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(Autonomous)

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(Re-Accredited by NAAC With 'B' Grade)

NANNAYYACET/AUCET CHEMISTRY-
STUDY MATERIAL

affinity of halogens is the maximum while that of alkali metals is the least.

In a group, electron affinity decreases with the increase in atomic number. Fluorine has slightly lower electron affinity than chlorine because fluorine has very small atomic size.

Hence there is a tendency of electron-electron repulsion, which results in less evolution of energy in the formation to F^- ion.

E.A: Halogens > Oxygen family > Nitrogen family > elements of I, III and IV groups > elements of group II.

viii. **Electronegativity:**

When two atoms are bonded by a covalent bond, both of them share a pair of electrons. The tendency of the bonded atom in a molecule to attract this shared pair of electrons is termed its electronegativity. It differs from electron affinity since it is concerned with atoms in molecules and not with isolated atoms. Same atom when present in different molecules may be in entirely different environments. It is unlikely, therefore, that electronegativity remains a constant quantity. It is, however, assumed to remain constant. Various attempts have been made to evolve a quantitative scale of electronegativity.

a. **Pauling's scale:**

Pauling scale of electronegativity is the most widely used. It is based on excess bond energies.

$X_A - X_B = 0.208\sqrt{\Delta}$

Where X_A and X_B are electronegativities of the atoms A and B respectively, the factor 0.208 arises from the conversion of K cal to eV while Δ = Actual bond energy $- \sqrt{(E_{A.A} \times E_{B.B})}$

b. **Mulliken's scale:**

Mulliken regarded electronegativity as the average value of ionization potential and electron affinity of an atom.

Electronegativity =

$= \dfrac{\text{Ionization potential + Electron affinity}}{2}$

relation between Pauling and Mulliken value

x pauling = $0.34 \times$ Mulliken $- 0.2$

17. **Magic numbers:**

Nuclei with 2, 8, 20, 28, 50, 82 or 126 protons or neutrons have been found to be particularly stable with a large number of isotopes. These numbers which are often referred to as magic numbers are the number of nucleons required for completion of these energy levels.

OBJECTIVE BITS

1. The total number of rare earth elements is
   1. 8
   2. 32
   3. 14
   4. 10

2. Which one of the following represents the electronic configuration of the most electropositive element?
   1. $[He]2s^1$
   2. $[Xe]6s^1$
   3. $[He]2s^2$
   4. $[Xe]2s^2$

3. Ionization energy of nitrogen is more than oxygen because of
   1. More attraction of electrons by the nucleus
   2. The extra stability of half-filled p-orbitals
   3. The smaller size of nitrogen atom
   4. More penetrating effect

4. The element whose electronic configuration is $1s^2\ 2s^2\ 2p^6\ 3s^2$ is a
   1. Metal
   2. Non metal
   3. Metalloid
   4. Inert gas

5. Elements of the same group are characterized by
   1. Ionization potential
   2. Electronegativity
   3. Ionization energy
   4. Number of electrons in outermost shell

6. Electronegativity of beryllium is same that of
   1. Aluminium
   2. Boron
   3. Magnesium
   4. Sodium

7. In the
   1. The
   2. There
   3. Ther
   4. The

8. Which rately
   1. 3d bl
   2. 4d bl
   3. 5d bl
   4. Inner

9. In peri ments
   1. Decr and
   2. Decr and i
   3. Incre and
   4. Incre and

0. Which tronega
   1. Al
   3. Si

1. Which
   1. Li
   3. Cl

2. Which size
   1. Br
   3. I

Which metallic
   1. P
   3. Sb

Alumini with
   1. Berylli
   3. Carbon

Which o highest
   1. Fluorir
   3. Bromir

the periodic table

The horizontal rows are called groups

There are eighteen elements in the third period

There are two elements in the first period

The vertical columns are called periods

Which of the following are shown separately at the bottom of the periodic table?

3d block elements

4d block elements

5d block elements

Inner-transition elements

In periodic table, ionization energy of elements

Decreases from left to right across a period and on descending a group

Decreases from left to right across a period and increases on descending a group

Increases from left to right across a period and on descending a group

Increases from left to right across a period and decreases on descending a group

Which of the following has maximum electronegativity?

1. Al 2. S
3. Si 4. P

Which of has the least ionization energy?

1. Li 2. Cs
3. Cl 4. I

Which of the following will have largest size

1. Br 2. I^-
3. I   4. F

Which of the following elements is most metallic?

1. P   2. As
3. Sb 4. Bi

Aluminium bears a diagonal relationship with

1. Beryllium 2. Boron
3. Carbon   4. Silicon

Which of the following halogens has the highest electron affinity?

1. Fluorine 2. Chlorine
3. Bromine   4. Iodine

16. The largest number of unpaired electrons is present in
1. Nitrogen 2. Oxygen
3. Fluorine 4. S^{-2}

17. Ce, having atomic number 58, is a member of
1. s–block elements 2. p–block elements
3. d–block elements 4. f–block elements

18. Group VA elements
1. Form ions at type E^{+5}
2. Have an outer shell electronic configuration which is short of five electrons of a noble gas structure
3. Have five unpaired p electrons in their outer shell
4. Show decreasing electronegativity with increasing atomic number

19. Element of group VIA
1. Are typical non-metals
2. Are less electronegative than corresponding elements of group VA
3. Exhibit allotropy
4. Form covalent compounds with a valency of six

20. The noble gases
1. Are diatomic
2. Are used to provide inert atmosphere
3. Do not form compounds with any other element
4. Have high melting/boiling points

21. Which of the following has the smallest covalent radius?
1. Be 2. B
3. C   4. N

22. Which of the following pairs of ions is isoelectronic?
1. F^- and Cl^- 2. F^- and O^-
3. Na^+ and K^+ 4. Na^+ and Mg^{3+}

23. Which of the following is the smallest cation?
1. Na^+ 2. Mg^{2+}
3. Ca^{2+} 4. Al^{3+}

24. Which of the following halogens has the least electron affinity?
1. Fluorine 2. Chlorine
3. Bromine   4. Iodine

25. Which of the following has zero electron affinity
    1. Nitrogen
    2. Oxygen
    3. Fluorine
    4. Neon

26. Which of the following pairs of elements shows the diagonal relationship?
    1. Li–Mg
    2. Na-Be
    3. Cs–F
    4. C–Si

27. Which of the following sets of elements is not of transition elements?
    1. Ti, Zr, Hf
    2. Fe, Co, Ni
    3. Ga, In, Tl
    4. Ca, Ag, Au

28. Which of the iso electronic ions K^+, Ca^{+2}, Cl^- and S^{-2} has the lowest ionization energy?
    1. K^+
    2. Ca^{+2}
    3. Cl^-
    4. S^{-2}

29. The least electronegative element in the periodic table is?
    1. Xe
    2. Cu
    3. Rb
    4. Na

30. Which of the following is Dobereiner triad?
    1. Zn, Cr, Na
    2. Cl, Br, I
    3. Ne, Ar, K
    4. none of the above

31. Keeping in view the periodic law and the periodic table, suggest which of the following elements should have the maximum electronegative character?
    1. O
    2. N
    3. F
    4. At

32. Lothar Meyer drew a graph showing the relation between
    1. Atomic number, atomic weight
    2. Atomic weight, atomic volume
    3. Atomic weight, atomic size
    4. Atomic number, atomic size

33. The elements on the right side of the periodic table are
    1. Metals
    2. Metalloids
    3. Non-metals
    4. Transition elements

34. In modern periodic table VI period contains?
    1. 8 elements
    2. 18 elements
    3. 32 elements
    4. 60 elements

35. Diagonally relationship is shown by
    1. Elements of first period
    2. Elements of second period
    3. Elements of third period
    4. None

36. An atom with high electronegativity generally has?
    1. Low electron affinity
    2. Large atomic size
    3. High ionisation potential
    4. Tendency to form positive ions

37. In the periodic table, going down in fluorine group
    1. Reactivity will increase
    2. Electronegativity will increase
    3. Ionic radius will increase
    4. Ionization potential will increase

38. Which of the alkali metals is smallest in size
    1. Rb
    2. Li
    3. K
    4. Na

39. Which has the maximum atomic radius
    1. Al
    2. Si
    3. P
    4. Mg

40. Which one is the correct order of the size of the iodine species?
    1. $I > I^+ > I^-$
    2. $I > I^- > I^+$
    3. $I^- > I > I^+$
    4. $I^+ > I^- > I$

41. the energy required to remove an electron of a gaseous atom from its ground state is called
    1. Ionization energy
    2. Potential energy
    3. Electrode potential
    4. Activation energy

42. In a group of the periodic table the ionisation potentials of elements decrease from top to the bottom because of
    1. Increase in atomic sizes
    2. Increase in densities
    3. Decrease in chemical reactivities
    4. Decrease in electronegativities

43. Which of the following transition involves maximum amount of energy?
    1. $M^- (g) \rightarrow M(g)$
    2. $M(g) \rightarrow M^+ (g)$
    3. $M^+ (g) \rightarrow M^{+2} (g)$
    4. $M^{+2} (g) \rightarrow M^{+3} (g)$

44. As one moves along a given row in the periodic table, ionization energy?
    1. Remain same
    2. Increases from left to right
    3. First increases, then decreases
    4. Decreases from left to right

hich has maximum first ionization
tential?

gativity   2. O

N   4. B

e ionization energy of nitrogen is more
an that of oxygen, why?

The extra stability of half–filled p orbitals
in nitrogen

Jown ir The smaller size of nitrogen

The former contains less number of electrons

The former is less electronegative

hich has the second highest ionization
tential?

use Nitrogen   2. Oxygen

nallest Carbon   4. Fluorine

4. Nectronegativity is a measure of the
micra capacity of an atom to

4. MAttract electrons   2. Attracts protons

er of ti Repel electrons   4. Repel protons

e most predominantly ionic compound
ll be obtained from the combination of
ements belonging to

ovo ai I & VII groups   2. II & VI groups

n its g II & V groups   4. VII & zero groups

hich of the following property displays
al ener ogressive increase with the rise in
on ene omic number across a period in the
ble th riodic table?

its de Electropositivity   2. Electron affinity

so of Ionization potential 4. Size of the atom

hich one of the following elements has
e maximum electron affinity?

jea   2. Cl   3. Br   4. I

hich of the following has zero electron
finity?

trans Oxygen   2. Fluorine

f energ Nitrogen   4. Neon

M (g) e strongest reducing agent is

row   K   2. Al   3. Mg   4. Br

54. The lightest metal is

1. Li   2. Mg

3. Ca   4. Na

55. Variable valency is shown by

1. Metallic elements   2. Normal elements

3. Transition elements 4. None of the above

56. Which of the following shows highest
magnetic moment?

1. N^{+3} 2. Cr^{+3}

3. Fe^{+3} 4. Co^{+3}

57. In the ground state of cobalt atom (Z = 27)
there are — unpaired electrons and thus
the atom is....

1. 2, dia magnetic   2. 2, para magnetic

3. 3, dia magnetic   4. 3, para magnetic

58. The first element of rare earth metals is

1. Cerium   2. Actinium

3. Uranium   4. Lanthanum

59. Element with lowest melting and boiling
point is

1. Hydrogen   2. Helium

3. Neon   4. Sodium

60. Elements with highest melting point and
boiling point respectively are

1. Diamond (carbon) and Osmium

2. Diamond (carbon) and Rhenium

3. Rhenium and graphite (carbon)

4. Coke

61. Densest known element is

1. Os   2. Fr

3. Cs   4. None

62. Most active metal known is

1. Na   2. Fe

3. Hg   4. Cs

63. Elements of zinc group (Zn, Cd and Hg)
are called

1. Noble metals   2. Coinage metals

3. Volatile metals   4. Precious metals

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acid
ium
loric
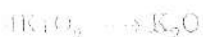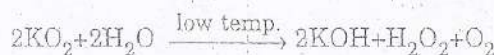dily
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15. i. K_2O (Potassium Oxide):

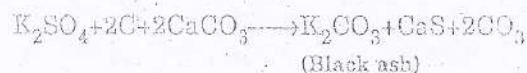$4K + O_2 \longrightarrow K_2O$

ii. KO_2 (Potassium Dioxide)

$K + O_2 \longrightarrow KO_2$

iii. KOH (Potassium hydroxide)

$Ba(OH)_2 + K_2SO_4 \longrightarrow 2KOH + BaSO_4\downarrow$

$2KO_2 + 2H_2O \xrightarrow{\text{low temp.}} 2KOH + H_2O_2 + O_2$
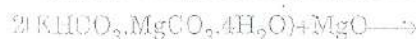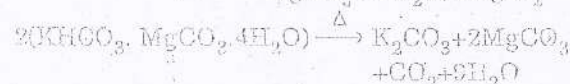
Its aqueous solution is known as 'Potash lye'

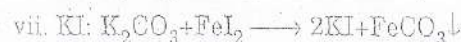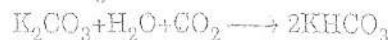iv. K_2CO_3 (Potassium Carbonate, Potash or pearl ash):

$KCl + H_2SO_4 \longrightarrow KHSO_4 + HCl$

$KHSO_4 + KCl \longrightarrow K_2SO_4 + HCl$

$K_2SO_4 + 2C + 2CaCO_3 \longrightarrow K_2CO_3 + CaS + 2CO_2$
(Black ash)
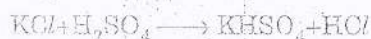
v. Solvay process cannot be used for its manufacture as potassium bicarbonate is very soluble and does not crystallize like solution bicarbonate.

It is now being manufactured by the Magnesia process or Precht's process.

$2KCl + 3MgCO_3 + 9H_2O + CO_2 \longrightarrow 2(KHCO_3.MgCO_3 + 4H_2O) + MgCl_2$

$2(KHCO_3.MgCO_3.4H_2O) \xrightarrow{\Delta} K_2CO_3 + 2MgCO_3 + CO_2 + 9H_2O$

2) $KHCO_3.MgCO_3.4H_2O) + MgO \longrightarrow 3(MgCO_3 2H_2O) + K_2CO_3$
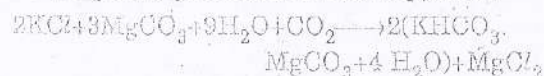
vi. $KHCO_3$ (Potassium bicarbonate)

$K_2CO_3 + H_2O + CO_2 \longrightarrow 2KHCO_3$

vii. KI: $K_2CO_3 + FeI_2 \longrightarrow 2KI + FeCO_3\downarrow$

viii. KNO_3 (Potassium Nitrate or India Salt petre):

$NaNO_3 + KCl \rightleftharpoons KNO_3 + NaCl$

It is used in the manufacture of gunpowder - intimate mixture of nitre (6 Parts), charcoal (1 part) and sulphur (1 Part) and in fire works. It is also used for refrigeration, in medicine in pickling of meat, as a fertilizer and oxidizing agent in the laboratory.

16. Rubidium is obtained by the following methods:

i. Heating a mixture of the carbonate and finely divided carbon.

ii. Heating the chloride with calcium in an exhaust tube.

17. Caesium is obtained by the following methods.

i. Heating the Hydroxide with Mg

ii. Electrolysis of a fused mixture of caesium and barium cyanides.

An alloy of caesium and silver is used in the electric eye used in the television.

1. Which of the following would have the lowest ionization energy?

1. Fr
2. F
3. Cs
4. Cl

2. Of the given pairs, the one showing diagonal relationship is?

1. Li and Mg
2. Li and Na
3. Li and Al
4. Li and Cl

3. The most electropositive elements are found in the group?

1. Zero
2. IA
3. IIB
4. VIII

4. If a certain element has atomic number 11 then the element is?

1. alkali metal
2. alkaline earth metal
3. halogen
4. inert gas

5. Beryllium shows diagonal relationship with?

1. Li
2. Al
3. B
4. Mg

6. Representative elements are the elements of?

1. s-block only
2. p-block only
3. s and p blocks
4. d-block

7. Typical elements is the name given to the elements of?

1. Zero group
2. IIA group
3. 2nd period
4. IIB group

8. Carbon monoxide and caustic soda react to form?

1. Na and CO_2
2. Acetaldehyde
3. Formic acid
4. Sodium formate

The number of water molecules of crystallization in sodium carbonate is?

1. 5
2. 10
3. 2
4. 7

10. Chile saltpeter is?

1. KNO_3
2. NH_4NO_3
3. $NaNO_3$
4. $Ca(NO_3)_2$

The cations of group IA elements are?

1. monovalent
2. bivalent
3. trivalent
4. polyvalent

Alkali metals do not occur free in nature because?

1. They have a very small size
2. They are very reactive
3. They are monovalent
4. They are ambident

An aqueous solution of sodium carbonate is?

1. acidic
2. alkaline
3. neutral
4. none

Which of the following is not an alkali metal?

1. Rh
2. Cs
3. Fr
4. Rb

Group IA elements belong to?

1. s–block
2. p–block
3. d–block
4. f–block

Alkali metal show tipical characteristics of?

1. Inner transition elements
2. Noble gases
3. Representative elements
4. Transition elements

The outer most configuration of alkali metals is?

1. ns^1
2. $2p^1$
3. ns^2
4. none

Which one of the following is the electronic configuration of an alkali metal?

1. $[Ne]\ 3s^1$
2. $[Ar]\ 3d^{10}\ 4s^1$
3. $[Kr]\ 4d^{10}\ 5s^1$
4. $[Xe]\ 4s^{14}\ 5d^{10}\ 6s^1$

Which of the following alkali metals is the most abundant in the earth's crust?

1. Li
2. K
3. Rb
4. Cs

20. Which of the following alkali metals is the most electro positive?

1. Li
2. K
3. Rb
4. Cs

21. Which one of the following metals has the highest density?

1. Li
2. Na
3. Rb
4. Cs

22. Which one of the following alkali metal is used in photoelectric cells?

1. Li
2. Na
3. Cs
4. Fr

23. Which of the following alkali metal ions in aqueous solution is the best conductor of electricity?

1. Li^+
2. Na^+
3. K^+
4. Cs^+

24. Which one of the following alkalimetals does not form alums?

1. Li
2. Na
3. K
4. Rb

25. K, Ca and Li metals may be arranged in the decreasing order of their standard electrode potentials as?

1. K, Ca, Li
2. Li, K, Ca
3. Li, Ca, K
4. Ca, Li, K

26. Which one of the following has a polarizing power close to that of magnesium?

1. Li
2. Na
3. K
4. Rb

27. Which of the following is a liquid at room temperature?

1. Na
2. Fr
3. Os
4. Ce

28. The most abundant salt of sodium is its?

1. Chloride
2. Nitrate
3. Sulphate
4. Phosphate

29. Fused NaCl is used for electrolysis because?

1. Aqueous NaCl solution cannot be electrolysed
2. Aqueous NaCl solution, if electrolysed gives, sodium which further reacts with water to form sodium hydroxide.
3. It becomes covalent in the fused state
4. It melts at a very low temperature

30. Which of the following is not characteristic of alkali metals?

 1. Good conductor of heat and electricity
 2. High oxidation potentials
 3. High melting points
 4. Solubility in liquid ammonia

31. Sodium burns in air to give?

 1. Sodium hydroxide   2. Sodium oxide
 3. Sodium peroxide   4. Sodium suboxide

32. The reaction of water with sodium is?

 1. endothermic   2. exothermic
 3. reversible   4. very slow

33. Which of the following is purely ionic?

 1. Sodium chloride   2. Lithium chloride
 3. Beryllium chloride 4. none

34. Which of the following alkali metal chlorides is soluble in pyridine?

 1. $LiCl$ 2. $NaCl$ 3. $RbCl$ 4. $CsCl$

35. Of the following Compounds which is the most stable?

 1. LiF   2. LiCl   3. LiBr   4. LiI

36. When CO_2 is passed through a strong solution of $NaCl$ saturated with ammonia, white crystals precipitating out contain?

 1. NH_4Cl 2. $NaHCO_3$
 3. Na_2CO_3 4. $(NH_4)_2CO_3$

37. The Correct formula of hypo is?

 1. $Na_2S_2O_3.3H_2O$ 2. $Na_2S_2O_3.4H_2O$
 3. $Na_2S_2O_3.5H_2O$ 4. Na_2SO_4

38. Which of following compound of potassium is known as 'pearl ash'

 1. K_2CO_3 2. $KMnO_4$ 3. KOH 4. K_2O_3

39. What is fusion mixture?

 1. $Na_2CO_3 + K_2CO_3$ 2. $Na_2CO_3 + NaHCO_3$
 3. $K_2CO_3 + KHCO_3$ 4. $NaHCO_3 + KHCO_3$

40. Which is most basic in Character?

 1. RbOH   2. KOH
 3. LiOH   4. NaOH

41. Which of the following has lowest lattice energy?

 1. CsI   2. KBr   3. NaCl   4. LiF

42. Which of the following compound is paramagnetic

 1. KO_2 2. Na_2O_2 3. K_2O 4. H_2O

43. Which of the following compounds is efflorescent?

 1. $NaHCO_3$ 2. $NaCO_3.H_2O$
 3. $Na_2CO_3.10H_2O$ 4. Na_2CO_3

44. Sodium is made by the electrolysis of a molten mixture of about 40% $NaCl$ and 60% $CaCl_2$ because

 1. $CaCl_2$ helps in conduction of electricity
 2. Ca^{2+} can displace Na from NaCl
 3. Ca^{2+} can reduce NaCl to Na
 4. The mixture has a lower melting point than NaCl

45. When KCl is heated with concentrated H_2SO_4 and solid $K_2Cr_2O_7$ we get?

 1. Chromic oxide   2. Chromic chloride
 3. Chromous chloride   4. Chromyl chloride

46. The metallic lustre exhibited by sodium is explained by....

 1. Diffusion of Na^+ ions
 2. Oscillation of loose electrons
 3. Excitation of free protons
 4. Existence of body centred cubic lattice

47. An alum is a

 1. Double salt   2. Mixed salt
 3. Common salt   4. Amphoteric salt

48. Sodium peroxide in contact with moist air turns white due to the formation of?

 1. Na_2CO_3 2. Na_2O
 3. NaOH   4. both 1 and 3

49. KO_2 is an example of

 1. Suboxide   2. Peroxide
 3. Superoxide   4. none

50. On prolonged exposure to air, sodium finally changes to?

 1. Na_2O 2. NaOH   3. Na_2CO_3 4. NaHCO

ANSWERS

1.1	2.1	3.2	4.1	5.2	6.3	7.3	8.4	9.2	10.3	11.1	12.2	13.2	14.1	15.1	16.3
17.1	18.1	19.2	20.4	21.4	22.3	23.4	24.1	25.2	26.1	27.2	28.1	29.2	30.3	31.3	32.2
33.1	34.1	35.1	36.2	37.3	38.1	39.1	40.1	41.1	42.1	43.3	44.4	45.4	46.2	47.1	48.1
49.3	50.3														

with cement is harder and water proof. It is called cement mortar.

26. Calcium phosphate $Ca_3(PO_4)_2$ is a constituent of bones and teeth. In the form of $Ca(H_2PO_4)_2$ it is called super phosphate of lime and is used

as fertilizer. Pure $Ca(H_2PO_4)_2$ is used as American baking powder. In general, a mixture of $Ca(H_2PO_4)_2 \cdot H_2O + 2 (CaSO_4 2H_3O)$ is known as super phosphate of lime.

