STRUCTURE OF THE ATOM

& PERIODIC TABLE

KCSE QUICK REVISION

Compilation of Possible Questions in Chemistry Likely to be Examined in KCSE.

A Special Analysis of Prediction Questions that may be Tested in KCSE from this Topic in Form 2.

CHEMISTRY

SERIES 1

For Marking Schemes

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STRUCTURE OF THE ATOM AND THE PERIODIC TABLE

1. In an experiment an unknown mass of anhydrous sodium carbonate was dissolved in water and the solution made up to 250cm^3. 25cm^3 of this solution neutralized 20cm^3 of 0.25M nitric acid.
(Na = 23.0 C = 12.0 O = 16.0)
Calculate:
(a) Moles of Nitric acid used
(b) Moles of sodium carbonate in 25cm of the solution
(c) Mass of unknown sodium carbonate used

2. Element **A** has atomic mass 23 and element **B** has atomic mass 7 and also have 12neutorns and 4 neutrons respectively.
(a) Write the electronic arrangement of **A** and **B**
(b) Which element has higher ionization energy? Explain

3. The table below shows the relative atomic masses and the percentage abundance of isotope M_1 and M_2 of element **M**.

	Relative atomic mass	**% abundance**
M_1	62.93	69.09
M_2	64.93	30.91

Calculate the relative atomic mass of element **M**

4. (a) Element **V** has two isotopes. Two thirds of V and one third of V . What is the relative atomic mass of element **V?**
(b) The following refers to element **Y**

Isotope	A	B	C
Isotope mass	54	56	57

Given that isotope **C** contains 31 neutrons in its nucleus find the number of protons in
isotope **B**

5. The table below shows the relative atomic masses and the percentage abundance of the isotopes L_1 and L_2 of element L.

	Relative atomic mass	% abundance
L_1	62.93	69.09
L_2	64.93	30.91

Calculate the relative atomic mass of element K.

6. An element **M** has two isotopes **M** and **M** . The relative atomic mass of the naturally occurring is 63.55. Calculate the percentage of each isotope

7. An oxide of element **G** has the formula as G_2O_3

(a) State the valency of element **G**

(b) In which group f the periodic table is element **G**?

8. The table below gives information about the ions T^+ and Z^{2-}

Ion	**T^+**	**Z^{2-}**
Electron arrangement	2.8	2.8.8
Number of neutrons	12	16

(a) How many protons are there in the nucleus of ?

(i) Element **T**?

(ii) Element **Z**?

(b) Determine the relative formula mass of the compound formed between **T** and **Z**

(c) State **two** conditions under which the compound would conduct electricity

9. Carbon and silicon belong to the same group of the periodic table, yet Carbon (IV) oxide is a gas while silicon (IV) oxide is a solid with a high melting point. Explain this difference

10. An ion of oxygen is larger than oxygen atom. Explain

11. Copper (II) oxide and charcoal are black solids. How would you distinguish between the two solids?

12. (a) Element X is found in period III and group IV. It consists of two isotopes ^{28}X and ^{Q}X. A sample of X was found to consist of 90% of ^{28}X.If the relative atomic mass of X is 28.3, work out the number of neutrons in ^{Q}X

(b) Draw an electrochemical cell for the above cell

13. Study the table below and answer the questions that follows:- (Letters are not the actual symbols of element)

Element	Electronic arrangement	Electrical conductivity
L1	2.8.2	Higher electrical conductivity
L2	2.8.1	High electrical conductivity
L3	2.8.3	Highest electrical conductivity

L3 has the highest electrical conductivity. Explain

14. Define the term melting point of a substance

15. 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	**Q**	**P**	**R**	**S**	**T**
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

(b) Give the number of neutrons in an atom of element **R**

16. The table below gives some elements in the periodic table. Use it to answer the questions that follow. The letters do not represent the actual symbols of the elements.

