

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

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

- (ii) Select the element which (1 mark)
 I Will form a divalent union

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- II Reacts most vigorously with water

(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. (°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. (°C)	1465	1418	Sublimes at 180	57	74	59	-35

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

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

- (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 ^o C
B	0.152	180
C	0.186	98
D	0.231	64
F	0.244	39

- (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 number 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 arrangement 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

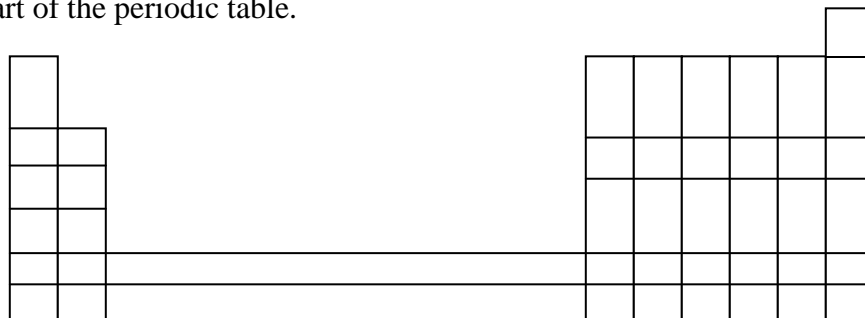
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Study the information below and answer the questions that follow. Letters W, X and Y represent elements in the periodic table but not the actual symbols of the elements

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

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

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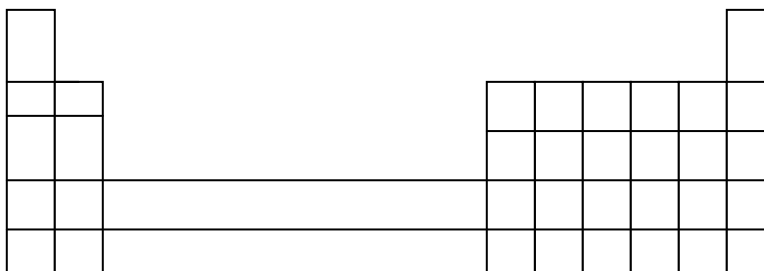
(b) What type of bond would be formed when X and Y react (1 mark)

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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.

13. 1994 Q 1

Complete the table below

Isotope	Number of		Electrons
	Protons	Neutrons	
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 (1 mark)

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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	GCl	801
H	12	650	HCl ₂	715
J	14	1410	JCl ₄	-70
K	16	113	K ₄ Cl 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

(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)

20. 1998 Q 15

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

					G				
					H			I	
F									

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 (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)

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 loses its outermost electron more readily than L. 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 from 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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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°C while that of sulphur is 44°C).

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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?

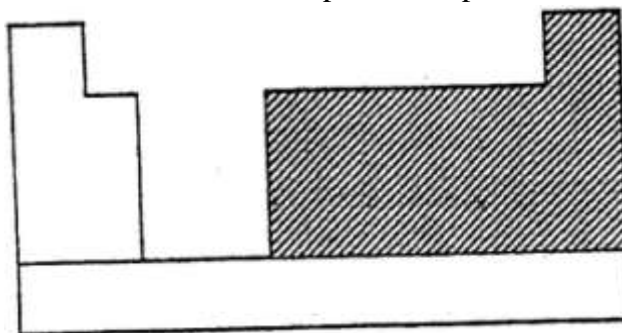
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32. 2003 Q 1a, b (i) PP2

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



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 K⁺ is greater than that of Na⁺ (1 mark)
 Mg²⁺ is smaller than that of Na⁺

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34. 2003 Q 10

An oxide of element F has the formula F₂O₅ (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.
(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

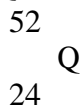
State and explain the relationship between the variations in the first ionization energies and the atomic radii. (3 marks)

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42. 2005 Q 4a,b

(a) An atom Q can be represented as



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 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 of 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 $^{18}_8\text{O}$. (1 mark)

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49. 2008 Q 11

The table below gives atomic numbers of elements represented by 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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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).

