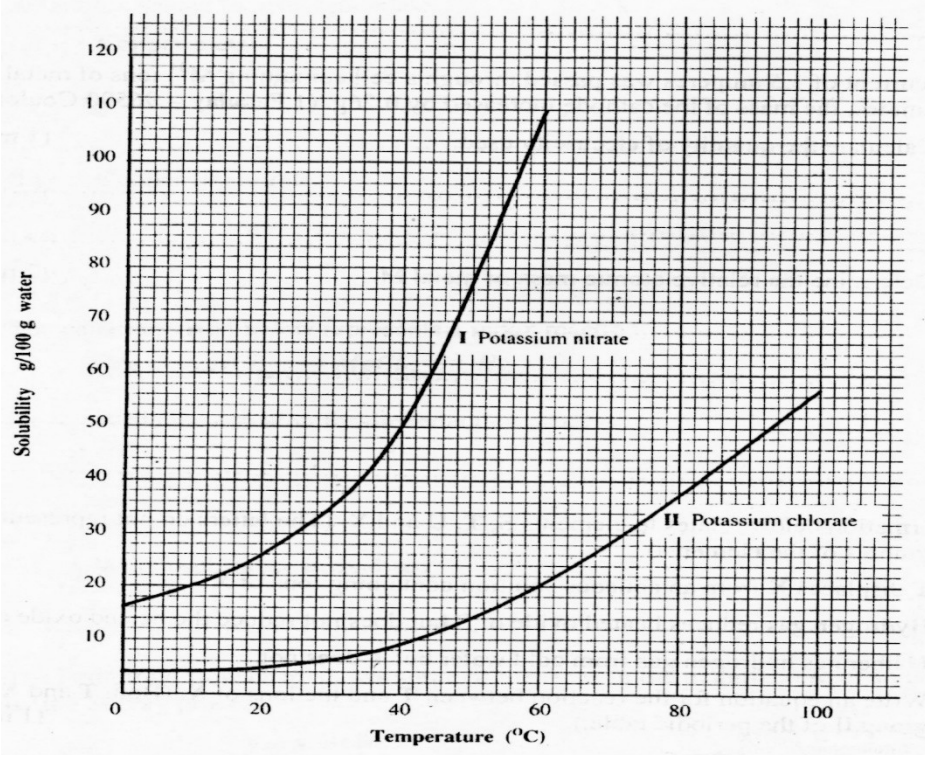
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18. 2000 Q 8 PP1

Study the solubility curves below and answer the questions that follow

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What happens when a solution containing 40gm of potassium chlorate and 40gm of potassium nitrate in 100gm of water at 90^0C is cooled to 40^0C? Explain

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19. 2001 Q 6c P2

c) Neutralization is one of the methods of preparing salts.

i) What is meant by neutralization?

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ii) Describe how you would prepare crystals of sodium nitrate starting with 200cm^3 of 2M sodium hydroxide.

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iii) Write an equation for the reaction that takes place when a solid sample of sodium nitrate is heated.

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20. 2003 Q 1c P2

Starting with aqueous magnesium sulphate, describe how you would obtain

a sample of magnesium oxide. (3 marks)

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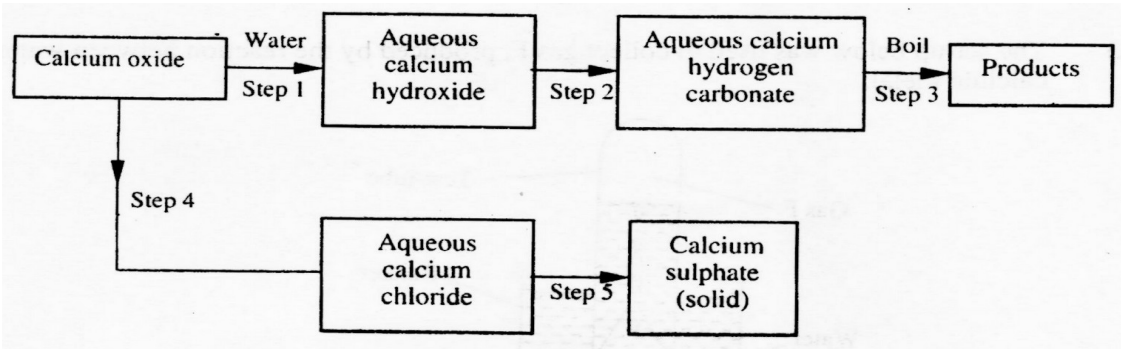
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21. 2004 Q 2b P2

(b) The scheme below shows some reactions starting with calcium oxide. Study it and answer the questions that follow.

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(i) Name the reagents used in steps 2 and 4
(2 marks)

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(ii) Write an equation for the reaction in step 3.
(1 mark)

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(ii) Describe how a solid sample of anhydrous calcium sulphate is obtained in Step 5

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22. 2005 Q2a P2

(a) Name one raw material which sodium hydroxide is manufactured
(1 mark)

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23. 2005 Q 1

State one use of sodium hydrogen carbonate.

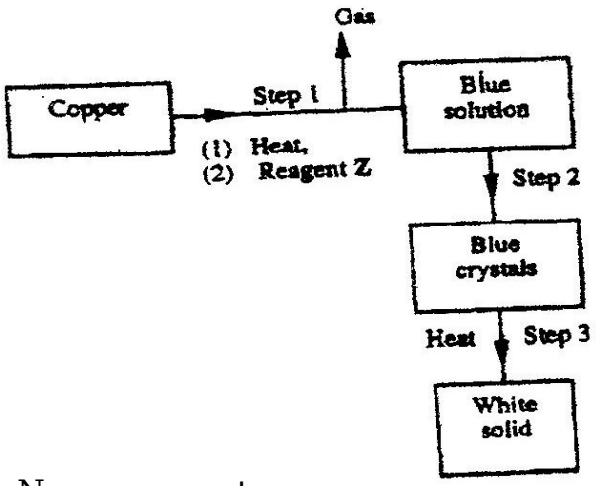
(1 mark)

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24. 2006 Q 27

Study the flow chart below and answer the questions that follow.



a) Name reagent z.

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b) Describe the process which takes place in step 2.

(1 mark)

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c) Identify the white solid.

