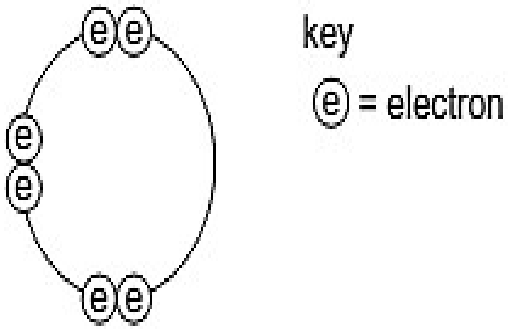
ILEYS SECONDARY SCHOOL

FORM 4 CHEMISTRY ASSIGNMENT ATOMIC STRUCTURE

MULTIPLE CHOICE QUESTIONS

1. **A nuclear particle that has about the same mass as a proton, but with no electrical charge, is called a(n)**
   A. Nuclide.
   B. Electron.
   C. Neutron.
   D. Isotope
2. **Which atom has the highest electronegativity?**
   A. Na
   B. P
   C. Cl
   D .Br
3. **Element X has six electrons in its outer shell.**



   How could the element react?
   A. by gaining two electrons to form a positive ion
   B. by losing six electrons to form a negative ion
   C. by sharing two electrons with two electrons from another element to form two covalent bonds
   D. by sharing two electrons with two electrons from another element to form four covalent bonds
4. **The nucleus of an atom has all of the following characteristics EXCEPT that it**
   A. Is positively charged.
   B. Contains nearly all of the atom's mass.
   C. Is very dense.
   D. Contains nearly all of the atom's volume.

Bare: Xamse Carab

5. Which one of the following sets represent a pair of isotopes?

A. $^{12}_{6}C$ and $^{14}_{7}N$ B) $^{32}_{16}S$ and $^{32}_{16}S^{2-}$

C) O_2 and O_3 D) $^{206}_{82}Pb$ and $^{208}_{82}Pb$

6. The nucleus of most atoms is composed of

A. Tightly packed protons.
B. Tightly packed protons and neutrons.
C. Tightly packed neutrons.
D. Loosely connected protons and electrons.

7. What is the electron configuration for potassium (atomic number 19)?

A) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5\ 3d^2$
B) $1s^2\ 2s^2\ 2p^8\ 3s^2\ 3p^5$
C) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
D) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^7$
E) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5\ 4s^1$

8. The symbols of two atoms may be written as shown.

$^{52}_{23}X$ $^{52}_{24}Y$

Which statement about these atoms is correct?

A. They are different elements because they have different numbers of neutrons.
B. They are different elements because they have different numbers of protons.
C. They are isotopes of the same element because they have the same nucleon number.
D. They are isotopes of the same element because they have the same proton number.

9. Protons have

A. Negative charges.
B. No charges.
C. An attraction for neutrons.
D. No mass

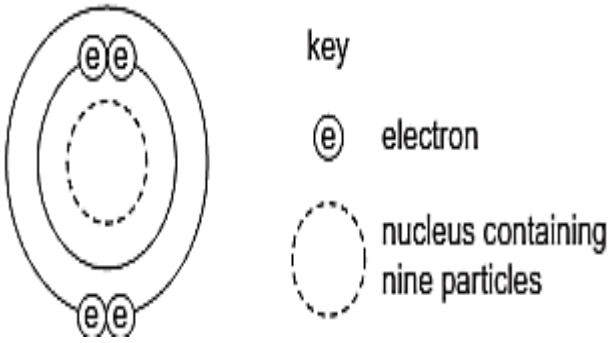
10. Most of the volume of an atom is occupied by the

A. Nucleus.
B. Electron cloud.
C. Nuclides.
D. Protons.

11. The diagram on the right shows an atom.

What is the proton number and neutron number of the atom?

	proton number	neutron number
A	4	5
B	4	9
C	5	4
D	5	9



12. An atom is electrically neutral because

A. Neutrons balance the protons and electrons.
B. Nuclear forces stabilize the charges.
C. The numbers of protons and electrons are equal.
D. The numbers of protons and neutrons are equal.