OBJECTIVE BITS

1. Which one of the following is not an alkaline earth metal?
   1. Ca   2. Sr   3. Rb   4. Ra

2. The correct sequence of alkaline earth metals in IIA group is
   1. Ba, Mg, Ca, Sr, Be, Ra
   2. Be, Mg, Ca, Sr, Ba, Ra
   3. Mg, Ba, Ca, Sr, Be, Ra
   4. Mg, Be, Ca, Sr, Ba, Ra

3. Alkaline earth metals show typical characteristics of
   1. Inner transition elements
   2. Noble gasses
   3. Representative elements
   4. Transition elements

4. The outer electronic configuration of alkaline earth metals is
   1. ns^2 2. ns^1 3. np^6 4. nd^{10}

5. Alkaline earth metals (group IIA elements) differ from group IIB elements in the electronic configuration of their
   1. Antepenultimate shell
   2. Inner most shell
   3. Outer most shell
   4. Penultimate shell

6. Density is the highest for
   1. Mg   2. Ca   3. Sr   4. Ba

7. Which one of the following has the highest melting point?
   1. Mg   2. Ca   3. Sr   4. Ba

8. In comparison to alkali, alkali earth metals are
   1. less reactive   2. less reducing
   3. less basic   4. all the three

9. Which of following has highest electrode potential?
   1. Be   2. Mg   3. Ca   4. Ba

10. Which of the following ions forms highly soluble hydroxide in water?
    1. K^+ 2. Zn^{++}
    3. Al^{+++} 4. Ca^{++}

11. The chemical composition of carnallite is
    1. $KCl. MgCl_2.6H_2O$ 2. $MgSO_4.7H_2O$
    3. $MgCO_3.CaCO_3$ 4. $MgCO_3$

12. What is extracted from the ore gypsum?
    1. Mg   2. Ca   3. Cu   4. Pb

13. Talc is an ore of
    1. Mg   2. Ca   3. Rb   4. None

14. The metal that can be extracted from sea water is
    1. Cl   2. Ca
    3. Mg   4. All the above

15. Which of the following metals is present in chlorophyll?
    1. Mg   2. Be
    3. Ca   4. None of these

16. Which of the following is used as a antacid
    1. MgO   2. $Mg(OH)_2$ 3. $MgSO_4$ 4. $MgCO$

17. Epsom salt is
    1. $MgSO_4.7H_2O$ 2. $MgSO_4 2H_2O$
    3. $2CaSO_4 H_2O$ 4. $BaSO_4 2H_2O$

18. Magnesium burns in air to give
    1. MgO   2. Mg_3N_2
    3. $MgCO_3$
    4. both MgO and Mg_3N_2

19. Mixture of $MgCl_2$ and MgO is called
    1. Portland cement   2. Sorrel's cement
    3. Double salt   4. None

20. Calcium does not combine directly with
    1. Oxygen   2. Nitrogen
    3. Hydrogen   4. Carbon

21. A fire work gives out crimson colour light, it contains a salt of
    1. Ca   2. Na   3. Sr   4. Ba

22. Bone ash contains
    1. CaO   2. $CaSO_4$
    3. $Ca_3(PO_4)_2$ 4. $Ca(H_2PO_4)_2$

23. Lithophone is a combination of ZnS and
    1. $PbSO_4$ 2. $CaSO_4$ 3. $SrSO_4$ 4. $BaSO$

Plaster of paris is
1. $CaSO_4.H_2O$
2. $CaSO_4.2H_2O$
3. $CaSO_4.\frac{1}{2}H_2O$
4. $CaSO_4.1\frac{1}{2}H_2O$

Which is quick lime
1. $Ca(OH)_2$
2. CaO
3. $CaCO_3$
4. $Ca(OH)_2+H_2O$

Mortar is a mixture of
1. Slaked lime, sand and water
2. Slaked lime, plaster of paris and water
3. Magnesium chloride, tar and lime
4. none of the above

Which mineral was used in isolation of radium
1. Lime stone
2. Pitch blend
3. Rutile
4. Hematite

A metal is sparingly soluble in water and its carbonate evolves CO_2 on heating. The metal is?
1. transition metal
2. an alkali metal
3. an alkaline earth metal
4. none

Solubility in water of sulphates down the Be group is Be > Mg > Ca > Sr > Ba. This is due to?
1. Ionic nature increases
2. Size of M^{2+} ion increases
3. Lattice energy decreases
4. Hydration enthalpy of M^{2+} ions decreases

Which of the following compounds gives acetylene upon reaction with water?
1. CaC_2
2. Al_4C_3
3. Mg_3N_2
4. none

Which of the following oxide is amphoteric
1. CO_2
2. SnO_2
3. BeO
4. Ag_2O

Which of the following hydroxides is most alkaline?
1. $Be(OH)_2$
2. $Mg(OH)_2$
3. $Ca(OH)_2$
4. $Ba(OH)_2$

Which of the following can be used to remove nitrogen from air?
1. $CaCl_2$
2. P
3. Mg
4. $BaSO_4$

The ionic carbide is ....
1. CaC_2
2. SiC
3. ZnC
4. none

Baryta is ....
1. $Ba(OH)_2$
2. $BaSO_4$
3. BaO
4. BaO_2

Which is most basic
1. P_2O_5
2. BeO
3. MgO
4. all are equal strength

37. Which of the following metals dissolve in NaOH with the evolution of Hydrogen?
1. Sr
2. Mg
3. Ca
4. Be

38. Alkaline earth metals are
1. oxidising agents
2. reducing agents
3. inert metals
4. Amphoteric

39. Which of the following elements has a tendency to form covalent bonds?
1. Be
2. Ca
3. Mg
4. Sr

40. Which of the following compound is most stable thermally
1. $MgCO_3$
2. $CaCO_3$
3. $SrCO_3$
4. $BaCO_3$

41. Flame test is not given by
1. Ca^{2+} ions
2. Mg^{2+} ions
3. Be^{2+} ions
4. both 2 and 3

42. A substance absorbs CO_2 and violently reacts with water. The substance is?
1. CaO
2. $CaCO_3$
3. H_2SO_4
4. none

43. Which of the following is true peroxide?
1. BaO_2
2. SO_2
3. CO_2
4. MnO_2

44. Which of the following has greater tendency for complex formation?
1. Beryllium
2. Magnesium
3. Calcium
4. Barium

45. The metal present in Grignard reagent is
1. Beryllium
2. Magnesium
3. Calcium
4. Barium

46. Which of the following has the smallest radius?
1. Li^+
2. Be^{2+}
3. Na^+
4. Mg^{2+}

47. Which of the following has highest solubility in water?
1. CaF_2
2. $CaCl_2$
3. $CaBr_2$
4. CaI_2

48. Electron is an alloy of
1. Mg and Zn
2. Al and Zn
3. Ni and Zn
4. none

49. Magnesium is mainly extracted from
1. dolomite
2. carnallite
3. cryolite
4. none

50. A metal, which shows properties similar to that of Mg, is
1. Al
2. Li
3. Na
4. none

ANSWERS

1.3 2.2 3.3 4.1 5.4 6.4 7.3 8.4 9.2 10.4 11.1 12.2 13.1 14.3 15.1 16.2
17.1 18.4 19.2 20.4 21.3 22.3 23.4 24.3 25.2 26.1 27.2 28.3 29.4 30.1 31.3 32.3
33.3 34.1 35.3 36.3 37.4 38.2 39.1 40.4 41.4 42.1 43.1 44.1 45.2 46.2 47.1 48.1
49.2 50.2

Chemistry Competitions   211   M.Sc. Entrance–Chemistry

i. An aqueous solution of the salt is acidic in nature due to hydrolysis.

ii. When its aqueous solution is concentrated, crystals of the dodecahydrate, $Al_2Cl_6 12H_2O$ are deposited.

iv. Aluminium chloride exists as a dimer, Al_2Cl_6 in which each atom attains an octet of electrons.

v. The covalent compound of $AlCl_3$ dissolves in ether, alcohol.

vi. $AlCl_3 + 3H_2O \rightleftharpoons Al(OH)_3 + 3HCl$

vii. $AlCl_3 + 6NH_3 \rightleftharpoons [Al(NH_3)_6)] Cl_3$

35. Three centered electron pair bond contains compounds are aluminium alkyls, diboranes and gallium alkyls.

OBJECTIVE BITS

Which one of the following does not belong to group IIIA?

1. B   2. Al   3. Ge   4. In

Boron is a

1. Metal   2. Non–metal
3. metalloid   4. none

Which one of the following is not a metal

1. B   2. Ga   3. In   4. Tl

Which shows variable valency

1. B   2. Al   3. Ga   4. Tl

Which of the following exhibits inert pair effect

1. B   2. Al   3. Tl   4. Sc

Which of the following resembles Silicon in same of its properties

1. B   2. Ga   3. In   4. Tl

Which of the following is used in high temperature thermometry

1. Na   2. Ga   3. Tl   4. Hg

Which of following is the smallest cation

1. Na^+ 2. Mg^{2+} 3. Ca^{2+} 4. Al^{3+}

The chief ore of aluminum is

1. Alunite   2. Bauxite   3. Cryolite   4. Felspar

Sapphire is a mineral of

1. Cu   2. Zn   3. Al   4. Mg

Which is not a compound of aluminum?

1. Corundum   2. Ruby
3. Diaspore   4. Dolomite

Which is amphoteric in nature?

1. K_2O 2. CaO   3. MgO   4. Al_2O_3

Cryolite is used in the electrolytic extraction of aluminum

1. To dissolve bauxite
2. To dissolve sodium
3. To dissolve aluminium fluoride
4. To decrease the solubility

14. The cathode used in the electrolytic cell of aluminium extraction is made of
1. Aluminium   2. Carbon lining
3. Iron   4. Steel

15. Which metal is extracted only by electrolytic reduction?
1. Al   2. Ag   3. Cu   4. Fe

16. Aluminium metal is refined by
1. Serpeck's process   2. Baeyer's process
3. Hoope's process   4. Hall's process

17. Aluminum becomes passive in
1. Conc. HNO_3 2. H_2CrO_4
3. $HClO_4$ 4. All

18. Which metal is protected by a layer of its own oxide?
1. Aluminum   2. Silver   3. Gold   4. Iron

19. Thermite is a mixture of
1. 3 parts of powdered Al and 1 part of Fe_2O_3
2. 1 part of powdered Al and 3 parts of Fe_2O_3
3. 1 part of powdered Al and 1 part of Fe_2O_3
4. 2 parts of powdered Al and 1 part of Fe_2O_3

20. In the alumino thermite process, aluminum act as
1. An oxidising agent   2. A flux
3. A reducing agent   4. A solder

21. In thermite welding process we use
1. Al powder   2. Fe powder
3. Ca powder   4. Al + Fe mixture

22. Alumina is
1. Acidic   2. Amphoteric
3. Basic   4. Neutral

23. Which is the hardest substance
1. Glass   2. Diamond
3. Corundum   4. Bauxite

24. Anhydrous $AlCl_3$ is obtained from
   1. HCl and aluminium metal
   2. Aluminium and chlorine gas
   3. Hydrogen chloride gas and aluminium metal
   4. None of these

25. Which one is a covalent compound?
   1. $Al_2(SO_4)_3$ 2. $AlCl_3$ 3. AlF_3 4. Al_2O_3

26. Which of the following is called alum?
   1. $NaAlO_2$
   2. $Na_2SO_4.Al_2(SO_4).24H_2O$
   3. $KCl.MgCl_2.6H_2O$
   4. $FeSO_4(NH_4)_2SO_4.6H_2O$

27. An example of a double salt is
   1. Bleaching powder   2. $K_4Fe(CN)_6$
   3. Hypo   4. Potash alum

28. Boron compounds behave as lewis acids because of their
   1. acidic nature   2. covalent nature
   3. electron deficient character
   4. ionising property

29. Which one of the following is not an electron deficient compound?
   1. BCl_3 2. $AlCl_3$ 3. Al_2Cl_6 4. B_2H_6

30. An aqueous solution of borax is
   1. Acidic   2. Alkaline
   3. Neutral   4. Bleaching agent

31. The borax bead test is based upon the formation of
   1. Boric acid   2. Boron oxide
   3. Elemental boron   4. Metaborates

32. Which one is metaboric acid?
   1. HBO_2 2. $H_2B_4O_7$ 3. H_3BO_3 4. $B(OH)_3$

33. Which one is a Lewis acid
   1. PCl_3 2. $AlCl_3$ 3. NCl_3 4. $AsCl_3$

34. Colemanite mineral of boron has the composition
   1. $2Mg_3B_5O_{15}.MgCl_2$ 2. $Ca_2B_6O_{11}.5H_2O$
   3. $Na_2B_4O_7.10H_2O$ 4. None

35. Which one of the following elements has the highest melting point?
   1. Aluminium   2. Gallium
   3. Boron   4. Thallium

36. Boranes have the general formula
   1. $B_{2n}H_{n+4}$ 2. B_nH_{n+5}3. B_nH_{2n+2} 4. B_nH_{n+4}

37. Which one is not a borane
   1. B_4H_{10} 2. B_5H_{11} 3. B_5H_{10} 4. B_5H_9

38. Which of the following elements +1 oxidation state is more stable than +3?
   1. Ga   2. Al   3. B   4. Tl

39. Which of the following compound is called as inorganic benzene (borazine)?
   1. B_6H_4 2. $B_3N_3H_3$ 3. $B_3N_3H_6$ 4. B_3N_6H

40. In the presence of polyhydroxy organic compound like mannitol, boric acid acts as
   1. a weaker acid
   2. a stronger acid
   3. a neutral compound
   4. an amphoteric compound

41. When orthoboric acid is heated to red heat the residue is
   1. boron   2. boric oxide (B_2O_2)
   3. pyroboric acid   4. metaboric acid

42. The borax bead test can be used to detect the presence of
   1. Al   2. Mg   3. Fe   4. Na

43. From B_2H_6 all the following can be prepared except
   1. B_2O_3 2. $NaBH_4$ 3. $B_2(CH_2)_6$ 4. H_3BO_3

44. Thallous hydroxide ($TlOH.H_2O$) is
   1. soluble in water
   2. insoluble in water
   3. does not react with turmeric paper
   4. turns blue litmus red

45. BN (boron nitride) is isoelectronic with
   1 O_2 2. N_2 3. B_2 4. C_2

46. When a borate is mixed with H_2SO_4 and ethyl alcohol, heated and the vapour ignited, the vapours burn with a
   1. red flame   2. bright green flame
   3. blue flame   4. yellow flame

47. H_3BO_3 is
   1. unstable   2. basic
   3. acidic   4. amphoteric

48. In B_2H_6
   1. There is a direct boron-boron bond
   2. B-H bonds are ionic
   3. The structure is similar to that of C_2H_6
   4. The boron atoms are linked through hydrogen bridges

49. The structure of BF_3 is
   1. square planar   2. tetrahedral
   3. pyramidal   4. equilateral triangular

Pure boron is best prepared by
1. heating KBF_4 with H_2 in the presence of a catalyst
2. heating BBr_3 with H_2 in the presence of a catalyst
3. heating B_2O_3 with H_2 in the presence of a catalyst
4. heating KBF_4 with K or Na in the presence of a catalyst

F–B–F bond angle in boron trifluoride
1. 109.5°   2. 120°   3. 90°   4. 128.6°

Which of the following statements regarding BF_3 is false?
1. It is a volatile liquid at room temperature
2. It forms an addition compound with NH_3
3. It it a Lewis acid
4. It has a planar structure

When $B_{10}H_{10}C_2H_2$ reacts with C_4H_9Li, it gives
1. $B_{10}H_{10}C_2Li_2$ 2. $B_{10}H_{10}C_2HLi$
3. $B_{10}C_{10}C_2Li$ 4. both 1 and 2

At high temperature, diborane reacts with excess of NH_3 to give
1. borazole   2. boron nitride
3. borax   4. carborane

Which of the following generic term is used for clovo compounds with both boron and carbon atoms in the polyhedral fame work
1. borazine 2. carborane 3. borate 4. borane

When B_2H_6 reacts with Cl_2 at 25°C, it gives
1. B_2H_5Cl 2. $B_2H_4Cl_2$
3. $BCl+HCl$ 4. none

When B_2H_6 and ammonia are reacted at high temperature in 1:2 ratio, it forms
1. BN   2. $B_3N_3H_6$ 3. B_2H_4 4. $B_3N_4H_8$

$Al(CH_3)_3 + 2B_2H_6 \longrightarrow$?
1. $B(CH_3)_3 + Al(BH_4)_3$ 2. $B(CH_3)_3Al + BH_3$
3. $(BCH_3)_4C + AlBH_3$ 4. $Al(BH_3)_4B(CH_3)_4$

59. $B_2H_6 + 6H_2O \xrightarrow{\text{hydrolysis}}$?
1. $B_2O_3+16H_2O$ 2. $B_4H_{10}+8H_2$
3. $2H_3BO_3+6H_2$ 4. none

60. When B_2H_6 is heated at 100°C in a sealed bulb, it decomposes into H_2 and
1. B_5H_{11} 2. B_4H_{10} 3. B_5H_9 4. $B_{10}H_{14}$

61. When $(C_2H_5)_2O$. BF_3 (boron trifluoride ether complex) reacts with metallic hydrides like LiH, it gives
1. $B_{10}H_{14}$ 2. B_5H_{11} 3. B_2H_6 4. None

62. Which of the following is similar to graphite
1. B   2. B_4C 3. B_2H_6 4. BN

63. In the Hall process substance deposited at cathode is
1. Mg   2. Al   3. Al_2O_3 4. Fe

64. Which Al compound is most likely to contain the ion Al^{3+}?
1. phosphate 2. oxide 3. chloride 4. Fluoride

65. Which of the following solids consist of ions?
1. BF_3 2. B_2H_6 3. CaB_2O_4 4. none

66. What is corundum?
1. SiC   2. Al_2O_3 3. $B_3N_3H_6$ 4. none

67. By the action of water on aluminium carbide to give
1. propane 2. methane 3. acetylene 4. butane

68. Borax is prepared by treating colemanite with
1. NaOH   2. Na_2CO_3 3. $NaHCO_3$ 4. $NaCl$

69. $AlCl_3$ exists as a dimer because?
1. Al has greater IP   2. Al has larger radius
3. incomplete p-orbitals 4. all the above

70. The main factor responsible for B–F bonds in BF_3 is
1. large electronegativity of F
2. $p\pi – d\pi$ back bonding
3. $p\pi – p\pi$ back bonding
4. none of these

ANSWERS

2.3	3.1	4.4	5.3	6.1	7.2	8.4	9.2	10.3	11.4	12.4	13.1	14.2	15.1	16.3
18.1	19.2	20.3	21.1	22.2	23.3	24.3	25.2	26.2	27.4	28.3	29.3	30.2	31.4	32.1
34.2	35.3	36.4	37.3	38.4	39.3	40.2	41.2	42.3	43.3	44.1	45.4	46.2	47.3	48.4
50.2	51.2	52.1	53.4	54.2	55.2	56.3	57.2	58.1	59.3	60.4	61.3	62.4	63.2	64.4
66.2	67.2	68.2	69.3	70.2										

Pyroxene minerals: Ex:Spodumene [LiAl(SiO_3)_2], Jadeite [NaAl(SiO_3)_2], Enstatite (MgSiO_3), Diopside [CaMg(SiO_3)_2],

Amphibole minerals: Tremolite [Ca_2Mg_5(Si_4O_{11})(OH)_2]

v. Sheet Silicates:

Sheet Silicates having the general formula, $(Si_2O_5)_n^{2n-}$.

Ex: Talc [Mg_2(Si_2O_5).Mg(OH)_2]
  Kaoline [Al_2(OH)_4Si_2O_5]
  Pyrophillite [Al_2(OH)_2Si_4O_{10}]

vi. Three–dimentional Silicates:

When a SiO_4^{4-} tetrahedra shares all its four oxygens with other SiO_4^{4-} tetrahedra, the result is the formation of a three dimentional lattice corresponding to the composition SiO_2.

Ex: Feld spars, Zeolites and Ultra marines.

OBJECTIVE BITS

1. Which one of the following is a metalloid?
   1. C
   2. Si
   3. Ge
   4. Sn

2. Which of the following element occurs in free state?
   1. C
   2. Si
   3. Ge
   4. Sn

3. The ability of a substance to assume two or more crystalline structures is called
   1. isomerism
   2. polymorphism
   3. isomorphism
   4. amorphism

4. Which of the following elements does not show allotropy?
   1. C
   2. Si
   3. Sn
   4. Pb

5. The inert pair effect is most prominent in
   1. C
   2. Si
   3. Ge
   4. Pb

6. Which of the following is a semiconductor?
   1. C
   2. Pb
   3. Ge
   4. Sn

7. Silicon is diagonally related to
   1. Al
   2. Be
   3. B
   4. C

8. Which of the following bonds is strongest?
   1. C–C
   2. Si–Si
   3. Sn–Sn
   4. Pb–Pb

9. Diamond and graphite are
   1. Isomers
   2. Isotopes
   3. Allotropes
   4. Polymers

10. The nature of chemical bonding in diamond is
    1. Ionic
    2. Covalent
    3. Coordinate
    4. Metallic

11. Carbon atoms in diamond are bounded with each other in a configuration
    1. Linear
    2. Tetrahedral
    3. Planar
    4. Octahedral

12. Which of the following is a conductor of electricity?
    1. Graphite
    2. SiO_2
    3. CO_2
    4. diamond

13. Graphite is used in nuclear reactors
    1. As a lubricant
    2. As a fuel
    3. For reducing the velocity of neutrons
    4. For lining inside of the reactor as an insulater

14. Moderate electrical conductivity is shown by
    1. Silica
    2. Graphite
    3. Carborundum
    4. Diamond

15. Which of the following is used in making printer's ink, shoe polish, black varnish and paint?
    1. Lamp black
    2. Carbon black
    3. Gas black
    4. Bone black

16. The coal containing maximum percentage of C is
    1. Anthracite
    2. Lignite
    3. Bituminous
    4. Peat

17. If the two compounds have the same crystal structure and analogous formula, they are called?
    1. Isomorphs   2. Isomers
    3. Isotopes   4. Isobars

18. The inert form of carbon is
    1. Charcoal   2. Diamond
    3. Coal   4. Graphite

19. A gas which burns with blue flames is
    1. CO_2 2. O_2
    3. N_2 4. CO

20. Which of the following is a true acid anhydride?
    1. CO   2. CO_2
    3. CaO   4. Al_2O_3

21. Dry powder extinguishers contain
    1. Sand and K_2CO_3 2. Sand and Na_2CO_3
    3. Sand and $NaHCO_3$ 4. Sand only

22. Water gas is a mixture of
    1. $CO+H_2O$ 2. $CO+H_2$
    3. $CO+CO_2$ 4. H_2O+air

23. Carburetted water gas used for lighting and heating purpose is a mixture of water gas and
    1. Oil gas   2. Producer gas
    3. Natural gas   4. Coal gas

24. Producer gas is a mixture of
    1. CO_2+N_2 2. CO_2+H_2
    3. $CO+N_2$ 4. $CO+H_2$

25. Synthesis gas is a mixture of
    1. Steam and carbon monoxide
    2. Carbon monoxide and nitrogen
    3. Hydrogen and carbon monoxide
    4. 229Hydrogen and methane

26. Which of the gases has following fuel composition $48\%H_2+34\%CH_4+15\% O_2+3\% CO$
    1. Coal gas   2. Petrol gas
    3. Water gas   4. Oil gas

27. Semi water gas is a mixture of
    1. CO, H_2 and N_2 2. CO_2, N_2 and H_2
    3. N_2, CO and Coal   4. CO, H_2 and CO_2

28. What is the mixture producer gas and water gas
    1. Semi water gas   2. Natural gas
    3. L.P.G.   4. LNG

29. The halide that is not hydrolysed is
    1. $SiCl_4$ 2. CCl_4
    3. SiF_4 4. $PbCl_4$

30. Which does not exist?
    1. $[SiCl_6]^{-2}$ 2. $[GeF_6]^{-2}$
    3. $[SnCl_6]^{-2}$ 4. $[CCl_6]^{-2}$

31. The maximum covalency shown by silicon is
    1. 2   2. 4   3. 6   4. 8

32. Carborundum is the commercial name of
    1. Al_2O_3 2. H_3PO_4
    3. SiC   4. Pb_2O_3

33. Glass reacts with
    1. HF   2. $H_2S_2O_7$
    3. HNO_3 4. $K_2Cr_2O_7$

34. Which is important constituent of transistors
    1. silver   2. radium
    3. osmium   4. germanium

35. Which one of the following is amphoteric?
    1. $SnCl_4$ 2. SiO_2
    3. CO_2 4. SnO_2

36. Which of the following compound of tin is a reducing agent?
    1. SnO_2 2. $SnCl_2$
    3. $SnCl_4$ 4. None of the above

37. Butter of tin is
    1. $SnCl_2 5H_2O$ 2. $SnCl_4 5H_2O$
    3. $SnBr_4 5H_2O$ 4. $SnBr_2 5H_2O$

38. When tin is treated with concentrated nitric acid
    1. It is converted into metastannic acid
    2. It is converted into stannous nitrate
    3. It is converted into stannic nitrate
    4. None of the above

39. Which of the following alloys contain tin as a major constituent?
    1. Solder   2. Bronze
    3. German silver   4. Bell metal

40. Which of the following compounds of elements in group IV would you expect to be most ionic in character?
    1. $PbCl_2$ 2. $PbCl_4$
    3. $SiCl_4$ 4. CCl_4

41. Which
    struct
    atoms
    atoms
    1. ZrC
    3. W_2C

42. The st
    decre
    1. CBr
    2. CC
    3. CF
    4. CI_4

43. Carb
    poun
    1. Va
    2. La
    3. Pr
    4. Te

44. CS_2
    1. CC
    3. CC

45. Whi
    may
    1. B
    3. C

46. Whi
    pro
    stro
    1. L
    3. A

47. On
    du
    1. F
    3. I

48. Wh
    us
    1.
    3.

49. N
    1.
    3.

50. W
    o

63. The reason why $SiCl_4$ is easily hydrolysed as compared to CCl_4 is that
   1. Silicon is non-metallic
   2. Silicon can extend its coordination number beyond four
   3. $SiCl_4$ can form hydrogen bonds
   4. The bonding in $SiCl_4$ is ionic

64. Etching of glass is done by the use of
   1. Aquaregia
   2. Fuming sulphuric acid
   3. Hydrofluoric acid
   4. Hydrochloric acid

65. Which of the following have cyclic silicate structures?
   1. $Si_3O_9^{6-}$
   2. $Si_6O_{18}^{12-}$
   3. both 1 and 2
   4. SiO_4^{2-}

66. Which of the following is represent a chain Silicate
   1. $(Si_4O_{11})_n^{6n-}$
   2. $Si_3O_9^{6-}$
   3. $Si_6O_{18}^{12-}$
   4. $(Si_2O_5)_n^{2n-}$

67. The oxidation numbers of Si in $Si_3O_9^{6-}$ and $Si_{16}O_{18}^{12-}$ respectively are
   1. $-4, -4$
   2. $-4, +4$
   3. $+2, +2$
   4. $+4, +4$

68. Which of the following orthosilicates is known as willemite?
   1. $Zn_2(SiO_4)$
   2. Be_2SiO_4
   3. $ZrSiO_4$
   4. Mg_2SiO_4

69. Silicate minerals are classified according to the manner of linking of
   1. $(SiO_3)_n^{4n-}$ triangular units
   2. SiO_4^{4-} tetrahedral units
   3. $(Si_2O_7)_n^{2n-}$ units
   4. none of these

70. An example of a covalent carbide will be
   1. B_4C
   2. ZrC
   3. SiC
   4. both 1 and 3

ANSWERS

1.3	2.1	3.2	4.4	5.4	6.3	7.3	8.1	9.3	10.2	11.2	12.1	13.3	14.2	15.1	16.1
17.1	18.2	19.4	20.2	21.3	22.2	23.4	24.3	25.3	26.1	27.1	28.1	29.2	30.4	31.3	32.3
33.1	34.4	35.4	36.3	37.2	38.1	39.1	40.1	41.4	42.3	43.3	44.3	45.4	46.3	47.1	48.3
49.1	50.1	51.2	52.3	53.2	54.2	55.1	56.4	57.1	58.2	59.1	60.3	61.1	62.1	63.3	64.3
65.3	66.1	67.4	68.1	69.2	70.4										

S₄N₄ structures   (twisted cyclic structures)
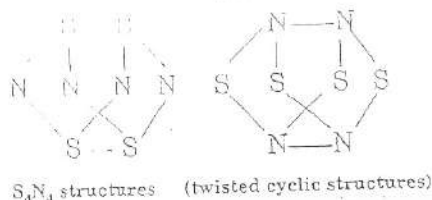
41. $(P_3N_5)_x$, $(P_2N_3)_y$, $(PN)_z$ types are phosphorus nitrides.

