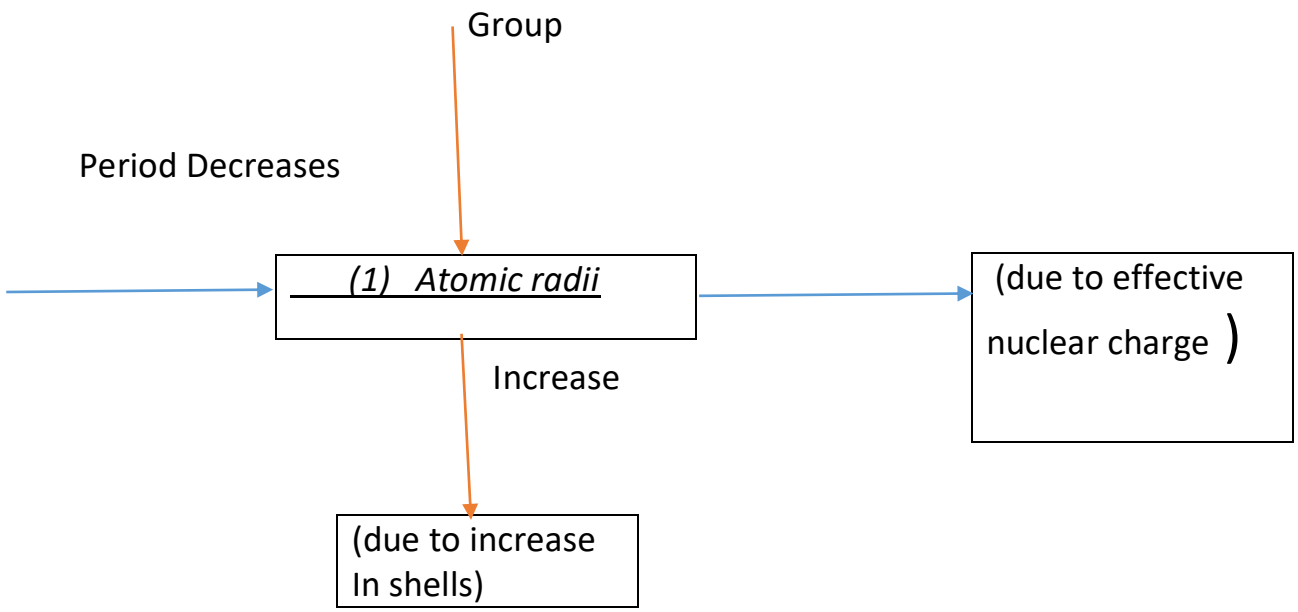
PISA QUESTIONS

CLASS X

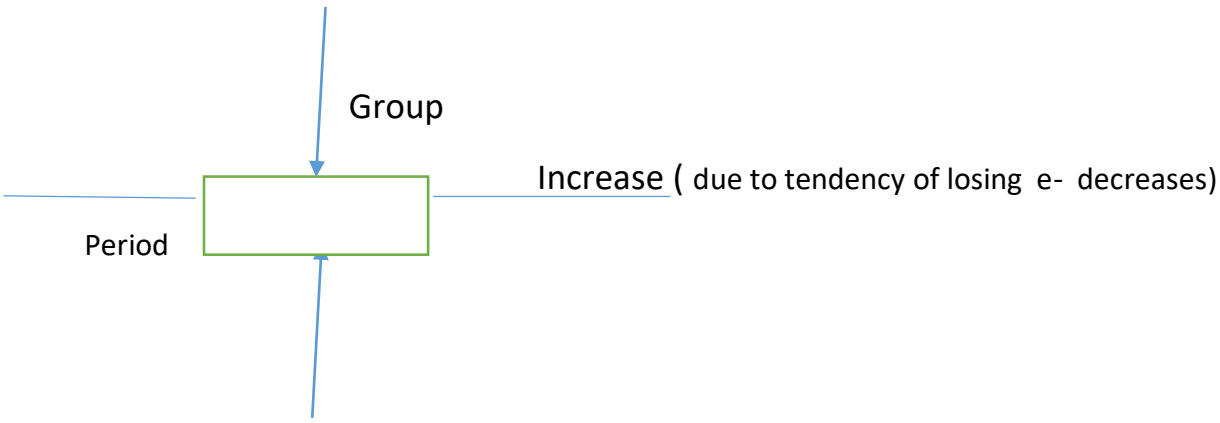
PERIODIC CLASSIFICATION OF ELEMENTS

QUESTION 1-

Periodic trends in properties of elements of periodic table



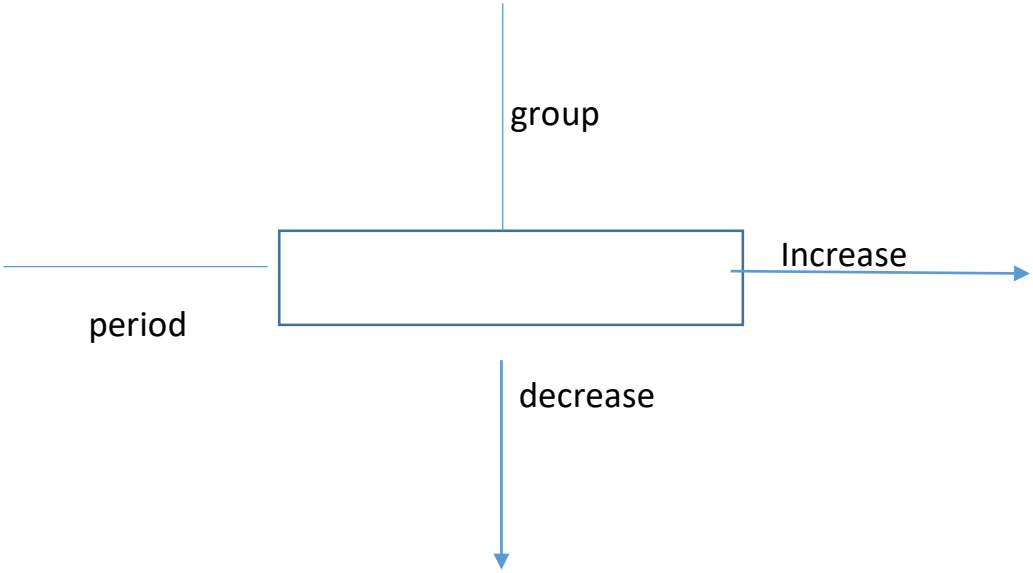
(2) Tonisation Enthalphy



Decrease (as size increase)