13. Helium-4 and helium-3 are

A. Isotopes.
B. Compounds.
C. Different elements.
D. Nuclei.

14. The total number of protons and neutrons in the nucleus of an atom is its

A. Atomic number.
B. Mass number.
C. Avogadro constant.
D. Number of neutrons.

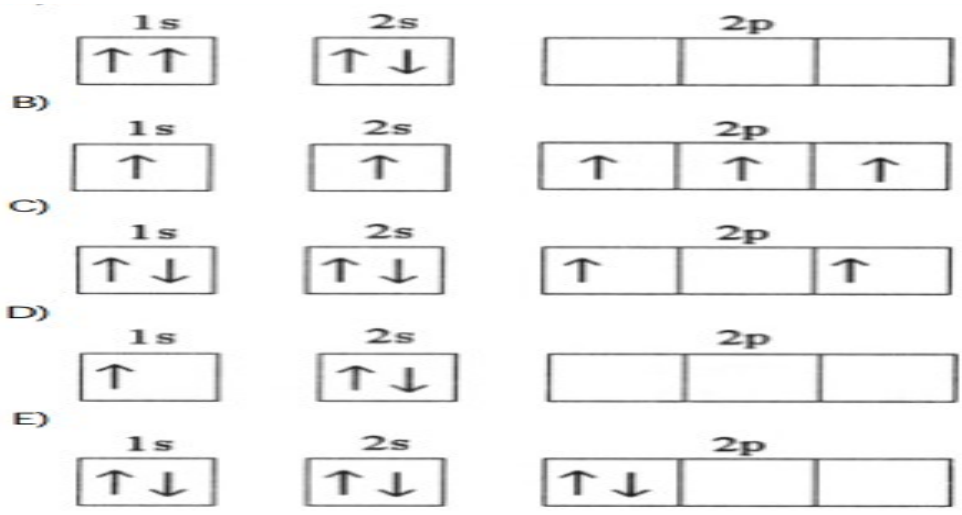
15. All atoms of the same element have the same

A. atomic mass
B. Mass number.
C. Number of neutrons.
D. Atomic number.

16. The atomic mass listed in the periodic table is the

A. Average atomic mass.
B. Relative atomic mass of the most abundant isotope.
C. Relative atomic mass of the most stable radioactive isotope.
D. Mass number of the most abundant isotope.

17. Which orbital diagram represents a violation of the Pauli Exclusion Principle?



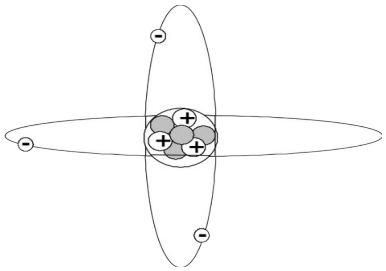
18. Zn-66 (atomic number 30) has

A. 30 neutrons.
B. 36 neutrons.
C. 33 neutrons.
D. 96 neutron

19. Ag-109 has 62 neutrons. The neutral atom has

A. 40 electrons.
B. 53 electrons.
C. 47 electrons.
D. 62 electrons.

20. The following diagram represents an atom of lithium.



Which of the following statements is **true**?

A. A lithium atom has 3 neutrons
B. Neutrons carry a charge of -1
C. The atomic number is 4
D. A lithium atom has 3 electrons

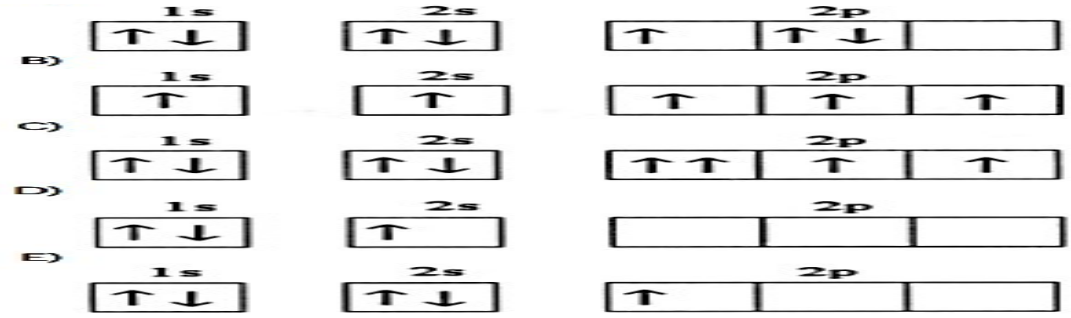
21. The part of the atom where the electrons CANNOT be found is the

A. Area surrounding the nucleus.
B. Electron cloud.
C. Nucleus.
D. Orbitals.

22. **The orbitals that are dumbbell-shaped and directed along the x, y, zaxes are called**