42. NaN_3:
   i. $N_2O + 2NaNH_2 \longrightarrow NaN_3 + NaOH + NH_3$
   ii. $NaNO_3 + 3NaNH_2 \longrightarrow NaN_3 + 3NaOH + NH_3$

OBJECTIVE BITS

1. The most basic and most stable hydride is
   1. NH_3 2. AsH_3
   3. SbH_3 4. PH_4

2. Which of the nitrogen oxides is a white solid?
   1. NO_2 2. N_2O_3
   3. N_2O_5 4. NO

3. Basicity of H_3PO_4 is
   1. 1   2. 2
   3. 3   4. 4

4. Which of the of following is Lewis base
   1. NF_3 2. $AlCl_3$
   3. NH_2^- 4. NH_4^+

5. The product obtained in heating ammonium nitrate is
   1. NO 2. NO_3
   3. N_2O_5 4. N_2O

6. Which of the following is coloured?
   1. NO 2. N_2O
   3. NO_2 4. NH_3

7. The anhydride of nitrous acid is
   1. N_2O 2. N_2O_3
   3. N_2O_2 4. N_2O_5

8. Hydroxyl amine is formed by the action of
   1. N_2O on fused sodamide
   2. reduction of nitric oxide by HCl
   3. by allowing N_2O to stand in contact with moist ion filings
   4. HNO_2 on hydrazine

9. Which of the following forms maximum P–H bonds?
   1. H_3PO_2 2. H_3PO_4
   3. H_3PO_3 4. $H_4P_2O_7$

10. PCl_3 undergoes hydrolysis to produce
   1. H_3PO_3 2. H_3PO_2
   3. H_3PO_4 4. HPO_3

11. $FeCl_3$ with H_3PO_4 gives a precipitate soluble in
   1. CH_3COOH 2. HCl
   3. H_2SO_4 4. $NaOH$

12. Which one of the following is dipolyphosphoric acid?
   1. H_3PO_3 2. $H_4P_2O_5$
   3. $H_4P_2O_7$ 4. H_3PO_4

13. Which of the following although tetrabasic forms normal and diacid salts?
   1. Hypophosphoric acid
   2. Peroxy phosphoric acid
   3. Glacial phosphoric acid
   4. Pyrophosphoric acid

14. Which of the following reduces the copper sulphate to metallic copper precipitate.
   1. HPO_3 2. $H_4P_2O_7$
   3. H_3PO_4 4. H_3PO_2

15. When hypophosphoric acid is heated above its melting point, it decomposes into
   1. HPO_3 2. H_3PO_3
   3. both 1 and 2   4. H_3PO_4

16. The action of 30% H_2O_2 on P_2O_5 in acetonitrile solution at a low temperature gives
   1. peroxy monophosphoric acid
   2. peroxy diphosphoric acid
   3. pyrophosphoric acid
   4. metaphosphoric acid

17. P_2O_3 inflames spontaneously in Cl_2 and forms
   1. PO_2Cl 2. $POCl_3$
   3. both 1 and 2   4. PCl_5

18. Which phosph
   1. P_2O_6
   3. P_2O_4

19. Which pared H_2O_2.
   1. Nitric
   3. Hypo

20. HNO_3
   1. $2H_2C$
   3. H_2O

21. When treated or with
   1. HNC
   3. HNC

22. N_2O is
   1. NaN
   2. NaN
   3. Cu a
   4. none

23. The m of elei
   1. P
   3. Al

24. A sub tate v acid a precip
   1. arse
   3. arsi

25. In wh is its
   1. NO
   3. NO

26. Whic phor
   1. Hy
   3. Tri

27. Amoi tains
   1. H_3
   3. H_3

Which of the following is the anhydride of phosphorous acid, H_3PO_3

1. P_2O_6
2. P_2O_5
3. P_2O_4
4. P_2O_3

Which of the following compound is prepared by dissolving N_2O_5 in anhydrous H_2O_2.

1. Nitric acid
2. Nitrous acid
3. Hyponitrous acid
4. Pernitric acid

$HNO_3 + 3HCl \rightarrow$?

1. $2H_2O + NOCl_3$
2. $2H_2O + NOCl + Cl_2$
3. $H_2O + NO_2Cl + Cl_2$
4. none of the above

When silver hyponitrite $(Ag_2N_2O_2)$ is treated with a solution of HCl in dry ether or with H_2S, it gives

1. HNO_2
2. HNO_3
3. HNO_2
4. $H_2N_2O_2$

N_2O is prepared by heating a mixture of

1. $NaNO_3$ and $(NH_4)_2SO_4$
2. $NaNO_3$ and H_2SO_4
3. Cu and HNO_3
4. none of the above

The metalloid among the following group of elements is

1. P
2. As
3. Al
4. Br

A substance which gives a yellow precipitate when boiled with an excess of nitric acid and ammonium molybdate and a red precipitate with silver nitrate is

1. arsenite
2. metaphosphate
3. arsenate
4. orthophosphate

In which of the following compounds of N is its valency lowest?

1. NO
2. N_2O
3. NO_2
4. N_2O_5

Which of the following oxyacids of phosphorus contains a P-P bond?

1. Hypophosphoric acid
2. Pyrophosphoric acid
3. Tripolyphosporic acid
4. None

Among the following compounds, which contains the maximum number of P-H bonds?

1. H_3PO_3
2. H_3PO_4
3. H_3PO_2
4. $H_4P_2O_7$

28. The number of short P-O bonds in P_4O_{10} is

1. 1
2. 2
3. 3
4. 4

29. In the solid state PCl_5 exists as

1. $[PCl_3]^{2-}$ and $[PCl_5]^{2+}$ ions
2. $[PCl_4]^+$ and $[PCl_6]^-$ ions
3. covalent PCl_5 molecule only
4. $[PCl_4]^-$ and $[PCl_6]^+$ ions

30. The basic character of NH_3, PH_3, AsH_3 and SbH_3 decreases in the order

1. $SbH_3 > PH_3 > AsH_3 > NH_3$
2. $NH_3 > PH_3 > AsH_3 > SbH_3$
3. $NH_3 > SbH_3 > PH_3 > AsH_3$
4. none of the above

31. In P_4O_{10} the

1. P=O bond is formed by $d\pi$ - $d\pi$ bonding
2. P=O bond is formed by $p\pi$ - $p\pi$ bonding
3. second bond in P=O is formed by $p\pi$ - $d\pi$ back bonding
4. none of the above

32. Upon reacting with tin, hot concentrated HNO_3 produces.

1. H_2SnO_3
2. $Sn(NO_3)_4$
3. SnO_2
4. $Sn(NO_3)_2$

33. The reaction of zinc with dilute HNO_3 leads to the formation of

1. N_2O_5
2. NH_4NO_2
3. NH_4NO_3
4. none

34. HNO_2 reacts with secondary amines to produce

1. nitrile
2. diazo salts
3. nitrogen
4. nitroso amines

35. Which among the following is the least basic

1. NF_3
2. NCl_3
3. NBr_3
4. NI_3

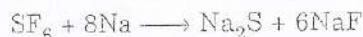36. Which of the following oxides of nitrogen is a mixed anhydride of two acids?

1. N_2O
2. NO
3. NO_3
4. N_2O_4

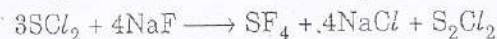37. Which of the following is an ionic compound

1. NI_3
2. NCl_3
3. NF_3
4. BiF_3

$$SF_6 + 8Na \longrightarrow Na_2S + 6NaF$$

It has an octahedral structure with sp^3d^2 hybridisation.

ii. Sulphur tetrafluoride (SF_4):

$$3SCl_2 + 4NaF \longrightarrow SF_4 + 4NaCl + S_2Cl_2$$
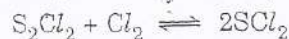
It is used as fluorinating agent. It converts $C=O$ to CF_2, COOH to CF_3, $P=O$ to PF_3 etc. It has distorted trigonal bipyramid structure.

iii. Sulphur chlorides:

a. Sulphur tetrachloride (SCl_4)
$$S_2Cl_2 + 3Cl_2 \longrightarrow 2SCl_4$$
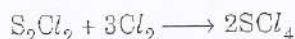
b. Sulphur dichloride (SCl_2)
$$S_2Cl_2 + Cl_2 \rightleftharpoons 2SCl_2$$

c. Sulphur monochloride (S_2Cl_2)
$$2S + Cl_2 \longrightarrow S_2Cl_2$$

iv. Sulphur mono bromide (S_2Br_2)
$$2S + Br_2 \longrightarrow S_2Br_2$$

S_2Cl_2, S_2Br_2 have similar structure that of H_2O_2.

Selenium Oxides:

i. Selenium dioxide (SeO_2):
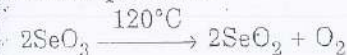
$$Se + air \ or \ O_2 \xrightarrow{\Delta} SeO_2$$
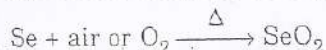
It is a white crystalline substance which disolves in water to give selenius acid. Therefore it is an anhydride of selenius acid.
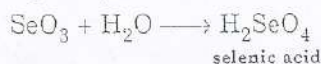
ii. Selenium trioxide (SeO_3):

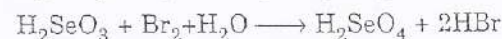It is prepared by the action of O_3 on selenium dissolved in selenium oxychloride.

$$Se + O_3 \longrightarrow SeO_3$$

Decomposition:

$$2SeO_3 \xrightarrow{120°C} 2SeO_2 + O_2$$

Hydrolysis:

$$SeO_3 + H_2O \longrightarrow H_2SeO_4$$
selenic acid

33. Selenium oxy acids:

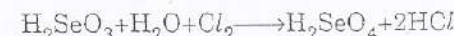i. Selenious ácid (H_2SeO_3):

$$SeO_2 + H_2O \longrightarrow H_2SeO_3$$

It is colourless crystal, which lose water in dry air and are converted to selenium dioxide. It is reduced to metallic selenium by SO_2.

$$H_2SeO_3 + H_2O_2 \longrightarrow H_2SeO_4 + H_2O$$
$$H_2SeO_3 + O_3 \longrightarrow H_2SeO_4 + O_2$$
$$H_2SeO_3 + Br_2 + H_2O \longrightarrow H_2SeO_4 + 2HBr$$
Selenic acid

$$H_2SeO_3 + 4HI \longrightarrow Se + 2I_2 + 3H_2O$$

ii. Selenic acid (H_2SeO_4):

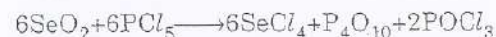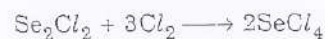$$H_2SeO_3 + H_2O + Cl_2 \longrightarrow H_2SeO_4 + 2HCl$$
selenious acid

34. Selenium halides:

SeF_6, SeF_4, $SeCl_4$, Se_2Cl_2 are important selenium halids.

i. Selenium tetrachloride ($SeCl_4$):
It is prepared by the action of Cl_2 on Se_2Cl_2 or by the action of PCl_5 on SeO_2.

$$Se_2Cl_2 + 3Cl_2 \longrightarrow 2SeCl_4$$
$$6SeO_2 + 6PCl_5 \longrightarrow 6SeCl_4 + P_4O_{10} + 2POCl_3$$

ii. Selenium mono chloride (Se_2Cl_2)
$$2Se + Cl_2 \longrightarrow Se_2Cl_2$$

OBJECTIVE BITS

1. Which one of the following elements has the highest ability to catenate
   1. Se
   2. Te
   3. O
   4. S

2. Ozone is ....
   1. an isotope of oxygen
   2. an isomer of oxygen
   3. all allotrope of oxygen
   4. none of these
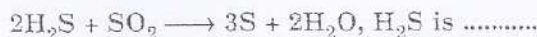
3. In the reaction
   $$2H_2S + SO_2 \longrightarrow 3S + 2H_2O, H_2S \ is \ ....$$
   1. an acid
   2. oxidising agent
   3. reducing agent
   4. precipitating agent

4. When SO_2 is passed through acidified $K_2Cr_2O_7$ solution
   1. The solution is decolourised
   2. The solution turns blue
   3. Green $Cr_2(SO_4)_3$ is formed
   4. SO_2 is reduced

5. Tetrahalide of tellurium (TeX$_4$) on hydrolysis forms
   1. Te(OH)$_2$
   2. TeOX$_2$
   3. TeO$_2$
   4. TeH$_2$

6. Iron reacts with SO$_2$
   1. Fe will be oxidized
   2. Fe will be reduced
   3. to gives FeS
   4. to give FeO

7. Sulphur is readily soluble in
   1. H$_2$O
   2. C$_2$H$_5$OH
   3. C$_2$H$_5$OC$_2$H$_5$
   4. CS$_2$

8. In the reaction of $3O_2 \rightleftharpoons 2O_3$
   1. ΔH = negative
   2. ΔH = positive
   3. oxygen is dissociated into atoms
   4. none of the above

9. Which one of the following is paramagnetic
   1. O$_2$
   2. S$_8$
   3. Se$_8$
   4. Te$_8$

10. Which one has the lowest boiling point
    1. H$_2$S
    2. H$_2$O
    3. H$_2$Se
    4. H$_2$Te

11. O$_3$ gives violet colour in
    1. benzidine solution
    2. acidified K$_2$Cr$_2$O$_7$
    3. tetramethyl base
    4. water

12. The most stable form of sulphur is
    1. plastic
    2. flower of sulphur
    3. monoclinic
    4. rhombic

13. Nitroso-sulphuric acid is obtained as an intermediate. It is
    1. H$_2$SO$_4$NO
    2. HSO$_4$NO
    3. HSO$_4$(NO)$_2$
    4. H$_2$SO$_4$(NO)$_2$

14. In contact process impurities of arsenic are removed by
    1. Fe$_2$O$_3$
    2. V$_2$O$_5$
    3. Al(OH)$_3$
    4. Fe(OH)$_3$

15. The mineral containing selinium is
    1. Clausthalite
    2. Petzite
    3. Hessite
    4. Sylvanite

16. Match the following
    a. Oil of vitriol
    b. Oleum
    c. Caro's acid
    d. Marshall's acid
    1. H$_2$S$_2$O$_7$
    2. H$_2$SO$_4$
    3. H$_2$S$_2$O$_8$
    4. H$_2$SO$_5$

1. a–1, b–2, c–3, d–4
2. a–2, b–1, c–4, d–3
3. a–4, b–3, c–2, d–1
4. a–1, b–4, c–2, d–3

17. H$_2$SO$_4$ works as mainly as
    1. Nitrating agent
    2. Hydrolysing agent
    3. Reducing agent
    4. Oxidizing agent

18. Which of the following compound gives carbon with concentrated H$_2$SO$_4$
    1. Formic acid
    2. Ethyl alcohol
    3. Oxalic acid
    4. Starch

19. H$_2$SO$_4$ has great affinity for H$_2$O because
    1. Acid forms hydrates with H$_2$O
    2. It hydrates the acid
    3. Acid decomposes water
    4. None of these

20. Which of the following compound gives CO$_2$ with conc. H$_2$SO$_4$.
    1. HCOOH
    2. C$_{12}$H$_{22}$O$_{11}$
    3. HOOC – COOH
    4. C$_2$H$_5$OH

21. The complex compound obtained in passing H$_2$S into ammonical solution of sodium nitro prusside is
    1. [Fe(CN)$_5$NOS]$^{4-}$
    2. [Fe$_4$(CN)$_6$]$^{3-}$
    3. [Fe(CN)$_6$]$^{3-}$
    4. none

22. Milk of sulphur is obtained by
    1. Na$_2$S$_2$O$_3$ + Cold HCl
    2. passing H$_2$S through HNO$_3$
    3. boiling milk of lime with sulphur and with HCl
    4. none of the above methods

23. Which of the following is a suboxide
    1. C$_3$O$_2$
    2. MnO$_2$
    3. CsO$_2$
    4. F$_3$O$_4$

24. Ozone is ....
    1. an oxidizing agent
    2. a reducing agent
    3. both 1 and 2
    4. an inert compound

25. Which has greater reactivity
    1. TeF$_6$
    2. SF$_6$
    3. SeFe$_6$
    4. TeCl$_4$

26. SF$_6$ involves hybridization of the type
    1. sp^3
    2. sp^{2}d^2
    3. sp^{3}d^2
    4. sp^{2}d^3

27. The catalyst used in the manufacture of H$_2$SO$_4$ by lead chamber process is
    1. oxides of nitrogen
    2. oxides of vanadium
    3. Ni
    4. Fe

(21)

... pπ – dπ interaction is involved in all the following except

1. Oxides and oxyacids of P
2. Oxides and oxyacids of S
3. Oxides and oxyacids of Cl
4. ethene

... O_3 reacts with iodine gives

1. I_4O_9
2. I_2O_5
3. IO_4
4. IO_5

... O_2 is paramagnetic, the lone pair of electrons is present in

1. bonding orbitals
2. antibonding orbitals
3. f–orbitals
4. p–orbitals

31. Which of the following is used in vulcanisation of rubber

1. S_2Cl_2
2. SF_6
3. Cl_2O
4. $HOCl$

32. The strongest oxidising agent is

1. $H_2S_2O_3$
2. H_2SO_4
3. HSO_3
4. HNO_3

33. Strong acidic oxide is

1. SO_3
2. CO_2
3. P_2O_5
4. SO_2

34. Sulphur does not form

1. SF_6
2. SF_4
3. SCl_6
4. S_2F_6

ANSWERS

1.4	2.3	3.3	4.3	5.3	6.1	7.4	8.2	9.1	10.1	11.3	12.4	13.2	14.4	15.1	16.2
17.4	18.4	19.1	20.3	21.1	22.3	23.1	24.1	25.2	26.3	27.1	28.4	29.1	30.2	31.1	32.4
33.1	34.3														

33. **Interhalogen compounds or Interhalogens:** Each halogen can combine with other halogens to form several compounds amongst themselves. These are known as interhalogens or interhalogen compounds. The main reasons for the formation of these compounds is the large electronegativity and size differences among the halogens. Thus fluorine, the most electronegative element and the smallest halogen, forms the maximum number of inter halogens (halogen fluorides). Interhalogen compound having maximum number of halogen atoms is IF_7.

34. **Pseudo halides and pseudohalogens:** Pseudohalides are the uni-negative groups which show certain characteristics of halide ions. Similarly, pseudohalogens are the covalent dimers of the pseudohalogenoids (halogens, X_2 are the dimers of halide ions, X^-), so far, only four pseudohalogens have been isolated. The most important pseudohalide is CN and thus its corresponding pseudohalogen cyanogen $(CN)_2$.

CN^-, SCN^-, $SeCN^-$ and $SCSN_3^-$ and their corresponding pseudo halogens are cyanogen $(CN)_2$, thiocyanogen $(SCN)_2$, selenocyanogen $(SeCN)_2$ and azido carbon disulphide (SCSN) respectively.

OBJECTIVE BITS

1. In gaseous state ionic character is greatest in
   1. HF
   2. HBr
   3. HCl
   4. HI

2. Which has the maximum degree of hydrogen bonding?
   1. HF
   2. BCl
   3. HBr
   4. H_2O

3. Which of the following does not liberate Br_2 from KBr
   1. F_2
   2. Cl_2
   3. I_2
   4. conc.H_2SO_4

4. From these, the element showing electro positive character is
   1. F_2
   2. Cl_2
   3. Br_2
   4. I_2

5. The most electropositive element in the following is
   1. F_2
   2. I_2
   3. Cl_2
   4. Br_2

6. In case of halogens strong oxidising character is favoured by their
   1. low ionization potential
   2. low electron affinity
   3. low dissociation energy
   4. low hydration energy

7. Which of the following is the strong reducing agent?
   1. HF
   2. HCl
   3. HBr
   4. HI

8. Chlorine is ....
   1. more reactive than Br_2 and I_2
   2. less reactive than Br_2
   3. less reactive than I_2
   4. more reactive than F_2

9. Which is the following is the strongest acid
   1. HF
   2. HCl
   3. HBr
   4. HI

10. Which of the following halogen exhibits only one oxidation state?
    1. F
    2. Cl
    3. Br
    4. I

11. Which of the following halogen has the highest bond energy?
    1. F
    2. Cl
    3. Br
    4. I

12. Which of the halogens has the highest electron affinity?
    1. Iodine
    2. Bromine
    3. Chlorine
    4. Fluorine

13. Which of the following halogens has the highest heat of hydration?
    1. Iodine
    2. Bromine
    3. Chlorine
    4. Fluorine

14. Which one of the halogens is the strongest oxidizing agent?
    1. Iodine
    2. Bromine
    3. Chlorine
    4. Fluorine

15. The su reacti case o
    1. F_2
    3. Br_2

16. Stand est for
    1. $\frac{1}{2}F_2$
    3. $\frac{1}{2}B$

17. Which water heat?
    1. F_2
    3. Br_2

18. Which has th
    1. Hyd
    3. Hyd

19. Which est bo
    1. HI
    3. HCl

20. Size order
    1. I^- >
    3. I >

21. The r
    1. is p
    2. dep
    3. is n
    4. dep

22. F_2 ca aque
    1. the
    2. F_2
    3. F_2
    4. Re ver

23. Halo
    1. Flu
    3. Br

The sum of energy terms involved in the reaction, $\frac{1}{2}X_2$ (g) $\rightarrow X^-$ (aq), is highest in case of

1. F_2 2. Cl_2
3. Br_2 4. I_2

Standard electrode potential is the highest for

1. $\frac{1}{2}F_2 + e^- \rightleftharpoons F^-$ 2. $\frac{1}{2}Cl_2 + e^- \rightleftharpoons Cl^-$
3. $\frac{1}{2}Br_2 + e^- \rightleftharpoons Br^-$ 4. all are equal

Which of the following halogen oxidizes water to oxygen with large evolution of heat?

