

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

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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. (°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?

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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 °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. ^o (C)	B.P. ^o (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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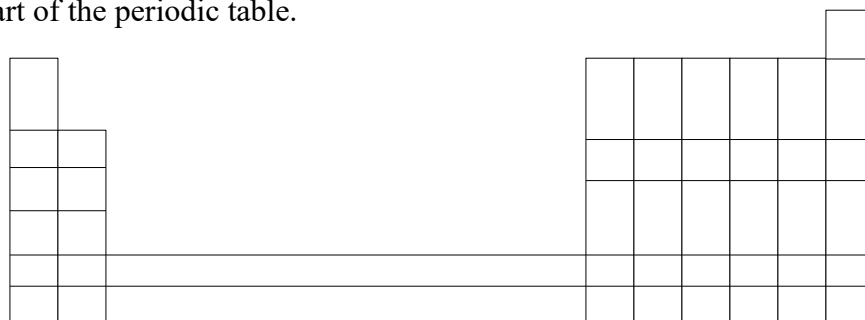
10. 1992 Q 1

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 Y₂W

(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 Y₂W

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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)

.....
.....

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)

.....

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

.....

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

.....

(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)
-
- (b) Write the formula of the compound that would be formed between X and Y (1 mark)

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)
-
- b) As a thermal insulator (1 mark)
-

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

- (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

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)

-
 (b) Write the formula of the most suitable anion formed when element Y ionizes (1 mark)

-
 (c) Explain the difference between the atomic radius of element Y and its ionic radius (1 mark)

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)

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

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)

.....
(ii) Period (1 mark)

.....
(b) Which element
(i) Is in gaseous state at room temperature? Explain

(Take room temperature to be 298K)

(2 marks)

.....
.....
(ii) Does not form oxide?

(1 mark)

(c) Write the

(i) Formula of the nitrate of element T

(1 mark)

.....
(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)

.....
ii. Most reactive metal

(4 marks)

.....
iii. Most reactive non-metal

(4 marks)

.....
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)

.....
.....

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

.....
.....

b) Select an element which is

i) The most reactive non – metal

.....

ii) A poor conductor of electricity

.....

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

.....

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

.....

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

.....

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)

								A
						B		
		C				D		E
		F						

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

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

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

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

- (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)

- ii. A soluble carbonates (1 mark)

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

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)

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?

(ii) What is meant by ionisation energy?

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

(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.

29. 2002 Q 1

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

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).

.....

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

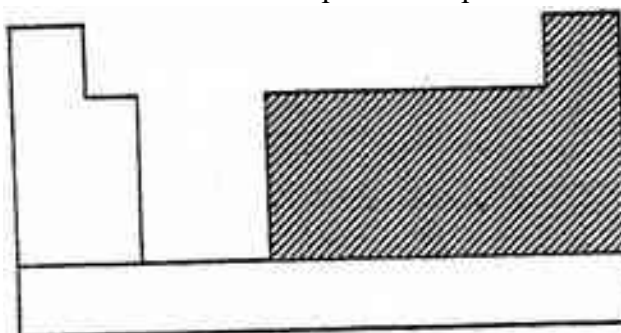
5. (a) Write the electronic configuration of calcium (atomic number 20) and Beryllium (atomic number 4)

(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)

.....

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)

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
mark)

(1

K⁺ is greater than that of Na⁺
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

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

(1

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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)

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

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.

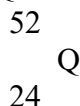
Element	First Ionisation energy (kJmol ⁻¹)	Atomic Radius (nm)
I	520	0.15
II	500	0.19
III	420	0.23
IV	400	0.25

State and explain the relationship between the variations in the first ionization energies and the atomic radii.

(3 marks)

42. **2005 Q 4a,b**

(a) An atom Q can be represented as



What does the number 52 represent? (1 mark)

(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)

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

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

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

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)

(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.

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

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)

.....

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

.....

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

48. 2008 Q 7

a) What are isotopes?
 (1 mark)

.....

 b) Determine the number of neutrons in $^{18}_8\text{O}$.

(1 mark)

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)

.....

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

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).

N	Q				B	S	
P					T		U

- 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)

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)

.....

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

.....

52. **2009 Q 3**

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

- (a) H₂S
- (b) SO₃²⁻

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)

54. **2010 Q 4a PP2**

a) 50cm³ of 1M copper (II)sulphate solution was placed in a 100cm³ 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 (°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)

.....

- 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)

.....

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

.....

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

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 ($^{\circ}\text{C}$)	Boiling Point ($^{\circ}\text{C}$)
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)

.....

b) Explain why the boiling point of iodine is much higher than that of chlorine. (2 marks)

.....

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)

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

.....

58. 2011 Q 31

What name is given to elements which appear in group (II) of the periodic table? (1 mark)

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)

.....

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

.....

60. 2012 Q14 P1

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

.....

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 : (1 mark)

(i) The general name of these elements;

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

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)

.....

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

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

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

.....
(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)

.....
(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)

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

.....
(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)