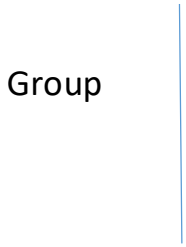
Is group it increase to due to effective nuclear charege.

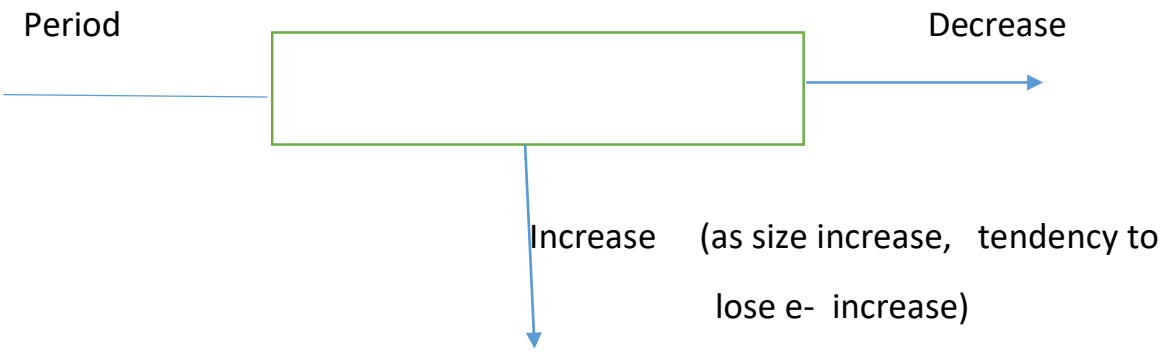
(3) Electro negativity



tendency of an atom to attract shared pair of p-

(4) metallic character





(5) Reactivity

Increase down the group for alkali, alkaline earth metal, etc opposite happens in non-metal.

