CHEMISTRY

WORKSHEET-8

STEP

A PROJECT BY PUNJAB GROUP

Worksheet-8

(B. Inorganic Chemistry)

PERIODS (s and p block elements)

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Q.1 Which one of the following isoelectronic species has comparatively smaller size?

A) Ar C) Cl^-

B) P^{-3} D) S^{-2}

Q.2 Mark the incorrect statement about ionization energy:

A) It is an index of metallic character

B) Elements having stable electronic configuration have greater ionization energy

C) It is always endothermic process

D) Elements having greater ionization energy have high electron affinity

Q.3 Elements in the periodic table can be classified on the basis of the following EXCEPT:

A) Acidic and basic character

B) Valence orbital

C) Electrical conductivity

D) Valence shell

Q.4 Mark the incorrect statement about the period and group in the modern periodic table:

Opt.	Period	Group
A)	It is horizontal row of elements from left to right	It is vertical column of elements from top to bottom
B)	It is the number of shells involved in the electronic configuration of an element	It is the number of electrons present in the valence shell of atom of an element
C)	There are eight periods	There are sixteen groups
D)	It is shown by Arabic numerals	It is shown by Roman numerals

Q.5 **All of the following periodic properties increase along the period EXCEPT:**

A) Ionization energy
C) Electron affinity
B) Atomic size
D) Electronegativity

Q.6 **All of the following statements about 1st ionization energy of elements are correct EXCEPT:**

A) O > N
C) Al > Mg
B) Be > B
D) Ne > He

Q.7 **The periodic table provides a basic framework to study the periodic behaviour of:**

A) Physical properties only
B) Chemical properties only
C) Physical and chemical properties of elements as well as their compounds
D) Metal and non – metals

Q.8 **Aluminium (Al) is a metal while Sulphur (S) is a non-metal, but even then they both:**

A) Belong to the same period
B) Belong to the same group
C) Are oxidizing agent
D) Are reducing agent

Q.9 **Atomic size of an element depends on:**

A) Number of inner shells only
B) Nuclear charge only
C) Both A and B
D) Neither A nor B

Q.10 **Which one of the following elements has less electronegativity value?**

A) N
C) F
B) O
D) C

Q.11 **Which of the following is polar molecule?**

A) CO_2
C) BF_3
B) NO
D) SO_3

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Q.12 Which of the following periodic properties has no unit?

A) Ionization energy
B) Electron affinity
C) Atomic radius
D) Electronegativity

Q.13 Mark the incorrect statement about electronegativity (E.N)?

A) The maximum E.N is that of F element in the periodic table
B) The minimum E.N is that of Cs element in the periodic table
C) It is the property of an element in the isolated form
D) It has no unit

Q.14 Consider the following applications of electronegativity (E.N):

I. If the E.N difference between two bonded atoms is zero or less than 0.5, then the bond is said to be non-polar covalent bond

II. If the E.N difference between two bonded atoms is 1.7, then the bond is said to be 50% covalent and 50% ionic bond

III. If the E.N difference between two bonded atoms is 1.6 or more than 0.5, then the bond is said to be polar covalent bond

IV. If the E.N difference between two bonded atoms is greater than 1.7, then the bond is said to be covalent in nature

Which one of the above statements is incorrect?

A) I only
B) II and III only
C) IV only
D) I, II, III and IV

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Q.15 Which of the following statements does not match correctly for electron affinity and electronegativity?

Opt.	Electron Affinity	Electronegativity
A)	It is the energy released or absorbed, when an electron is added to a gaseous atom to form a negative ion	It is the power of an atom to attract shared pair of electrons in a molecule. It is concerned with the attraction for electrons of atoms in molecules
B)	It is concerned with the attraction for electrons of single gaseous atoms	It is associated with atom of element in the molecule
C)	Its unit is $kJmol^{-1}$	It has no unit
D)	It cannot be measured directly. It has relative value	It can be measured directly

Q.16 Which of the following transition element does not have oxidation number according to group number?

A) Mn (VII) C) Zn (II)

B) Cu (I) D) Cr (V)

Q.17 Which of the following is true about Na, Si and S?

A) Their chlorides are ionic solid

B) Covalent bond is found in most of the compounds

C) They are in the same period of the periodic table

D) They are in the same group of the periodic table

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Q.18 The apparent charge that an atom would have in a compound is called oxidation state (O.S).