A. Dorbitals.
B. Forbitals.
C. P orbitals.
D. S orbitals.

23. Which of the following denotes an orbital diagram for a boron atom?



24. The major difference between a 1s orbital and a 2sorbital is that

A. The 2sorbital can hold more electrons.

B. The 2sorbital has a slightly different shape.

C. The 2sorbital is at a higher energy level.

D. the 1sorbital can have only one electron

25. The number of orbitals for the d sublevel is

A. 5.

B. 3.

C. 7.

D. 2

26. How many electrons can occupy the sorbitals at each energy level?

A. two, if they have opposite spins

B. one

C. two, if they have the same spin

D. no more than eight

27. If nis the principal quantum number of a main energy level, the number of electrons in that energy level is

A. n.

B. n^2

C. 2n.

D. $2n^2$

28. Which of the following electron configurations is incorrect as written?

A) $1s^2 2s^2 2p^6 3s^2 3p^6$

B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$

C) $1s^2 2s^2 2p^6 3s^2$

D) $1s^2 2s^2 2p^6$

E) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$

29. **The atomic sublevel with the next highest energy after 4pis**
   A. 4d.
   B. 5p.
   C. 4f.
   D. 5s.

30. The element with electron configuration $1s^2 2s^2 2p^6 3s^2 3p^2$ is
   A. Mg (Z= 12).
   B. S (Z= 16).
   C. C (Z= 6).
   D. Si (Z= 14).

31. These subatomic particles determine how the atoms of an element will behave chemically
   A. proton
   B. electron
   C. neutron
   D. valence electron

32. The electron configuration of Ga is _____.

A) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^1$

B) $[Ar] 4s^2 3d^{11}$

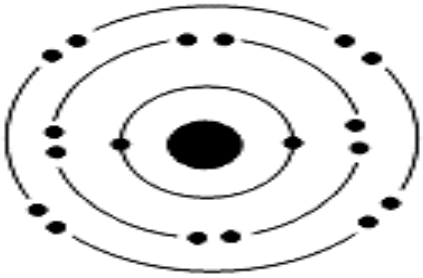
C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$

D) $1s^2 2s^2 3s^2 3p^6 3d^{10} 4s^2 4p^1$

E) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4d^1$

STRUCTURED QUESTIONS

1. The diagram below shows the electronic arrangement of an unknown substance



i. How many protons would there be if the unknown substance was a neutral atom?.....
.....

ii. How many protons would there be if the substance was a $2^{+¿¿}$ ion?
.....

iii. In what group of the periodic table would the unknown substance be if the represented a $1^{+¿¿}$ ion?
.....

iv. How many neutrons would the $1^{+¿¿}$ ion have if its relative atomic mass was 39?
.....

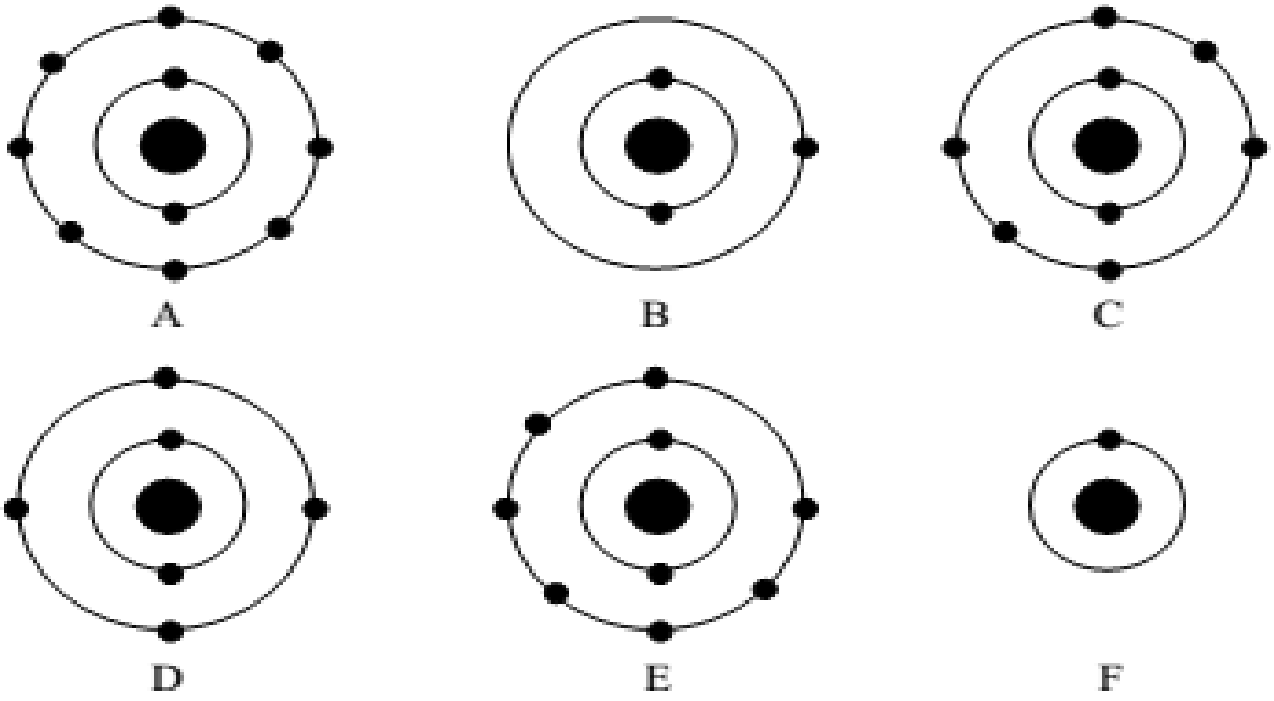
v. In what group of the periodic table would the unknown substance be if it represented a $1^{-¿¿}$ ion?
.....