(1 mark)

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25. 2007 Q 6

In an experiment, a few drops of concentrated nitric acid were added to aqueous iron(II) sulphate in a test – tube. Excess sodium hydroxide solution was then added to the mixture.

a) State the observations that were made when:

i) Concentrated nitric acid was added to aqueous iron (II) sulphate (1 mark)

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ii) Excess sodium hydroxide was added to the mixture. (1 mark)

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b) Write an ionic equation for the reaction which occurred in (a) (ii) above. (1 mark)

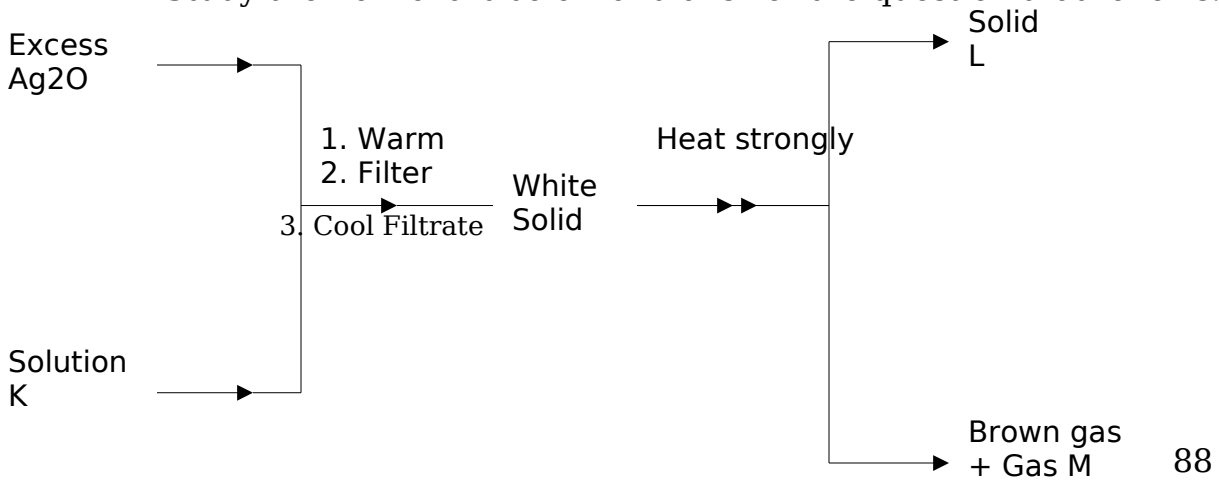
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26. 2007 Q 9

Study the flow chart below and answer the question that follows.



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Identify:
(3 marks)

a) Solution K .....

b) Solid L .....

c) Gas M .....

27. 2007 Q 13

a) Name the process that takes place when:

(i) Crystals of zinc nitrate change into solution when exposed to air
(1 mark)

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28. 2007 Q 18

Starting with sodium metal, describe how a sample of crystals of sodium hydrogen carbonate may be prepared.
(3 marks)

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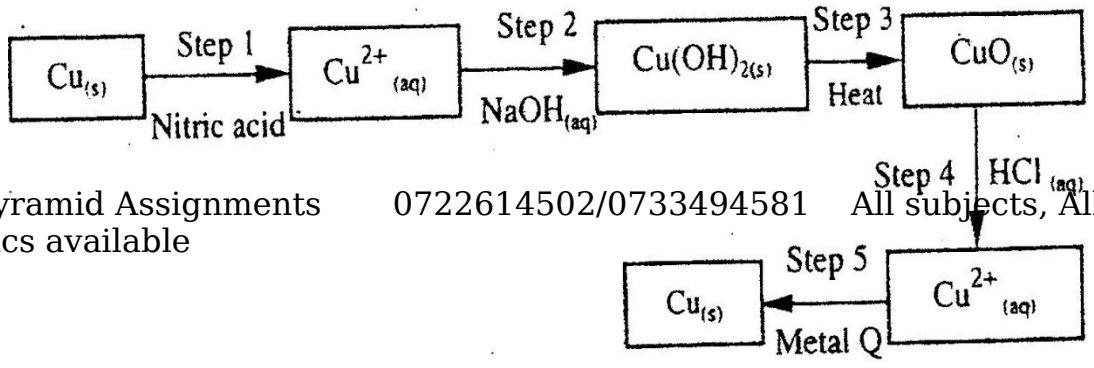
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29. 2007 Q 3 P2

The flow chart below shows a sequence of chemical reactions starting with copper study it and answer the questions that follow.



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(a) In step 1, excess 3M nitric acid was added to 0.5g of copper powder

(i) State two observations which were made when the reactions was in progress (2 marks)

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(ii) Explain why dilute hydrochloric acid cannot be used in step 1 (1 mark)

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(iii) I Write the equation for the reaction that took place in step 1 (1 mark)

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II Calculate the volume of 3M nitric that was needed to react completely with 0.5g of copper powder. (Cu = 63.5) (3 marks)

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(b) Give the names of the types of reactions that took place in steps 4 and 5 (1 mark)

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c) Apart from the good conductivity of electricity, state two other properties that make it possible for copper to be extensively used in the electrical industry. (2 marks)

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30. 2007 Q 6b P2

(b) The table below shows the solubility of ammonium phosphate in water at different temperatures.

Temperature (C^0)	Solubility of ammonium phosphate in g/100g water
10	63.0
20	69.0
30	75.0
40	82.0
50	89.0
60	97.0

(i) On the grid provided, draw the solubility curve of ammonium phosphate (Temperature on x – axis)
(3 marks)

(ii) Using the graph, determine the solubility of ammonium phosphate at 25^0C (1 mark)

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(iii) 100g of a saturated solution of ammonium phosphate was prepared at 25^0C

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I what is meant by a saturated solution?
(1 mark)

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II Calculate the mass of ammonium phosphate which was used to prepare the saturated solution
(2 marks)

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31. 2008 Q 15

The table below gives the solubilities of substances J, K and L at different temperatures

Substance	Solubility in grammes per 100 g water at			
	0^0C	20^0C	40^0C	60^0C
J	0.334	0.16	0.097	0.0058
K	27.60	34.0	40.0	45.5
L	35.70	36.0	40.0	37.3

Select the substance which, when dissolved in water, heat is given out. Give a reason
(2 marks)

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32. 2008 Q 16

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Starting with copper metal, describe how a sample of crystals of copper (II) chloride may be prepared in the laboratory.
(3 marks)

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33. 2008 Q 17

A compound whose general formula is $M(OH)_3$ reacts as shown by the equation below.

$M(OH)_{3(s)} + OH^-_{(aq)} \rightarrow M(OH)_4^-{}_{(aq)}$

$M(OH)_{3(s)} + 3H^+_{(aq)} \rightarrow M^{3+}_{(aq)} + 3H_2O_{(i)}$

(a) What name is given to compounds which behave like $M(OH)_3$ in the two reactions
(1 mark)

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(b) Name two elements whose hydroxides behave like that of M
(2 marks)

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34. 2009 Q 2

Hardness of water may be removed by either boiling or addition of chemicals.

a) Write an equation to show how boiling removes hardness of water.
(1 mark)

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b) Name two chemicals that are used to remove hardness of water
(2 marks)

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35. 2009 Q 11

Starting with 50 cm^3 of 2.8M sodium hydroxide, describe how a sample of pure sodium sulphate crystals can be prepared.
(3 marks)

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36. 2009 Q 18

Bottle of sodium carbonate, sodium chloride and sugar have lost their labels. A student prepares and tests an aqueous solution of a sample from each bottle. The results obtained are as shown in the table below.