(6) Hydration Enthalpy

Energy released when the iron interact with the water molecule.

H.E 1/size of ion

Electronic configuration for some common g

S-Block

Group1 : ns^1	Group15 : ns^2 np^3
Group2 : ns^2	Group16 : ns^2 np^4
Group13 : ns^2 np^1	Group17 : ns^2 np^5
Group14 : ns^2 np^2	Group18 : ns^2 np^6

P-Block

Anomalous Behaviour

It is mostly shown by the first member of any group.

Due to small size.

Due to absence of d-orbital.

Due to high polarising power.

Diagonal Relationship

Some element of group 1,2,13,14 etc which are at top have some properties with the next element of next group diagonally.

Li	Be	B
↘	↘	↘
Mg	Al	Si

Due to small size their size matches (approximately).

QUESTIONS

1 Why Li^+ salts are hydrated in nature?

1- Which metal in the alkali metal reacts with nitrogen?

2- When alkali metal is dropped in NH_3, what colour does it give and why?

3- Arrange according to lattice energy:

Li F	Na F	K F	R b F	Cs F	big-big
Li F	Li Cl	Li Br	Li I		small-small
Li Cl	Na Cl	K Cl	R b Cl	Cs Cl	lattiue- energy effect

4- Condition for solubility.

5- Why $liCo_3$ decompose while other alkali metal not?

6- Why are alkaline earth metal harder than alkali metals?

7- Strongest reducing nature element in alkali metals.

8- Why some elements give flame colouration?
9- Li X have couslent properties have Na X, why? (X= halogens)

Answers

1- Due to high hydration enthalpy because H.E 1/size of ion
2- Lithium. (due to small size)
3- Blue colour due to ammoniated electron.
4- > , > , > , >

> , > , >

< , < , < , <

5- High hydration enthalpy and low lattice enthalpy.
Due to lattice energy effect.

Big cation small-anion or small cation big anion unstable

Big-big or small-small → stable.

6- Due to metallic bonding. (more outer e- → strong bonding).
7- Lithium. (because it got oxidized easily).Due to transition of electron.
8- Due to transition of electron.
9- Due to transition of electron.
10- Due to high polarizing power of Li, Li attracts e- density.

QUESTION 2
CLASSIFICATION OF ELEMENTS

The periodic table, also known as the periodic table of elements, is a tabular display of the chemical elements, which are arranged by atomic number, electron

configuration, and recurring chemical properties. The structure of the table shows periodic trends. The seven rows of the table, called periods, generally have metals on the left and non-metals on the right. The columns, called groups, contain elements with similar chemical behaviours. Six groups have accepted names as well as assigned numbers: for example, group 17 elements are the halogens; and group 18 are the noble gases. Also displayed are four simple rectangular areas or blocks associated with the filling of different atomic orbitals.

The organization of the periodic table can be used to derive relationships between the various element properties, and also to predict chemical properties and behaviours of undiscovered or newly synthesized elements. Russian chemist Dmitri Mendeleev published the first recognizable periodic table in 1869, developed mainly to illustrate periodic trends of the then-known elements. He also predicted some properties of unidentified elements that were expected to fill gaps within the table. Most of his forecasts proved to be correct. Mendeleev's idea has been slowly expanded and refined with the discovery or synthesis of further new elements and the development of new theoretical models to explain chemical behaviour. The modern periodic table now provides a useful framework for analyzing chemical reactions, and continues to be widely used in chemistry, nuclear physics and other sciences.

