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Periodic Properties

Mendeleev,s periodic Table

1.There are 2,8 and 8 elements in first, second and third periods of periodic table respectively. Explain Prediction of group, period and block of a given element

2. Predict the period ,group number and block of the following elements
A(at. number=8),B(at. number=),C(at. number=28)and ,D(at. number=54)

3.What is atomic number of the element having maximum number of unpaired 2p electrons? To which group it belong?

4 .i) 3d,4dand 5d series consists of 10 elements each. Explain

ii) Why the f-block elements are called inner transition element?

iii) Transition elements show horizontal as well as vertical relationship .explain.

iv)what is the maximum number of electrons that can be filled in f-subshell/

(A)10 (B)8
(C)6 (D)14

Periodic in Atomic Properties

1. Compare the size of Cl , Cl^- , and Fe^{++} ion .
(A)Cl^->Cl>Fe^{++} (B)Cl^->Fe^{++}>Cl
(D)Cl>Cl^->Fe^{++} (D)Fe^{++}>Cl^->Cl

2. The radii of Ar is the radii of chlorine.

3. (i) Arrange the following ions in order of their increasing ionic radii LI^{-+},Mg^{2+},K^+,Al^{3+}.
(ii) Be and Al are placed in different periods and groups but they show the similar properties.

Ionisation Potential or Ionisation Energy

1.Magnesium has the first and second ionisation potential 7.646 and 15.035 eV respectively. What is the amount of energy required to convert all the magnesium atoms present in 24mg to magnesium vapours?

(A) 2.188kj (B) 21.88kj
(C) 218.8kj (D) 2818kj

Electronegativity

1.Arrangethe following compounds in the order of their decreasing stability if the electro negative values of elements are as follows
H=2.1 F=4, Cl=3.0, Br=2.8
I=2.3,N=3.0
HF,NCl_3, HBr, Hl, HCl

2. Why are inert gases mono-atomic?

3. i) NaOH behaves as a base while $Zn(OH)_2$ is amphoteric why?

ii)Sodium is strongly metallic, while chlorine is strongly non-metallic .explain.

iii)Which one is amphoteric?

A)$Zn(OH)_2$ B)NaOH C)KOH D)CO_2

Effective nuclear charge and shielding effect

1.i)why are metals good conductors of current?

ii)Comment on "Iodine possesses some metallic nature".

PROBLEMS

1.In alkali metal group which is strongest reducing agent in aqueous solution and why?

2.The electron affinity of sulphur greater than oxygen. Why?

3.The first ionization energy of carbon atom , whereas reverse is true for the second ionization energy.explain

4.The ekecton affinity oof chlorine is 3.7 eV. How much energy in kcal is eleased when 2g if chlorine is compeletely converted to Cl^- ion in a gaseous state ?

5.Name the groups and period of the elements having atomic numbe 18 and 26. What ae the possible valencies of the above elements?

6.Anhydrous $AlCl_3$ is covalent.

From the date given below, predict whether it would remain covalent or become ionic in solution, (lionization energy for Al=5137 kj mol^{-1}; $\Delta_{Hydroation}$ for Al^3= -4665 kj mol^{-1}; $\Delta_{Hydration}$ for Cl^- = -381 kj mol^{-1})

7. $N_0/2$ of $(X^+)_g$ by energy ΔH_1 and $N_o/2$ atoms of $(X)_g$ are converted into $(X^-)_g$ by energy ΔH_2.
Calculate (EA) and (EA) of $(X)_g$.

8."Electron affinity of Cl is the highest among the halogens yet, F is the storongest oxidizing agent". Why?

9.Which of the following species will have the largest and smallest size?
Mg, Mg^{2+} ,Al and Al^{3+}

10.The sum of firs and second lionization energest and those of third ionization energies in (kj mol^{-1}) of nickel and plation are

	$(IE)_1+(IE)_2$	$(IE)_3+(IE)_4$
Ni	2.49	8.80
Pt	2.66	6.70

Based on this information write

(i)the most common oxidation states of Ni and Pt.

(ii)Name of metal (NI or Pt) which can more easily from compounds in its +4 oxidation state.