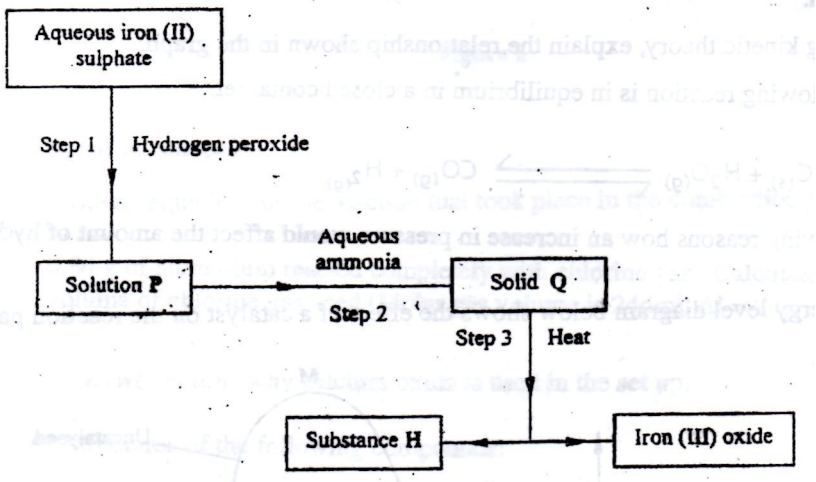
Bottle	P^H	Electrical conductivity	Correct label
1	7	conducts	
2	7	Does not conducts	
3	10	conducts	

Complete the table by filling the correct label for each bottle.

37. 2009 Q 23

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Use the flow chart below to answer the questions that follow.



(a) What observation would be made in step I
(1 mark)

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(b) Name another substance that could be used in step 2
(1 mark)

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(c) Give the name of substance

H. .....

38. 2009 Q 25

For each of the following reactions, state the observation and write the formula of the compound responsible for the observation

(a) Bromide water is added to aqueous potassium iodine
(1 ½ mark)

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(b) Excess aqueous ammonia is added to copper (II) hydroxide (precipitate)

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39. 2010 Q 5

Hydrate cobalt(II) chloride exists as pink crystals and anhydrous cobalt(II) chloride is a blue powder. Describe a laboratory experiment that can be used to show that the action of heat on hydrated cobalt(II) chloride is a reversible reaction. (3 marks)

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40. 2010 Q 24

Describe how a solid sample of the double salt, ammonium iron(II) sulphate, can be prepared using the following reagents; Aqueous ammonia, sulphuric(VI) acid and iron metal.

(3 marks)

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41. 2011 Q 3

A mixture contains ammonium chloride, copper (II) oxide and sodium chloride.

Describe how each of the substances can be obtained from the mixture (3 marks)

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42. 2011 Q 13

Distinguish between the terms deliquescent and efflorescent as used in chemistry.

(2 marks)

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43. 2011 Q 30

A sample of river water is suspected to contain zinc ions. Describe how the presence of zinc ions and sulphate ions can be established.
(3 marks)

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44. 2011 Q 4 P2

a) When excess calcium metal was added to 50 cm^3 of 2 M aqueous copper (II) nitrate in a beaker , a brown solid and bubbles of gas were observed.

i) Write two equations for the reactions which occurred in the beaker.
(2 marks)

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ii) Explain why it is not advisable to use sodium metal for this reaction.
(2 marks)

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b) Calculate the mass of calcium metal which reacted with copper (II) nitrate solution.
(relative atomic mass of Ca=40)
(2 marks)

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c) The resulting mixture in (a) above was filtered and aqueous sodium hydroxide added to the filtrate drop wise until in excess. What observations were made? (1 mark)

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d) i) Starting with calcium oxide, describe how a sample of calcium carbonate can be prepared.
(3 marks)

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ii) Name one use of calcium carbonate.
(1 mark)

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45. 2012 Q6 P1

Study the information in the table below and answer the questions that follow:

Salt	Solubility (g/100g water)	
	At 40°C	At 60°C
$CuSo_4$	28	38
$Pb(NO_3)_2$	79	98

A mixture containing 35g of $CuSO_4$ and 78g of $Pb(NO_3)_2$ in 100g of water at 60°C was cooled to 40^0C.

(a) Which salt crystallised out? Give a reason
(2 marks)

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(b) Calculate the mass of the salt that crystallised out
(1 mark)

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46. 2012 Q16 P1

Use the following information on substances S, T, V and hydrogen to answer the questions that follow:

(i) T displaces V from a solution containing V ions

(ii) Hydrogen reacts with the heated oxide of S but has no effects on heated oxide of V.

(a) Arrange substances S, T, V and hydrogen in the order of increasing reactivity.
(2 marks)

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(b) If T and V are divalent metals, write an ionic equation for the reaction in (i) above.
(2 marks)

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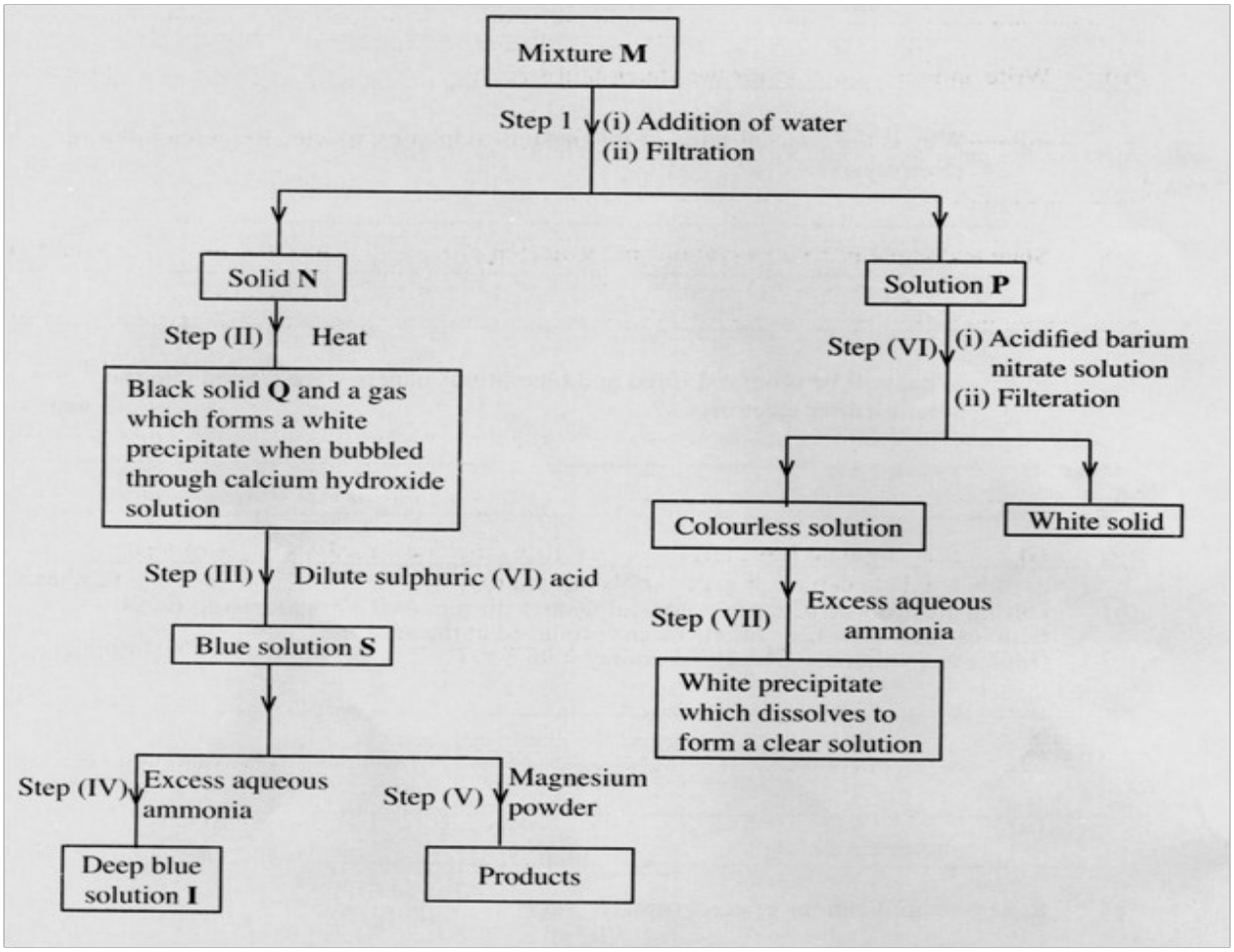
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47. 2012 Q6 P2

