Periodic Classification of Elements

4 Marks Questions

1. How does the atomic radius vary in a period and in group? Explain?

The atomic radius is the distance between the centre of the nucleus and the outer most orbital.

Variation of atomic radius in a period:

As the atomic number increases in the period the charge of the nucleus increases step by step from left to right. So the nuclear attraction over the electron charge cloud increases. In other words, there is more and more contraction of electron shells. Hence the atomic radius decreases on moving from left to right across a period.

Variation of atomic radius in a group:

In moving down in a group, the number of principal shell increases. Therefore the size of the atom increases. Hence the radius of the atom increases in moving from to bottom in a group.

2. Explain the variation of ionization energy in group and period?

Ionization Energy (IE) or Ionization potential: It is defined as the minimum energy required to remove an electron from the outer most orbital of an atom in the gaseous state. It has units of electron volt (ev) or kilojoules per mole.

The amount of energy required to remove the first electron from the outer most orbital in its ground state is called the 'first ionization Energy'

X_g + Energy ----------▌ X^+_g + e^-

(first I.P.)

Similarly, the minimum energy required to remove an electron from

X^+_g + Energy ----------▌ X^{2+}_g + e^-

(Second I.P.)

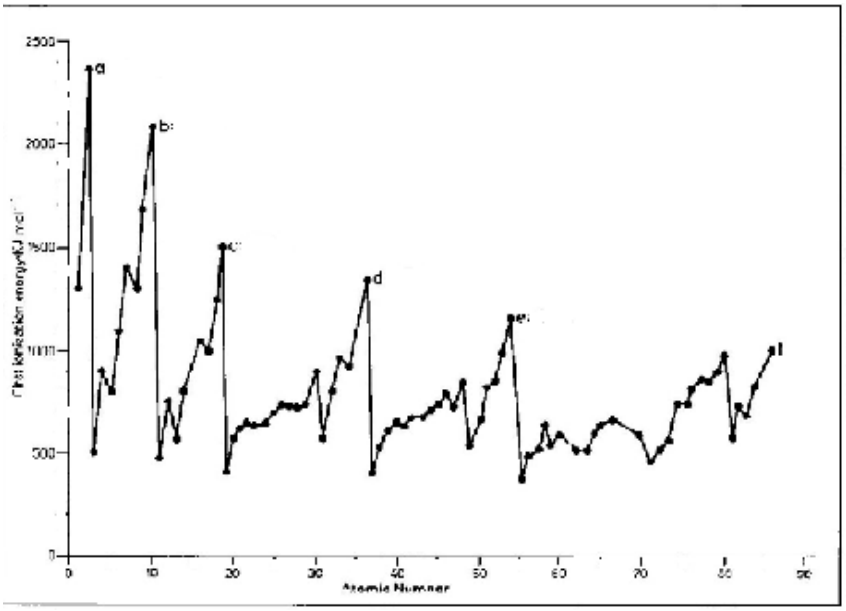
Variation of Ionization Energy in groups :

It is evident that ionization energy generally decreases on moving down a group. The atomic size increases on moving down a group. Thus the large the atomic size, the smaller in the ionization energy. The reason for this is that as the size of the atom increases, the outer electrons lie farther away from the nucleus. Hence according to Coulombs law, the attractive pull from the nucleus on the outer electron decreases and it becomes easier to Knock out an electron from the outer shell of the electron.

Variation of ionization Energy in periods:

In a period from left to right ionization energy do not follow any regular trend. In the first period ionization energy increases from hydrogen to helium. In the second period ionization potential increases from Li to Be and then decreases at boron.

From born to nitrogen it again increases and then decreases at oxygen. This is because nitrogen has half-filled electronic configuration ($2P^3$) which is stable and therefore its ionization energy increase. These trends are shown in the figure



a=Helium(He) b=Neon(Ne) c=Argon(Ar) d=Krypton(Kr)e=Xenon(Xe) f=Radon(Rn)

Very Short Answer Questions (1 Mark Questions):

1. Give Examples of two Doberiener triads?

A) The Doberiener triads are

i) Chlorine (17), Bromine (35), Iodine (53)

ii) Sulphur (16), Selenium (34) , Tellunium.