OBJECTIVE

1.Which is true about the electronegativity order of the following elements?
(A)P>Si (B)C>N (c)Br>Cl (D)Sr>Ca

2.The correct order of second ionization potential of carbon, nitrogen, oxygen is
(A)C>N>O>F (B)O>N>F>C (C)O>F>N>c
(D)F>O>N>C

3.Which has the largest first ionization energy?
(A)Na (B)K (C)Rb (D)Li

4.Which of the following element has highest ionization energy?
(A)Carbon (B) Boron (C)Oxygen (D) Nitrogen

5.The electronegativity the following elements increases in order
(A)S<P<N<O (B)P<S<N<O (C)N<O<P<S
(D)N<P<S<O

6.Correct order of the size of C,N,P and S follows the order.
(A)N<C<P<S (B)C<N<S<P (C)C<N<P<S
(D)N<P<S<O

7.The five successeve ionization energies of an element are 800, 2427, 3658, 25024 &32824 KJ mol^{-1} respectively. The number of valence electron is
(A)3 (B)5 (C)1 (D)2

8.Which of the following transitions involves maximum amount of energy?

(A)$M^-(g) \longrightarrow M(g)$ (B)$M^-(g) \longrightarrow M^{+(g)}$

(C)$M^+(g) \longrightarrow M^{+2}(g)$ (D)$M^{+2}(g) \longrightarrow M^{+3}(g)$

9.Which one of the following statements is incorrect?

(A) Greater is the nuclear charge, greater is the electron affifity

(B) Neon has zero electron affinity

(C) Electron affinity decreases from fluorione to iodine in the group

(D) Generally electron affinity decreases in going down and increases across period from left the right

10.Which of the following is correct?

(A)With increase in atomic size, ionization energy increases

(B)With increase in atomic size, electron increases

(C)With increase in atomic size, metallic character increases

(D)With increase in atomic size, electronegativity increases

11.The set representing the correct order of first ionization potential is

(A)K>Na>Li (B)Be>Mg>Ca (C)B>C>N (D)Ge>Si>C

12.Amongst the following oxides which is least acidic

(A) Al_2O_3 (B) B_2O_3 (C) CO_2 (D)NO_2

13.The lower electron affinity of fluorine than that of chlorine is due to

(A) Smaller size

(B) Smaller nuclear charge

(C) Difference in thei electronis arrangement

(D) Its highest reactivity

14.The first ionization potential of which of the element is higest

(A)Na (B)Mg (C)Al (D)Si

15.Which one of the following indicates the correst order of variation in experimental atomic size?

(A)BE>C>F> Ne (C)Be<C<F<Ne (C)Be>C>F>Ne

(D)F<Ne<Be<C

ASSIGNMENTS

SECTION – I (PART – A)

LEVEL-1

1.Why Be and Mg does not impart soloration to the flame?

2.I.E. of magnesium is greater than of Na and also Al. Explailn.

3.Why is Ag a noble metal and K is a highly reactive metal?

4.The formation of F^-_g from $F_{(g)}$ is exothermic whereas that of O^{2-} from $O_{(g)}$ is endothermic. Why?

5.Which is/are the diamagnetic species among the following?

Cu^{2+} ,Cr^{3+} ,Co^{3+} ,Cd^{2+}.

6.Why the second ionization potential of an element is higher than the first ?

7.The amount of energy released when 10^6 atoms of iodine in vapour state are converted to I^- ions is 4.9×10^{-13}j.What is the electron affinity of iodine in eV per atom.

8.(A),(B) and (C) are elements in the third short period.Oxide of (A) is ionic, that of (B) is amphoteric and of (C) a giant molecule. (A),(B) and (C) have atomic number in the order?

9.If each orbital can take maximum of three electrons, what is the number of elements in third periodic of the periodic table?

10.You are given Avogadro's number of atoms of X. If half of the atoms of X transfer one electron to the other half of 'X' atoms, 409 kJ must be added. If these X^- ions are subsequently converted to X^+, an additional 733 kJ energy must be added. Calculate IE and EA of X in eV. Use (1 eV= 1.603×10^{-19} J and N= 6.023×10^{23}).