The flow chart below shows a sequence of reaction involving a mixture of two salts,
mixture M. study it and answer the questions that follow.

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(a) Write the formula of the following

(i) Anion in solid **Q** (1 mark)

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(ii) The two salts present in mixture **M**

(2 marks)

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(b) Write an ionic equation for the reaction in step (VI)
(1 mark)

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(c) State and explain the observations made in step (V)
(3 marks)

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(d) (i) Starting with Lead (II) oxide, describe how a pure solid sample of lead
sulphate can be prepared in the laboratory
(2 marks)

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(ii) How can one determine whether the led sulphate prepared is pure (2 marks)

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NAME **INDEX NUMBER**
SCHOOL **DATE**

CARBON AND ITS COMPOUNDS

1. 1989 Q 12

On strong heating a substance R gives a gas which turns limewater cloudy and a black residue S remains S dissolves in dilute nitric acid to give a solution T. When aqueous ammonia is added to T a light blue precipitate is formed. The precipitate dissolves in dilute nitric acid to give a deep blue solution

Name:

Substance R

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Ions in

S .....

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2. 1991 PPI Que 10.

Both graphite and molten lead (II) chloride conduct electricity. State how each of the substances conducts electricity.

(i) Graphite.
(1 mark)

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(ii) Molten lead (II) chloride
(1 mark)

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3. 1991 Q 22

When a salt T is heated, a black solid is left and a colourless gas which turns calcium hydroxide solution cloudy is evolved. Identify T and write an equation for the decomposition.
(2 marks)

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4. 1994 PPIA Que 17.

Give two properties of carbon dioxide which makes it suitable for use in fire extinguishers?
(2 marks)

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5. 1994 PPIA Que 27.

What is meant by the term allotropy? Give an example of an element that exhibits allotropy.
(1 mark)

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6. 1995 PPIA Que 27.

Give a reason why calcium hydroxide solution is used to detect the presence of carbon dioxide gas while sodium hydroxide solution is NOT.
(1 mark)

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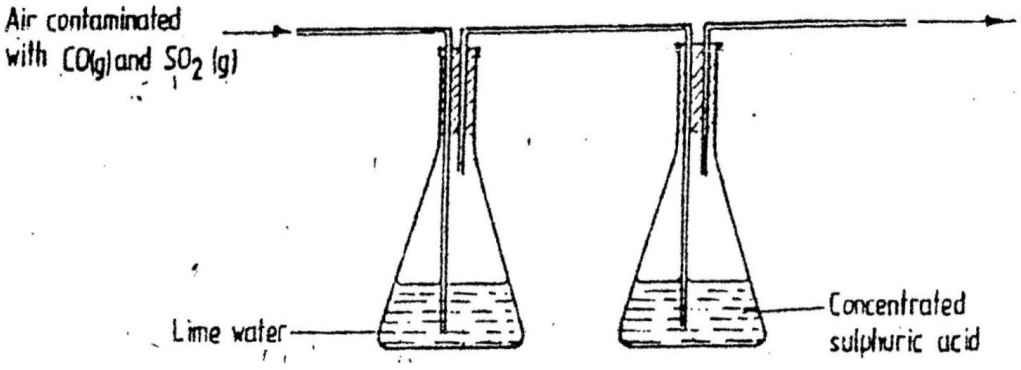
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7. 1996 Q 8

A sample of air contaminated with carbon monoxide and sulphur dioxide was passed through the apparatus shown in the diagram below.



Which contaminant was removed by passing the contaminated air through the apparatus Explain . (2 marks)

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8. 1996 Q 23

Explain how you would obtain solid carbonate from a mixture of lead carbonate and sodium carbonate powders.
(3 marks)

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9. 1997 Q 2

When extinguishing a fire caused by burning kerosene, carbon dioxide is used in preference to water .Explain .....

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10. 1997 Q 4

When dilute nitric acid was added to a sample of solid C, a colourless gas that formed a white a white precipitate with limewater was produced. When another sample of solid C was heated strongly in a dry test – tube, there was no observable change.

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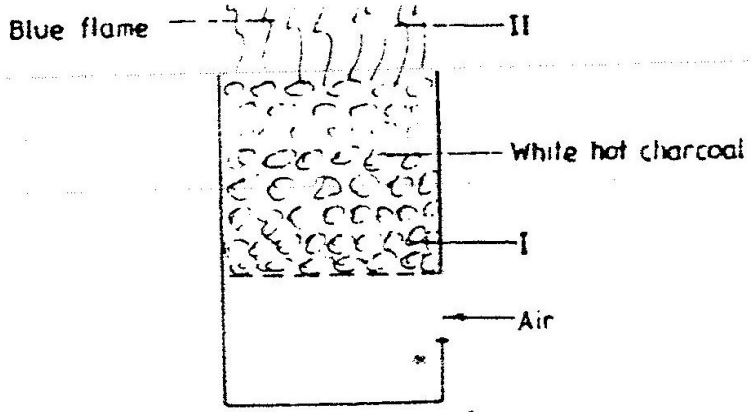
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11. 1998 Q 20

The diagram below represents a charcoal burner. Study it and answer the questions that follow



Write equations for the reactions taking place at I and II

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12. 1999 Q 23

When excess carbon monoxide gas was passed over heated lead (II) oxide in

combustion tube, lead (II) oxide was reduced

(a) Write an equation for the reaction, which took place

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(b) What observation was made in the combustion tube when the reaction was complete?