The elements from atomic numbers 1 (hydrogen) through 118 (oganesson) have been discovered or synthesized, completing seven full rows of the periodic table. The first 94 elements all occur naturally, though some are found only in trace amounts and a few were discovered in nature only after having first been synthesized. Elements 95 to 118 have only been synthesized in laboratories or nuclear reactors. The synthesis of elements having higher atomic numbers is currently being pursued: these elements would begin an eighth row, and theoretical work has been done to suggest possible candidates for this extension.

There are specific patterns present in the arrangement of elements in the periodic table. These periodic table trends arise out of the specific arrangement of elements due to the Periodic Law. Studying these trends, allows chemists, scientists and even us to quickly identify certain properties of an element.

One of the trends in the modern periodic table is that of the valency of an atom. As you already know, the valency of an atom is the number of electrons it has in its outermost shell or the number of atoms in requires to complete its outermost shell. However one can determine the valency of an element simply from its position in the periodic table.

Atomic size is the distance between the centre of the nuclei and its outermost orbit. In simple terms, it is the radius of an atom. It is noticed that the

atomic size of elements decrease as we move from left to right in a period. This is because the electrons increase hence increasing the nuclear charge.

When the nuclear charge is stronger, the nucleus pulls the electrons closer to itself so reducing the atomic radii. As opposed to this when one moves from the top to bottom of a group, the atomic size of elements increases. This is because the number of shells of the atom increase, increasing their radii.

Example: The atomic size of all elements in period 2 in picometer (pm)

Electronegativity is the ability of an atom of any element to attract a shared pair of electrons in a chemical bond, towards itself. It is a measure of atom's tendency to form a molecule by attracting electrons to itself. The most electronegative element is Fluorine and the least is Caesium.
So by this, you can probably deduce that as you move in a row (period) from left to right the electronegativity increases. And from top to bottom in a column (group) it will decrease. This is because when the number of shells increases as we go down a group, so the pull of the nucleus to attract electrons decreases.

Q. Answer the following questions on the basis of your understanding of the given paragraphs and the related studied concepts.

1) Out of the three elements P,Q and R having atomic number 11, 17 and 19 respectively ,which two elements will show similar properties and why? Draw the electron dot structures of elements having similar properties. (2)

2)" Hydrogen occupies a unique position in modern periodic table". Justify the statement.

3) Write the formulae of chlorides of Eka-Silicon and Eka-Aluminium, the elements predicted by Mendeleev . (2)

4) An element with atomic number 117 has recently been discovered. What is the group number and period number of the element? What is its IUPAC and officially accepted name? Also predict whether it is a metal or a non-metal. (2)

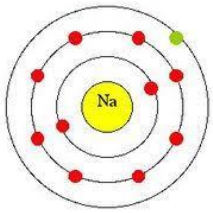
5) What is difference between nuclear charge and effective nuclear charge? (2)

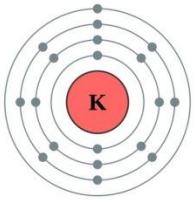
ANSWERS

1. ANSWER: P(11) : 2,8,1 R(19) : 2,8,8,1 Q(17) : 2,8,7

Elements 'P' and 'R' will show similar properties as they belongs to same group with valency 1 due to same numbers of valence electrons.

19: Potassium 2,8,8,1





2. ANSWER: Both hydrogen and alkali metals have similar outermost electronic configuration therefore some of the properties of hydrogen are similar to those of alkali metals.

2. Both hydrogen and halogens also have similar outermost electronic configuration and hence they have similar properties.

3. ANSWER: Eka-Silicon is Germanium .It lies in group 4 of Mendeleev"s periodic table and thus has a valency of 4 then the formulae of its chloride is GeCl4 .

Eka- Aluminium is Gallium . It lies in group 3rd of Mendeleev"s periodic table and thus has a valency of 3 then the formulae of its chloride is GaCl3.