LEVEL – II

1.Why alkali metals do not from dipositive ions ?
2.Why the atomic radii of 5d transition elements is approximately same as 4d transition elements
3.Why Be and Mg atoms do not impart colour in flame?
4.arrange the following in increasing order of the property indicated:
Li^+, Na^+, K^+, Rb^+, and Cs^+ (hydrated radii)
5.The radius of cation is lesser then atom while that of an anion is greater than of atom .Explain.
6.Arange the following ions in their increasing radii: Li^+,Mg^{2+},K^+,Al^{3+}
7.Given the name and atomic number of the inert gas atom in which the total number of d-elctrons is equal to the difference in number of p- and s-electrons.
8.Chlorine can be converted into chloride ion easily as compared to fluoride ion from fluorine. Explain
9.The first IP of lithium is 5.41 eV and electron affinity of Cl is -3.16 eV. Calculate ΔH in $kJmol^-$ for the reaction:
$Li(g)+Cl(g) \longrightarrow Li^+(g)+Cl^-(g)$
10.first and second ionization energies of magnesium are 7.65 and 15.035 eV respectively. The amount of energy in kJ needed to convert all the atoms of magnesium into Mg^{2+} ions present in 12 mg of magnesium vapours is [Given 1 eV =96.5 $kJmol^{-1}$]
11. Atomic radius and ionic radius of F(g) and $F^-(g)$ are 72 and 136 pm respectively . calculate the ratio and percentage increase in terms of volume during formation of $F^-(g)$ from F(g).
12.The first ionization energy of H and He are 13.6 eV and 24.6 eV respectively . how much energy would be given out during the formation of ground state of he atom from He^{2+}nucleus if it combines with two electrons?

Part B

1. An element with atomic number 20 is placed in wich period of the periodic table?
(A) 4 (B) 3 (C) 2 (D) 1
2. The statement that is not correct for periodic classification of element is
(A) The properties of element are a periodic function of their atomic numbers.
(B) Non-metallic element are less in number than metallic element
(C) The first ionization energies of element along a period do not vary in a regular manner with increase in atomic number
(D) For transition element the ionization energies increase gradually with increase in atomic number.
3. Which one of the following ions has the smallest radius?
(A) Cl^- (B) S^{2-} (C) K^+ (D)Ca^{2+}
4. In the modern periodic table, element are arranged in
(A) Increasing mass (B) Increasing volume
(C) Increasing atomic number (D) Alphabetically

5. The statement that is false regarding the long form of the periodic table is
(A)It reflects the sequence of filling the electrons in the order of sub-energy levels s, p, d and f.
B) It helps to predict the stable valency states of the elements.
C) It reflects trends in physical and chemical properties of the elements.
D) It helps to predict the relative ionic character of the bond between any two elements.
6. In the periodic table , going down in fluorine group?
A) Reactivity will increase
B) Electronegativity will increase
C) Ionic radius will increase
D) Ionization potential will increase

7. Which one of the following is smallest in size?

A) N^{3-} B)O^{2-} C)F^{-} D)Na^{+}

8. Which one of the following element has the highest ionization energy?

A) $[Ne]3s^2 3p^1$ B)$[Ne]3s^2 3p^3$ C)$[Ne]3s^2 3p^2$

D)$[Ar]3d^{10} 4s^2 4p^2$

9. Which of the following represents an ordering of the period 4 element Br, Ca, Kr and K by decreasing atomic size?

A) K, Kr, Ca, Br, B) K, Ca ,Br ,Kr C) Kr, Br, Ca, K

d) Ca, K, Br, Kr

10. The electronegativity of the following element increase in the order

A) C, N ,Si ,P B) N, Si, C, P C) Si, P, C, N

D) P, Si, N, C

11. An atom with high electro negativity generally has

A) Tendency tom from $^{+}$ve ions

B) High ionization energy

C) Large atomic size

D) Low electron affinity

12) Which of the following oxides is most basic?

A) Na_2O B) MgO C) Nl_2O_3 D) CuO

13) Consider the isoelectronic series

K^{+}, S^{2-}, Cl, Ca^{+2}, the radii of the ions decrease as

A) $Ca^2 > K^{+} > Cr^{-} > S^{2-}$ B) $Cr^{-} > S^{-2} > K^{+} > Ca^{+2}$ C) $S^{-2}.Cr^{-} > K^{+} > Ca^{+2}$

D) $K^{+} > Ca^{+2} > S^{2-} > Cr$

14) Which of the following elements has the highest electro negativity?

A) As B) Sb C) P D) S

15) Which of the following have least electron affinity?