Consider the following statements about O.S:

I. In ionic compounds, the number of electrons which an atom loses or gains is its O.S

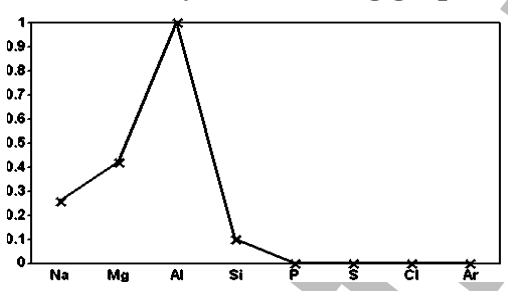
II. In a covalent compounds, the O.S of an element is decided by the difference of electronegativity between two atoms In a covalent compound, the element with greater electronegativity has negative O.S

III. In a covalent compound, the element with less electronegativity has positive O.S

Which of the above statement about O.S is / are correct?

A) III only
B) II only
C) I and II
D) I, II and III

Q.19 The trend shown by the following graph is for:



A) Electrical conductivity
B) Boiling point
C) Ionization energy
D) Atomic size

Q.20 Electrical conductivity in metal increases down the group.

What is the correct order of conductivity in IB?

A) Cu > Ag > Au
B) Ag > Cu > Au
C) Cu < Ag < Au
D) Ag > Au > Cu

Q.21 In the short period melting points and boiling points of elements:

A) Increase
B) Decrease
C) First increase then decrease
D) Remain unchanged

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Q.22 Mark the correct statement about atomic radius:

A) It decreases along a period from left to right
B) It increases from top to bottom in a group
C) Both A and B
D) Neither A nor B

Q.23 Which of the following factors does not affect ionization energy of elements?

A) Magnitude of nuclear charge
B) Size of the atom
C) Shielding effect
D) Density

Q.24 Which of the following elements has smaller 1st ionization energy?

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

Q.25 Keeping in view the size of atoms, which order is correct?

A) N > C
B) P > Si
C) Ar > Cl
D) Li > Be

Q.26 In which of the following pairs, the radius of the second atom is greater than that of the first atom?

A) Na, Mg
B) Sr, Ca
C) P, N
D) Cl, Br

Q.27 Energy required to remove an electron from the outermost shell of an isolated gaseous atom in its ground state is called:

A) Electron Affinity
B) Lattice Energy
C) Crystal Energy
D) Ionization Energy

Q.28 The cause of periodicity of elements is because of similar:

A) Density
B) Valence shell electronic configuration
C) Chemical properties
D) Diagonal relationship

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Q.29 Identify the incorrect statement about cationic radius (r_+):

Opt.	Cationic radius (r_+)
A)	With the loss of one or more electrons from neutral atom, it becomes positive ion.
B)	Then there is loss of the outermost shell
C)	There is an imbalance protons-electrons ratio i.e. number of protons > number of electrons
D)	Nucleus hold decrease on the valence electrons and thus cationic radius increase

Q.30 Which of the following halides of aluminium is predominantly covalent in nature?

A) AlI_3 C) $AlBr_3$
B) $AlCl_3$ D) AlF_3

Q.31 Consider the following statements about the electronegativity of the elements in the periodic table
I. It increases in the period 3 from Na to Cl.
II. It increases in group II from Ba to Be.
III. It increases in group VII from I to F.
Which of the above statement is/are correct?

A) I only C) II and III only
B) II only D) I, II and III

Q.32 What is not a trend from left to right across the elements of the third period of the periodic table?

A) The radii of the atoms decrease
B) The oxides of the elements change from basic to acidic
C) The melting points of the elements decrease steadily
D) The compounds of the elements change from ionic to covalent

Q.33 In general, why first ionization energy decreases down a group of the periodic table?

A) The nuclear charge is increasing
B) The electron to be ionized becomes progressively further from the nucleus
C) There are progressively more electrons between the nucleus and the electron to be ionized
D) Both B and C

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Q.34 An element of the third period (Na to S) is heated in chlorine. The product is purified and then added to water. The resulting solution is found to be neutral.

What is the element?

A) Sodium
B) Aluminium
C) Silicon
D) Phosphorus

Q.35 Which property of the first six elements of period 3 (sodium to sulphur) continuously increases numerically?