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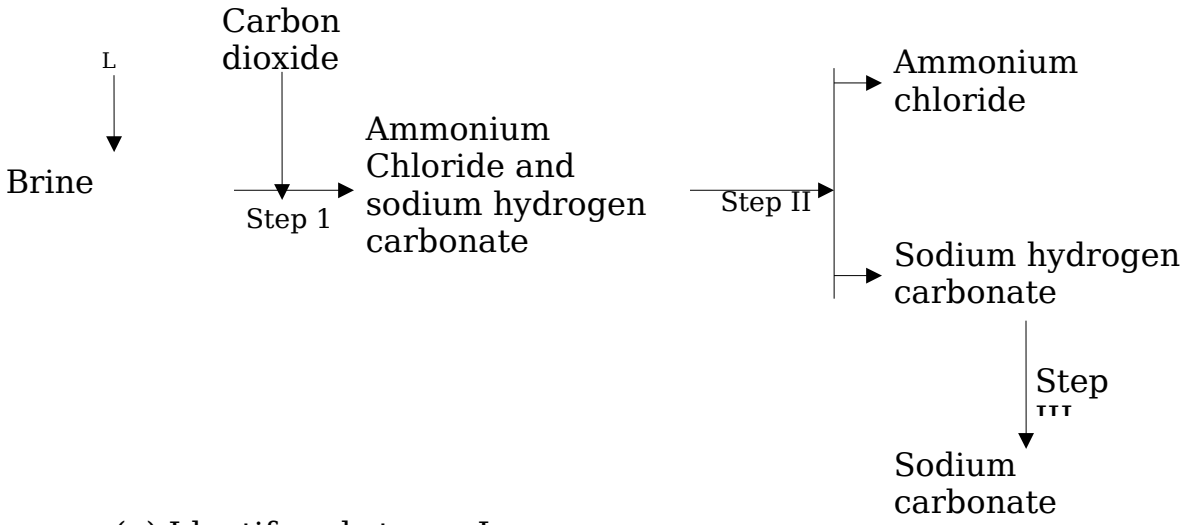
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(c) Name another gas, which could be used to reduce lead (II) oxide

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13. 2000 Q 3

The simplified flow chart shows some of the steps in the manufacture of sodium carbonate by the Solvay process



(a) Identify substance L

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(b) Name the process – taking place in step II

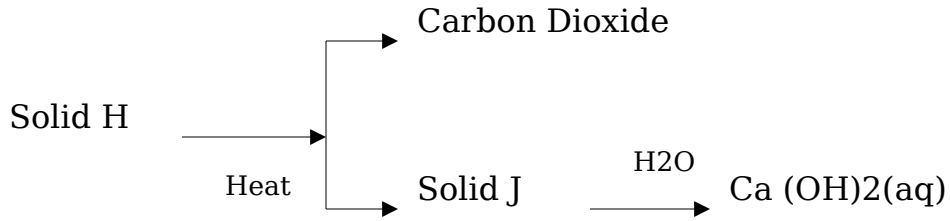
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(c) Write an equation for the reaction, which takes place in step III

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14. 2000 Q 10

Use the scheme below to answer the questions that follow



(a) Identify the solid

H .....
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J .....
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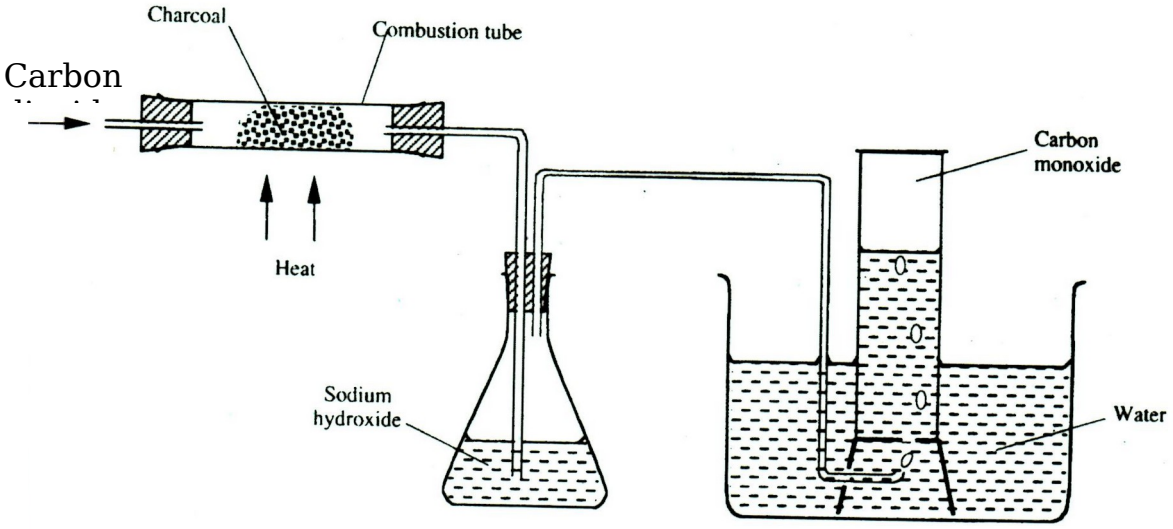
(b) State one commercial use of solid J

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15. 2000 Q 6b PP2

(b) In an experiment, carbon dioxide gas as passed over heated charcoal and the gas produced collected as shown in the diagram below



(i) Write an equation for the reaction that took place in the combustion tube

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(ii) Name another substance that can be used instead of sodium hydroxide

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(iii) Describe a sample chemical test that can be used to distinguish between carbon dioxide and carbon monoxide

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(iv) Give one use of carbon monoxide

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16. 2001 Q 14

When the oxide of element H was heated with powdered carbon the mixture glowed and carbon dioxide was formed. When the experiment was repeated using the oxide of element J, there was no apparent reaction.