1. F_2 2. Cl_2
3. Br_2 4. I_2

Which one of the following halogens acids has the lowest melting point?

1. Hydrofluoric acid   2. Hydrochloric acid
3. Hydrobromic acid   4. Hydroiodic acid

Which of the following acid has the highest boiling point?

1. HI   2. HBr
3. HCl   4. HF

Size of the iodine species follows the order

1. $I^- > I > I^+$ 2. $I^+ > I^- > I$
3. $I > I^- > I^+$ 4. none of these

The reaction $2\,ClO_3^- + I_2 \rightarrow 2IO_3^- + Cl_2$

1. is possible
2. depends upon state of products
3. is not possible
4. depends upon temperature

F_2 cannot be prepared by electrolysis of aqueous sodium fluoride because

1. the solution is non-conductor of electricity
2. F_2 reacts with electrodes
3. F_2 reacts violently with H_2O
4. Reduction potential of $\frac{1}{2}F_2 + e^- \rightleftharpoons F^-$ is very low

Halogen prepared from seaweeds is

1. Fluorine   2. Chlorine
3. Bromine   4. Iodine

24. On heating NaX with H_2SO_4 and MnO_2, the halogen that cannot be prepared is
1. F_2 2. Cl_2
3. Br_2 4. I_2

25. When a fluoride is heated with concentration H_2SO_4 in a glass tube, the vapour escaping consist of
1. HF   2. F_2
3. H_2SiF_4 4. H_2SiF_6 and H_2F_2

26. On heating KBr and concentrated H_2SO_4 for some time, the gases evolved are
1. HBr + Br_2 2. $Br_2 + SO_2$
3. SO_2 + HBr   4. None

27. When KI and KNO_3 mixture is treated with dil H_2SO_4 we get vapour of
1. $I_2 + NO_2 + NO$ 2. $I_2 + NO$
3. NO   4. I_2

28. The reddish brown gas escaping on heating a chloride and $K_2Cr_2O_7$ mixture with concentration H_2SO_4 are of
1. Cl_2 2. CrO_2Cl_2
3. CrO_3 4. none of these

29. When the vapours of chromyl chloride are passed through NaOH solution, it turns yellow. This is due to the formation of
1. CrO_2Cl_2 2. CrO_3
3. $Na_2Cr_2O_7$ 4. Na_2CrO_4

30. Which of the following acid is strongest
1. $HClO_4$ 2. $HClO_3$
3. $HClO_2$ 4. $HClO$

31. Which of the following is most stable
1. $HClO_4$ 2. $HClO_3$
3. $HClO_2$ 4. $HClO$

32. One of the products of a reaction between solid $KMnO_4$ and conc. HCl is
1. a red liquid
2. a greenish yellow gas
3. MnO_2
4. $HClO_4$

33. Which of the following ion is planar
1. ClO_2^- 2. ClO_4^-
3. IF_7 4. none

34. The compound which does not contain a peroxy linkage?
1. H_2SO_5 2. $HClO_4$
3. H_3PO_5 4. $H_2S_2O_3$

The oxidation state of oxygen is expected to be positive in

1. ClO_2
2. F_2O
3. NO_2
4. SO_2

. O_3 with dry I_2 gives

1. $I(IO_3)_3$
2. I_2O_7
3. I_2O_5
4. None

37. Which of the following would not give H_2O_2 on hydrolysis?

1. HNO_3
2. HNO_4
3. $H_2S_2O_3$
4. $HClO_4$

38. The structure of IF_7 is

1. tetrahedral
2. octahedral
3. trigonal bipyramid
4. pentagonal bipyramid

39. The structure of Cl_2O is

1. TBP
2. octahedral
3. tetrahedral
4. linear

40. Which has the highest oxidising power

1. $HClO$
2. $HClO_2$
3. $HClO_3$
4. $HClO_4$

41. The type of hybrid orbitals used by chlorine atom in ClO_2^- is

1. sp
2. sp^2
3. sp^3
4. none

42. Which of the following is pseudohalide

1. I_3^-
2. ICl
3. CN^-
4. none

43. Which one below is pseudohalogen

1. $(CN)_2$
2. IF_7
3. I_2O_5
4. None

44. The type of bonding in HCl molecule is

1. polar covalent
2. hydrogen bonding
3. pure covalent
4. none of these

45. Acidified $KMnO_4$ is decolourised by

1. HCl
2. HI
3. Cl_2
4. None

46. When Cl_2 is passed over dry slaked lime at room temperature, the main reaction product is

1. $CaCl_2$
2. $CaOCl_2$
3. $Ca(OCl_2)_2$
4. none

47. Bleaching powder reacts with a few drops of concentrated HCl to give

1. Cl_2
2. $HOCl$
3. O_2
4. CaO

48. Br_2 can be liberated from KBr solution by the action of

1. Iodine solution
2. Bromine water
3. Chlorine water
4. None

49. Br_2 gas turns starch iodide paper

1. Red
2. Green
3. Blue
4. Yellow

50. Tincture of iodine contains

1. I_2 and rectified spirit
2. KI, I_2 and rectified spirit
3. KI and rectified spirit
4. I_2 and ether

51. The solubility of iodine in water is increased, if it is mixed with

1. $CHCl_3$
2. C_2H_5OH
3. NaOH
4. KI

52. Iodine reacts with liquor ammonia to give

1. NH_4I and HI
2. NH_3NI_3 and HI
3. NH_4I and NI_3
4. None

53. Fluorine does not show positive oxidation state due to absence of

1. s- orbitals
2. p- orbitals
3. d- orbitals
4. none

54. Freon is

1. $CClF_3$
2. $C_2H_2F_2$
3. CCl_2F_2
4. None

55. Chlorine acts as a bleaching agent only in the presence of

1. moisture
2. dry air
3. sunlight
4. hydrogen

56. A gas reacts which CaO, but not with $NaHCO_3$. The gas is

1. CO_2
2. Cl_2
3. O_2
4. N_2

57. When cold NaOH reacts with chlorine which of the following is formed

1. $NaClO_3$
2. $NaClO_2$
3. NaClO
4. None

58. Which of the following is most basic

1. F
2. Br
3. Cl
4. I

59. Which three h

1. F
3. Br

60. Oxidising or

1. I < F
3. F > C

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Which of the following halogen displaces three halogens from their compounds?

1. F
2. Cl
3. Br
4. I

Oxidising action increases in the following order

1. $I < F < Cl < Br$
2. $F < Cl < Br < I$
3. $F > Cl > Br > I$
4. $F = Cl > Br = I$

61. The general electronic configuration of halogens is

1. ns^2np^5
2. ns^2np^3
3. ns^2
4. ns^2np^4

62. Which of the following halogens is purified by sublimation?

1. Fluorine
2. Chlorine
3. Bromine
4. Iodine

ANSWERS

1.	2.1	3.3	4.4	5.2	6.3	7.4	8.1	9.4	10.1	11.2	12.3	13.4	14.4	15.1	16.1
17.1	18.2	19.4	20.1	21.1	22.3	23.4	24.1	25.4	26.2	27.2	28.2	29.4	30.1	31.1	32.2
33.1	34.2	35.2	36.1	37.4	38.3	39.3	40.1	41.1	42.3	43.1	44.1	45.2	46.2	47.1	48.3
49.3	50.2	51.4	52.2	53.3	54.3	55.1	56.2	57.3	58.4	59.1	60.3	61.1	62.4		

OBJECTIVE BITS

1. Which one of the following metal ions is not coloured
   1. V^{+3}
   2. Ti^{+3}
   3. Zn^{+2}
   4. Cu^{+2}

2. Which one of the following ions is dia magnetic?
   1. Cr^{+2}
   2. V^{+2}
   3. Ti^{+3}
   4. Sc^{+3}

3. Which one of the following ions has the least magnetic moment?
   1. Cu^{+2}
   2. Ni^{+2}
   3. Co^{+2}
   4. Fe^{+3}

4. Which one of the following ions has the maximum magnetic moment?
   1. Co^{+2}
   2. Ti^{+3}
   3. Cr^{+3}
   4. V^{+3}

5. Transition metals
   1. exhibits inert pair effect
   2. exhibits variable oxidation states
   3. have low melting point
   4. do not show catalytic activity.

6. The maximum magnetic moment is shown by the transition element ion with the electronic configuration
   1. $3d^8$
   2. $3d^5$
   3. $3d^7$
   4. $3d^9$

7. The highest oxidation state is shown by transition element with outermost configuration as
   1. d^3s^3
   2. d^5s^1
   3. d^5s^2
   4. d^3s^2

8. Which one of the vanadium pentahalides exists?
   1. VF_5
   2. VCl_5
   3. VBr_5
   4. VI_5

9. Which one of the following is least covalent
   1. VCl_2
   2. VCl_3
   3. VCl_4
   4. $VOCl_3$

10. Which one of the following is least acidic
    1. VCl_2
    2. VCl_3
    3. VCl_4
    4. $VOCl_3$

11. Which one of the following ligands can bring out the highest oxidation state in a transition metal
    1. F^-
    2. Cl^-
    3. Br^-
    4. I^-

12. Which one of the following acts as a acid ligand?
    1. F^-
    2. O^{-2}
    3. NH_3
    4. CO

13. The general electronic configuration of transition elements is
    1. $(n-1)d^{1-5}$
    2. $(n-1)d^{1-10}ns^1$
    3. $(n-1)d^{1-10}ns^{0-2}$
    4. none

14. Transition elements are coloured due to?
    1. metallic nature
    2. small size
    3. unpaired d-electrons
    4. none

15. A transition element X has a configuration $[Ar] 3d^4$ in its +3 oxidation state. Its atomic number is?
    1. 25
    2. 28
    3. 27
    4. 20

16. Which of the following has highest magnetic moment?
    1. Co^{3+}
    2. Cr^{3+}
    3. Fe^{3+}
    4. none

17. Purest form of iron is?
    1. White cast iron
    2. Grey cast iron
    3. Wrought iron
    4. Sponze iron

18. Formation of interstitial compound makes the transition metal
    1. More metallic
    2. More ductile
    3. More soft
    4. More brittle

19. In which of the following the metal atom has E.A.N. as 36?
    1. $[Fe(CN)_6]^{4-}$
    2. $[PdCl_4]^{2-}$
    3. $[Fe(CN)_6]^{3-}$
    4. none

20. Misch metals are
    1. Alloys of rare earth metals
    2. Alloys of d-block elements
    3. Alloy of Zn-Hg
    4. Alloy of Al, Mg, Gd

21. The ion which exhibits green colour?
    1. Cr^{2+}
    2. Mn^{3+}
    3. Co^{2+}
    4. Ni^{2+}

22. The highest magnetic moment is exhibited by the transition metal ion bearing the outer configuration?
    1. $3d^8$
    2. $3d^5$
    3. $3d^2$
    4. $3d^7$

23. Trans readil
    1. Sma
    3. Lar

24. The t B_{12} is
    1. Mg
    3. Fe

25. Maxi the tr follov
    1. ns
    3. (n+

26. Fe^{2+} i
    1. Ba(
    3. NH

27. Tran as ca
    1. La
    2. La ad
    3. U
    4. B

28. The man
    1. Ni
    3. Co

29. Whi exhi
    1. Pd
    3. Cr

30. Prои NH_3
    1. Ni
    3. Co

31. Sec star
    1. Yt
    3. Le

32. Mag due
    1. S
    3. Bi

33. The
    1. Ye
    3. V

23. Transition elements form complexes very readily because of?
1. Small cation size
2. Vacant d–orbitals
3. Large ionic charge
4. All are correct

24. The transition metal present in vitamin B_{12} is?
1. Mg
2. Co
3. Fe
4. Cd

25. Maximum number of oxidation states of the transition metal is derived from the following configuration?
1. ns electrons
2. (n–1) d electrons
3. (n+1) d electrons
4. ns+(n–1) d electrons

26. Fe^{2+} ion is distinguished by Fe^{3+} ion by?
1. $BaCl_2$
2. $AgNO_3$
3. NH_4SCN
4. none

27. Transition elements are frequently used as catalysts, because of?
1. Large ionic charge
2. Large surface area for the reactants to be adsorbed
3. Unpaired d–electrons
4. Both (2) and (3) are correct

28. The element present in red blood cells of man is?
1. Ni
2. Ra
3. Co
4. Fe

29. Which of the following transition metals exhibits the highest oxidation state?
1. Pd
2. Os
3. Cr
4. Mn

30. Promoter used in the manufacture of NH_3?
1. Ni
2. Os
3. Co
4. Mo

31. Second series of transition elements starts with?
1. Yttrium
2. Chromium
3. Lead
4. Scandium

32. Magnetic property of transition metal is due to?
1. Spin of electron
2. Orbital moment
3. Both
4. Neither of the two

33. The colour of Fe^{2+} ions is?
1. Yellow
2. Light green
3. Very dark green
4. Pink

34. Chromium has most stable oxidation state in?
1. +5
2. +3
3. +2
4. +4

35. Negative oxidation states of transition elements is only shown in?
1. Halides
2. Sulphides
3. Carbonates
4. Complexes

36. Transition metals in their compounds show?
1. Ionic bonds
2. Covalent bonds
3. both 1 and 2
4. Ionic and co–ordinate bonds

37. In the first transition series, the incoming electron enters?
1. 5 d–orbital
2. 4 d–orbital
3. 3 d–orbital
4. 2 d–orbital

38. Adams catalyst is?
1. Pt/PtO
2. Pt/Ni
3. Pt
4. Pt_2O and PtO

39. Transition elements that show anomalous electronic configuration in first series are?
1. Cr and Ni
2. Cu and Co
3. Fe and Ni
4. Cr and Cu

40. Maximum magnetic activity is shown by metals with?
1. 5 unpaired electrons
2. 4 unpaired electrons
3. 6 unpaired electrons
4. all are equal

41. Non stoichiometric compounds are formed by?
1. Alkali metals only
2. Transition elements only
3. Noble gas only
4. More than one of the above said elements

42. Metallic bond is stronger in transition metals than alkali and alkaline earth metals because of?
1. More number of electrons including d–electrons
2. Large size of the atoms
3. Smaller size of atoms
4. (1) and (3)

43. Which of the following is not an interstitial compound?
   1. TiN
   2. Fe_2O_3
   3. Mn_2C_3
   4. W_2C

44. Variable valencies of transition elements is due to?
   1. Different energies of (n–1)d electrons
   2. Different energies of ns electrons
   3. Similar energies of (n–1)d electron
   4. Similar energies of (n–1)d and ns electrons

45. Which of the following transition elements exhibit +8 oxidation states?
   1. Cu, Zn
   2. Ru, Os
   3. Ag, Au
   4. Cu, Cr

46. Colour in transition metal compounds is attributed to
   1. Small sized metal ions
   2. Absorption of light in the UV region
   3. Complete ns subshell
   4. Incomplete (n–1)d subshell

47. Which zinc compound is white in cold and yellow in hot?
   1. ZnS
   2. ZnO
   3. $ZnCl_2$
   4. $ZnSO_4$

48. Transition metals, despite high oxidation, are poor reducing agent due to
   1. High heat of vaporization
   2. High ionization energies
   3. Low heats of hydration
   4. All of these

49. An ion of a transition metal has magnetic moment of 1.73 B.M., it could be
   1. Cu^{2+} 2. Ni^{2+} 3. Cr^{3+} 4. Fe^{2+}

50. Which one of the following is not an interstitial compound?
   1. All steels
   3. Tungsten carbide
   3. Vanadium nitride
   4. WO_3

51. The magnetic moment of a transition metal ion is 2.83 BM. The number of unpaired electrons present in this ion is?
   1. 1   2. 2   3. 3   4. 4

52. Paramagnetic substance in a magnetic field experiences?
   1. Loss in weight
   2. Increase in weight
   3. No change in weight
   4. None

53. Which of the following has maximum density
   1. Hg
   2. Au
   3. Os
   4. Pd

54. Which of the following ions has minimum ionic radius?
   1. Ni^{2+}
   2. Co^{2+}
   3. Cr^{2+}
   4. V^{2+}

55. Transition elements are hard, because of
   1. Covalent bonds
   2. Ionic bonds
   3. Hydrogen bonds
   4. Vander Waal's forces

56. The second ionisation energy of Cr is greater than the neighbouring element because of?
   1. More paired electrons
   2. Half filled d–orbitals
   3. Half filled s–orbitals
   4. Unpaired s–electron

57. The transition element which exhibits maximum oxidation state has the electronic configuration?
   1. d^3s^2
   2. d^5s^1
   3. d^5s^2
   4. d^8s^2

58. The transition metals have less tendency to form ions due to?
   1. High I.E.
   2. Low heat of hydration of ion
   3. High heat of sublimation
   4. All of these

59. Which oxide of Mn is amphoteric?
   1. MnO_2
   2. Mn_2O_3
   3. Mn_2O_7
   4. MnO

60. Like d–block elements, Zn and Cd do not exhibit variable valence, because
   1. d–orbitals are completely filled
   2. Their outer shells contain two electrons each
   3. They have low melting points
   4. All are correct

ANSWERS

1.3	2.4	3.1	4.1	5.2	6.2	7.3	8.1	9.1	10.1	11.1	12.4	13.3	14.3	15.1	16.3
17.3	18.4	19.1	20.1	21.4	22.2	23.4	24.2	25.4	26.3	27.4	28.4	29.2	30.4	31.1	32.1
33.2	34.2	35.4	36.3	37.3	38.1	39.4	40.1	41.2	42.4	43.3	44.4	45.2	46.4	47.2	48.1
49.1	50.4	51.2	52.2	53.3	54.1	55.1	56.2	57.3	58.4	59.1	60.1				

Tm^{3+} (1) – colourless, Tm^{3+} (2)–very pale, Er^{3+} (3) -green pink, Ho^{3+} (4)–pale yellow, Dy^{3+} (5) – yellow, Tb^{3+} (6), pale pink where oxidation sates in the brackets

13. **Magnetic properties:**

La^{3+} ($4f^0$) and Lu^{3+} ($4f^{14}$) having no unpaired electron don't show paramagnetism while all other tripositive ions of lanthanides are para-magnetic.

14. **Complexes:**

The lanthanide ions (M^{3+}) have a high charge but their sizes being large. They do not form complexes very readily. Most common ligands with which they form stable complexes are

Type	Examples
Chelating oxygen ligands	EDTA, citric acid, oxalic acid, acetyl acetone
Nitrogen ligands	ethylene diamine, NCS⁻

OBJECTIVE BITS

1. Which of the following forms a stable +4 oxidation state:
   1. La　　　　2. Eu
   3. Gd　　　　4. Ce

2. The separation of lanthanides in ion-exchange method is based on
   1. size of unhydrated ions
   2. basicity of the hydroxides
   3. size of the hydrated ions
   4. the solubility of their nitrates

3. All the lanthanides exhibit a valency of
   1. 3　　　　2. 4
   3. 2　　　　4. 6

4. Among the lanthanides the one obtained by synthetic method is
   1. Lu　　　　2. Pr
   3. Pm　　　　4. Gd

5. Actinides are
   1. all synthetic elements
   2. include element 104
   3. have only short lived isotopes
   4. have variable valency

6. As the atomic number increases the ionic radii of tripositive lanthanon ions Ln^{+3} is
   1. decrease
   2. increase
   3. first increase then decrease
   4. first decrease then increase

7. As the atomic number increases from 57 to 71, in tripositive lanthanon ions the number of unpaired electrons
   1. increase regularly from 0 to 14
   2. first increase from 0 to 7 and then fall to 0
   3. increase from 0 to 5 and then fall to 0
   4. do not show any regularly

8. With the rise in atomic number from 57 to 71, the colour of the tripositive lanthanon ion
   1. does not show any regular change
   2. gradually develops from colourless to deep red
   3. gradually fades from deep red to colourless
   4. changes from colourless ⇒ pink → colourless → pink → colourless

9. Misch metal is formed by
   1. lanthanides　　　2. actinides
   3. d–block elements　　4. none

10. On roasting pitchblende freed from gangue with fusion mixture we get
   1. Na_2ThO_3　　　2. Na_2UO_4
   3. UO_2CO_3　　　4. ThO_2

11. The most characteristic oxidation state of lanthanides is
   1. +1　　　　2. +2
   3. +3　　　　4. +4

12. The lanthanide contraction refers to?
   1. Ionic radius of that series
   2. Size of the hydrated M^{+3} ions
   3. Size of the unhydrated M^{+3} ions
   4. Basicity of the hydroxides

13. Lanthanide elements are present in
   1. Bertholloids
   2. Warm super conductors
   3. Misch metal
   4. All of these

14. Which of the following is not the configuration of lanthanides
   1. [Xe] $4f^1 6s^2$　　2. [Xe] $4f^1 5d^1 6s^2$
   3. [Xe] $4f^9 5d^1 6s^2$　　4. [Xe] $4f^{14} 5d^1 6s^2$

15. The e thanid
   1. Hf
   3. Nb

16. The se exchar
   1. the s
   2. size
   3. size
   4. basi

17. What thanid
   1. simi
   2. cons
   3. sam
   4. all t

18. Ionic ment
   of lan
   1. Zr⁺
   3. V⁺5

19. Lantl
   1. Fra
   2. Sol
   3. Co
   4. Ior

1.4
17.4

15. The element which follows the lanthanides in the 6th period is

1. Hf
2. Zr
3. Nb
4. Mn

16. The separation of lanthanides by the ion exchange method is based on

1. the solubility of the nitrates
2. size of the hydrated M^{+3} ions
3. size of the unhydrated M^{+3} ions
4. basicity of the hydroxides

17. What factors make the separation of lanthanides a formidable task?

1. similarly in ionic size
2. constant charge of +3
3. same charge to radius ratio
4. all the above

18. Ionic radii of the following pairs of elements become identical as a consequence of lanthanide contraction?

1. Zr^{+4} and Hf^{+4}
2. Cr^{+3} and Mo^{+3}
3. V^{+5} and Nb^{+5}
4. Ag^+ and Au^+

19. Lanthanides are separated best by

1. Fractional crystallization
2. Solvent extraction
3. Complex formation using EDTA
4. Ion exchange resins

20. The stable +2 ions of lanthanides in aqueous solution are

1. Yb^{+2}
2. Eu^{+2}
3. both
4. none

21. Lanthanides form complexes with

1. Monodentate ligands
2. Bidentate ligands
3. Chelating agents
4. Simple anions

22. 5f level is successfully filled up in

1. Lanthanides
2. Actinides
3. Rare gases
4. Transition elements

23. The first element of the series called rare earth is

1. Yittrium
2. Actinium
3. Lanthanum
4. Cerium

24. In Lanthanides, the ionic radius of M^{+3} from La to Lu?

1. Increases
2. Decreases
3. Remains constant
4. First increases and then decreases

25. In lanthanides the differentiating electron enters?

1. d–sub level
2. f– sub level
3. s– sub level
4. p–sub level

26. The most common lanthanide is
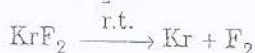
1. Lanthanum
2. Cerium
3. Samarium
4. Plutonium

ANSWERS

1.4 2.3 3.1 4.1 5.4 6.1 7.2 8.3 9.1 10.4 11.3 12.1 13.4 14.1 15.1 16.2
17.4 18.1 19.4 20.3 21.3 22.2 23.4 24.2 25.2 26.2

ii. It is also prepared by the photolysis of F_2 and Kr in argon atmosphere.

iii. KrF_2 is a colourless crystalline solid.

iv. It is soluble in anhydrous HF.

v. At room temperature it is less stable than the XeF_2.

$$KrF_2 \xrightarrow{r.t.} Kr + F_2$$

24. Krypton tetrafluoride, KrF_4:

i. $Kr + 2F_2 \xrightarrow[\text{at low temperature}]{\text{electric discharge}} KrF_4$

ii. It is a colourless liquid.

iii. $KrF_4 + 2H_2O \xrightarrow{\text{room temperature}} Kr + O_2 + 4HF$

25. Compounds of Radon:

A radon fluoride has also been obtained by heating the two elements. But as the half-life period of the most stable isotope of radioactive radon is 3.8 days, the composition and structure of radon fluoride have not been established.