2. On which atomic property is the Mendeleev's periodic table based?

A) The Mendeleev's periodic table based on atomic weight.

3. State the Mendeleev's periodic Law?

A) Mendeleev's periodic law states that "the properties of elements are the periodic functions of their atomic weights".

4. Write the general electronic configuration of inert gases?

A) The general outer most electronic configuration of inert gases is ns^2 np^6 except helium whose electronic configuration is $1s^2$.

5. What are inner transition elements?

A) f-block elements are called inner Transition elements.

6. Define atomic radius?

A) **Atomic radius:**

It is defined as the distance between the centre of the nucleus and the outer most orbital.

7. Define Ionization energy? Or Ionization potential?

A) **Ionization energy:**

It is defined as the minimum energy required to remove an electron from the outer most orbital of an atom in the gaseous state.

8. Define the electro negativity?

A) **Electro negativity:**

It is the tendency of bonded atom in a molecule to attract the electron density of the shared pair of electrons

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9. Define electropositive character?

A) **Electropositive character**:

The ability of an atom to loose one or more electrons to become a positive ion is called electropositive character.

10. Which group elements have the highest electropositive character?

A) Group – I, Group – II elements are more electropositive elements.

11. Which group elements can be used as oxidizing and reducing reagents?

A) VII group elements (F, Cl, Br, I) are acts as strong oxidizing reagents and Group – I, Group – II elements are acts as strong reducing reagents.

Short Answer Questions (2 Marks questions)

1. What is "Newland's concept of octaves"

A) If the elements are arranged sequentially in the increasing order of their atomic weights, every eight element is having similar to that of the first element. This hypothesis is designated as "Newland's concept of octaves".

2. Name the inert gases?

A) The inert gases are Helium (He), Neon (Ne), Argon (Ar), Krypton (Kr), Xenon (Xe) and Radon (Rn). In general these gases are inert towards any chemical reaction and hence named as "Inert gases".

3. How does the atomic radius vary in period and in group in the periodic table?

A) **In period:** From left to right in the period the atomic radius decreases.

In Group: In a group, the atomic radius increases from top to bottom.

4. How does the ionization potential vary in a period and in a group in the periodic table?

A) In a group ionization energy decreases from to to bottom and in a period ionization energy varies irregularly.

5. Define oxidation and reduction?

A) **Oxidation:** Addition of oxygen to a given compound or removal of hydrogen from the compound is called oxidation.

Reduction: Addition of hydrogen to given compound or removal of oxygen from the compound is called reduction.

PART – B

Multiple Choice Questions (½ Mark each)

1. **In a Dobereiner triad, the atomic weight of middle element is :** [ ]

a) The sum of the atomic weights of first and the third elements.

b) The product of the atomic weights of first and the third elements.

c) The ratio of the atomic weights of first and the third elements.

d) The mean of the atomic weights of first and the third elements.

2. Mendeleef's periodic table is based on the **[ ]**

a) Atomic weight

b) Atomic Number

c) Atomic radius

d) Atomic Volume.

3. The units of Atomic radius **[ ]**

a) Angstroms

b) $K.Joules.mol^{-1}$

c) eV

d) $K.Cal.mol^{-1}$

4. The ionization potential in a group from top to bottom **[ ]**

a) Decreases

b) Increases

c) Remains the same

d) Increases and decreases

5. Which of the following have the minimum Atomic radius **[ ]**

a) N

b) Na

c) K

d) F

6. Which of the following is a Dob Reiner's triad? **[ ]**

a) Ne, Ca, Na

b) Li, Na, K

c) H_2, N_2, O_2

d) Na, Br, Ar

7. f-block elements are also called: **[ ]**

a) Transition elements

b) Transuranic elements

c) Alkali elements

d) Inner transition elements.