a) Suggest one method that can be used to extract element J from its oxide

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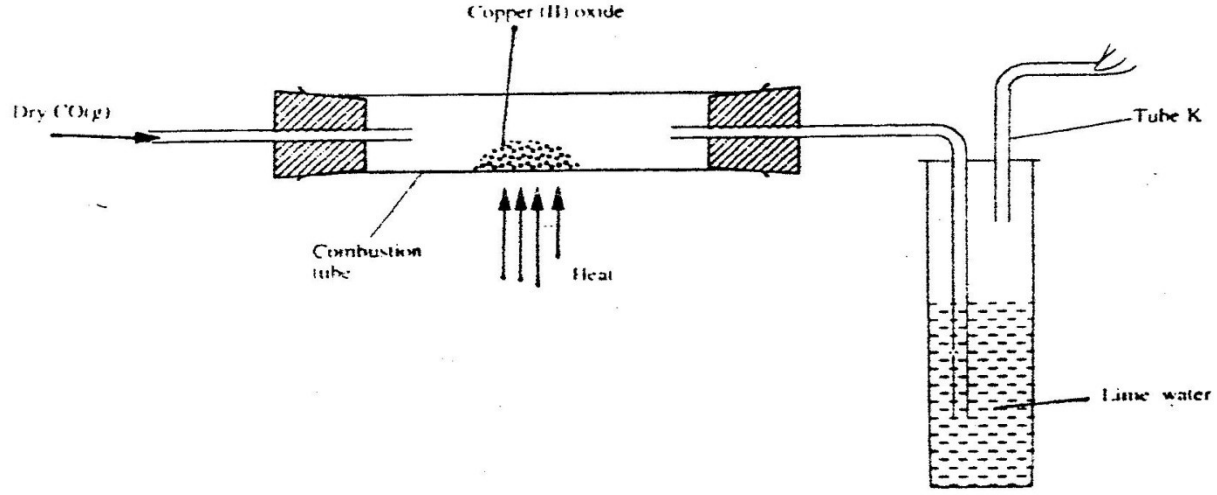
b) Arrange the elements H, J and carbon in the order of their decreasing creativity.

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17. 2001 Q 21

The apparatus shown below shown below was used to investigate the effect of carbon monoxide on copper (II) oxide.



a) State the observation that was made in the combustion tube at the end of the experiment.

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b) Write an equation for the reaction that took place in the combustion tube

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c) Why is it necessary to burn the gas coming out of tube K?

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18. 2002 Q 15

When carbon dioxide gas was passed through aqueous calcium hydroxide a white suspension was formed

(a) Write an equation for the reaction that took place

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(b) State and explain the changes that would occur when carbon dioxide gas is bubbled through the white suspension

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19. 2002 Q 5 PP2

(a) Candle wax is mainly a compound consisting of two elements. Name the two elements
(2 marks)

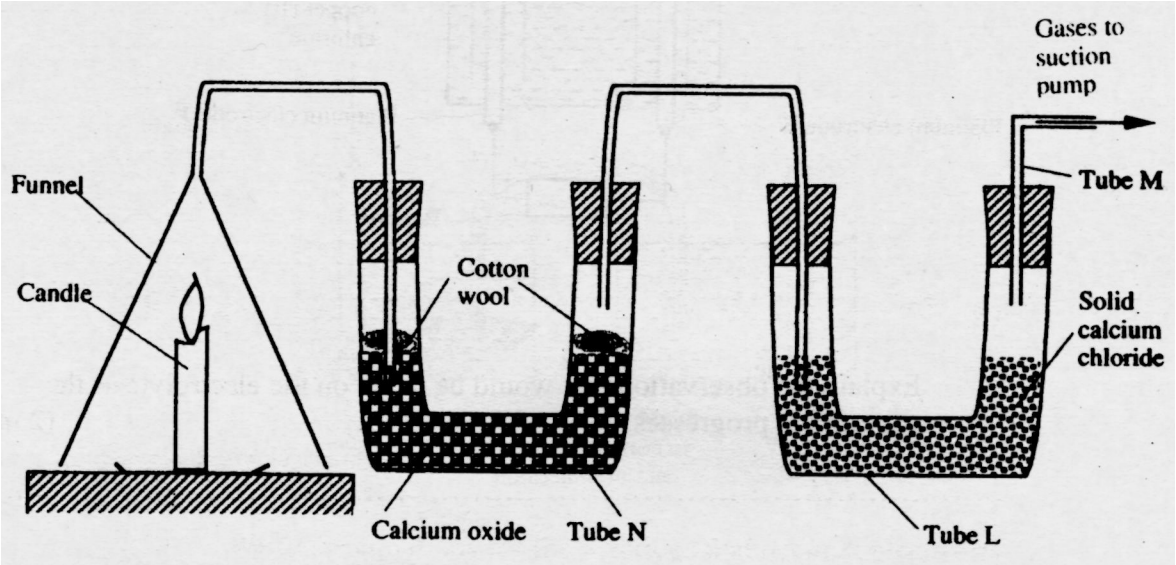
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(b) The set- up below was used to investigate the burning of a candle study it and answers the questions that follow

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(i) What would happen to the burning candle if the pump was turned off? Give reasons

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(ii) State and explain the changes in mass that are likely to occur in tube N by the end of
the experiment (3 marks)

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(iii) Name two gases that come out through tube M
(2 marks)

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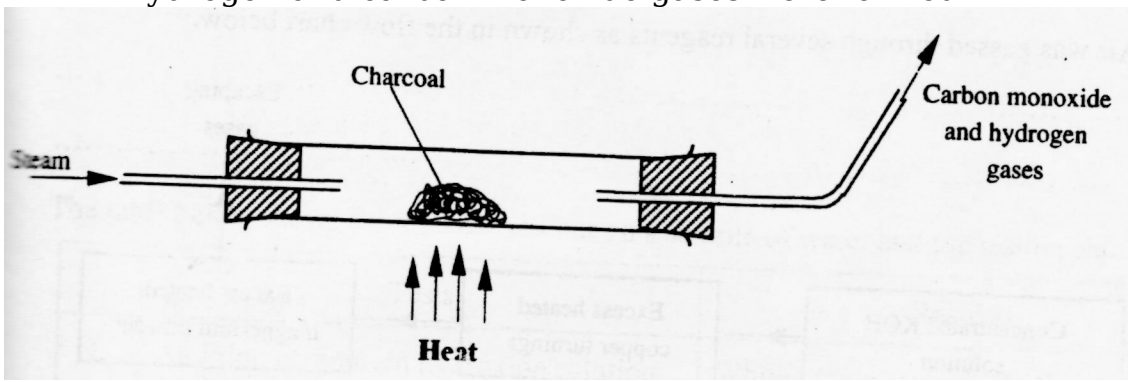
(iv) Name another substance that could be used in the place of calcium oxide in tube N

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20. 2003 Q 12

When steam was passed over heated charcoal as shown in the diagram below,

hydrogen and carbon monoxide gases were formed



(a) Write the equation for the reaction which takes place (1 mark)

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(b) Name two uses of carbon monoxide gas, which are also uses of hydrogen gas (2 marks)

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21. 2004 Q 1

When a candle was brunt completely. The total mass product was found to be greater than the original mass of the candle. Explain