2. Complete the following paragraphs about atoms.

Atoms are the _____ particles of matter that can exist on their own. They are made up of particles called protons, _____ and electrons. Protons have a _____charge and electrons have a _____ charge. The protons are found in the _____ of the atom. In a neutral atom, the number of protons must _____ the number of electrons. If they do

not, the particle will be called an _____. The number of protons in an atom is called its _____ _____. The total number of particles in the nucleus gives the _____ _____ of the element

3. The diagrams below represent the electronic arrangement of different atoms and ions



i. Which letter represents an atom of a Group I metal? .....
.....

ii. Which letter represents an atom of a Group VII non-metal? .....
.....

iii. Which letter represents an atom of a noble or inert gas? .....
.....

iv. Which letter represents an atom which is not in the second period of the Periodic Table? .....
.....

v. Which letter represents an ion of a Group I metal? .....
.....

vi. Which two letters represent atoms which forman ionic compound with a formula similar to Na_2S? .....
.....

4. An unknown element is found to exist as the following two isotopes:

$^{24}_{13}X$ $^{28}_{13}X$

i. Complete the following table

	number of protons	number of neutrons	number of electrons
$^{24}_{13}X$			13
$^{28}_{13}X$	13	15	

ii. Describe what is meant by the term '**isotopes.**
.....
.....

iii. In experiments, both isotopes were found to show the same chemical behaviour Use the information in the table to explain

why the chemical behavior of both isotopes is the same

.....

.....

iv. A naturally occurring sample was found to contain 25% of X-24 and 75% of X-28. Calculate the relative atomic mass of the element X

.....

.....

.....

.....

5. The table below shows the electronic arrangements of six atoms, A to F.

atom	A	B	C	D	E	F
electronic arrangement	2, 8, 6	2, 8, 8	2, 8, 3	2	2, 8, 8, 6	2, 5

Use the letters representing the atoms to select the following:

A. Two atoms from the same group of the periodic table. .....

.....

B. The ion $k^{+¿¿}$

.....

C. Two noble gases. .....

D. An atom which has 3 electrons in its outside shell.

.....
.....

E. An atom which has 5 electrons in its outside shell.

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.....

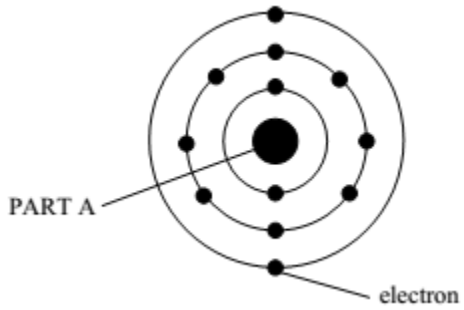
F. An atom with the atomic number 24.

.....
.....

G. An atom with 7 protons.

.....
.....

6. A. The diagram below shows an atom of magnesium.



ILEYS SECONDARY SCHOOL

FORM 4 CHEMISTRY ASSIGNMENT ATOMIC STRUCTURE

A. What is the name of part A? .....

.....