A) Oxygen B) Fluorine C) Nitrogen D) Carbon

16) In which of the following, the Vander Waal' s radii is largest

A) Ne B) O C) Cl D) F

17) Second and successive electron affinity of an element

A) Is always negative (energy is released)

B) Is always positive (energy is absorbed)

C) Can be positive of negative

D) Is always zero

18) From the ground states electronic configuration of the elements give below, pick up the one with highest value of second ionization energies.

A) $1s^2, 2s^2, 2p^6, 3s^2$ B) $1s^2, 2s^2, 2p^6, 3s^1$ C) $1s^2, 2s^2, 2p^6$

D) $1s^2, 2s^2, 2p^5$

19. which of the following process refers to IE^2

A) $X(g) \rightarrow X^{2+}(g)$ B) $X^{+}(g) \rightarrow X^{2+}(g)$ C) $X^{+}(aq) \rightarrow X^{2+}(g)$

D) $X(g) \rightarrow X^{+}(g)$

20.which of the following statement concerning ionization energy is not correct ?

A) The $I.E_2$. is always more than the first.

B) within a group, there is a gradual increase in ionization energy because nuclear charge increases.

C) Ionization energies of Be is more than B.

D) Ionization energies of noble gases are high.

21. Which one of the following ions has the smallest radius ?

A) C^{4-} B) N^{3-} C) O^{2-} D) F^{-}

22. Ionisation energy of nitrogen is more than oxygen because

a)nucleus has more attraction for electrons

b) half – filled atom is small

c)nitrogen atoms is small

d)more penetration effect

23. Which of the following orders is wrong?

a)$NH_3<PH_3<AsH_3$ – acidic

b) $Li<Be<B<C<IE_1$

c) $Al_2O_3<MgO<Na_2O<K_2O$ – Basic

d) $Li^+<Na^+<K^+<Cs^+$ - Ionic radius

24. Which of the following is strongest base?

a)$Be(OH)_2$ b)$Mg(OH)_2$ c)$Al(OH)_3$ d)$Si(OH)_4$

25. Which one of the following grouping represent a set of isoelectronic species? (At. nos Cs=55, Br=35)

a)N^{3-},F^-,Na^+ b)Ca^{2+},Cs^+,Br c)Be,Al^{3+},Cl^-

d) Na^+,Ca^{2+},Mg^{2+}

26. The elements with atomic numbers 58 t0 71 are called

a)normal elements b) transition elements c) lanthanides

d) actinides

27. Increasing order of electronic affinity is

a)N<O<Cl<Al b)O<N<Al<Cl c)Al<N<O<Cl

d)Cl<N<O<Al

28. Stability order of +3 and +1 states of boron family elements is

a)$Ga^{3+}<In^{3+}<Ti^{3+}$ b)$Ga^+>In^+>Tl^+$ c)$Ga^+<In^+<Ti^+$

d)$Ga^{3+}<Ga^+>Ti^+$

29. The lanthanide contraction is responsible for the fact that

(A) Zr and Y have about the same radius

(B) Zr and Ns have similar oxidation state

(C) Zr and Hf have about the same radius

(D) Zr and Zn have the same oxidation state

30. among the following which has more ionization energy than Mg?

(A) Na (B) Mg^{2+} (C) Ca (D) Al^{3+}

Multiple Choice Question
(Multiple Options Correct)

1.The properties which are common to both groups 1 and 17 elements in the periodic table are

a)Electropositive character increases down the groups

b)Reactivity decreases from top to bottom in these groups

c)Atomic radii increase as the atomic number increases

d)Electronegativity deceases on moving down a group

2.Which if the following pairs of elements have almost similar atomic radii?

(A)Zr, Hf (B)Mo, W (C) Co, Ni (D) Mb, Ta

3.Chlorine atom does not differ from chlorine ion in the number of which of the folloing?

a) Electrons b) Size c) Protons d)Neutrons

4.Which of the folloing processes do not involve absorption of energy?

a)$S(g)+e^- \rightarrow S^-(g)$ b)$O^-(g)+e^- \rightarrow O^{2-}(g)$

c) $Cl(g)+e^- \rightarrow Cl^-(g)$ d)$O(g)+e^- \rightarrow O^-(g)$

5.Which of the following show amphoteric behavior?

a)$Zn(OH)_2$ b)BeO c)Al_2O_3 d) $Pb(OH)_2$

NUMERICAL BASED

1.An element has its electronic configuration as given $[Ar]_{18}3d^5 4s^{1.}$ Predict the group number of this element in the long form of periodic table.