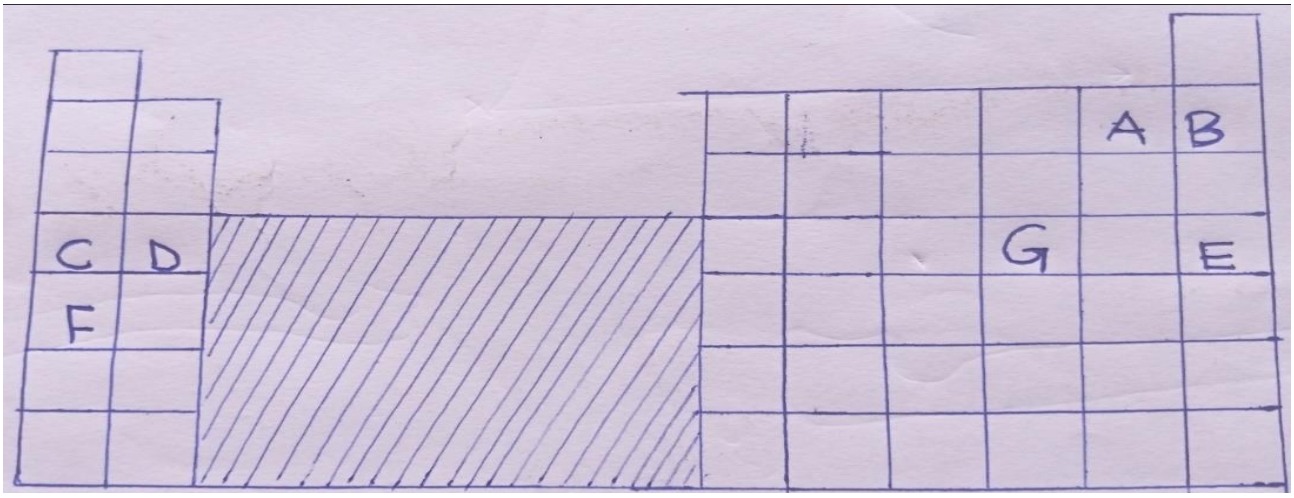
Element	A	B	C	D	E
Atomic number	12	13	14	15	16

Which of the above letters represent:

a) A metallic element which forms ions with the smallest ionic radius? Explain

b) A non metallic element with the largest bbatomic size? Explain

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



a) Write down the formula of the compound formed between C and A.

b) Which element has the same electron arrangement as the stable ion of:

(i) **F** …….. (ii) **A** ……..

c) Element **Q** has atomic number 15. Indicate its position on the grid.

d) Explain how the atomic radii of the following compare:

(i) C and F

(ii) C and D

e) Write the type of bond present in a compound formed between D and A.

f) Compound C and G were completely burned in oxygen.

(i) Write down equations to show the combustion of each of the elements.

(ii) State whether each of the oxides (i) above is basic or acidic.

18. The number of protons, neutrons and electrons in atoms **A** to **F** are given in the table below the letters do not represent the actual symbol of the elements:-

Atoms	Protons	Neutrons	Electrons
A	3	4	2
B	9	10	10
C	12	12	12
D	17	18	17
E	17	20	17
F	18	22	18

(a) Choose from the table the letters that represent:

(i) An atom of a metal .....

(ii) A neutral atom of a non-metal.....

(iii) An atom of a noble gas .....

(iv) A pair of isotopes .....

(v) A cation .....

19. (a) Study the table below and answer the questions that follow.

Particle	Atomic number	Ionic configuration	Formula of oxide	Atomic radii	Ionic radii
P	4	……..	……..	0.110	0.031
Q	……..	2.8.8	QO	0.200	0.099
R	……..	2.8.8	R_2O	0.230	0.133
S	17	2.8.8	S_2O_7	0.099	0.181
T	16	……..	……	0.104	0.231

(i) Complete the table above

(ii) From the table, choose the most reactive metal. Explain

(iii) Which element is the most electronegative. Explain

(iv) Using dots (**.**) and crosses (x) to represent electrons, show the bonding in the chloride of **Q**

(v) Explain the solubility of element **T** in water

(b) (i) Why is aluminium used to make utensils yet it is a reactive metal?