B. What two types of particle does part A contain?

.....

.....

C. What is the charge on part A?.....

D. How many electrons are in one atom of magnesium?

.....

.....

E. Write the electron arrangement for an atom of magnesium.

.....

.....

F. Use the diagram and your above answers to answer the following questions.

i. In what group of the Periodic Table is magnesium?

.....

.....

ii. Explain your answer in question(i).

.....

.....

iii. In what period of the Periodic Table is magnesium?

.....

iv. Explain your answer in question(iii).

.....

.....

7. Use the table below to answer the questions A to B that follow:

Element	Atomic Number	Mass Number
Sodium	11	23
Potassium	19	39
Oxygen	8	16
Sulfur	16	32

A. What is the chemical symbol for the potassium atom?

.....

B. Write the electron arrangement for the potassium atom

.....

C. State the number of neutrons in the sodium atom

.....

D. What do the electron arrangements of oxygen and sulfur have in common? .....

E. Write the electron arrangement for the oxide ion.

.....

8. A. Complete the electron configuration of the Mg+ ion

$1s^2$

.....

B. Write an equation, including state symbols, to show the reaction that occurs when the second ionization energy of magnesium is measured. DHi2=1450kJ mol–1

.....

.....

C. Explain why the second ionisation energy of magnesium is greater than the first ionisation energy of magnesium.

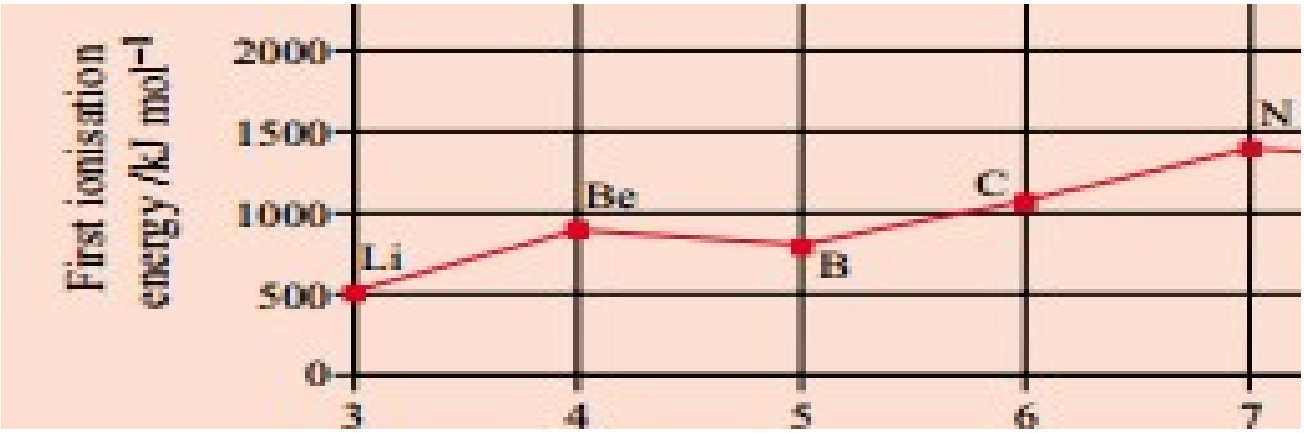
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9. This question is about trends in the Period 2 elements from lithium to nitrogen.



A. Define first ionization energy

.....

.....

.....

.....

B. State the general trend in first ionisation energies for the Period 2 elements lithium tonitrogen

.....

.....

C. Identify the element that deviates from this general trend of ionization energy, from lithium to nitrogen, andexplain your answer.

Element.....

.....

Explanation.....

.....

.....

.....

D. Identify, from the Period 2 elements lithium to nitrogen, the element that has the largest atomic

radius. .....

.....

10. The table below shows atomic radius and ionic radius of four different elements. Using the information in the table, answer the following question.

element	Atomic radius	Ionic radius
X	0.156	0.095
T	0.099	0.181
G	0.125	0.050
W	0.039	0.124

From the table:

A. State at least one element which is metal, give a reason to your answer

Element .....

Reason.....

B. State two elements which are non-metals, give a reason to your answer

Two elements .....

Reason .....

C. Which element in the table is the strongest oxidizing agent, give a reason to your answer

Element .....

Reason .....

D. Define atomic radius

.....

.....

E. Explain why atomic radius

i. Increases down any group of the periodic table

.....