26. Clathrate Compounds:

The inert gases or noble gases such as Ar, Kr, and Xe also form a number of compounds in which the gases are trapped into the cavities of crystal lattices of certain organic (or inorganic) compounds like phenol, hydroquinone etc, under pressure. Thus inert gases are enclosed into the crystal lattices of organic or inorganic molecules. These compounds are called enclosure or clathrate compounds. They are also known as cage compounds. The substance having the cavities of crystal lattices is known as Host (H), while the atoms of noble gases enclosed in it are called the Guest (G). Thus clathrate = organic or inorganic molecule (Host) + Inert gas (Guest)

The guest components in clathrate compounds are held by vander waals forces in crystalline case formed by the host substances and hence there is no chemical bonding involved in these compounds. It is also not essential that all cavities in the host structure are filled. Thus clathrates are non-stoichiometric compounds.

ex: quinol Ar, quinol Kr, quinol Xe, Kr $(C_6H_5OH)_3$, hydroquinone – Kr* (Kryptonates).

Uses of clathrates:

i. Kr–85 clathrate provides a safe and useful source of β–radiation which are useful for measuring thickness of gauges.

ii. Xe–133 clathrates provides a compact source for γ–radiation.

iii. Clathrates are used in separation of noble gases.

iv. Clathrates play an important role in some physiological action.

e.g: it is though that the anaesthetic action of Xe and many other anaesthetics is due to aqueous clathrate in physiologically strategic spots.

27.
NOBLE GAS	DISCOVERY
Helium	– Jansen in atmosphere
Helium	– Lockeyer and Ramsay inclevite (a mineral of Uranium)
Neon (New)	– W.Ramsay in air
Argon	– Reyleigh in air
Krypton (Hidden gas)	– W. Ramsay in air
Xenon (Stranger gas)	– W. Ramsay in air
Radon	– E.E. Dorn by disintegration of Radium

OBJECTIVE BITS

1. Element is extremely stable if its outer configuration is
1. ns^2np^6
2. ns^2
3. ns^2np^3
4. ns^2np^4

2. Which is the most abundant inert gas in air
1. He
2. Ne
3. Ar
4. Xe

3. Clevite, a source of α–rays, when heated at higher temperature emits
1. H_2
2. He
3. Rn
4. N_2

4. β– quinol solution forms clathrate with
1. He
2. Ar
3. Xe
4. 2 and 3

5. In a Ramsay's method of preparing inert gas mixture
   1. atmospheric O_2 is removed by hot Mg
   2. O_2 of N_2 and O_2 mixture is removed by hot CaC_2
   3. O_2 of dry air is removed by hot Cu metal
   4. None of these

6. In Fisher–Ring's process, nitrogen is removed by
   1. $CaCN_2$
   2. H_2O_2
   3. hot Mg
   4. The product of the reaction between lime and coke

7. The gases that are not adsorbed on charcoal at 173K
   1. N_2 and He   2. He and Ne
   3. N_2, O_2 and Ar   4. Ar, Ne and Kr

8. To separate Ar from the mixture of Ar, Kr, Xe activated charcoal is maintained at
   1. –180°C   2. > 200K
   3. –196°C   4. 77K

9. From Ar, Kr and Xe at liquid N_2 temperature the component separated out is
   1. Kr   2. Ar
   3. Xe   4. Kr and Xe

10. He and Ne mixture separated by passing it through
    1. liquid O_2 pipes   2. liquid H_2 pipes
    3. red hot Cu tube   4. none of these

11. An orange red solid of an inert gas compound is
    1. $Xe[PtF_6]$ 2. $XeOF_4$
    3. XeO_4 4. XeF_4

12. The compound of an inert gas first prepared is
    1. $HgHe_2$ 2. $Xe[PtF_6]$
    3. Ar_6H_2O 4. $XeOF_4$

13. The reason for the chemical activity of Kr and Xe is
    1. relatively easy polarisability
    2. vacant d–orbitals in valence shell
    3. low IP values
    4. all of the above

14. The ionisation energy of inert gas is maximum in the period because
    1. it is a gas
    2. the heat of vapourisation is relatively low
    3. the atomic size decreases
    4. stable electronic configuration

15. Excess of Xe $+F_2 \xrightarrow[673K]{Ni}$?
    1. XeF_2 2. XeF_4
    3. XeF_6 4. none

16. Which of the following compound reacts with Hg easily?
    1. $XeOF_4$ 2. XeF_4
    3. XeF_6 4. XeF_2

17. In which of the following compounds, the central element undergoes sp^3d hybridisation?
    1. XeO_4 2. XeF_2
    3. $XeOF_4$ 4. XeF_4

18. Which of the following on hydrolysis yields XeO_3 and Xe?
    1. $XeOF_4$ 2. XeF_6
    3. XeF_4 4. XeF_2

19. In which of the following compound Xe involving sp^3d^2 hybridisation
    1. XeO_2F_2 2. XeF_4
    3. XeO_3 4. XeF_6

20. Na_4XeO_6 + conc. $H_2SO_4 \longrightarrow$?
    1. XeO_3 2. XeO_4
    3. XeO_2 4. None

21. Balloons for studies on atmosphere use
    1. He and O_2 2. He and H_2
    3. He and Ne   4. only He

22. An inert gas with highest reactivity
    1. He   2. Xe
    3. Ne   4. Ar

23. Which of the fluids spills over the container on its own
    1. Xe   2. He–I
    3. He–II   4. Ne

24. A molecule with a distorted octahedral structure
    1. XeF_4 2. $XeOF_4$
    3. XeF_6 4. XeO_2F_2

25. In clathrate compounds
    1. the quinol is trapped in inert gas
    2. H_2O forms co–ordinate bonds with inert gas
    3. inert gas is trapped in quinol
    4. none

26. Hybridisation of Xe in XeO_3 is
    1. sp
    2. sp^2
    3. sp^3
    4. sp^3d

27. Noble gases are mono–atomic because
    1. Their densities are less than one
    2. the C_p/C_v ratio is 1.41
    3. The C_p/C_v ratio is 1.67
    4. They are unreactive

28. Electro negativity of an inert gas is
    1. low
    2. high
    3. zero
    4. negative

29. Shape of XeF_4 molecule is
    1. square planar
    2. linear
    3. Pyramidal
    4. none

30. Which of the following is not formed
    1. XeF_6
    2. XeF_4
    3. XeF_3
    4. XeF_2

31. Which of the following is most difficult to liquify and solidify?
    1. Kr
    2. Ar
    3. Ne
    4. He

32. Which of the following fluorine compounds not exist?
    1. SF_6
    2. XeF_4
    3. $XeOF_4$
    4. HeF_2

33. Shape of XeO_3 compound is
    1. Distorted octahedral
    2. Trigonal
    3. Pyramidal
    4. None

34. The forces of cohesion in liquid helium are
    1. Ionic
    2. Covalent
    3. Metallic
    4. Vander Waals

35. Which of the following inert gas does not form clathrates?
    1. He
    2. Kr
    3. Ar
    4. Xe

36. Neon gives a characteristic spectrum with
    1. yellow lines
    2. green lines
    3. orange lines
    4. none

37. Hybridisation of Xe in XeF_4 and what is its geometry
    1. sp^3d^2 and octahedral
    2. sp^3d^2 and square planar
    3. dsp^2 and square planar
    4. d^2sp^3 and octahedral

38. The no. of lone pairs are associated with Xe in XeF_2
    1. 1
    2. 2
    3. 3
    4. 4

39. Which of the following compound that attacks pyrex glass is?
    1. XeF_6
    2. XeF_4
    3. XeF_2
    4. None

40. The inert gas that is substituted for nitrogen in air used by deep sea divers for breathing is
    1. He
    2. Ne
    3. Ar
    4. Kr

41. The hydride ions are isoelectronic with
    1. He^+
    2. He^{2+}
    3. Be
    4. none

42. Partial hydrolysis of XeF_4 produces?
    1. XeO_3
    2. XeF_2
    3. $XeOF_2$
    4. none

43. Which one of the following noble gases is obtained by radioactive disintegration
    1. Kr
    2. Br
    3. Rn
    4. Xe

44. Clathrate compounds formed by noble gases are essentially maintained by
    1. covalent bonding
    2. coordinate bonding
    3. hydrogen bonding
    4. none of these

45. Which one of the following is not formed when an electric discharge passes through helium?
    1. HeH^{2+}
    2. HeH^+
    3. He_2^+
    4. He_2

46. A rare gas that was detected in the sun before it was discovered on earth is
    1. He
    2. Ne
    3. Kr
    4. Xe

47. Which one of the following noble gases is least polarizable?
    1. Xe
    2. Kr
    3. Ne
    4. He

48. Xenon reacts directly with
   1. F_2 2. Br_2
   3. Cl_2 4. all
49. Asthama patients use the following mixture for artificial respiration
   1. O_2+Ne 2. O_2+He
   3. O_2+Kr 4. O_2+Xe

50. XeF_6 is a —
   1. covalent compound
   2. clathrate compound
   3. cage–type compound
   4. ionic compound

(34)

ANSWERS

1.1	2.3	3.2	4.4	5.3	6.4	7.2	8.4	9.2	10.2	11.1	12.2	13.4	14.4	15.1	16.2
17.2	18.3	19.2	20.2	21.4	22.2	23.3	24.3	25.3	26.3	27.3	28.3	29.1	30.3	31.4	32.4
33.3	34.4	35.1	36.1	37.2	38.3	39.1	40.1	41.1	42.1	43.3	44.3	45.4	46.1	47.4	48.1
49.2	50.1														

$$2KMnO_4+3H_2SO_4+5H_2O_2 \rightarrow K_2SO_4+$$
$$2MnSO_4+8H_2O+5O_2$$
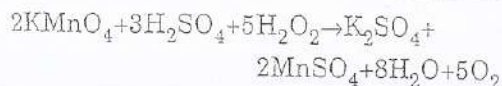
b. Br_2 is decolourised. Br_2 is reduced to HBr.

c. $HOCl+H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$

in alkaline medium:

a. $2Fe^{3+}+H_2O+2OH^- \rightarrow 2Fe^{2+}+2H_2O+O_2$

b. $2KMnO_4+3H_2O_2 \rightarrow$
$$2MnO_2^- + 3O_2 + 2H_2O + 2KOH$$

c. $Cl_2+H_2O_2+2OH^- \rightarrow 2Cl^- + 2H_2O + O_2$
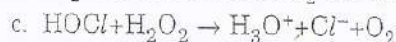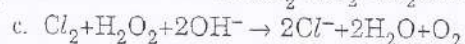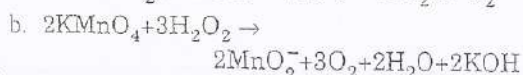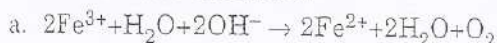
iv. a. Ag_2O is reduced to Ag

b. PbO_2 is reduced to yellow PbO

c. H_2O_2 gives peroxo-metal complexes and peroxo acid anions.

22. i. H_2O_2 turns starch – Iodide paper or solution to blue due to the liberation of I_2. The liberated I_2 gives blue colour with starch.

ii. H_2O_2 gives an orange – yellow colour with titanium salts in concentrated H_2SO_4 due to the formation of H_2TiO_4.

iii. a mixture of $KClO_3$ and aniline in dil. H_2SO_4 and H_2O_2 gives violet colouration.

23. i. H_2O_2 is a bleaching agent for hair, silk, wool and ivory. Ammonia and H_2O_2 solution is used to wash hair and to impart golden yellow colour.

ii. H_2O_2 is a disinfectant and germicide for wounds.

iii. H_2O_2 is used for the production of epoxides, propylene oxide and polyurethanes.

iv. It is also used in the synthesis of hydro quinones, pharmaceutical and food product like tartaric acid.

OBJECTIVE BITS

1. Heavy water is obtained by
1. By adding impurities to water
2. Keeping water in nuclear reactor
3. Prolonged electrolysis of ordinary water
4. Evaporation of water

2. The metal which displaces hydrogen from a boiling caustic soda solution is
1. Fe
2. Zn
3. Mg
4. Ag

3. Tritium atom has
1. Two neutrons and two protons
2. One neutron and two protons
3. Two neutrons and one proton
4. None

4. Heavy water is used in nuclear reactor to
1. increase the speed of neutrons
2. slow down the speed of neutrons
3. absorb neutrons
4. increase the no. of neutrons

5. Bleaching action of H_2O_2 is due to
1. Oxidation
2. Reduction
3. Decomposition
4. None

6. Hydrogen peroxide is not used as
1. bleaching agent
2. reducing agent
3. oxidizing agent
4. dehydrating agent

7. Decomposition of H_2O_2 is retarded by___
1. Zinc
2. MnO_2
3. Acetanilide
4. Finely divided metals

8. H_2O_2 is stored in_____
1. Plastic container after addition of stabilizer
2. Iron container after addition of stabilizer
3. Glass container after addition of stabilizer
4. None

9. Acidified solution of chromatic acid on treatment with H_2O_2 yields
1. $Cr_2O_2+H_2O+O_2$
2. CrO_5+H_2O
3. $CrO_3+H_2O+O_2$
4. $H_2Cr_2O_7+H_2O+O_2$

10. Activated Hydrogen is obtained by
1. Thermal decomposition of water
2. Electrolysis of heavy water
3. Passing silent electric discharge through hydrogen at low pressure
4. Reaction of water with heavy metals

11. In aqueous solution of H_2 will not reduce
1. Zn^{2+}
2. Ag^+
3. Cu^{2+}
4. Fe^{2+}

12. Hydrogen is not obtained when zinc reacts with
1. Dilute HCl
2. coldwater
3. Dilute H_2SO_4
4. Hot 20% NaOH

Which of the following can not reduce the acidified solution of $KMnO_4$
1. Fe^{2+} (aq)
2. H_2
3. Solution of ethanediodic acid
4. Nascent hydrogen

In presence of finely divided Ni, hydrogen reacts with vegetable oils. The process is known as
1. Oxidation   2. Nickelation
3. Halogenation   4. Hydrogenation

Which of the following hydrides is the most powerful reducing agent?
1. NH_3 2. HF
3. LiH   4. CH_4

Which of the following sterilises water?
1. SO_4 2. O_3
3. CO_2 4. N_2

H_2O_2 oxidises H_2S to
1. H_2SO_3 2. H_2SO_4
3. S   4. $H_2S_2O_8$

Ammonium per sulphate solution on heating under reduced pressure gives
1. H_2O_2 2. $(NH_4)_2SO_4$
3. H_2 4. O_2

The cathode in the middle compartment of Castner–Kellner process is
1. Steel   2. Mercury
3. Iron   4. Graphite

Which of the following alcohol is prepared from water gas
1. CH_3OH 2. $CH_3CH_2CH_2OH$
3. C_2H_5OH 4. $C_6H_5CH_2OH$

Calcium carbide reacts with water to produce?
1. Ethane   2. Methane
3. Ethyne   4. Ethylene

Industrial hydrogen is prepared by passing an electric current through a solution of
1. $NaCl$ 2. $Ca(OH)_2$
3. $MgCl_2$ 4. NaOH

45. In case of H_2O_2, which of the following is incorrect?
1. It is decomposed by MnO_2
2. It is more stable in basic solution
3. It behaves as reducing agents towards $KMnO_4$
4. It acts as strong oxidising agent in acid and basic solutions

46. For which of the following halogen hydrogen shows maximum affinity?
1. Br_2 2. Cl_2
3. I_2 4. F_2

47. On hydrolysis, which of the following will not give H_2O_2?
1. HNO_4 2. $H_2S_2O_8$
3. H_2SO_5 4. $HClO_4$

48. Hardwater does not give good lather with soap, because soap precipitated as
1. Hydroxides of calcium and magnesium
2. Calcium and magnesium carbonates
3. Magnesium and calcium stearates
4. None

49. The deliquescent substance amongst the following is
1. $BaCl_2.2H_2O$
2. $FeSO_4.7H_2O$
3. $CaCl_2.6H_2O$
4. $CuSO_4.5H_2O$

50. Deliquescent substances are usually
1. Insoluble in water
2. Highly soluble in water
3. slightly soluble in water
4. None

51. An oxide that gives H_2O_2 an treatment with dilute H_2SO_4 is
1. Na_2O_2 2. SnO_2
3. MnO_2 4. PbO_2

ANSWERS

|			4.2	5.1	6.4	7.3	8.1	9.2	10.3	11.1	12.2	13.2	14.1	15.3	16.1
			20.4	21.2	22.2	23.1	24.2	25.2	26.4	27.3	28.3	29.4	30.3	31.2	32.1
			36.4	37.3	38.2	39.3	40.1	41.3	42.1	43.3	44.4	45.2	46.4	47.4	48.3

13. When H_2 reacts with Na it acts as
    1. Reducing agent   2. Oxidising agent
    3. Both   4. None

14. The most reactive state of hydrogen is
    1. Nascent hydrogen   2. Heavy Hydrogen
    3. Atomic hydrogen   4. Molecular Hydrogen

15. The hydrogen produced in contact with the substance to be reduced is knowns as
    1. Ordinary hydrogen   2. Atomic hydrogen
    3. Nascent hydrogen   4. Molecular hydrogen

16. Degree of hardness is expressed in
    1. parts per million   2. parts per kg
    3. parts per litre   4. parts per hundred

17. Titanium salts give the following colour with H_2O_2?
    1. Orange Red   2. Blue
    3. Violet   4. Yellow

18. In the use of chlorine as bleaching agent, the substance that is mainly responsible for bleaching is
    1. $HOCl$ 2. HCl
    3. Cl^- 4. Cl_2

19. In the reaction between CuO and H_2, the hydrogen
    1. loses electrons
    2. is reduced
    3. is a catalyst
    4. acts as an oxidising agent

20. H_2O_2 acts as oxidising agent in
    1. Alkaline medium only
    2. Neutral medium
    3. Acidic medium only
    4. Acidic as well as alkaline medium

21. A mixture of hydrazine (N_2H_4) and 0–60% solution of H_2O_2 is used as
    1. Rocket fuel   2. Antiseptic
    3. Fertilizer   4. None

22. Boiling temporary hard water may produce
    1. $Ca(HCO_3)_2$ 2. $CaCO_3$
    3. $CaSO_4$ 4. $Ca(OH)_2$

23. H_2O_2 acts as antiseptic due to its —— property
    1. Oxidising   2. Bleaching
    3. Reducing   4. Acidic

24. The lightest combustible element is
    1. He   2. H_2
    3. Ca   4. Li

25. High boiling point of water is due to
    1. High dielectric constant
    2. Hydrogen bonding
    3. Its high specific heat
    4. low dissociation constant

26. In acid medium H_2O_2 acts as an oxidizing agent in its reaction with
    1. MnO_4^- 2. O_3
    3. Ag_2O 4. I^-

27. The substance which reduces the speed of decomposition of H_2O_2 is—
    1. Pt   2. NaOH
    3. Alcohol   4. Na_2CO_3

28. H_2O_2 is —
    1. Para magnetic   2. Ferromagnetic
    3. Dia magnetic   4. None

29. In the reaction of Ozone and H_2O_2, latter acts as —
    1. Bleaching agent   2. Oxidising agent
    3. 1 & 2   4. Reducing agent

30. The reaction, $2H_2O_2 \rightarrow 2H_2O + O_2$ shows that
    1. It acts as reducing agent
    2. It acts as oxidising agent
    3. H_2O_2 is decolourised
    4. None

31. Which of the following is true peroxide?
    1. PbO_2 2. Na_2O_2
    3. NO_2 4. MnO_2

32. The shape of H_2O_2 molecule is
    1. open book shape with 90' angle
    2. square planar
    3. pyramid
    4. tetrahedron

33. The hybridization of the orbitals of oxygen in H_2O_2 is
    1. sp^3 2. sp
    3. sp^3d 4. sp^2

34. The ionisation of hydrogen gives
    1. Hydronium ion   2. Hydride ion
    3. Proton   4. Hydroxyl ion

35. Whi
    acid
    1. F
    2. H
    3. S
    4. N

36. In p
    reac
    kno
    1. O
    3. H

37. Whi
    mos
    1. N
    3. L

38. Whi
    1. S
    3. C

39. H_2O
    1. H
    3. S

40. Am
    ing
    1. H
    3. H

41. The
    of C
    1. S
    3. Ir

42. Whi
    par
    1. C
    3. C

43. Cal
    duc
    1. E
    3. E

44. Ind
    an
    1. A
    3. M

because the d-orbitals are not directly affected by the ligands and moreover the number of ligands is smaller.

$$\Delta_t = -\frac{4}{9}\Delta_o$$

Where, the negative sign means the reversal of the orbital levels..

17. d-orbital splitting in square planar complexes:
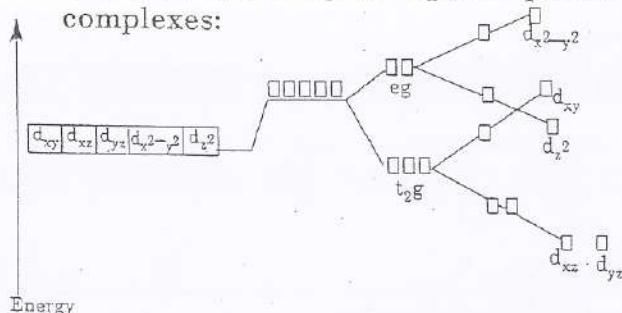
18. Tetrahedral complexes have generally high spin even when strong field ligands are involved. This is because the ligands hardly approach towards the orientation of d-orbitals. Hence the extent of splitting energy is small. The electrons prefer to obey Hund's rule and occupy separate orbitals as far as possible. Therefore, such complexes are high spin.

19. Spectrochemical series:

$CO > CN^- > NO_2^- > bipy > en > NH_3 \sim Py > NCS^- > H_2O \geq C_2O_4^{2-} > OH^- > F^- > Cl^- > Br^- > I^-$.
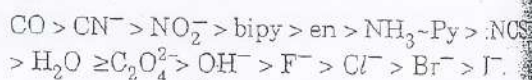
Strong field ligands ⟵⟶ weak field ligands

OBJECTIVE BITS

1. The hybridisation of $[Ni(CN)_4]^0$ ion is?
   1. dsp^2 2. sp^3d^2 3. d^2sp^2 4. sp^3

2. Which of the following is paramagnetic?
   1. Nickel carbonyl
   2. Potassium ferricyanide
   3. Potassium ferrocyanide
   4. Cobalt hexamine chloride.