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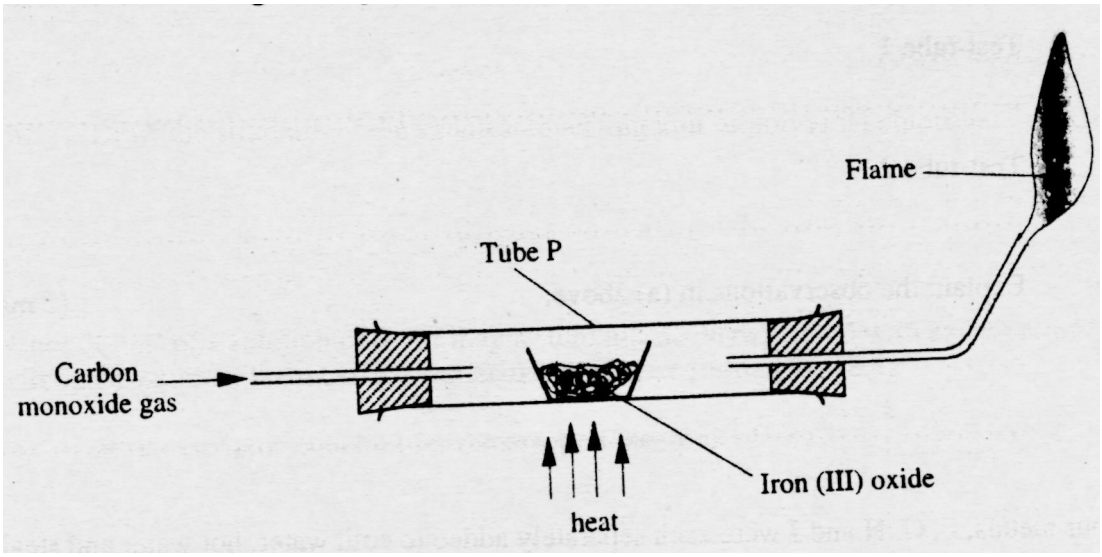
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22. 2004 Q 18

Carbon monoxide gas passed over heated Iron (III) as shown in the diagram below.



a) Give the observation made in tube P.
(1 mark)

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b) Write the equation for the reaction which takes place in tube P.
(1 mark)

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23. 2004 Q 7a PP2

(a) Brine usually contains soluble calcium and magnesium salts. Explain how
sodium carbonate is used to purify brine.
(2 marks)

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24. 2005 Q 27

Dry carbon monoxide gas reacts with heated lead (II) oxide as shown in the equation below

$PbO(s) + CO(g) \rightarrow Pb(s) + CO_2(g)$

(a) Name the process undergone by the lead (II) oxide (1 mark)

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(b) Give a reason for your answer in (a) above (1 mark)

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(c) Name another gas that can be used to perform the same function as carbon monoxide gas in the above reaction.

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25. 2005 Q 28

When a hydrocarbon was completely burnt in oxygen, 4.2g of carbon dioxide and 1.71 g of water were formed. Determine the empirical formula of the hydrocarbon

(H= 1.0 ; C=12.0 ; 0 = 16.0)

(3 marks)

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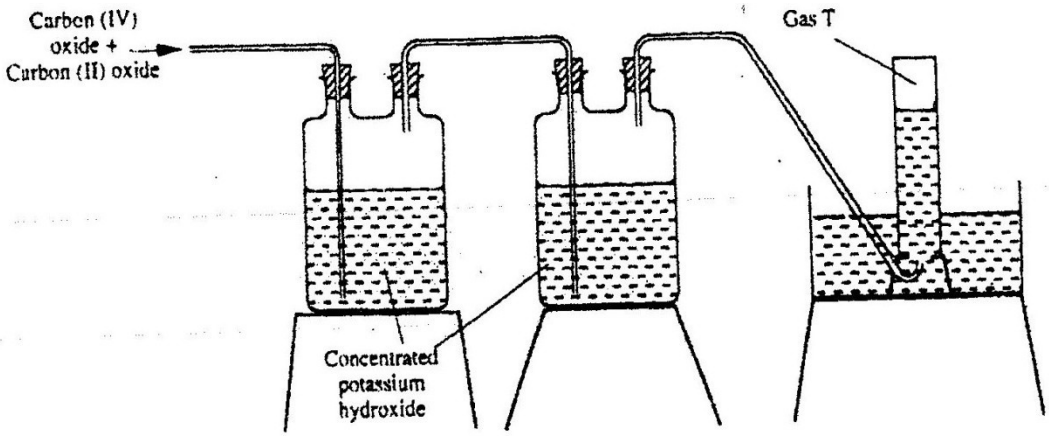
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26. 2006 Q 22

The diagram below represents part of a set – up used to prepare and collect gas T.



a) Name two reagents that are reacted to produce both carbon (IV) oxide and carbon (II) oxide.
(1 mark)

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b) Write the equation for the reaction which takes place in the wash bottles. (1 mark)

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c) Give a reason why carbon (II) oxide is not easily detected.
(1 mark)

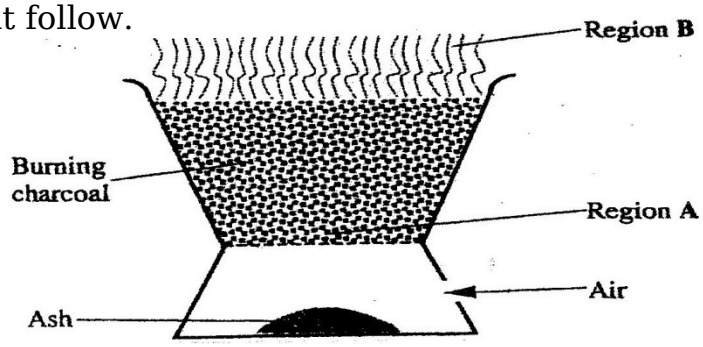
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27. 2007 Q 1

The diagram below shows a "Jiko" when in use. Study it and answer the questions that follow.



a) Identify the gas formed at region A.
(1 mark)

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b) State and explain the observation made at region B.
(2 marks)

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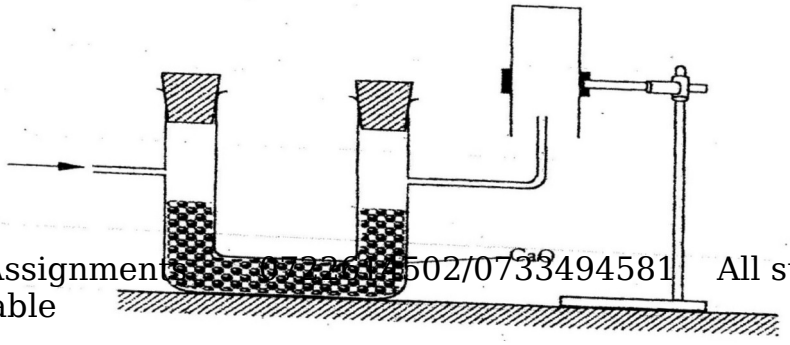
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28. 2007 Q 10

The set-up below was used to collect a dry sample of a gas.



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Give two reasons why the set-up cannot be used to collect carbon (IV) oxide gas. (2 marks)

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29. 2007 Q 5d P2

(d) Carbon exists in different crystalline forms. Some of these forms were recently discovered in soot and are called fullerenes

(i) What name is given to different crystalline forms of the same element?