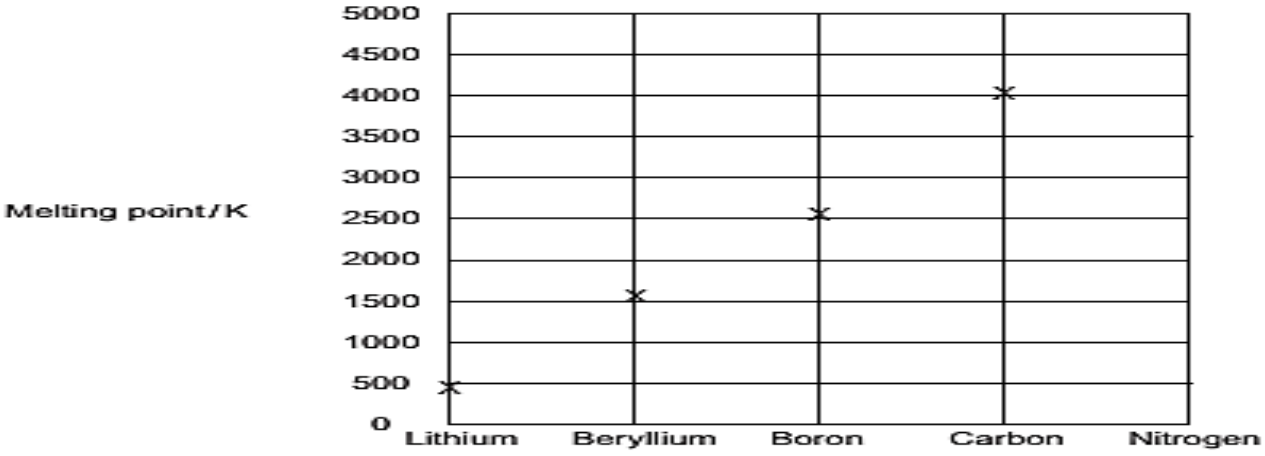
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ii. ii. Decreases across the period

.....

.....

11. The crosses in the table below show general trend of melting point across period 2.



A. Draw a cross on the diagram above to show the melting point of nitrogen

B. Explain, in terms of structure and bonding, why the melting point of carbon is high

.....

.....

.....

12. A. State and explain the general trend in the first ionisation energies of the Period 3 elements sodium to chlorine.

Trend.....

Explanation .....

....

B. State how the element sulfur deviates from the general trend in first ionisation energies across Period 3. Explain your answer.

How sulfur deviates from the trend .....

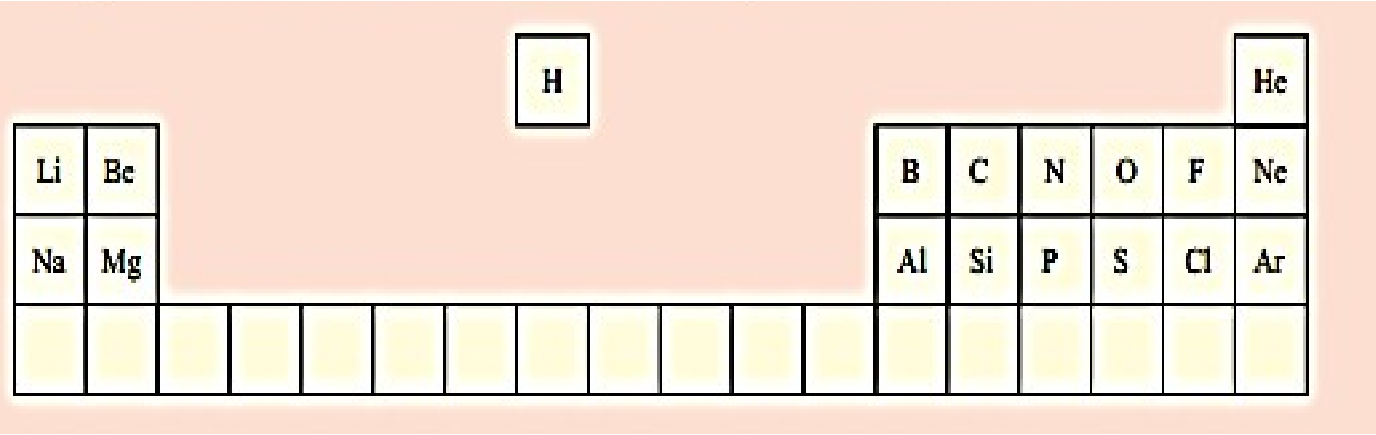
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Explanation.....
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13. Study the periodic grid below and answer the following questions.