4. ANSWER: The atomic number of the 1st halogen F is 9. Adding magic numbers 8, 8,18,18,32 and 32, the atomic number of the last halogen should be 8+8+18+18+32+32=117. Thus, the element with Z =117 is a halogen .Therefore its group number is 17 and period number is 7 and its IUPAC name is Uus and officially accepted name is *Tennessine*. Since halogen are non-metal therefore elements with Z =117 should also be a non- metal.

5. ANSWER: Nuclear charge is equal to the number of protons present in the nucleus.

Effective nuclear charge .The electrons present in the inner shells shield or screen the valence electrons from the nucleus. As a result the nuclear charge actually experienced by the valence electrons is little less than the actual nuclear charge this is called affective nuclear charge.

QUESTION 3

UNESCO To Launch International Year Of The Periodic Table Of Chemical Elements

The International Year of the Periodic Table of Chemical Elements will be launched today at UNESCOs Headquarter

January 29, 2019 17:51 IST

New Delhi:
The International Year of the Periodic Table of Chemical Elements will be launched today at UNESCO's Headquarters, Paris. According to a statement from the United Nations Educational, Scientific and Cultural Organization (UNESCO), events and activities will be held throughout the year to celebrate the 150th anniversary of the organisation of the periodic table by Russian scientist Dmitri Mendeleev, one of the fathers of modern chemistry.

The Director-General of UNESCO, Audrey Azoulay, will open the event with Mikhail Kotyukov, Minister of Science and Higher Education of the Russian Federation, Pierre Corvol, President of France's Académie des Sciences, and Andrey Guryev, CEO of PhosAgro.

The event will bring together scientists, representatives of the private sector.

It will feature a lecture on the “Periodic Table for Society and the Future” by the Professor Ben Feringa, 2016 Nobel Laureate in Chemistry.

At the launch, UNESCO will present its educational initiative, 1001 Inventions: Journeys from Alchemy to Chemistry.

Consisting of educational material and science experiments to help young people improve their understanding of chemistry and its numerous uses, the initiative will be brought to schools around the world during 2019, the UNESCO statement said.

a) Name two other scientists before Mendeleev who attempted to classify the elements

_____

_____

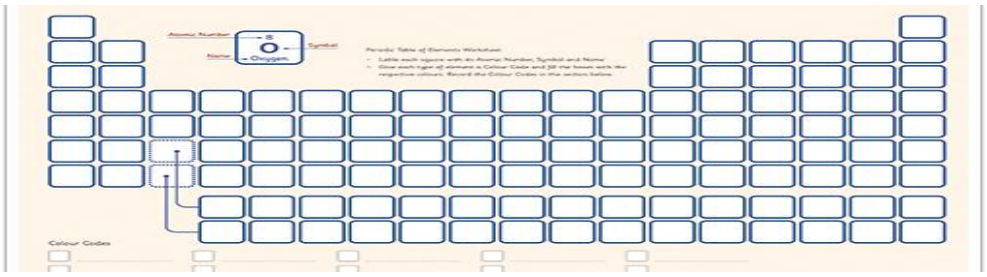
b) What was the basis of arranging the elements followed by Mendeleev? Why was his criterion not correct?

c) How are the elements arranged in the modern periodic table?

d) .Why does the first period have only two elements?

e) .How does the valency of the elements in a given period vary from left to right?

QUESTION 4. Below is a blank periodic table. Answer the questions that follow it.



a) Shade the column which contain gaseous non metals only.

b) What is the special name given to elements placed below the main periodic table.

_____

_____

_____

c) Name the liquid non metal.

_____

d) Two element X, Y and Z belong to 17th group but to 2nd,3rd and 4th period respectively. Number of valence electrons in Y is 7. Find the number of valence electrons in X and Z.

_____

_____

e) Name the elements present in the third period and classify them into metals and nonmetals.

_____

_____

_____