3. The IUPAC name of $[Cr(NH_3)_4 Cl_2]NO_3$ is?
   1. Tetra aminodichloro nitrate
   2. Tetra aminodichloro chromium (III) nitrate
   3. Dichlorotetraaminochromium (III) nitrate
   4. none

4. When $[Co(NH_3)_6]Cl_3$ ionises in water, the number of ions produced are?
   1. 4   2. 5   3. 6   4. 3

5. Mohr's salt is?
   1. Acid salt   2. Basic salt
   3. Normal salt   4. Double salt

6. The hybridisation in $Ni(CO)_4$ is?
   1. sp^2 2. sp^3 3. dsp^3 4. dsp^2

7. The number of isomers possible for square planar complex $K_2 [PdClBr_2 (SCN)]$ is?
   1. 2   2. 4   3. 5   4. 6

8. The groups satisfying the secondary valencies of a cation in a complex are called?
   1. Ligands   2. Radicals
   3. Primary valencies   4. Secondary valency

9. In complexes, the primary valency of the metal is always?
   1. Ionic   2. Zero
   3. Covalent   4. None

10. Co-ordination number of Cu in $[Cu(NH_3)_6]$ is?
    1. 2   2. 3   3. 6   4. 8

11. The metal in a complex acts as?
    1. Lewis acid   2. Lewis base
    3. Neutral compound   4. None

12. Complexes with bidentate ligands are called?
    1. Ligands   2. Chelates
    3. Complexes   4. None

13. The outer complexes are generally formed by?
    1. Strong ligands   2. Weak ligands
    3. Complexes   4. None

14. In which of the following compounds, the transition metal is in oxidation state of zero?
    1. $[Fe(H_2O)_3 (OH)_3]$ 2. $[Ni(CO)_4]$
    3. $[Fe(H_2O)_6]SO_4$ 4. $[CO(NH_3)_6]Cl_3$

15. Blue colour/precipitate will be obtained when $K_4Fe(CN)_6$ reacts with
    1. Fe (II) ions   2. Cu (II) ions
    3. Fe (III) ions   4. Cu (I) ions

16. IUPAC name of the complex compound $K_3Fe(CN)_6$ is?
   1. Potassium hexacyanoferrate (III)
   2. Potassium ferrocyanide ion (II)
   3. Potassium hexacyanoferrate (II)
   4. none

17. The complex $[Co(NH_3)_3Cl_3]$ is?
   1. Neutral
   2. Positive ion
   3. Negative ion
   4. None

18. A group of atoms can function as a ligand only when?
   1. It is positively charged ion
   2. It has an unshared electron pair
   3. It is negatively charged ion
   4. It is a small molecule

19. Which of the following is not true for ligands metal complex?
   1. Larger the ligand, the more stable is the metal ligand complex
   2. Highly charged ligand forms stronger bonds
   3. Larger the permanent dipole moment of ligand, the more stable is the bond
   4. none of these

20. An example of double salt is ?
   1. Bleaching powder
   2. $[Ni(CO)_4]$
   3. Hypo
   4. Potash alum

21. Which of the following is bidentate ligand?
   1. $C_2O_4^{2-}$
   2. $H_2NCH_2CH_2NH_2$(en)
   3. Both 1 and 2
   4. None

22. Which is not correct in the case of $[Cu(NH_3)_4]^{2+}$ complex?
   1. dsp^2 hybridisation
   2. Paramagnetic (One unpaired electron)
   3. Square planar
   4. All are correct

23. The IUPAC name of $[Pt(NH_3)_4NO_2Cl]SO_4$ is
   1. Nitrochloro tetra ammine platinum (IV) sulphate
   2. Chloronitro platinum (IV) sulphate
   3. Tetramine chloronitrito platinum (IV) sulphate
   4. Platinum (IV) tetramine nitrochloro sulphate

24. The magnetic behavior of complex $K_4[Fe(CN)_6]$ is?
   1. Paramagnetic
   2. Diamagnetic
   3. Ferromagnetic
   4. None

25. Which of the following is π complex?
   1. Triethyl aluminium
   2. Ferrocene
   3. Diethyl zinc
   4. Nickel carbonyl

26. EDTA is?
   1. 6-co-ordinate
   2. 2-co-ordinate
   3. 4-co-ordinate
   4. 8-co-ordinate

27. The neutral ligand is?
   1. Chloro
   2. Aquo
   3. Ammine
   4. both 2 and 3

28. The EAN of Ni in $[Ni(CN)_4]^{2-}$ is?
   1. 34
   2. 32
   3. 36
   4. 54

29. Complexes with halide ligands are generally?
   1. High spin complexes
   2. Low spin complexes
   3. Both
   4. None

30. Complexes with CN^- ligands are usually?
   1. High spin complexes
   2. Low spin complexes
   3. Both
   4. None

31. The tetrahedral crystal field splitting is only .... of the octahedral splitting
   1. 3/7
   2. 2/9
   3. 4/9
   4. 5/9

32. Which of the following orders is correct in spectro chemical series of ligands?
   1. $Cl^- < F^- < C_2O_4^{2-} < NO_2^- < CN^-$
   2. $CN^- < C_2O_4^{2-} < Cl^- < NO_2^-$
   3. $C_2O_4^{2-} < F^- < Cl^- > N_2^- < CN^-$
   4. $F^- < Cl^- < NO_2^- < CN^- < C_2O_4^{2-}$

33. Which of the following is low spin complex?
   1. $[Mn(CN)_6]^{3-}$
   2. $[Fe(CN)_6]^{3-}$
   3. $[Co(CN)_6]^{3-}$
   4. All correct

34. Which of the following is high spin complex?
   1. $[Co(NH_3)_6]^{2+}$
   2. $[FeF_6]^{3-}$
   3. $[CoCl_6]^{3-}$
   4. All are correct

35. Which one of the following complexes does not have tetrahedral geometry?
    1. $[Ni(NH_3)_4]^{2+}$
    2. $[Cu(CN)_4]^{3-}$
    3. $[NiCl_4]^{2-}$
    4. $[Ni(CN)_4]^{2-}$

36. Geometrical isomerism would be expected for?
    1. $[Zn(NH_3)_4]^{2+}$
    2. $[Pt(NH_3)_2 Cl_2]$
    3. $[Au(NH_3)_2]^+$
    4. $[Ni(NH_3)_4]^{2+}$

37. In complexes, the ligands are linked to be central metal atom or ion by
    1. Coordinate bond
    2. Ionic bonds
    3. H-bonds
    4. Vander Waals forces

38. Octahedral complex (C.N = 6) shows cis-trans isomerism if they are of the type
    1. Ma_4b_2
    2. Ma_3b_3
    3. Ma_6
    4. Ma_5b

39. Ziegler-Natta catalyst is
    1. $TiCl_4–(C_2H_5)_3Al$ complex & heterogeneous catalyst
    2. Used for polymerization of alkenes
    3. Used to control stereo-chemical properties of polymers
    4. All the above

40. Wilkinson's catalyst is
    1. $[(C_6H_5)_3P]_3 RhCl$
    2. Used in the hydrogenation of alkenes
    3. Homogeneous catalyst
    4. All the above

41. Which of the following is Zeisse's salt?
    1. $[(C_5H_5)_2Fe]$
    2. $(Ph_3P)_3 RhCl$
    3. $[(C_6H_6)_2Cr]$
    4. $K[PtCl_3C_2H_4]$

42. Which one of the following square planar complexes will show cis-trans isomerism?
    1. Ma_4
    2. Ma_3b
    3. Ma_2b_2
    4. $Mabcd$

43. For which of the following d^n configuration can octahedral complexes exist in both high spin and low spin forms?
    1. d^5
    2. d^4
    3. d^3
    4. d^2

44. Which co-ordination number of Co in $[Co(NH_3)_5NO_2]Cl_2$ is
    1. 2
    2. 4
    3. 6
    4. 8

45. Which of the following has maximum paramagnetic character?
    1. $[Fe(H_2O)_6]^{2+}$
    2. $[Zn(H_2O)_6]^{2+}$
    3. $[Cr(H_2O)_6]^{3+}$
    4. all are equal

46. π-acid ligand among the following is?
    1. F^-
    2. O^{2-}
    3. NH_3
    4. CO

47. When a diamagnetic substance is placed in magnetic field then it indicates?
    1. Increase in weight
    2. Decrease in weight
    3. No change in weight
    4. None of the above

48. In the formation of complex, the transition metal cation?
    1. Gives electron pair
    2. Accepts electron pair
    3. Gives or accepts electron pair
    4. None of the above

49. $[Co(NH_3)_5 Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$ exhibit?
    1. Hydrate isomerism
    2. Ionisation isomerism
    3. Ligand isomerism
    4. Co-ordination isomerism

50. Which of the following is strong field ligand?
    1. CN^-
    2. NO^{2-}
    3. en
    4. NH_3

ANSWERS

1.1	2.2	3.3	4.1	5.4	6.2	7.1	8.1	9.1	10.3	11.1	12.2	13.2	14.2	15.3	16.
17.1	18.2	19.1	20.4	21.3	22.4	23.1	24.2	25.2	26.1	27.4	28.1	29.1	30.2	31.3	32.
33.4	34.4	35.4	36.2	37.1	38.1	39.4	40.4	41.2	42.3	43.1	44.3	45.1	46.4	47.2	48.
49.2	50.1														

14 Solutions

$$= \frac{\text{wt. of the base}}{\text{eq. wt. of the base}} \qquad \frac{V_B N_B}{1000} = \frac{\text{wt. of the acid}}{\text{eq. wt. of the acid}}$$

PROBLEMS & SOLUTIONS

...ine the molarity of the solution ...ning 6 millimoles of solute in 60 ml ...tion.

$$\frac{\text{o. of millimoles of solute}}{\text{olume of solution in ml.}}$$

$$\frac{}{0} = 0.1$$

...he molarity of the solution obtained ...xing 200 ml of water with 300ml of ...NaOH.

Sol: $M_1 V_1 = M_2 V_2$
(For NaOH)   (For mixture)

$$0.5 \times 300 = M_2 \times 500$$

$$M_2 = \frac{0.5 \times 300}{500} = 0.3 \text{ M}$$

3. Determine the amount of NaOH present in 200 ml of 0.5N solution?

Sol: wt. of solute $= \dfrac{N \times V \times \text{gram. eq. wt}}{1000}$

$$= \frac{0.5 \times 200 \times 40}{1000} = 4 \text{ gr.}$$

OBJECTIVE BITS

...glucose solutions are mixed one has ...ume of 480ml, and a conc. of 1.50M ...the second, 520 ml of conc. of 1.20M. ...molarity of the final solution is

...44 M   2. 2.70 M

...44 M   4. 1.5 M

...lution is prepared by mixing of the ...wing number of moles of hydrocar-
...s 1.28 moles C_7H_{16}, 1.80 moles of C_8H_{18} ...2.12 moles of C_9H_2O. The mole frac-
... of C_8H_{18} is

...7   2. 0.5

...35   4. 0.2

...lution is 0.1M with respect to KCl and ...M with respect to $MgCl_2$. The molarity ...Cl⁻ ions in the solution is

...1   2. 0.15

...2   4. 0.5

...ich one of the following aqueous solu-...ns has the lowest boiling point

...02 M HCl   2. 0.005 M KBr

...01 M NaCl   4. 0.015 M C_2H_5OH

...e temperature at which the vapour ...essure is equal to the external pressure ...called?

...Freezing point   2. Boiling point

...Critical temperature 4. none

6. Molarity of 12% NaOH is

  1. 1 M   2. 2 M

  3. 3 M   4. 4 M

7. 6.4 gms of methyl alcohol is present in 200 ml of water. The molality of methanol solution is

  1. 0.5M   2. 1m

  3. 1.5m   4. 2m

8. The mole fraction of O_2 in a mixture of CH_4 and O_2 containing equal masses is

  1. $\dfrac{1}{2}$ 2. $\dfrac{1}{3}$

  3. $\dfrac{2}{3}$ 4. $\dfrac{1}{4}$

9. Increase of temperature of an aqueous solution will cause

  1. decrease in molarity of the solution

  2. decrease in molarity of the solution

  3. decrease in mole fraction of the solution

  4. decrease in weigh percentage of the solution

10. 0.4 moles of Na_2CO_3 is present in 500 ml. of its solution. Normality is

  1. 0.8   2. 1.6

  3. 0.32   4. 2

11. Concentration unit independent of temperature would be?

  1. molarity   2. molality

  3. normality   4. none

ANSWERS

3   2.3   3.4   4.2   5.2   6.3   7.2   8.2   9.2   10.2   11.2

$= 740.2 - 530.1\%$

Partial pressure of water $(P_B) = 530.1$ mm

$$\frac{P_A}{P_B} = \frac{n_A}{n_B} = \frac{W_A/M_A}{W_B/M_B} = \frac{W_A \times 18}{W_B \times 112.5} = \frac{210.1}{530.1}$$

$$\frac{W_A(C_6H_5Cl)}{W_B(H_2O)} = \frac{210.1 \times 112.5}{530.1 \times 18} = 2.48$$

$W_A = 2.48 \times W_B$ and $W_A + W_B$

$\% W_A = \dfrac{2.48\, W_B}{3.48\, W_B} \times 100 = 71.2$

$\% W_B = 100 - 71.26 = 28.74$

OBJECTIVE BITS

1. If a dilute solution has N_1 molecules of the solute and N_2 molecules of both solute and the solvent, the ratio of the decrease in vapour pressure to the vapour pressure of the solvent is equal to

   1. $\dfrac{N_2 - N_1}{N_1}$ 2. $\dfrac{N_2}{N_1 + N_2}$

   3. $\dfrac{N_1 + N_2}{N_2}$ 4. $\dfrac{N_1}{N_2}$

2. An azeotropic mixture of two liquids
   1. obeys Raoult's law
   2. cannot be separated by distillation
   3. is not perfectly homogeneous
   4. slowly separates into two different layers

3. Which of the following substances shows decrease in solubility with increase in temperature?
   1. CeSO$_4$ 2. NaCl
   3. H$_2$O   4. none

4. Two moles of oxygen, and three moles of N_2 and 5 moles of CO_2 are mixed in a 10 dm^3 flask at 27°C. What is the partial pressure of CO_2.
   1. 1738.26 kpa   2. 470.3 kpa
   3. 1247.10 kpa   4. 2450.3 kpa

5. Solubility of gas in liquid is generally expressed interms of
   1. ionisation potential   2. adsorption coefficient
   3. absorption coefficient   4. none of these

6. Which of the following statements is correct?
   1. If in any solution, the solvent does not obey Raoult's law the solute obeys Henry's law
   2. If in any solution, the solvent obeys Raoult's law, the solute obeys Henry's law
   3. If in any solution, the solvent obeys Raoult's law, the solute does not obey Henry's law
   4. none of the above

7. In an ideal solution —— on components
   1. heat is absorbed
   2. heat is evolved
   3. no heat is evolved or absorbed
   4. heat is either absorbed or evolve

8. A solution of two or more cons said to be ideal, if it obeys R exactly at
   1. all pressures and all concentrati
   2. all concentrations and all tempe
   3. all temperatures and all pressur
   4. all concentration at 100°C

9. Which of the following statem rect for an ideal solution?
   1. It obey's Raoult's law at all co and at all temperatures
   2. $\Delta H_{mixing} = 0$
   3. $\Delta V_{mixing} = 0$
   4. all are correct

10. The constituents of ideal soluti separated by
    1. crystallisation   2. sublimatic
    3. fractional distillation 4. chromatog

11. The entropy change of mixing fc binary solution at 27°C is 13J The free energy change of mixir
    1. −3.90 KJ mol^{-1} 2. −1.8 KJ m
    3. −32.93 KJ mol^{-1} 4. 2.54 KJ m

12. A maximum or minimum obtain perature. Composition curve of of two liquids indicates
    1. an azeotropic mixture
    2. a cryohydric mixture
    3. a compound of formation
    4. none

he law which related the solubility of a as with pressure is known as

The Raoult's law   2. The Henry's law

The Boyle's law   4. The Newton's law

n azeotropic solution of two liquids has iling point lower that either of them hen it?

shows positive deviation from Raoult's law

shows negative deviation from Raoult's law

shows no deviation from Raoult's law

none of the above

lutions which distill without change in mposition or temperature are called

amorphous   2. azeotropic mixture

ideal solution   4. none

ie solutions which show positive or neg-ive deviation from Raoult's law are lled?

Ideal solutions   2. Non-ideal solutions

True solutions   4. colloidal solutions

17. Azeotropic mixture are
1. mixture of two solids
2. constant boiling mixtures
3. those which boil at different temperatures
4. none

18. Which of the following will form an ideal solution
1. $CHCl_3$ and CH_3COOCH_3
2. C_6H_6 and CCl_4
3. H_2O and HBr
4. C_2H_5OH and CCl_4

19. The mixture of n–hexane and n–heptane is an example of
1. Ideal solution
2. Real solution
3. Dilute solution
4. none

20. Water forms azeotropic mixtures with
1. HCl   2. C_2H_5OH
3. HNO_3 4. all of the above

ANSWERS

2.2   3.1   4.3   5.3   6.2   7.3   8.2   9.4   10.3   11.1   12.1   13.2   14.1   15.2   16.2
18.2   19.1   20.4

CHARACTERISTIC OF VARIOUS TYPES OF SOLIDS

Characteristics	Ionic	Metallic	Covalent	Molecular
Units present on lattice sites	+Ve and -Ve ions	+Ve ions in a 'sea' of electrons	Atoms	molecules
Binding force	Electrostatic attraction between ions	Electrostatic attraction between cations and sea of electrons	strong covalent bonds	weak Van der Waal's for dipole-di force
Hardness	Hard	Variable	Very hard (except -graphite)	very soft
Brittleness	Brittle	Very low	Medium	Low
Melting point	High	Moderate to high	very high	low
Electrical conductivity	Bad conductors	Good conductors	Bad conductors (except graphite)	Bad conductors
Solubility	soluble in polar and insoluble in non-polar solvents	insoluble in polar as well as non-polar solvents	insoluble in polar and usually soluble in non-polar solvents	soluble as insolu in both
Examples	$NaCl$, ZnS, KNO_3, CaO	Metals and alloys	Diamond, graphite, S, Quartz, SiO_2, SiC	H_2, H_2O, N_2, CCl Sugar, N gases

PROBLEMS & SOLUTIONS

1. Calculate the Miller indices of crystal planes which cut through the crystal axis at (2a, 3b, C).

Sol:

	a	b	c
intercepts	2	3	1
reciprocals	1/2	1/3	1
clear fraction	3	2	6

Hence Miller Indices are (3 2 6)

2. The parameters of an orthorhombic unit cell are a = 50 pm, b = 100 pm, c = 150 pm. Determine the spacing between the (1 2 3) planes.

Sol: For an orthorhombic unit cell,

The interplanar distance d_{hkl} is given by

$$\frac{1}{[d_{(hkl)}]^2} = \frac{h^2}{a^2} + \frac{k^2}{b^2} + \frac{l^2}{c^2}$$

$$\frac{1}{(d_{(hkl)})^2} = \frac{1}{(d_{123})^2} = \left(\frac{1}{50}\right)^2 + \left(\frac{2}{100}\right)^2 + \left(\frac{3}{150}\right)^2$$

$$\frac{1}{d_{hkl}} = 29\,pm$$

OBJECTIVE BITS

1. Defect in FeO crystals is due to
   1. Metal excess due to anion vacancies
   2. Metal deficiency due to cation vacancies
   3. Metal excess due to interstitial cations
   4. Metal deficiency due to interstitial anions

2. The crystals which are good conductors of heat and electricity are
   1. ionic
   2. molecular
   3. covalent
   4. metallic

3. NaCl crystallises in an fcc lattice, number of atoms in the unit cell is
   1. 2
   2. 4
   3. 6
   4. 8

4. Bravais lattice are of
   1. 28 types
   2. 7 types
   3. 14 types
   4. 21 types

5. Crystals can be divided into
   1. 6 categories
   2. 7 categories
   3. 8 categories
   4. 9 categories

(h,k,l) represents

1. Crystal systems   2. Lattice parameter
3. Weiss indices   4. Miller indices

The miller indices of the crystal planes which cut through the crystal axes at (2a, 3b, c) are

1. (123)   2. (321)
3. (231)   4. (326)

In a crystal, the number of symmetries would be

1. 1   2. 2
3. 3   4. 4

The radius ratio (r^+/r^-) of KF is 0.98. Therefore KF will have ..... type of structure.

1. ZnS   2. CsCl
3. diamond   4. graphite

The mass of a unit cell of CsCl corresponds to

1. Four Cs^+ and four Cl^-
2. Two Cs^+ and two Cl^-
3. One Cs^+ and one Cl^-
4. Eight Cs^+ and one Cl^-

The structure of KCl (determined by X-ray studies)

1. simple cubic   2. face-centered cubic
3. body centered cubic 4. rhombic

In NaCl crystal each chloride ion is surrounded by

1. $4Na^+$ 2. $6Cl^-$
3. $6Na^+$ 4. $8Na^+$

Graphite is an example of

1. a metal   2. electrical anisotropy
3. a semiconductor   4. none

Ice is an example of

1. Molecular crystal 2. Ionic crystal
3. Covalent crystal   4. metallic

The phenomenon in which a substance can form more than one type of crystal structure is known as

1. isomerism   2. isomorphism
3. polymorphism   4. mesomorphism

The occurrence of different chemical compounds in the same crystalline form is known as

1. polymorphism   2. isomorphism
3. mesomorphism   4. isomerism

17. In a crystalline solid with bcc lattice the number of lattice points per unit cell is

1. 1   2. 2
3. 4   4. 6

18. The coordination number in the bcc lattice is

1. 4   2. 6
3. 8   4. 12

19. In a fcc lattice the number of nearest neighbours for given lattice point is

1. 6   2. 8
3. 12   4. 14

20. Close-packing is maximum in the lattice of the type

1. simple cubic   2. face centered cubic
3. body-centered cubic 4. none

21. The distance between (111) planes in NaCl crystal, whose unit cell dimensions is 2.814×10^{-10} m is

1. 2.814×10^{-10} m   2. $2.814/3 \times 10^{-10}$ m
3. $\dfrac{2}{\sqrt{3}} \times 2.814 \times 10^{-10}$ m   4. $\dfrac{1}{\sqrt{3}} \times 2.814 \times 10^{-10}$ m

22. Which of the following planes will be absent in a simple cubic system?

1. (111)   2. (100)
3. (220)   4. (200)

23. In the Bragg's equation for diffraction of X-rays 'n' represents

1. a quantum number
2. the order of reflection
3. the no. of moles
4. none

24. In X-ray diffraction pattern if the reflections from the crystal planes 100, 110, 210, 211 are absent the crystal lattice is

1. fcc
2. bcc
3. simple cubic (primitive)
4. none

25. In the X-ray diffraction method for a bcc lattice, h,k,l can value

1. even value   2. odd value
3. h+k+l is even value 4. any value

26. The crystal plane for which the interplanar spacing $d_{hkl} = \dfrac{a}{\sqrt{12}}$ is ...

  1. 222   2. 221

  3. 111   4. 101

27. For a cubic crystal $\dfrac{d_{100}}{a}$ is equal to

  1. 1   2. $\dfrac{1}{2}$ 3. $\dfrac{1}{4}$ 4. $\dfrac{1}{8}$

28. The total number of space groups in a crystal is

  1. 7   2. 32

  3. 14   4. 230

29. A cubic crystal has ... three-fold axes of symmetry

  1. 2   2. 3

  3. 4   4. 6

30. A crystal which possesses no element of symmetry is

  1. H_3BO_3 2. $K_2Cr_2O_7$

  3. $CuSO_4.5H_2O$ 4. all of the above

31. A tetragonal crystal possesses the following axis of symmetry?

  1. 2-fold   2. 3-fold

  3. 4-fold   4. 6-fold

32. All crystals except ...... are anisotropic

  1. cubic   2. trigonal

  3. orthorhombic   4. hexagonal

33. A crystal having unit cell dimensions $a \neq b \neq c$, $\alpha = \beta = \gamma = 90°$ is

  1. cubic   2. monoclinic

  3. tetragonal   4. orthorhombic

34. The substance which does not have a sharp melting point is

  1. $NaCl$ 2. ice

  3. glass   4. diamond

35. Which of the following crystals have 8:8 coordination?

  1. NH_4Br 2. $AlFe$

  3. NH_4Cl 4. all of these

36. Which type of crystals contain one Bravias lattice

  1. Triclinic   2. Hexagonal

  3. Rhombohedral   4. all of these

37. How many octahedral sites per ... are there in a cubic close packe... ture?

  1. 1   2. 2

  3. 4   4. 6

38. If a crystal contains a total of ... and n Schottky defects are produ... removing n cations and r anions ... interior of the crystal, then

  1. $n = Ne^{E/kT}$ 2. $n = Ne^{-E/kT}$

  3. $N = ne^{-E/2KT}$ 4. $n = Ne^{-E/2KT}$

39. Sodium chloride shows Schottky d... and $AgCl$ Frenkel defects. Their elec... conductivity is due to the

  1. higher coordination number of $AgCl$

  2. lower coordination number of $NaCl$

  3. motion of electrons and not the mo... ions

  4. motion of ions and not the motion... trons

40. A solid solution of $CdBr_2$ in $AgBr$ co...

  1. Frenkel defects   2. Colour center

  3. Schottky defects   4. both 1 and 3

41. In $AgCl$, the silver ion is displaced ... its lattice position to an interstiti... tion. Such a defect is called a

  1. Frenkel defect   2. Schottky defe...

  3. Colour centre   4. none

42. Cu crystallizes in an fcc form and N... bcc form. The coordination number... Cu and Na are respectively

  1. 6 and 8   2. 8 and 12

  3. 12 and 8   4. 8 and 6

43. If there are N atoms in a crystal ... interstitial positions in its structu... there are n Frenkel defects in the ... then

  1. $n = (NN_i)e^{-E/2kT}$ 2. $N = (nN_i)^{1/2}e$...