A. Identify an element from the first three periods that fits each of the following descriptions.

i. The element that forms a 2-ion with the same electronic configuration as neon (Ne).....

ii. The element that forms a 3+ ion with the same electronic configuration as neon (Ne).

.....

iii. The element that has the electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^3$.

.....

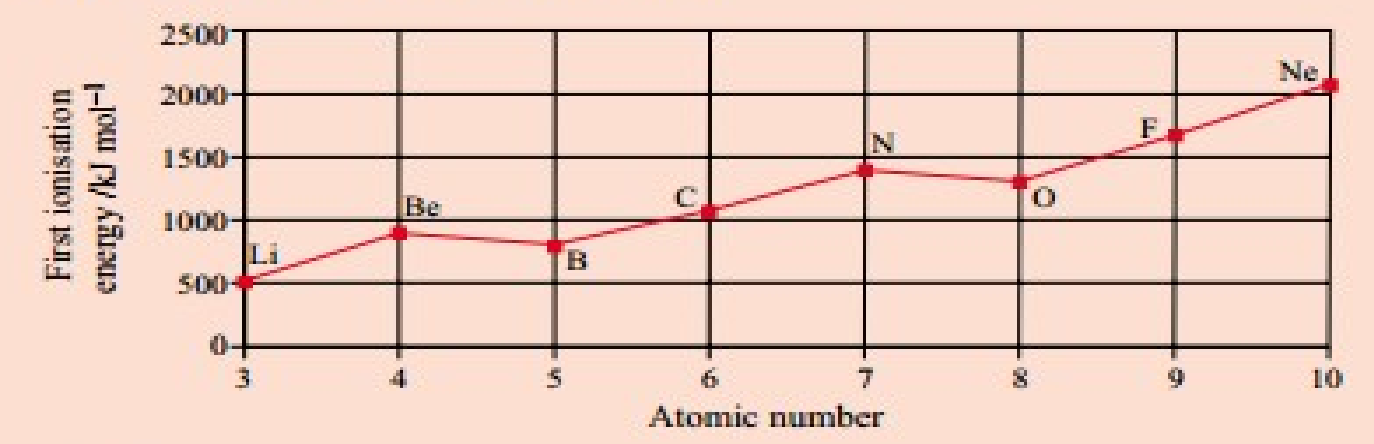
iv. The element with the largest atomic radius

.....

v. The element in period three with the highest boiling point.

.....

14. The diagram below shows the variation in the first ionization energies of elements across period 2 of the periodic table.



A. Define the term first ionization energy

.....

.....

B. Explain why the first ionization energies show a general increase across period 2.

.....

.....

.....

C. Explain why the first ionization energy of N is greater than that of

.....

.....

.....

D. Explain why the first ionization energy of B is less than that of Be

.....

.....

.....

15. Mass spectrometry can be used to identify isotopes of elements.

A. In terms of fundamental particles, state the difference between isotopes of an element.

.....

.....

.....

.....

B. State why isotopes of an element have the same chemical properties.

.....

.....

.....

.....

C. Give the meaning of the term relative atomic mass.

.....

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D. The mass spectrum of element Xhas four isotopes. The table below gives the relativeabundance of each isotope in a sample of element X

m/z	64	66	67	68
Relative abundance	12	8	1	6

Calculate the relative atomic mass of element X.

.....

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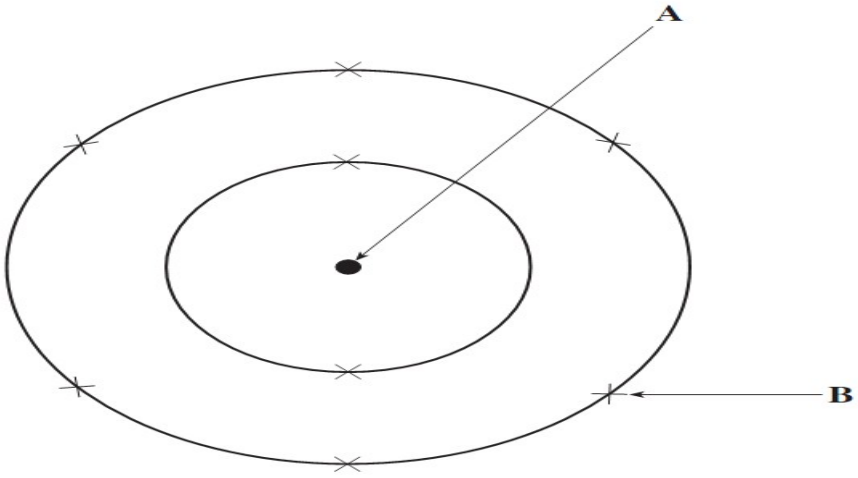
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16. The diagram below shows an atom of oxygen.