					R	S	
N	Q					T	U
P							

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

(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) H₂S

(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 ($^{\circ}\text{C}$)	26.3	31.7	22.0
Initial temperature ($^{\circ}\text{C}$)	22.0	22.0	22.0

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.

Element	Atomic No.	Melting Point (^o c)	Boiling Point (^o 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 (°C)	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)

.....
Period: (½ mark)

.....

(b) Helium, neon and argon belong to group 8 of the periodic table. Give :
(i) The general name of these elements; (1 mark)

.....

(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		B	C
D				E	F		G
							H

(a) Which is the 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°C 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)

STRUCTURE OF THE ATOM, PERIODIC TABLES AND CHEMICAL FAMILIES MARKING SCHEME

1. 1989 Q1a P1

- (i) 7 the relative atomic mass is closer to 7
(ii) Neutrons-4, electrons =3

2. 1989 Q13 P1

- (i) 2.8.8
(ii) Discharge Tube

3. 1989 Q33 P1

- (a) (i) No reaction, no more NaOH
(ii) $33 \pm 0.5 \text{ cm}^3$
(iii) 67°C
(iv) $(50+33) \times 67 \times 4.2 \text{ J} = 23356.2 \text{ Joules}$
Moles of NaOH $= \frac{50 \times 1}{1000} = 0.05 \text{ moles}$
Neutralization $= \frac{23356.2}{0.05} \times 10 = 467.1 \text{ kJ/mole}$

- (b) (i) WCl_2
(ii) NaCl and MgCl_2 – have the highest boiling points
(iii) No, reason, Group VIII elements are inert.

5. 1990 Q1 P1

- (a) P is more reactive than Q Reasons
(I) Metallic atoms lose electrons more readily down the group
(b) Electron arrangement Q = 2.8.2; P = 2.8.8.2. or differ by one energy level Atomic mass of P = $2+8+8+2 = 20$

6. 1990 Q11 P1

- (a) 2.8.5
(b) E forms covalent chloride/ molecular chloride burning Kerosene

7. 1991 Q2 P1

- (i) S group, explanation: atomic radius increase downwards
(ii) They are metal

8. 1991 Q8 P1

- (a) Neutrons = $69 - 31 = 38$
(b) $\frac{69 \times 60.4}{100} + \frac{71 \times 39.6}{100}$
 $= 41.676 + 28.116$
 $= 69.8 (69.792)$

9. 1991 Q30 P1

- (a) (i) B-2.8.2
F-2/8.6
(ii) B-basic
F-Acidic
(b) Allotropy/Allotropic
(i) $A \rightarrow C$ Number of outermost electrons increases / atomic radii decreases
hence metallic bond strengthen/ strength increase
(ii) D exhibits a giant atomic (covalent) structure each C atom is bounded by four covalent/strong bonds between atoms

10. 1992 Q1 P1

- (i) $Y^{2+} = 2.8.8$

(ii) $W^2 = 2.8.8$

11. 1993 Q1 P1

- (a) X = 2.8.8.2
Y = 2.6
(b) Ionic or electrovalent

12. 1993 Q23 P1

- (a) (i) v
(ii) S
(iii) Q because it needs to either lose or gain for electrons, thus its tendency to share electrons is high.
(iv) Alkali metals
(v) R and S are in same period, across the period nuclear attraction increase, nuclear charge increases / greater attraction by nuclear hence atomic radius decreases.

13. 1994 Q1 P1

Protons = 27, Neutrons = 32, Electrons = 27
 $= 3.78 \times 10^5 \text{ kg}$

14. 1995 Q1 P1

- a) X -2, 8, 3, $\sqrt{\quad}$ (1 mark)
Y - 2, 8, 6, $\sqrt{\quad}$ (1 mark)
b) X_2Y_3 $\sqrt{\quad}$ OR Al_2S_3 (1 mark)

15. 1995 Q12 P1

Hydrogen forms compounds by losing one electron like group I elements or by gaining one electron like group VII element / Hydrogen has one electron in outermost shell. (2 marks)

16. 1996 Q6, 15 P1

6. a) G
b) E
15. a) X, both energy levels are full i.e 2:8 outer energy level full/has octane structure/inert gas structure.
b) (i) W and Y
(ii) YW

17. 1997 Q23 P1

- a) - period 3 / Third period
- Y^{3-} / p^3
- Ionic radius is large – Atomic radius smaller
- Incoming electron repelled by electron in shell / energy level.