(ii) Distinguish between valency and oxidation number

20. a) Work out the oxidation number of phosphorous in the following compound H_3PO_3

b) Study the equation below:

$$Mg_{(s)} + 2H_2O_{(l)} \longrightarrow Mg(OH)_{2(aq)} + H_{2\,(g)}$$

Which species has undergone oxidation .Explain

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

(a) Explain why element **L** appears in two different groups in the grid above

L							**L**	
M	**P**			**T**		**J**	**U**	**X**
N	**Q**			**S**			**V**	**Y**
							W	

(b) State the name of the chemical family to which **P** and **Q** belong

(c) Write the formula of the compound formed between **P** and **V**

(d) Compare the melting points of **Q** and **S**. Explain

(e) Identify an element whose oxide dissolves in both acids and alkalis

(f) Write the equation for the burning of **T** in excess air

(g) Using dots (•) and cross (**x**) to represent electrons, draw a diagram to illustrate bonding in the sulphide of **Q**

(h) State **one** use of element **X**

22. The grid below is part of the periodic table. The elements are not represented by their actual symbols. Use the information to answer the questions that follow.

T					K	S		
		W	R				N	
Q								

a) (i) Which is the most reactive

(I) Non — metal?

Explain

(II) Metal?

Explain

(ii) Name the family to which elements **T** and **Q** belongs.

(iii) Write the formula of the compound formed when **W** reacts with **S**.
(iv) Name the type of bond and structure formed when elements **R** and **K** react.
(v) Explain why element **N** doesn't form compounds with other elements.
(vi) Compare the atomic radii of **T** and **Q.** Explain.

23. Study the data given in the following table and answer the questions that follow. The letters are not the actual symbols of elements.

Element	Number of protons	Melting point	Bpt ^{o}C
A	11	98	890
B	12	650	1110
C	13	60	2470
D	14	1410	2360
E	15	442 590	280
F	16	113 119	445
G	17	-101	-35
H	18	-189	-186

(i) State and explain the trend in melting point in **A B C**
(ii) Explain why the melting point and boiling points of element **D** is the highest
(iii) Explain why the element represented by letter **E** has two melting point values
(iv) Write down the chemical formula between element **C** and sulphate ions
(v) Name the chemical family in which **H** belong and state one use of the element
(vi) What is the nature of the oxide of the elements represented by letters **C** and **F**?

24. An element **W** has an atomic number 13.
a) Write the electronic configuration of the most stable ion of **W**
b) Write the formula of the oxide of the element **W**

25. Identify the particles that facilitate the electric conductivity of the following substances

(i) Sodium metal

(ii) Sodium Chloride solution

(iii) Molten Lead Bromide

26. Compare with a reason the atomic radius of Sodium to that of Aluminum.

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

Ion	No. of protons	No. of electrons
P^{3-}	7	10
Q^{+}	19	18
R^{2+}	12	10

a) Write the electron arrangement of element P.

b) Give the group and period to which elements Q and R respectively.

Q ……

R ……

28. Ethanol is a liquid at room temperature but does not conduct electricity. Explain.

29. Electronic configuration for elements represented by **P, Q, R** and **S** are:-

P= 2.8.6, Q= 2.8.2, R= 2.8.1 D= 2.8.8.

(a) Select the element which forms

(i) A double charged ion

(ii) A soluble carbonate

30. The table below gives information on four elements by letters **K, L, M** and **N**. Study it and answer the questions that follow. The letters do not represent the actual symbol of the elements.

Element	**Electron arrangement**	**Atomic radius (nm)**	**Ionic radius (nm)**
K	2.8.2	0.136	0.065
L	2.8.7	0.099	0.181
M	2.8.8.1	0.203	0.133
N	2.8.8.2	0.174	0.099

(a) Which **two** elements have similar properties? Explain

(b) What is the most likely formula of the oxide of **L**?

(c) Which element is non-metal? Explain

31. Study the information given below and answer the questions that follow:

Element	Atomic radius (nm)	Ionic radius (nm)	Formula of oxide	Melting point of oxide (^oC)
A	0.364	0.421	A_2O	-119
D	0.830	0.711	DO_2	837
E	0.592	0.485	E_2O_3	1466
G	0.381	0.446	G_2O_5	242
J	0.762	0.676	JO	1054

(i) Write the formula of the compound formed when **J** combined with **G**

(b) Explain why the melting point of the oxide of **E** is higher than that of the oxide of **G**

For Marking Schemes/Answers

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