2.Folloing is the list of few elements : Fe,Ar,Cs,Ca,Ge and Sr. How many elements of these belong to s-block?

Comprehension Type

Read the following paragraph and answer the question given below:

The amount of energy releases hen an electron is added to an isolated gaseous atom to produce a monovalent anion is called electron affinity or first electron affinity or electron gain enthalpy. The first electron affinity is given a negative sign as the addition of an electron to a netural atom in an exothermic process. The addition of electron to A^- required energy to overcome the force of repulsion. Thus, the second electron affinity is an endothermic process.

1.Which of the following processes is endothermic in nature?

a)$O^- + e \rightarrow O^{2-}$ b) $Cl + e \rightarrow Cl^-$ c) $S + e \rightarrow S^-$

d) $F + e \rightarrow F^-$

2.The electron affinities of halogens are :

F= -332, Cl= -349, Br= -324, I= -295 $kJmol^{-1}$

The highest value of Cl as compared to that of F is due to

a) higher atomic radius of F

b) smaller electronegativity of F

c) weaker electron repulsion in Cl

d) more vacant p – subshell in Cl

3.Which of the following species has the highest electron affinity?

a) F^- b)O^- c)Na^+ d)O

MATCH THE FOLLOWING

Column – I	Column – II
(A) Fullerence	(p) Lanthanoid
(B)Promethium	(q) Actinide
(C)Water	(r) Lewis base
(D)Lawerencium	(s) Allotrope
	(t) Bucky ball structure

SECTION – II

Multi Choice Question

(Single Option Correct)

1.Which of the following isoelectronic ions has the lowest ionization energy?

a) K^+ b) Ca^{+2} c) Cl^- d)S^{-2}

2. Which of the following are isoelectronic?

NO^-_3 , CO^{2-}_3 , ClO^-_3 , SO_2

a)NO^-_3, CO^{2-}_3, ClO^-_3 b)NO^-_3,CO^{2-}_3,SO_2 c)CO^{2-}_3, ClO^-_3,SO_2

d) None of these

3.According to modern periodic law, the chemical properties of elements are the periodic functions of their

a) Density b) Atomic number c) Mass number

d) Atomic Mass

4) Highest ionization potential in a period is shown by

(A) alkali metal (B) transition element (C) halogens
(D)alkaline earth metals

5. Downward in a group, electropositive character of element
(A) Increases (B) Decreases (C) Remains same
(D) None of the above

6. The law of octave applies to which of the following set of element?
(A) B, N, C (B) Be, Mg, Ca (C) As, K, Ca
(D) none of these

7.which of the following has the largest ionic radius?
(A) Be^{+2} (B) Mg^{+2} (C) Ca^{+2} (D) Sr^{+2}

8. the ionization potential of nitrogen is more than that of oxygen molecules because of
(A) Greater attraction of electrons by the nucleus
(B) Extra stability of the half filled p-orbitals
(C) Smaller size of nitrogen
(D)More penetrating effect

9. The size of species I, I^+ and I^- decreases in the order
(A) $I^+ > I^- > I$ (B) $I^- > I > I^+$ (C) $I^- > I^+ > I$ (D) I. $I^+ > I^-$

10. The element whose electronic configuration is $1s^2$, $2s^2$, $2p^6$, $3s^2$ is a/an
(A) metal (B) metalloid (C) inert gas (D) Non-metal

11. The number of periodic and groups in the long form of periodic table are
(A) 7 and 9 (b) 8 and 18 (C) 7 and 18 (D) 6and 10

12. The element of groups 1.2.13.14.15.16.17.18.are collectively called
(A)noble (B)trypical elements (C)transition elements
(D)representative elements

13.The 3^{rd} period of the periodic table contains
A) 8 elements b) 32 elements c) 3 elements d) 18 elements

14. Which of the following sets contains pair of elements that do no0t belong to same group but show chemical resemblance?
a) Hf,Zr b) K, Rb c) Be, Al d) B, Al

15. Which of the following belongs to the category of transition metal?
a) K b) Ra c) Fe d) All of the above