18. 1997 Q3 P2

- i) G, H, L ($\frac{1}{2}$ Mark if 2)
Reason = Have a 1, 2, 2 e's respectively in outer orbit / their Chlorides have a high M.P easily loses e's / outer orbital have less than 4 e's.
- ii) HK or Mgs (not KH or smg)
- iii) J has strong covalent bonds / has a giant covalent / atomic structure / weak van der waals between molecules.
- iv) +4 / 4⁺
- v) I – M.P of fluoride of G is higher because fluorine is more reactive than chlorine/forms stronger ionic bonds G than chlorine/Fluorine is more electronegative
II – reactivity of L is higher. Reactivity within metallic group increases down the group and L is below H. L loses e's easily // L is more electropositive.

19. 1998 Q7 P2

- (a) (i) S and W
- (ii) T, U, V
- (b) (i) V(I) it is the only element whose boiling point is below 298K
- (ii) V
- (c) (i) T(NO₃)₃
- (ii) 2S + U S₂U
- (d) Ionic (I) T. Is a metal while U is a non- metal ($\frac{1}{2}$). Therefore T loses electrons to U. T is electropositive while U electronegative. ($\frac{1}{2}$)
- (e) (i) Cathode
Hydrogen (I)
- (ii) Anode
Oxygen (I)

20. 1998 Q15 P1

- (a) (i) - F
- (ii) - I

21. 1998 Q7bP1

- (a) IV, II, I,III

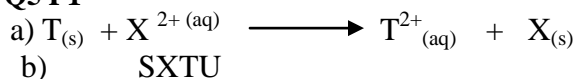
22. 1999 Q7 P1

C = 2.3; Valency 3
C₂S₃ OR C₂S₅

23. 1999 Q3a-d P2

- (a) M = 2.8, Q = 2.8.8
- (b) (i) Q
- (ii) Q or N
- (c) 4, Four
- (d) R has a large atomic radius than L (water) in its outermost electron is not tightly held in its nucleus (I)

24. 2000 Q5 P1



25. **2000 Q1 P2**
 a) i) Alkaline earth metals
 ii) A
 iii) Covalent
 They form bond by sharing of electrons:
 iv) D_2O_3 or Al_2O_3
 v) Tick or G is in the right place

 b) i) H Their boiling points are quite close
 ii) K
 iii) I L its boiling point is lower than room temperature and is slightly soluble in water.
 II J
26. **2001 Q3 P1**
 (a) (i) B || Magnesium || 2.8.2
 (ii) C || Sodium || 2.8.1
 (b) D || Argon || 2.8.8.2
27. **2001 Q13 P1**
 G3, because it has the smallest atomic radius. Its outer most electron is tightly held by the nucleus or it requires a lot of energy to remove it.
28. **2001 Q6a P2**
 (a) (i) Alkali metals
 (ii) - Enthalpy change when 1 mole of e-5 is removed from 1 mole of gases atom or
 - Energy required to remove radius therefore the outermost electron is MOST STRONGLY attracted to the nucleus, hence more energy is required to removed it.
 (most strongly or very strongly in the attraction must be mentioned for a candidate to score 1 mark)
29. **2002 Q1 P1**
 It is uncreative
30. **2002 Q2 P1**
 Oxygen exists as discrete molecules (O_2) with only weak van der waal forces between them. While sulphur exists as S_8 rings and chains which are bulky
31. **2002 Q3, 5 P1**
 A sulphur, carbon, nitrogen
 B Sodium potassium, lithium

 (a) calcium 2.8.8.2
 Beryllium 2.2
 (b)(i) Both elements are in the same group but the two valence electrons of calcium are further away (1) They are not strongly held by the nucleus,