A. Use the words in the box below to complete the structure of an atom.

electron	**neutrons**	**nucleus**	**protons**

i. The centre of the atom, labelled**A** is called

.....

ii. The Centre of the atom contains ..... and.....

iii. The particle labeled**B** is an .....

B. Explain why an atom is neutral in charge when it is not ionized

.....

.....

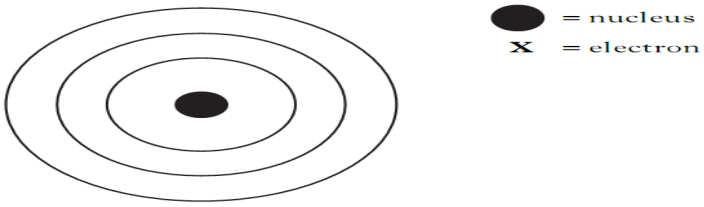
17. Atoms contain particles called protons, neutrons and electrons. The nuclide notation of the sodium atom is shown.

$$^{24}_{11}Na$$

A. Complete the table to show the number of each type of particles in this sodium atom.

Particle	Number
Electron	11
Proton	
Neutron	

B. Complete the diagram below to show how the electrons are arranged in a sodium atom.



C. Explain what holds the negatively charged electrons in place around the nucleus

.....

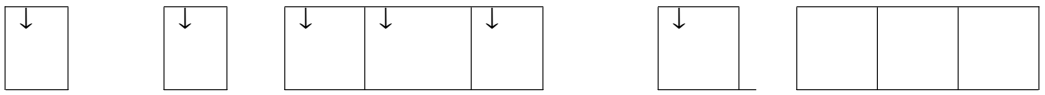
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18. The electronic configuration of aluminium (atomic number 13) can be shown as:-

Electronic structure 2, 8, 3 or

spdf notation $1s^2, 2s^22p^6, 3s^23p^1$ or

Electrons in boxesnotation



Give the electronic, spdf notation and electrons in boxes notation to show the electronic configurations of the following elements: -

A. Silicon (atomic number 14)

Electronic structure.....

spdf notation.....

Electrons in boxes notation

B. 

Sulphur (atomic number 16)

Electronic structure.....

spdf notation.....

Electrons in boxes notation

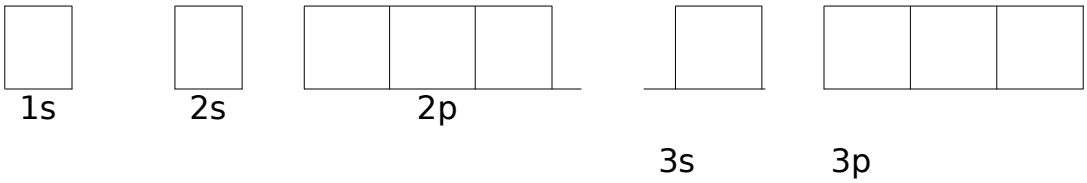


C. Sodium (atomic number 11)

Electronic structure.....

spdf notation .....

Electrons in boxes notation



19. Elements Magnesium, Aluminium and Sulphur belong to period three of the periodic table. Their atomic and ionic radii are shown in the table below.

	Magnesium	Aluminium	Sulphur
Atomic Number	12	13	14
Atomic Radius	0.134	0.102	0.089
Ionic Radius	0.099	0.075	0.113

A. Why is the ionic radius of sulphur greater than its atomic radius?

.....

.....

.....

.....

B. Explain why aluminium has smaller radius than magnesium?

.....

.....

.....

.....

C. Briefly explain why ionic radius of magnesium is smaller than their atomic radius?

.....

.....

.....

.....

20. State descriptions of:

A. Pauli-exclusion principle .....

.....

....

.....

B. Aufbau principle .....

.....

.....

.....

....

C. Hund's rule .....

.....

.....