  3. $n = (NN_i)^{1/2}e^{-E/2kT}$ 4. $n = (NN_i)^{1/2}e$...

44. In a ccp structure, the

  1. 1st and 4th layers are repeated

  2. 2nd and 4th layers are repeated

  3. 1st, 3rd and 6th layers are repeated

  4. 1st and 3rd layers are repeated

$= 0.51 \text{ min}^{-1}$

$t_{1/2} = \dfrac{0.693}{K}$

$= \dfrac{0.693}{0.51} = 13.58 \text{ min}$

13. The value of specific rate constant for the decomposition of nitrogen pentoxide is 3.46×10^{-5} at 25°C and 4.87×10^{-3} at 65°C. What is the activation energy for the reaction.

Sol. $K_1 = 3.46 \times 10^{-5}$, $T_1 = 273 + 25 = 298 \text{ K}$

$K_2 = 4.87 \times 10^{-3}$, $T_2 = 273 + 65 = 338 \text{ K}$

according to Arrhenius equation

$\log \dfrac{K_2}{K_1} = \dfrac{E_a}{2.303R} \left[\dfrac{1}{T_1} - \dfrac{1}{T_2} \right]$

$= \dfrac{E_a}{2.303R} \left[\dfrac{T_2 - T_1}{T_1 T_2} \right]$

$\log \dfrac{4.87 \times 10^{-3}}{3.46 \times 10^{-5}} = \dfrac{E_a}{2.303 \times 1.987} \left[\dfrac{338 - 298}{298 \times 338} \right]$

$\therefore E_a = 24.8 \text{ K calories}$

14. For a second order reaction the initial concentration of reactant is 5×10^{-4} mole / lit, it is 40% decomposed in 50 minutes. What is the value of rate constant?

Sol. $a = 5 \times 10^{-4}$ mole / lit

$= 0.0005$ mole / lit

$x = \dfrac{0.0005 \times 40}{100} = 0.0002$

For second order rate equation we know

$K_2 = \dfrac{1}{at} \cdot \dfrac{x}{a-x}$

$= \dfrac{1}{0.0005 \times 50} \cdot \dfrac{0.0002}{(0.0005 - 0.0002)}$

$= 26.67 \text{ lit / mole / min}$

15. For a reaction $X(g) \to Y(g) + Z(g)$, the life time is 10 min. In what period would the concentration of X reduced to 10% of initial concentration.

Sol. $K_1 = \dfrac{0.693}{t_{1/2}} = \dfrac{0.693}{10} = 0.0693 \text{ min}^{-1}$

$t_{1/2} = \dfrac{2.303}{K_1} \log \dfrac{a}{a-x}$

$= \dfrac{2.303}{0.0693} \log \dfrac{100}{10} = 32 \text{ min}$

16. The half life of a reaction is 24 hours start with 10 grams of the reactant many grams of it will remain after 96 hrs.

Sol. $a = \dfrac{a_0}{2^n}$ and $n = \dfrac{t}{t_{1/2}}$

Where a_0 is the initial concentration of the reactant

n is the numbers of half life periods

a is remaining part of the reactant

$\therefore n = \dfrac{96}{24} = 4$

$a = \dfrac{a_0}{2^n} = \dfrac{10}{2^4}$

$\therefore a = \dfrac{10}{16} = 0.625 \text{ grams}$

OBJECTIVE BITS

1. The rate of a chemical reaction
   1. Increases as the reaction proceeds
   2. Decreases as the reaction proceeds
   3. May increase or decrease during the reaction
   4. remains constant as the reaction proceeds.

2. The correct order indicated against the rate of reaction A+B is $\xrightarrow{K}$ C is
   1. $\dfrac{d[C]}{dt} = K [A]$
   2. $\dfrac{-d[C]}{dt} = K [A] [B]$
   3. $\dfrac{-d[A]}{dt} = K [A] [B]$
   4. $\dfrac{-d[A]}{dt} = K [A]$

3. In reversible reaction both sides rate of a reaction are
   1. same
   2. different
   3. one side more
   4. reactant rates more

4. The rate of a reaction does not depend upon
   1. Pressure
   2. Temperature
   3. Concentration
   4. Catalyst

5. The rate constant of a reaction depends
   1. Temperature
   2. Mass
   3. Weight
   4. Time

6. The specific rate constant of a first order reaction depends on the
   1. Concentration of the reactant
   2. Concentration of the product
   3. Time
   4. Temperature

In which of the following cases, does the reaction go farthest to completion

1. $K=10^2$
2. $K=10^{-2}$
3. $K=10$
4. $K=1$

According to the collision theory of chemical reactions

1. A chemical reaction occurs with every molecular collision
2. Rate is directly proportional to the number of collisions per second
3. Reactions in the gas phase are always of zero order
4. Reaction rates are of the order of molecular speeds

A zero order reaction is one whose rate is independent of

1. Temperature of the reaction
2. The concentration of the reactants
3. The concentration of the products
4. The material of the vessel in which the reaction is carried out

For a zero order reaction

1. The reaction rate is double when the initial concentration is doubled
2. The time for half change is half the time taken for completion of the reaction
3. The time for half change is independent of the initial concentration
4. The time for completion of the reaction is independent of the initial concentration.

The hydrolysis of ethyl acetate is a reaction of

1. First order
2. Second order
3. Third order
4. Zero order

The rates of a certain reaction (dC/dt) at different times are as follows. The reaction is

Time	0	10	20	30
Rate (mole.time^{-1}.sec^{-1})	2.8×10^{-2}	2.78×10^{-2}	2.8×10^{-2}	2.79×10^{-2}

1. Zero order
2. First order
3. Second order
4. Third order

3. Which of the following, rate laws has an over all order of 0.5 for reaction involving substances x, y and z?

1. Rate = $K(C_x)(C_y)(C_z)$
2. Rate = $K(C_x)^{0.5}(C_y)^{0.5}(C_z)^{0.5}$
3. Rate = $K(C_x)^{1.5}(C_y)^{-1}(C_z)^0$
4. Rate = $K(C_x)(C_z)^n/(C_y)^2$

14. The unit of rate constant for a zero order reaction is

1. Litre. sec^{-1}
2. Lit.mole^{-1}sec^{-1}
3. Mole.lit^{-1}sec^{-1}
4. Mole.sec^{-1}

15. The following data are for the decomposition of ammonium nitrate in aqueous solution

Time (min)	10	15	20	25	Initially
Volume of N_2(c.c.)	6.25	9.00	11.40	13.65	35.05

The order of the reaction is......

1. First order
2. Zero order
3. Third order
4. Second order

16. If reaction between A and B to give C shows first order kinetics in A and second order in B, the rate equation can be written as

1. Rate = K [A] [B]$^{1/2}$
2. Rate = K [A]$^{1/2}$ [B]
3. Rate = K [A] [B]^2
4. Rate = K [A]^2 [B]

17. The second order rate constant is usually expressed as

1. Mole.lit^{-1} sec^{-1}
2. Mole.$^{-1}$ lit^{-1} sec^{-1}
3. Mole.$^{-1}$ lit^{-1} sec^{-1}
4. Mole.$^{-1}$ lit. sec^{-1}

18. The rate of reaction between A and B increases by a factor of 100, when the concentration of A is increased 10 folds, the order of reaction with respect to A is

1. 10
2. 1
3. 4
4. 2

19. If the concentration is expressed in moles per litre, the unit of the rate constant for a first order reaction is

1. mole. litre^{-1} sec^{-1}
2. mole. litre^{-1}
3. sec^{-1}
4. mole^{-1}

20. The specific rate for a reaction is 1.0×10^{-4} mol. lit^{-1} min^{-1}. The order of the reaction is

1. zero
2. one
3. two
4. three

21. The half life of a first order reaction is 69.35. The value of the rate constant of the reaction is

1. 1.0 s^{-1}
2. 0.1 s^{-1}
3. 0.01 s^{-1}
4. 0.001 s^{-1}

22. The minimum energy required for the reacting molecules to undergo reaction is
    1. potential energy
    2. kinetic energy
    3. thermal energy
    4. activation energy

23. The rate constant of one of the reaction is found to be double that of the rate constant of another reaction. Then the relationship between the corresponding activation energies of the two reaction (Ea^1 and Ea^{11}) can be represented as
    1. $E_a^1 > Ea^{11}$
    2. $E_a^1 < E_a^{11}$
    3. $E_a^1 = E_a^{11}$
    4. $E_a^1 = 4E_a^{11}$

24. Energy of activation of an exothermic reaction is
    1. zero
    2. negative
    3. positive
    4. can't to predicted

25. A first order reaction has specific rate constant of 2 min^{-1}. The half life of the reaction will be
    1. 1.653 min
    2. 0.347 min
    3. 2 min
    4. 0.0347 min

26. The half life of a first order reaction is 10 min. If initial amount is 0.08 mol/litre and concentration at some instant is 0.01 mol/litre, then t =
    1. 10 min
    2. 20 min
    3. 30 min
    4. 40 min

27. A catalyst increases the rate of reaction because it
    1. increases the activation energy
    2. decreases the energy barrier for reaction
    3. decreases the collision diameter
    4. increases the temperature coefficient

28. According to adsorption theory of catalyst, the speed of the reaction increases because
    1. The concentration of reactant molecules at the active centres of the catalyst becomes high due to adsorption.
    2. In the process of adsorption the activation energy of the molecules becomes large.
    3. Adsorption produces heat which increases the speed of the reaction
    4. None of the above

29. An example of auto catalytic reaction
    1. The decomposition of nitroglycerine
    2. Thermal decomposition of $KClO_3$ MnO_2 mixture
    3. Break down of $^{14}C_6$
    4. Hydrogenation of vegetable oil using catalysts

30. Which of the following catalyst is used preparing toluene by reacting benzene with methyl chloride?
    1. Ni
    2. Anhydrous $AlCl_3$
    3. Pd
    4. Pt

31. a biological catalyst is
    1. an amino acid
    2. carbohydrate
    3. the nitrogen molecule
    4. an enzyme

32. Organic catalysts differ from inorganic catalysts
    1. by acting at very high temperature
    2. by acting at low temperature
    3. being used up
    4. being proteinous in nature

33. Enzyme activity is maximum at
    1. 300 K
    2. 310 K
    3. 320 K
    4. 330 K

34. The enzyme which can catalyse the version of glucose to ethanol is
    1. Zymase
    2. Invertase
    3. Maltase
    4. Diastase

35. The reaction $x+y+z \longrightarrow$ products is found to obey the rate law,
    $r = \dfrac{-d[A]}{dt} = K[x]^2 [y]^{3/2} [z]^{-1/2}$.
    The overall order of the reaction is
    1. 1
    2. 3
    3. 5/2
    4. 7/2

36. The rate constant for a second order reaction is 0.001 litre mole^{-1}. sec^{-1}. If expressed in units of ml. mole^{-1} min^{-1}, is
    1. 0.01
    2. 10^3
    3. 9.96×10^{23}
    4. 9.96×10^{-23}

37. For 1st order reaction $t_{1/2}$ is 100 s rate constant of the reaction is
    1. 6.93×10^{-3} sec^{-1}
    2. 6.93×10^{-4}
    3. 6.90×10^{-2} sec^{-1}
    4. none of these

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Thermodynamics

1. Two moles of an ideal gas expand spontaneously into a vacuum. The work done is .....
   1. Zero
   2. Infinity
   3. 2J
   4. None

2. If Z is a state function, then $\oint dz$ is ....
   1. Positive
   2. Zero
   3. Negative
   4. Infinity

3. The work differential dw is ....
   1. an exact differential
   2. a state function
   3. an inexact differential
   4. none

4. If internal energy U and volume V remains constant, then for an isothermal process (i.e. T is constant)
   1. $dS \leq 0$
   2. $dS \geq 0$
   3. $dU \leq 0$
   4. $dU \geq 0$

5. Free energy change (ΔG) in a process was found to be –138.0 KJ at 303 K and –135.0 KJ at 313 K. Calculate the change in enthalpy (ΔH) accompanying the process at 308 K.
   1. 228.9 KJ
   2. 22.89 K
   3. 2289 KJ
   4. 228.9 J

6. The intensive property is ....
   1. ΔV
   2. ΔG
   3. ΔH
   4. C_p

7. For a reaction $\Delta U = -18.5$ KJ mol^{-1} and $\Delta n(g) = 2$, the reaction is
   1. endothermic
   2. spontaneous
   3. exothermic
   4. in equilibrium

8. For a real gas $\frac{\partial u}{\partial U}$ is
   1. zero
   2. negative
   3. positive
   4. none

9. The maximum work done in ergs for isothermal and thermodynamically

10. For a gaseous reaction at 300 K, ΔH –4.98 KJ, assuming that R = 8.3 JK $\Delta n(g)$ is ....
    1. –2
    2. 1
    3. 3
    4. 2

11. For the reaction $C + 2H_2 \rightarrow CH_4$, ΔH
    1. –2RT
    2. –RT
    3. RT
    4. 2RT

12. The heat capacity of a system at con pressure is represented by
    1. $C_p = (\partial H - \partial T)_p$
    2. $C_p = (\partial H + \partial T)$
    3. $C_p = \left(\frac{\partial H}{\partial T}\right)_p$
    4. none of these

13. The heat change at constant volum equal to
    1. ΔH
    2. ΔE
    3. ΔG
    4. RT

14. The ΔH for a reaction is independent
    1. the path followed
    2. ΔV
    3. the initial and final states
    4. T

15. For which of the following reaction $\Delta H = \Delta U$
    1. $C + O_2 \rightarrow CO_2$
    2. $C + \frac{1}{2}(O_2) \rightarrow CO$
    3. $N_2 + O_2 \rightarrow 2NO$
    4. $N_2O_4 + \frac{1}{2}O_2$

16. ΔH_f° is non zero for
    1. O_2 (g)
    2. Br_2 (l)
    3. C (graphite)
    4. NO(g)

17. ΔH_f° of SO_2 is –297.5 KJ mol^{-1}. The en required for the decomposition of SO_2 is ....
    1. – 148.75 KJ
    2. 148.75 KJ
    3. –297.5 KJ
    4. 297.5 KJ

18. For the combustion of one mol CH_3COOH (l) at 25°C

37. A system in which the macroscopic properties do not under go any change with time is said to be in
   1. Thermodynamic equilibrium
   2. Mechanical equilibrium
   3. Chemical equilibrium
   4. None of the above

38. Which of the following is extensive property of a system?
   1. Mass 2. Volume
   3. Energy 4. All of these

39. Which of the following is independent of the amounts of the substance present in the system?
   1. Extensive property
   2. Intensive property
   3. Macro scopic property
   4. All of the above

40. .... process is one in which the deviation from thermodynamic equilibrium is infinitesimal
   1. Chemical equilibrium
   2. A mechanical equilibrium
   3. A state equilibrium
   4. A quasi equilibrium

41. If the volume remain same during a process, it is said to be
   1. an isothermal process 2. isobaric process
   3. isochoric process 4. cyclic process

42. If after a series of changes the system returns to initial state, then overall process is called a
   1. isothermal precess 2. isobaric process
   3. isochoric process 4. cyclic process

43. A system in which .... is/are exchanged with the surrounding is called in open system
   1. energy
   2. both energy and matter
   3. both temperature and pressure
   4. temperature

44. A change in which the temperature of the

45. Which of the following is true for thermodynamic quantity?
   1. It obeys the laws of thermodynamics
   2. It is used in measuring thermal change
   3. It is used in thermodynamics
   4. Its value depends on the state of the system

46. Enthalpy and temperature are
   1. both extensive properties
   2. both intensive properties
   3. extensive, intensive properties respectively
   4. intensive, extensive properties respectively

47. Which of the following is thermodynamic variable of a system
   1. internal energy 2. pressure
   3. work 4. both 1 and 2

48. The property that does not depend on path of a system is
   1. entropy 2. heat
   3. enthalpy 4. 1 and 3

49. Which of the following is state function
   1. Entropy 2. Free energy
   3. enthalpy 4. All

50. According to SI convention work done on the system is .... and work done by system is ....
   1. negative, negative 2. positive, positive
   3. negative, positive 4. positive, negative

51. A process during which the system thermally insulate, i.e, it neither absorb heat from the surroundings nor give heat to the surroundings is termed as
   1. isothermal process 2. adiabatic process
   3. isobaric process 4. isochoric process

52. Which of the following is mathematical form of first law of thermodynamics?
   1. $\delta Q = \left(\frac{\partial U}{\partial T}\right)_V dT + \left(\frac{\partial U}{\partial V}\right)_T dV + PdV$
   2. $\delta Q = \left(\frac{\partial U}{\partial T}\right)_T dT + \left(\frac{\partial U}{\partial V}\right)_V dV + P\,dV$
   3. $\delta Q = \left(\frac{\partial U}{}\right) dT^2 + \left(\frac{\partial U}{}\right) dV^2$

ings, dU (change in internal energy) is

1. PdV
2. −PdV
3. −dV
4. 0

If the volume remains unchanged during a process, it is said to be an

1. cyclic process
2. isochoric process
3. isobaric process
4. isothermal process

Work obtained in isothermal irreversible expansion of an ideal gas is .... that obtained in the case of reversible isothermal expansion.

1. equal to
2. less than
3. greater than
4. none

. If the final temperature is higher than the initial temperature in a process, it is called

1. adiabatic expansion
2. adiabatic compression
3. cyclic expansion
4. cyclic compression

7. If energy remains fined in an ideal gas undergoing transformations the process is called as

1. cyclic transformation
2. adiabatic expansion
3. adiabatic compression
4. isothermal transformation

58. If the temperature of a gas increases, then a gas at high pressure expands into a region of

1. lower pressure
2. higher pressure
3. either 1 or 2
4. None

59. If work done (W) by expansion of one more of an ideal gas from V_1 to V_2 is equal to $-RT \ln\left(\dfrac{V_1}{V_2}\right)$, then the process, is

1. Irreversible isothermal expansion
2. Reversible isothermal expansion
3. Isothermal diffusion
4. Irreversible adiabatic expansion

60. What is the work done for the conversion of 1 mole of water at 100°C to steam at 1 atm pressure (Latent heat of vaporisation

61. Enthalpy of a system is mathematically defined as [U = internal energy, P = pressure, V = volume].

1. H = U − PV
2. H = U + PV
3. H = (U − P)V
4. H = (U + P)V

62. At constant volume, the change in enthalpy is equal to

1. change in temperature
2. change in pressure
3. change in internal energy
4. sum of the changes in internal energy and pressure

63. Which of the following is correct for a system when temperature is constant.

1. dH = 1/dV
2. dH = P(dV)
3. dH = d(nRT)
4. dH = 0

64. The quantity of heat required to raise the temperature of a system from the lower to higher temperature divided by the temperature difference is called as .... of a system.

1. enthalpy
2. heat capacity
3. entropy
4. none

65. The heat capacity of a system (C_V) particularly a gaseous system, at a constant volume is represented by

1. $C_V = (\partial U \times \partial T)_V$
2. $C_V = \left(\dfrac{\partial U}{\partial T}\right)_V$
3. $C_V = (\partial U + \partial T)_V$
4. $C_V = (\partial U - \partial T)_V$

66. The heat capacity of a system particularly at constant pressure is represented by

1. $C_p = \left(\dfrac{\partial H}{\partial T}\right)_P$
2. $C_p = (\partial H \times \partial T)_P$
3. $C_p = (\partial H + \partial T)_P$
4. $C_p = (\partial H - \partial T)_P$

67. Which of following is defined as a homogeneous and physically distinct part of system which is bounded by a surface and is mechanically separable from other parts of the system

1. A phase
2. A state
3. A property
4. A state variable

84. An adiabatic change is always
   1. irreversible
   2. reversible
   3. may be carried out reversibly or irreversibly
   4. none

85. In the case of an ideal gas under going isothermal transformation, its energy
   1. remains same
   2. increases as the pressure increases
   3. decreases as the pressure increases
   4. increases as the volume increases

86. Which of the following are state functions
   1. ΔE (internal energy)
   2. ΔH (enthalpy)
   3. q_v, q_p (heat exchanged in a constant volume and pressure process)
   4. all of the above

87. Which of the following property is dependent on the path?
   1. V   2. H
   3. E   4. Q

88. The dimensions for the molal heat capacity of a gas are
   1. Cal. deg^{-1}.g^{-1} 2. Cal. deg^{-1}. mol^{-1}
   3. Cal. deg^{-1}. atm^{-1} 4. Cal. cm^3 deg^{-1}

89. The heat of a reaction at constant pressure is equal to (R–reactants, P–products)
   1. $E_{(R)}-E_{(P)}$ 2. $E_{(P)}-E_{(R)}$
   3. $H_{(R)}-H_{(P)}$ 4. $H_{(P)}-H_{(R)}$

90. The heat change in a chemical reaction at constant pressure is
   1. ΔE 2. ΔH
   3. ΔV 4. ΔP

91. Enthalpy of a compound is equal to its
   1. heat of formation   2. heat of reaction
   3. heat of dilution   4. heat of combustion

92. The measure of bond dissociation energy is the change in
   1. enthalpy   2. entropy
   3. free energy   4. internal energy

   1. work is done on the system
   2. work is done by the system
   3. work done by the system against an external pressure
   4. none of the above

94. Work done in a reversible expansion is
   1. $\int_{V_1}^{V_2} PdV$ 2. $\ln RT\ dv$
   3. $\int \frac{nRT}{V}\ dv$ 4. $P\Delta V$

95. Which of the following is an intensive property
   1. volume   2. enthalpy
   3. temperature   4. mass

96. which of the following are true of a reversible isothermal process?
   1. $\Delta E=0$ 2. $\Delta H=0$
   3. $q=w$ 4. all of the above

97. Which of the following is true for an isothermal process involving an ideal gas?
   1. $\Delta G>\Delta A$ 2. $\Delta G=\Delta H+\Delta T\Delta S$
   3. $\Delta G=\Delta A$ 4. none

98. A heat engine can have a maximum efficiency of
   1. 1   2. <1
   3. >1   4. 0

99. In an irreversible work cycle, the entropy is
   1. decreased   2. increased
   3. minimum   4. constant

100. When two ideal liquids are mixed, the entropy
   1. decreases   2. increases
   3. remains constant   4. zero

101. If one mole of an ideal gas is expanded isothermally to twice its initial volume, ΔS will be closest to
   1. 0.3   2. 0.6
   3. 1.0   4. 1.4

68. The difference between the molar heat capacity of a gas at constant pressure (C_p) and at constant volume is equal to

 1. 8.314 joules/deg/mole
 2. 8.314 calories/deg/mole
 3. 1.987 joules/deg/mole
 4. 2.987 calories/deg/mole

69. In free isothermal expansion ΔU, ΔH, Q, W are all equal to

 1. 2
 2. 1
 3. -2
 4. 0

70. In free adiabatic expansion .... remains constant.

 1. pressure
 2. temperature
 3. volume
 4. enthalpy

71. Which of the following is correct in case of reversible expansion or compression?

 1. W (expansion) = W (compression)
 2. W (expansion) $\geq$ W (compression)
 3. W (expansion) $\leq$ W (compression)
 4. W (expansion) = – W (compression)

72. Which of the following representations is correct for the work done by the system in reversible isothermal expansion?

 1. W (rev) = – nRT log $P_1 \times P_2$

 2. W (rev) = – nRT log $\dfrac{P_1}{P_2}$

 3. W (rev) = – 2.303 nRT log $P_1 \times P_2$

 4. W (rev) = – 2.303 nRT log $\dfrac{P_1}{P_2}$

73. The amount of work done by 2 moles of an ideas gas at 298k in reversible isothermal expansion from 10L to 20L is

 1. –3434.9 J
 2. 34.349 J
 3. 4848.9 J
 4. 4300.9 J

74. Work done (W) on the system in reversible adiabatic compression for n moles of an ideal gas is equal to

 1. W = C_V (T_2+T_1)
 2. W = C_V (T_2-T_1)
 3. W = C_V $(T_2 \times T_1)$
 4. W = CV (T_2/T_1)

75. What is the relation between tempe and volume in reversible adiaba pression of ideal gases?

 1. TV = constant
 2. TV^γ = constan
 3. $TV^{\gamma-1}$ = constant
 4. $TV^{\gamma-4}$ = constan

76. Which of the following equations sents the Poission law?

 1. $P_1V_1 = P_2V_2$
 2. $\dfrac{P_1}{V_1} = \dfrac{P_2}{V_2}$
 3. $P_1V_1^\gamma = P_2V_2^\gamma$
 4. $P_1V_1^{\gamma-1} =$ PV

77. Two moles of an ideal gas at S compressed adiabatically and reve to occupy a volume of 4.48 lit. Cal the final pressure of the gas?