(1 mark)

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(ii) Fullerenes dissolve in methylbenzene while the other forms of carbon
do not. Given that soot is a mixture of fullerenes and other solid forms of carbon, describe how crystals of fullerenes can be obtained from soot. (3 marks)

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(iii) The relative molecular mass of one of the fullerenes is 720. What is the molecular formula of this fullerene? (C=12.00)
(1 mark)

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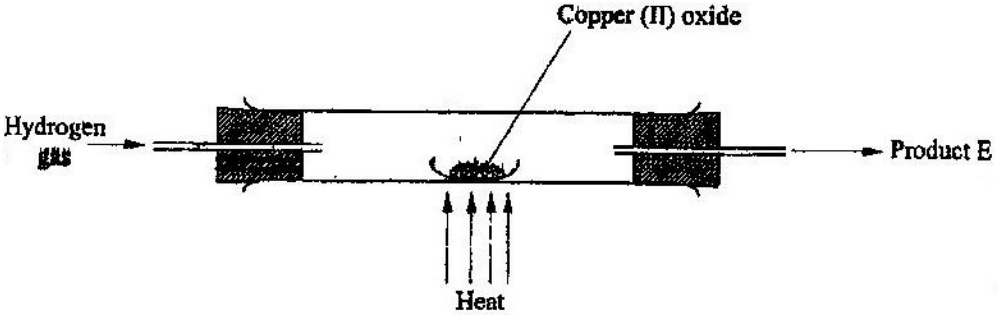
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30. 2008 Q 13

In a laboratory experiment hydrogen gas was passed over heated copper (II) oxide as shown the diagram below.



Describe a chemical test that can be used to identify the product E.
(2 marks)

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31. 2008 Q 26

When solid B_1 was heated, a gas which formed a white precipitate when passed through lime water was produced. The residue was dissolved in dilute nitric (V) acid to form a colourless solution B_2. When dilute hydrochloric acid was added to solution B_2 a white precipitate which dissolved on warning was formed.

a) Write the formula of the;

I Cation in solid B_1 (1 mark)

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II anion in solid B_1 (1 mark)

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b) Write an ionic equation for the reaction between the residue and dilute nitric (V) acid.
(1 mark)

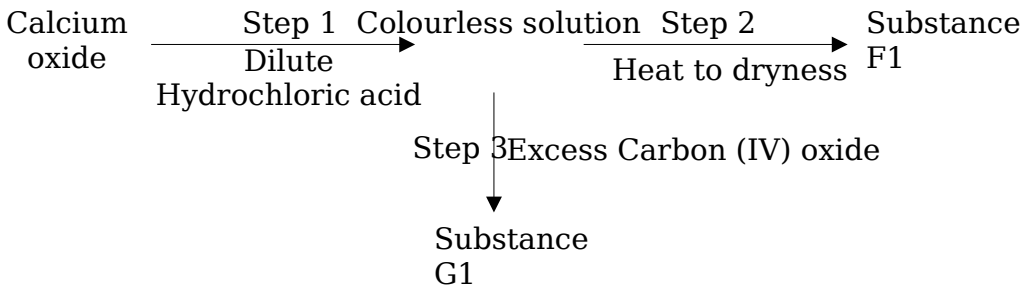
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32. 2008 Q 31

Study the flow chart below and answer the questions that follow.



a) Give the name of the process that takes place in step 1.
(1 mark)

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b) Give;

(i) The name of substance G_1

.....

(ii) One use of substance F_1

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33. 2009 Q 15

A student used the set up shown in the diagram below in order to study the reactions of some metals with steam. The experiment was carried out for ten minutes.

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(a) What observation would be made if gas F is ignited?

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(b) When the experiment was repeated using iron powder instead of magnesium ribbon,
very little gas F was obtained.
(i) Give a reason for this observation
(1 mark)

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(ii) What change in the conditions of the experiment should the student have made in
order to increase the volume of gas F produces.
(1 mark)

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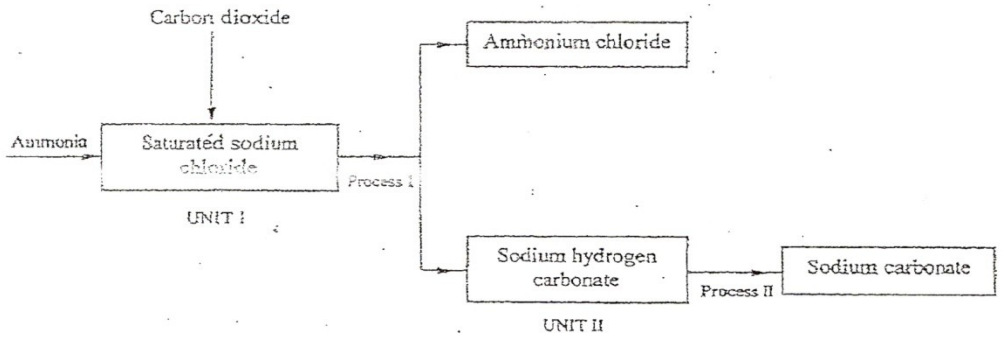
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34. 2009 Q 4 PP2

(a) The Schematic diagram shows part of the solvay process used for the
manufacture of sodium carbonate

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(i) Explain how the sodium chloride required for this process is obtained from sea water
(2 marks)

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(ii) Two main reactions take place in UNIT 1.The first one is the formation
of ammonium hydrogen carbonate

1. Write an equation for the reaction.
(1 mark)

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2. Write an equation for the second reaction
(1mark)

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(iii) State how the following are carried out
(2 marks)

1. Process 1

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2. Process II

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(iv) In an experiment to determine the percentage purity of the sample of sodium carbonate produced in the Solvay process, 2.15 g of the sample reacted completely with 40.0cm of 0.5 m sulphuric acid

I. Calculate the number of moles of sodium carbonate that reacted
(2 marks)

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II. Determine the percentage of sodium carbonate in the sample.
(Na=23.0, C=12, O=16.0)
(2 marks)

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(b) Name two industrial uses of sodium carbonate.
(2 marks)

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35. 2010 Q 15

Carbon (II) oxide is described as a “silent killer”

a) State **one** physical property of carbon (II) oxide that makes it a “silent killer” (1 mark)

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b) State and explain **one** chemical property that makes carbon (II) oxide poisonous to human beings
(2 marks)

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36. 2010 Q 26

A water trough, aqueous sodium hydroxide, burning candle, watch class and a graduated gas jar were used in an experimental set up to determine the percentage of active part of air. Draw a labeled diagram of the set up at the end of the experiment.
(3 marks)

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37. 2011 Q 11

Exhaust fumes of some cars contain carbon II oxide and other gases

a) Explain how carbon (II) oxide is formed in the internal combustion engines

(1 mark)

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b) Name two gases other than carbon (II) oxide that are contained in exhaust fumes and are pollutants.
(2 marks)

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38. 2011 Q 21

Graphite is one of the allotropes of carbon.

a) Name one other element which exhibits allotropy
(1 mark)

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b) Explain why graphite is used in the making of pencil leads.
(2 marks)

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39. 2012 Q23 P1

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Describe how the percentage by mass of copper in copper carbonate can be determined.

(3 marks)

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