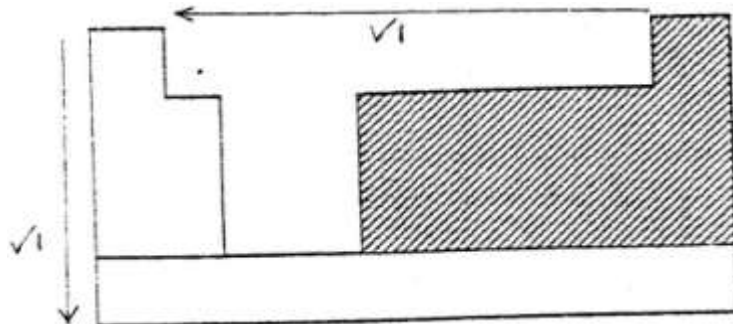
hence are readily released.

(1)

(3 marks)

32. 2003 Q1a, b (i) P2

a) Non-metals



b) i) KB/KF/KI/KA

33. 2003 Q2 P1

K^+ has three energy levels while Na^+ has only two (1)

Mg^{2+} nucleus has 12 protons attracting 10 e^- (1) Na^+ has 11 protons attracting 10 e^- hence

Mg^{2+} radius shrinks more (1) Or Mg^{2+} has higher nucleus charge (1) shrinking the ions (1)

34. 2003 Q10 P1

a) +5 / 5

b) 5 / V

35. 2003 Q24 P1

Group 7 elements react by gaining electrons. A small atom has a high e^- affinity. This trend decreases down the group.

36. 2004 Q3 P1

The energy required to remove the outermost electron is lower for B than for (1) therefore B is more reactive than (i) (2 marks)

37. 2004 Q16 P1

a) F and J (1 mark)

b) HFJG (2 marks)

38. 2004 Q20 P1

Neutron – proton ratio

Amount of energy released during isotope decay

39. 2004 Q1a P2

(a) (i) Green/ yellow gas

(ii) Slightly soluble/ soluble (Rej highly soluble

(iii) Violet/ purple/ grey/ black solid

40. 2005 Q6 P1

(a) B and F

They are isotopes i.e. atoms of the same element with same mass number but different atomic number

(b) Mass number = Atomic number + No. of neutrons

$$7 = 3 + n$$

$$7 = 3n$$

$$N = 4$$

$$\text{Cl} \quad \text{H}$$

41. 2005 Q16 P1

Increases atomic radius results in decrease of 1st ionization energy

Increasing the radius, decreases the force of attraction from to the outermost electron.

Hence decreasing in the 1st ionization energy down the group.

42. 2005 Q4a, b P1

a) The number 52 represents mass number i.e.: the sum of the number of protons and neutrons in an atom of an element.

$$N = 20 = 2: 8: 8: 2 \quad p = 17 = 2:8:7$$

b) i) $N + p_2 \rightarrow Np_2$

ii) P,R and S

P is a non – metal while R and S are metals, arranged in the order of S,R and P from left to right form metals (S and R) but increases from left to right for non – metal (p)

iii) S, it is a metal and is the one having the largest atomic radius which decreases from left to right for metal of the same period.

iv) p and u

43. 2006 Q5 P1

a) In solid state - Does not conduct
Ions are fixed (1 ½ marks)

b) Aqueous solution - Conducts
Ions are mobile (1 ½ marks)

44. 2006 Q12 P1

$$62.93 \times 69.09 + 64.93 \times 30.91$$

$$100$$

$$= 43.4783 + 20.0698$$

$$= 63.548$$

(3 marks).

45. 2007 Q3a, 8

3a) Group (VIII) elements

8. Across the period there is a gradual increase in number of protons in the nucleus. This increases the force as attracted between the nucleus and the electrons.

46. 2007 Q25b P1

(b) It is less dense and does not burn like hydrogen

47. 2007 Q26 P1

- (a) They are both metals and need to lose electrons to be stable
 (b) $\text{RCO}_3(\text{s}) \rightarrow \text{RO}(\text{s}) + \text{CO}_2(\text{g})$
 (c) Q^{-3}

48. 2008 Q7 P1

- (a) Atoms of the same element having different masses or atoms of the Same element having different number of neutrons.
 (b) $18 - 8 = 10$ neutrons

49. 2008 Q11 P1

- (a) Ionic/ electrovalent
 (b) Has 7 electrons in its outermost energy level and hence easily gains an electron to complete the octet or it is most electronegative.