A) Atomic radius
B) First ionization energy
C) Maximum oxidation number in oxide
D) Melting point

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ANSWER KEY (Worksheet-8)							
1	A	11	B	21	D	31	D
2	D	12	D	22	C	32	C
3	D	13	C	23	D	33	D
4	C	14	C	24	A	34	A
5	B	15	D	25	D	35	C
6	D	16	D	26	D		
7	C	17	C	27	D		
8	A	18	D	28	B		
9	C	19	A	29	D		
10	D	20	B	30	A		

ANSWERS EXPLAINED

Q.1 **(A)** Argon (Ar) has comparatively smaller size as shown in the tabular form:

Species	Radius (om)
P^{-3}	212
S^{-2}	184
Cl^{-}	181
Ar	94

- Order of decreasing size of isoelectronic species is as follow:

$$P^{-3} > S^{-2} > Cl^{-} > Ar$$

Q.2 **(D)** In fact, elements having stable electronic configuration have greater ionization energy and lower electron affinity e.g. **N** atom has half-filled **p-subshell** electronic configuration ($_7N = 1s^2, 2s^2, 2p^3$) and its **$I.E_1$** is **1402kJmol^{-1}** whereas its **electron affinity** is **-7kJmol^{-1}.**

Q.3 **(D)** Elements in the periodic table **cannot** be classified into four blocks **(s, p, d and f)** on the basis of valence shell because valence shell is the outermost shell. The number of electrons present in the valence shell determine group of the elements.

- Elements in the periodic table can be classified into four blocks. This classification is based upon the valence orbital of the element involved in chemical bonding.

Q.4 **(C)** **It is incorrect statement. In fact, there are seven periods and eighteen groups in the modern periodic table.**

Q.5 **(B)** Along the period as the **nuclear charge** increases with the **increase** in **atomic number,** electrons in the valence shell are pulled closer to the **nucleus**. Thus the overall **size** of the atom **decreases.**

Q.6 **(D)** **It is incorrect statement. In fact $_2He$ ($1s^2$) has smaller size than $_{10}Ne$, therefore, He has greater 1st I.E. then that of Ne as shown below:**

He ($I.E_1$ = 2372kJmol^{-1}),

Ne ($I.E_1$ = 2081kJmol^{-1})

Q.7 **(C)** The periodic table provides a basic framework to study the periodic behaviour of physical and chemical properties of elements as well as their compounds.

Q.8 **(A)** Both belong to the same period

$_{12}Mg$ (2,8,2) number of shells involved

= 3 (period = 3)

$_{17}Cl$ (2,8,7) number of shells involved

= 3 (period = 3)

Q.9 **(C)** **With the increase** of **number of inner shells**, atomic size of an atom increases because nucleus hold on the valence electrons decreases. e.g. in IIA group size of Mg is greater than that of Be. This happens in a **group**.

With the increase of **nuclear charge**, size of atom decreases e.g. size of Be is smaller than that Li. This happens in a **period**.

Q.10 (D) Carbon has less electronegativity value as shown in the tabular form.

Elements	E.N
N	3.0
O	3.5
F	4.0
C	2.5

Q.11 (B) NO is a polar molecule because it has electronegativity difference 0.5 (O = 3.5, N = 3.0).

Q.12 (D) Electronegativity has no unit.

Q.13 (C) It is the property of an element in the associated form (i.e. in the molecular form.

Q.14 (C) It is incorrect statement. The correct statement is as follow.

- If the E.N difference between two bonded atoms is greater than 1.7, then the bond is said to be ionic in nature

Q.15 (D) It is incorrect statement.

The correct statement is as follow:

Opt.	Electron Affinity	Electronegativity
D)	It can be measured directly	It cannot be measured directly. It has relative value

Q.16 (D)

Elements	Groups	Examples	O.S per atom
Mn	VIIB	$K^{+7}MnO_4$	Mn (VII)
Cu	IB	$Cu^{+2}{}_2O^{-2}$	Cu (I)
Zn	IIB	$Zn^{+2}O^{-2}$	Zn (II)
Cr	VIB	$K^{+2}{}_2Cr^{+12}{}_2O^{-14}{}_7$	Cr (VI)

Q.17 (C) They are in the same period of the periodic table.

Q.18 (D)

- In ionic compounds, the number of electrons which an atom loses or gains is its O.S
- In a covalent compounds, the O.S of an element is decided by the difference of electronegativity between two atoms In a covalent compound, the element with greater electronegativity has negative O.S
- In a covalent compound, the element with less electronegativity has positive O.S

Q.19 (A)

- Electrical conductivity increases from Na to Al because it depends on number of free electrons.
- From Na to Al number of free electrons increase and thus electrical conductance increases upto Al.

Prop.	Metals	Metalloid	Non-metals
Examples	Na, Mg and Al	Si	P, S, Cl and Ar
Conductor/ Non-conductor	Good conductor	Poor conductor	Non-conductor
Electrical Conductance (ohm^{-1} cm^{-4})	10^{-3}	10^{-5}	10^{-10}
Effect of increase in temperature	Conducti-vity slowly falls	Conductivi-ty usually increase	No effect

Q.20 (B) The correct order of conductivity of IB is as follow: Ag > Cu > Au

Q.21 (D) Melting and boiling points of elements first increase then decrease due to the following reasons.