8. The law octaves applies to : **[ ]**

a) B, C, N

b) As, K, Ca

c) Be, Mg, Ca

d) None

9. The element which is citied as an example to prove the validity of Mendeleev's periodic law is:

a) Indium

b) Hafnium

c) Gallium

d) Helium

FILL IN THE BLANKS (½ Marks each)

1. The first classification of elements is attempted by _____
2. The modern periodic table has _____periods
3. The first period has _____elements.
4. The _____period is incomplete.
5. In a group the electro negativity _____from top to bottom.
6. Addition of hydrogen to a given compound is called _____
7. Elements from atomic Number 58 to 71 are known as _____
8. The _____attempt of classification of elements are made by Deberenier.
9. In _____ the atomic weight of middle element is nearly the arithmetic mean of first and third elements.

10. Mendeleev and _____used Atomic property viz., atomic weight, for classification of elements.
11. Mendeleev's periodic law states that the properties of elements are in periodic dependence upon their _____
12. Modern periodic laws states that the properties of the elements are periodic functions of their _____
13. Modern periodic table is divided into _____periods and _____groups.
14. The first period has only _____elements.
15. The second and third periods have _____elements.
16. Fourth, fifth and sixth periods have _____elements each
17. _____ & _____are placed at the bottom of the periodic table.
18. _____period is incomplete.
19. Based on the electronic configuration, the elements are classified into _____types.
20. _____ is the distance between the centre of the nucleus and the outmost orbit.
21. Atomic radius is expressed in the units of _____
22. In a period atomic radius _____from the left to right and in a group it _____ from top to bottom.
23. _____ is the energy required to remove an electron from the outermost orbital in the gaseous state.
24. I.E. is expressed in _____
25. In a group ionization energy _____from top to bottom and in a period ionization energy varies irregularly.
26. _____ is the ability of the bonded atom to attract the electron density of the shared electrons.
27. _____ is expressed in Pauling's state.
28. In a period Electro Negativity values _____from left to right of periodic table and in a group it _____ from top to bottom.
29. Scandium was discovered by _____
30. Gallium was discovered by _____
31. Mendeleev's eka boron because _____
32. Mendeleef predicted an element with atomic weight 68 and named as _____
33. Eka aluminium is treated as _____-
34. Eka boron because _____
35. Elements from atomic number 90 to 103 are known as _____
36. Each period starts with and _____
37. All S-block elements are _____metals.

38. Moseley's periodic law depends on _____

39. The valences of all elements in a group are _____

40. The group number of an element represents _____

MATCHING (½ MARK EACH)

I.

	GROUP – A			**GROUP – B**
1.	s– block elements	[	]	a) lies between S & P blocks
2.	p – block elements	[	]	b) Zero group elements
3.	d- block elements	[	]	c) I A and IIA group elements
4.	f – block elements	[	]	d) III A to VII A group elements.
5.	Inert gases	[	]	e) Lanthanides and Actinides.

II.

	GROUP – A			**GROUP – B**
1.	Triad Theory	[	]	a) Actinides
2.	Law of Octave	[	]	b) Lanthanides
3.	Halogens	[	]	c) VII A group elements
4.	Rare earth elements	[	]	d) John A.R. Newlands
5.	The elements with atomic Number 90 to 103	[	]	e) J.W. Dobereiner.

ANSWERS

I. 1) d 2) a 3) a 4) a 5) d 6) b 7) d 8) c 9)c

II.

1.	Dobereiner	21) Angstroms
2.	Seven	22) decreases, increases
3.	Two	23)Ionization energy
4.	Seventh	24)Electron volts
5.	Decreases	25)decreases
6.	Reduction	26)Electro negativity
7.	Lanthanides	27)Electro negativity
8.	First	28)Increases, decreases
9.	Dobereiner triad	29)Nilson
10.	Lother Meyer	30)de Boisbaudran
11.	Atomic weights	31)Scandium
12.	Electronic configuration	32)Eka aluminium
13.	7, 18	33)Gallium
14.	Two	34)Scandium,
15.	Eight	35)Antinides
16.	18	36)Alkali metal
17.	Lanthanides, Actinides	37)Alkali

18. Seventh
19. Four
20. Atomic radius

38)Atomic numbers
39)same
40)Number of electrons in valence shell

III. I)

1. .c
2. .d
3. .a
4. .e
5. .b

II)

1. .e
2. .d
3. .c
4. .b
5. .a
6.