50. 2008 Q18 P1

- (a) Position for silicon
 (b) U

51. 2009 Q1 P1

- (a) Energy required to remove 1 mole of electrons from 1 mole of gaseous atoms
 (b) B (1) 418??? It loses electrons most readily (1)
 Reject lowest i.e. $\text{Mg}(\text{HCO}_3)_2(\text{aq}) \rightarrow \text{MgCO}_3 + \text{H}_2\text{O} + \text{CO}_2(\text{g})$

(1 mark)

52. 2009 Q3 P1

- (i) 2.8.8
 (ii) 2.8.2

53. 2009 Q6 P1

- 60
 $30^{\text{E}+21}$ wrong/ correct change (- 1/2)

54. 2010 Q4a P2

- a) i) C, copper A,B
 B is the most reactive because it has highest ΔT
 C is the least reactive because it cannot displace ions of copper from solution. A is more reactive than copper because it displaces Cu^{2+} from solution.
 ii)
 Blue colour of the solution fades/ disappeared.
 Black deposit is formed.

55. 2011 Q5a, b (i-iii) P2

- 5(a)
- Electron is negatively charged while proton is positively charged
 - Electron has a mass of $\frac{1}{1840}$ units while proton has a mass of 1 unit
 - Mass of proton is bigger than that of electron.
- 5(b)

- (i) F
- (ii) 27
- (iii) E_2G_3 / A_2O_3

56. 2011 Q22 P1

- (a) Bromine
- (b) -At room temp ($25^{\circ}C$) bromine is solid since its MP and BP is between $-7^{\circ}C$ and $5^{\circ}C$
- Atomic mass of iodine is higher than that of Cl_2
- Molecular mass

57. 2011 Q24 P1

- (a) Y
Y and Z the 2 must be mentioned
- (b) They have the same number of protons (8) but different atomic masses/
Mass numbers / number of neutrons

58. 2011 Q31 P1

Alkaline earth metals

59. 2012 Q2 P2

- (a) C, \sqrt it has small size/ hence readily attracts electrons to itself. / highest electrons
highest tendency to gain electrons. affinity/ smallest to radius / most
electronegative electrons (2 marks)
(accept)
- (b) (i) $AB_2 / CO_2 / AB / CO$ (1 mark)
- (ii) Covalent bond (1 mark)
- (c) (i) Halogens \sqrt 1
- (ii) $C_2 (g) 2H^- aq \longrightarrow H_2 (s) + 2C^-(aq)$ (1 mark)

OR



Accept state of H_2 as aq or g.

- (d) F - has very strong covalent $\sqrt{1/2}$ bonds between the atoms with giant atomic $\sqrt{1/2}$ structure.
- G - is made up of atoms $\sqrt{1/2}$ bonded, covalently. The molecules have weak
Vander waals $\sqrt{1/2}$ forces. Simple molecular structure (2 marks)
- (e) $D_2O \sqrt{1/2}$ OR $D_2O_2 \sqrt{1/2}$ OR Na_2O OR Na_2O_2 (1 mark)
- (f) \sqrt 1 mark



60. 2012 Q4 P1

- (a) BDAC - across the period the number of protons / or nuclear charge increases
Or across the period atomic radius decrease

NB: CADB - from right to left atomic radius increases

- (b) D.

Across the period conductivity increases due to increase to delocalised/ free electrons

61. 2012 Q14 P1

Ionisation energy – is the energy required to remove an electron from an atom an
atom in gaseous

Electron affinity – is the energy change that results in the formation of an ion when an
atom gains electron.

62. 2012 Q27 P1

- (a) group 5 (or v) (or five)
Period 3 /III/ or three

(b) (i) noble gases / inert gases / rare gases

(ii) in balloons (Helium)

- fluorescence lamps / light bulb
- disco lights
- arc welding
- x-ray tubes
- in diluting O₂ gas cylinder, deep sea diving, mountain climbing