Across the short periods the melting and boiling points of elements increase with the number of valence electrons up to group IVA and then decrease upto the noble gases.

Since carbon has the maximum number of binding electrons, thus it has a very high melting point. In diamond in which each carbon is bonded to four other carbon atoms forming a giant covalent structure and has high melting point 3550°C.

Q.22 (C) Both statements are correct:

- It decreases along a period from left to right
- It increases from top to bottom in a group

Q.23 (D) density does not effect ionization energy of elements.

Q.24 (A) Oxygen has comparatively greater 1st ionization energy ($kJmol^{-1}$):

A) Oxygen (1314)
B) Nitrogen (1402)
C) Fluorine (1681)
D) Helium (2372)

Q.25 (D)

Size of Li is greater than that of Be because as we move along the period nuclear charge increases and attraction between nuclear charge and valence electron increases.

Name of property	Li	Be
Atomic radius (pm)	123	89

Q.26 (D)

- **Both Cl and Br are in group VIIA**
- **Br has more filled shells of electrons and has greater shielding effect.**
- **Hence, the attractive forces between nuclear charge and valence electrons is weaker in Br and therefore, Br has a larger radius as shown in the tabular form:**

Property	Cl	Br
Atomic radius (pm)	99	114

Q.27 (D)

Energy required to remove an electron from the outermost shell of an isolated gaseous atom in its ground state is called ionization energy. It depends on the following factors:

- **Nuclear charge**
- **Atomic size**
- **Nature of atomic orbitals**

Q.28 (B)

- **The cause of periodicity of elements has same valence shell electronic configuration. e.g. the elements of IIA group have same valence shell electronic configuration such as ns^2.**

Further explanation:

- **When we arrange different elements in the order of increasing atomic numbers, we find that the elements with similar valence shell electronic configurations recur after definite intervals of 2, 8, 18 or 32 (magic number).**
- **These elements with similar valence configuration, have similar**

properties and are placed in a same vertical configuration, all halogens have $ns^2\ np^5$ and all inert gases have $ns^2\ np^6$ (except He) valence shell electronic configuration.

- **To sum up, the cause of periodicity is the repetition of electronic configuration with similar valence shell configuration.**

Q.29 (D) It is incorrect statement

The correct statement is as follow:

Opt.	Cationic radius (r_+)
D)	Nucleus hold increase on the valence electrons and thus cationic radius decrease

Q.30 (A)

AlI_3 is predominantly covalent in nature because electronegative difference between aluminium and iodine is less than 0.5.

Q.31 (D) Electronegativity, *X*, is a measure of the ability of an atom to pull the electrons in a covalent bond.

I.

- Across a period, atomic size decreases and number of protons increases.
- Hence, the ability to attract electrons increases, i.e. X increase.

II and III.

- Going up a group atomic size decreases and screening effect decreases as a result of less filled shell of electrons.
- Hence, the attraction for electrons increases, i.e. X increases.

Q.32 (C) The metallic bond strength increases at first and M.P. increases. When it becomes a non-metal, the M.P. becomes very low.

(A) The atomic radii decreases as the nuclear charge increases while shielding effect remains the same. The attraction for electrons increases and hence the atomic size decreases.

(B) The elements change from metals to non-metals. Hence, the oxides change from being basic to amphoteric and then to acidic.

(D) As the elements change from metallic to non-metallic, the compounds of the elements charge from ionic to covalent.

Q.33 (D)

$$M_{(g)} \longrightarrow M^+_{(g)} + e^- \qquad \Delta H = 1^{st}\ \text{I.E.}$$

- **Lower first ionization energy is experienced by one with larger atomic radius (down the group) and more screening electrons (down the group).**
- **When the valence electrons become further away from the nucleus, less energy would be required to remove the valence electrons.**

Q.34 (A)

$$2Na + Cl_2 \longrightarrow 2NaCl$$

Na readily reduces Cl_2 to form NaCl. Since NaCl is a salt that can be formed from a strong acid (HCl) and a strong base (NaOH), it is neutral in water, i.e. it does hydrolyse in water.

Q.35 (C)

- **Maximum oxidation number in oxide increases continuously from sodium to sulphur (from +1 to +6).**
- **Since the number of valence electrons increases.**
- **Option A is incorrect since atomic radius decreases from Na to S as nuclear charge increases but shielding is approximately the same as electrons are added to the same shell.**
- **Option B is incorrect since first I.E. of Al is lower than the of Mg and first I.E. of S is lower than that of P so that the increase is not continuous.**
- **Option D is incorrect since melting points of P and S are lower than that of S.**

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