 1. 470.55 Kp_a
 2. 4705.5 Kp
 3. 47.05 Kp_a
 4. 4767.05 Kp

78. The phenomenon of change of tem ture when a gas is made to expand batically from a region of high pres a region of extremely low pressu known as

 1. Stark effect
 2. Zeman effect
 3. Joule – Thompson effect
 4. Absolute temperature effect

79. When an ideal gas undergoes exp under adiabatic conditions in vacu change takes place in its

 1. enthalpy
 2. internal ene
 3. pressure
 4. All

80. Which of the following values of formation indicates that the pro least stable?

 1. + 64.8 K cal
 2. + 13.7 K cal
 3. – 234.6 K cal
 4. – 13.7 K cal

81. Enthalpy for the reaction C + O_2

 1. zero
 2. positive
 3. negative
 4. none

82. Heat of nutralization of strong aci weak base is

 1. 13.7 Kcal
 2. less than 13.7 Kcal
 3. greater than 13.7 Kcal

102. If ΔC_v is found to be positive for a partic-
ular reaction, It means that
    1. ΔH decreases with increase in temperature
    2. ΔH increases with increase in temperature
    3. the reaction is slow
    4. ΔH and ΔE are identical

103. The minimum work which must be done
to compress one mole of oxygen at 300K
from a pressure of 2 atm to a pressure of
200 atm
    1. –11,488 J   2. –1144kJ
    3. –5744 J   4. +11.488 KJ

104. The Vander Waal's constant a and b for
hydrogen in litre atmosphere units are
0.246 and 2.67×10^{-2} respectively. The
inversion temperature of hydrogen is
    1. –48.5°C   2. zero
    3. +48.5°C   4. 20°C

105. Entropy change of the universe in
reversible process is
    1. negative   2. positive
    3. constant   4. none

106. The entropy changes involved in the con-
version of 1 mole of ice at 0°C and 1 atm to
liquid at 0°C and 1 atm is (The enthalpy of
fusion per mole of ice is 6008 J/mios)
    1. zero   2. 22 J/K
    3. 33 J/K   4. 66 J/K

107. A closed system is one which can
exchange, with surroundings
    1. matter but not energy
    2. matter as well as energy
    3. neither energy nor matter
    4. energy but not matter

108. Which of the following is not an intensive
property?
    1. molar volume   2. temperature
    3. entropy   4. chemical potential

109. When a sample of an ideal gas is allowed

111. For an ideal gas
    1. $\left(\dfrac{dU}{dV}\right)_v = 0$ 2. $\left(\dfrac{\partial P}{\partial T}\right)_v = 0$
    3. $\left(\dfrac{\partial U}{\partial T}\right)_v = 0$ 4. $\left(\dfrac{\partial U}{\partial V}\right)_T = 0$

112. The temperature of the system dec___
in an?
    1. Isothermal compression
    2. Adiabatic expansion
    3. Adiabatic compression
    4. Isothermal expansion

113. The variation of enthalpy of reac___
temperature is given by
    1. Hess's law
    2. Arrhenius equation
    3. Kirchhoff's equation
    4. Joule–Thompson equation

114. At a certain temperature T_1 the en___
mic reaction A→B proceeds alm___
completion. The entropy change i___
    1. $\Delta S < 0$ 2. $\Delta S > 0$
    3. $\Delta S = 0$ 4. none

115. For an isothermal expansion of a___
gas?
    1. w=0   2. q=0
    3. $\Delta E=0$ 4. $\Delta V=0$

116. Which one of the following qua___
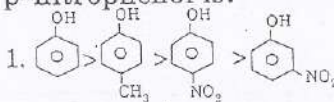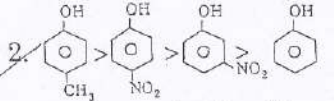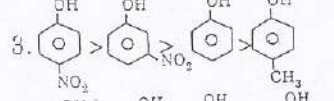independent of pressure?
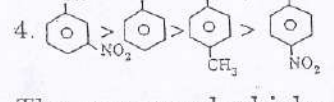   1. ΔS 2. ΔH
    3. ΔG 4. none
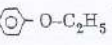
117. The GIBB'S free energy of a rea___
27°C is –26 Kcals and its entropy ch___
60 cals/ deg. ΔH for the reaction i___
    1. 44K cals   2. –22 K cal
    3. –44 K cals   4. none of the ___

118. At constant P and T the change in t___
free energy (ΔG) may be expressed ___

OBJECTIVE BITS

1. The reaction in which phenol differs from alcohol is
   1. It reacts with NH_3
   2. It forms yellow crystals of iodoform
   3. If liberates H_2 with Na metal
   4. None of these

2. The correct order of acidity among phenol, p–methyl phenol, m–nitrophenol and p–nitrophenol is?

3. The compound which will readily couple with benzene diazonium chloride is
   1. Benzene   2. Phenol
   3. Benzaldehyde   4. Benzoic acid

4. C_6H_5ONa reacts with CO_2 at 127°C and 4–7 atms. pressure to give?
   1. Salicylaldehyde   2. Benzoic acid
   3. Sodium Salicylate 4. None

5. Benzoic acid and phenol can be distinguished by?
   1. Aqueous Na_2NO_3 2. Aqueous $NaHCO_3$
   3. Conc. HCl   3. Alcoholic KOH

6. Which of the following functional group present in Cresol is?
   1. Amino group   2. Ether group
   3. Ketonic group   4. Alcoholic group

7. A compound A when reacted with PCl_5 and then with ammonia give B. B when treated with bromine and caustic potash produced C. C on treatment with $NaNO_2$ and HCl at 0°C and then boiling produced orthocresol. Compound A is
   1. benzoic acid   2. ortho toluic acid
   3. o–chloro toluene 4. salicylic acid

8. A diazonium salt reacts with phenol to give an azo dye. The reaction is called
   1. coupling reaction
   2. oxidation reaction
   3. condensation reaction
   4. none of these

9. Which of the following compound that undergoes nitration readily is
   1. nitrobenzene   2. benzoic acid
   3. phenol   4. none

10. On boiling with conc. HBr, C_6H_5-O-C_2H_5 yields

11. Sodium phenoxide on heating with carbondioxide and further oxidation gives
    1. phenol   2. benzyl alcohol
    3. benzoyl alcohol 4. salicylic acid

12. When sodium salicylate is distilled with NaOH + CaO, it forms
    1. C_6H_5OH 2. C_6H_5COOH
    3. $C_6H_4(OH)COOH$ 4. C_6H_5COONa

13. Salicylic acid when treated with bromine water yields?
    1. 2, 4, 6– tribromophenol
    2. orthobromophenol
    3. meta bromophenol
    4. none

14. When toluene is oxidised in the presence of V_2O_5, it yields
    1. benzene   2. phenol
    3. benzoic acid   4. cyclohexane

15. Phenol and cyclohexanol can be distinguished by using
    1. Na   2. CH_3COCl
    3. PCl_5 4. $FeCl_3$

16. Picric acid and benzoic acid can be distinguished by
    1. aq. Na_2CO_3 2. aq. $FeCl_3$
    3. con. NaOH   4. $NaHCO_3$

578

17. Phenol when treated with bromine in carbon disulfide gives?

1. 2, 4, 6 – tribromophenol
2. ortho bromo phenol
3. meta bromo phenol
4. para bromo phenol

18. The most convenient method of removing a phenolic group from a compound is by

1. dehydration
2. oxidation with $KMnO_4$
3. distilling with Zn dust
4. all of the above

19. Which of the following is formed when sodium phenoxide is heated with C_2H_5I?

1. phenol
2. phenetole
3. benzoic acid
4. salicylic acid

20. Phenol is more acidic than cyclohexanol because?

1. cyclohexanol is rich in hydrogen
2. cyclohexane ring shows resonance
3. benzene ring shows resonance
4. none of the above

21. When phenol is heated with phthalic anhydride in the presence of conc. H_2SO_4 the product formed is

1. methyl orange
2. phenolphthalien
3. both 1 and 2
4. none

22. Cresols, when distilled with Zn dust to gives

1. xylene
2. phenol
3. toluene
4. none

23. When C_6H_5OH and $C_6H_5N_2Cl$ coupled, the main product is

1. p–hydroxyazo benzene
2. benzophenone
3. biphenyl
4. aniline

24. Benzoylation of phenol in alkaline medium is known is

1. Kolbe's reaction

25. Phenol $\xrightarrow[NaOH]{CO_2}$ salicylic acid repre

1. Kolbe's synthesis
2. Wurtz–fittig reaction
3. Reimer–Tiemann reaction
4. none

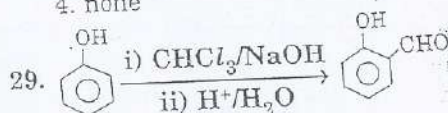26. Which of the following reagents wil duce salicylaldehyde on reaction phenol

1. $CO_2/NaOH$
2. HCl/ACl_3
3. $CHCl_3/NaOH$
4. Zn dust

27. When benzene diazonium chloride tion is boiled, it yields

1. phenol
2. nitrobenzene
3. benzoic acid
4. benzene

28. Phenols may be obtained from magnesium bromide by treating

1. NaOH
2. CO_2 by hydrolysis
3. [O] followed by hydrolysis
4. none

29.

This reaction is known as

1. Wurtz–fittig reaction
2. Perkin's reaction
3. Kolbe's reaction
4. Reimer–Tiemann reaction

30. C_6H_5OH with conc. HNO_3 in pre conc. H_2SO_4 forms

1. o–nitrophenol
2. 2, 4–dinitroph
3. picric acid
4. none

31. Which of the following is correct m ing order of their acidic strength

1. $C_6H_5CH_2OH < C_6H_5OH < C_6H_5COOH$
2. $C_6H_5CH_2OH < C_6H_5COOH < C_6H$
3. $C_6H_5OH < C_6H_5CH_2COOH < C_6H$
4. $C_6H_5COOH < C_6H_5OH < C_6H_5$
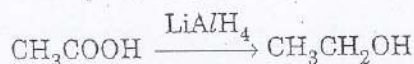
32. Salicylic acid, aspirin, nylon acid have a common raw mate

ii. Reactions due to carbonyl group (reduction):

  a. Carboxylic acid undergo reduction with $LiAlH_4$ to give primary alcohols.

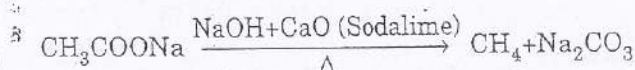$$CH_3COOH \xrightarrow{LiAlH_4} CH_3CH_2OH$$

  b.
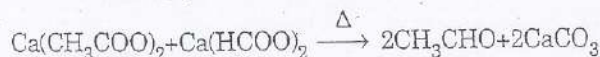$$CH_3COOH + 3H_2 \xrightarrow{Red\ P\ /\ HI} CH_3-CH_3 + 2H_2O$$

iii. Reactions involving carboxyl group as a whole.

  a. Decarboxylation:

  When sodium salts of carboxylic acids are heated with soda-lime, alkanes are formed.
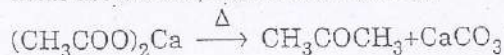
$$CH_3COONa \xrightarrow[\Delta]{NaOH + CaO\ (Sodalime)} CH_4 + Na_2CO_3$$

  b. Aldehyde formation:

$$Ca(CH_3COO)_2 + Ca(HCOO)_2 \xrightarrow{\Delta} 2CH_3CHO + 2CaCO_3$$

  c. Ketone formations:

  When calcium or barium salts of carboxylic acids are heated, ketones are formed.

$$(CH_3COO)_2Ca \xrightarrow{\Delta} CH_3COCH_3 + CaCO_3$$

  d. Kolbe's reaction (Electrolysis):

  When concentrated aqueous solutions of sodium or potassium salts of carboxylic acids are electrolysed, alkanes are formed.

$$CH_3COONa + 2H_2O \xrightarrow{Electrolysis} CH_3-CH_3 + 2CO_2 + 3NaOH + H_2$$
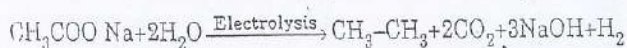
iv. α-halogenation (Hell-Volhard–Zelinsky (HVZ) reaction):
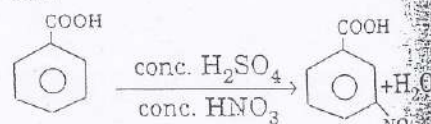
  Carboxylic acids having an α–hydrogen are halogenated at the α–position on treatment with chlorine or bromine in the presence small amount of red phosphorus to give halo carboxylic acids. The reaction is known as Hell–Volhard–Zelinsky reaction.

$$RCH_2COOH \xrightarrow[H_2O]{X_2\ /Red\ P_4} \underset{\text{α-halocarboxylic}}{RCH-COOH}$$
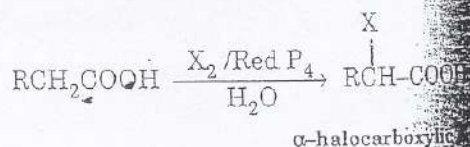
where, X is Cl or Br.
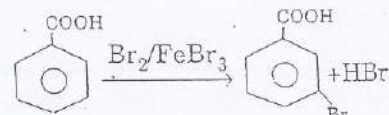
v. Ring substitution in aromatic acids

  Aromatic carboxylic acids undergo trophilic substitution reactions in which carboxyl group is a deactivating and m directing group. Aromatic carboxylic, however, do not undergo Friedel ca tion.

Benzoic acid   m-nitrobenzoic acid

m-bromobenzoic acid

vi. a. $2CH_3COOH + 2Na \longrightarrow 2CH_3COONa$

  b. $CH_3COOAg + Br_2 \xrightarrow{\Delta} CH_3Br + 2AgBr$

  methyl bromide
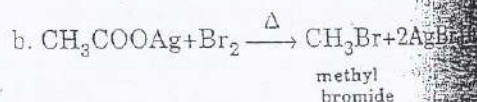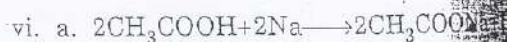
OBJECTIVE BITS

1. The IUPAC name of

$$CH_3-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{C_2H_5}{|}}{CH}-CH_2-COOH \text{ is}$$
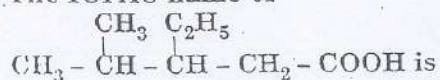
  1. 3-ethyl -2 methyl pentanoic acid
  2. 2-ethyl -3 methyl pentanoic acid
  3. 3-ethyl -4 methyl pentanoic acid
  4. none

2. When ... is treated with Grignard reagent, followed by hydrolysis with acid, it forms carboxylic acid.

  1. $CH_2 = CH_2$ 2. CO_2
  3. $CH_3-CO-CH_3$ 4. CH_3CHO
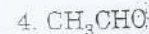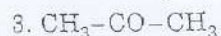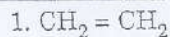
3. Alkyl substituted acetoacetic ester hydrolysis with conc. KOH yields

  1. ethanol
  2. acetic acid
  3. alkylacetic acid
  4. all of the above

4. When butyric acid is treated with H_2O_2, it forms
1. α-hydroxy butyric acid
2. β-hydroxy butyric acid
3. γ-hydroxy butyric acid
4. All of the above

5. With strongly electropositive metals, like Na and Zn, fatty acids give salts with the liberation of
1. H_2 gas
2. O_2 gas
3. H_2S gas
4. H_2O

6. When ammonium acetate is dehydrated with P_4O_{10}, it forms
1. acetamide
2. acetaldehyde
3. methyl alcohol
4. methyl cyanide

7. The acidity of carboxylic acid increases when
1. an electron withdrawing substituent group is attached with COO^-
2. an electron releasing substituent group is attached with COO^-
3. a proton withdrawing substituent group is attached with COO^-
4. none of the above

8. When ammonium formate is heated, it gives
1. acetaldehyde
2. acetic acid
3. formamide
4. formaldehyde

9. Which of the following compounds or elements does not react with formic acid?
1. halogens
2. conc. H_2SO_4
3. ammonical silver nitrate
4. Fehling's solution

10. Calcium acetate on heating gives
1. ethane
2. acetone
3. methane
4. acetaldehyde

11. Crotonic and iso-crotonic acids are
1. chain isomers
2. geometrical isomers
3. functional isomers
4. optical isomers

12. Identify the compound X in the following reaction: $BrCH_2-CH_2Br \xrightarrow[H_2O]{KCN} X$
1. Acetic acid
2. Malonic acid
3. Adipic acid
4. Succinic acid

13. Oxalic acid reacts with C_2H_5OH in the presence of H_2SO_4 to give
1. ethylmethyl oxalate
2. dipropyl oxalate
3. dimethyl oxalate
4. diethyl oxalate

14. When potassium chloroacetate is heated with aqueous potassium cyanide followed by hydrolysis, is gives
1. succinic acid
2. adipic acid
3. malonic acid
4. oxalic acid

15. CH_3COONa on reaction with CH_3COCl gives
1. methyl acetate
2. acetic anhydride
3. acetyl chloride
4. none

16. Strongest acid among the following is
1. CCl_3COOH
2. CBr_3COOH
3. CF_3COOH
4. CH_3COOH

17. Which of the following compounds will give brisk effervescence of CO_2 on treatment with $NaHCO_3$
1. Acetic acid
2. alcohol
3. phenol
4. methanol

18. Aliphatic carboxylic acids are isomeric with
1. esters
2. ethers
3. ketones
4. acid anhydride

19. A mixture of aldehyde and carboxylic acid can be separated by using
1. HCl
2. NH_3
3. $NaHSO_4$
4. $NaHCO_3$

20. Identify the final product (C) in the following reaction
$C_2H_5Br \xrightarrow{aq.NaOH} A \xrightarrow[H_2SO_4]{Na_2Cr_2O_7} B \xrightarrow{(C_2H_5O)_3Al} C$
1. ethylacetate
2. acetic acid
3. acetaldehyde
4. propionic acid

21. In the α-halogenation of aliphatic acids, the catalyst used is
1. P_4
2. Zn
3. $FeCl_3$
4. Al

22. The solvent which can dissolve all the carboxylic acids is
1. water
2. conc H_2SO_4
3. dilute NaOH
4. conc. HCl

ANSWERS

1.3	2.2	3.4	4.2	5.1	6.4	7.1	8.3	9.1	10.2	11.2	12.4	13.4	14.3	15.2	16.3
17.1	18.1	19.4	20.1	21.1	22.3										

18. Hydrolysis of HCN gives
    1. CH_3CHO
    2. HCHO
    3. HCOOH
    4. CH_3COOH

19. When methyl cyanide is hydrolysed in presence of alkali, the product is
    1. Acetic acid
    2. Methane
    3. $CO_2 + H_2O$
    4. Acetamide

20. $X \xrightarrow{[H]} RCH_2CH_3$
    $\xrightarrow{H_3O^+} RCOOH$, X is
    1. Nitrile
    2. Oxime
    3. Nitrite
    4. Isonitrile

21. Acetamide reacts with NaOBr in alkaline medium to form
    1. CH_3NH_2
    2. $CH_3CH_2NH_2$
    3. NH_3
    4. CH_3CN

22. $CH_3CONH_2 \xrightarrow{Br_2+NaOH}$?
    1. CH_3Br
    2. CH_3NH_2
    3. $CH_3CH_2NH_2$
    4. CH_3COOH

23. What is the proper sequence of reagent in the Hofmann's degradation reaction?
    1. Br_2, KOH, H_2O
    2. KOH, Br_2, H_2O
    2. H_2O, KOH, Br_2
    4. Br_2, H_2O, KOH

24. Gabriel's phthalimide synthesis is used for the preparation of
    1. Primary aromatic amines
    2. Primary aliphatic amines
    3. Secondary amines
    4. Tertiary amines

25. Hofmann reagent is
    1. Diethyl oxalate
    2. Dimethyl oxalate
    3. Benzyl chloride
    4. Benzene sulphonyl chloride

26. A mixture of primary, secondary and tertiary amines along with quaternary ammonium salt can be seperated by
    1. Hinsberg method
    2. Hofmann method
    3. Both 1 and 2
    4. None

27. Hinsberg reagent is
    1. Diethyl oxalate
    2. Benzyl chloride
    3. Benzene sulphonyl chloride
    4. None

28. Primary, secondary and tertiary amines may be separated by using
    1. Benzene sulphonyl chloride
    2. Diethyl oxalate
    3. Both 1 and 2
    4. None

29. Which is the strongest base?
    1. Methyl amine
    2. Dimethyl amine
    3. Trimethyl amine
    4. Ammonia

30. Order of basicity of amines is
    1. ter > sec > pri
    2. pri > sec > ter
    3. sec > ter > pri
    4. ter > pri > sec

31. Gas evolved during the reaction of sodium metal on ethylamine is
    1. N_2
    2. C_2H_2
    3. CO_2
    4. H_2

32. The product obtained when methyl amine is treated with nitrous acid is
    1. CH_3OH
    2. CH_3ONO
    3. 1 and 2
    4. CH_3COCH_3

33. Reaction of an aliphatic primary amine with nitrous acid in cold leads to the formation of
    1. A nitrile
    2. An alcohol
    3. A secondary amine
    4. A diazonium salt

34. The action of nitrous acid on ethyl amine gives
    1. Ethyne
    2. Ethyl nitrile
    3. ethyl alcohol
    4. None

35. Carbyl amine reaction is given by
    1. $C_6H_5NHCH_3$
    2. $(CH_3)_3N$
    3. $(CH_3)_2NH$
    4. $-NH_2$

36. Which of the following amines will react with nitrous acid to give nitrogen
    1. CH_3NH_2
    2. $CH_3CH_2NH_2$
    3. $(CH_3)_3N$
    4. $CH_3-CH-NH_2$ CH_3

37. Which of the following will evolve nitrogen with mixture of $NaNO_2$ and HCl
    1. Primary amines
    2. Secondary amines
    3. Tertiary amines
    4. 2 and 3

38. Pri fro rea
    1. C
    2. N
    3. C
    4. Z

39. C_2H con
    1. C
    2. C
    3. C
    4. C

When benzene diazonium chloride is heated with water, the product is

1. phenol
2. aniline
3. benzyl chloride
4. benzyl alcohol

56. Identify the product $C_6H_5N_2Cl \xrightarrow{C_2H_5OH}$?

1. C_6H_5OH
2. C_6H_6
3. $C_6H_5CH_2OH$
4. $C_6H_5NH_2$

57. When benzene diazonium chloride is heated with methanol the product is

1. phenyl methyl ether
2. ethyl ethyl ether
3. methyl benzene
4. toluene

58. Benzene diazonium chloride when reacts with hypophosphorous acid produces

1. phenol
2. phenyl phosphate
3. phenyl phosphite
4. benzene

59. The product obtained when phenol reacts with benzene diazonium chloride is

1. Phenyl hydroxylamine
2. Parahydroxy azobenzene
3. Phenyl hydrazine
4. Phenyl isocyanide

60. The end product of the reaction

Ethyl amine $\xrightarrow{HNO_2}$ A $\xrightarrow{PCl_5}$ B $\xrightarrow{HNH_2}$ C is
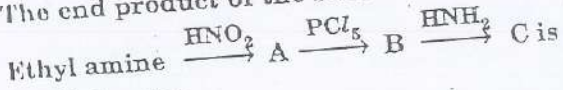
1. Ethyl amine
2. Acetamide
3. Methyl amine
4. Ethyl amide

61. Phenol $\xrightarrow{Zn}{distillation}$ A $\xrightarrow{Conc. HNO_3}{conc. H_2SO_4, 60°C}$

B $\xrightarrow{Zn}{NaOH}$ C, In the above reaction compounds A, B and C are

1. benzene, nitrobenzene and aniline
2. benzene, dinitrobenzene and meta nitroaniline
3. toluene, m–nitrobenzene and m–toluidine
4. benzene, nitrobenzene and hydrazobenzene

62. $C_6H_5NH_2 \xrightarrow{(CH_3CO)_2O}$ X $\xrightarrow{Br_2 in}{CH_3COOH}$ Y $\xrightarrow{H_2O/H^+}{\Delta}$ Z

in the reaction compound Z is

1. 2, 4, 6 –tri nitro aniline
2. m– bromo aniline
3. p – bromo aniline
4. nitro benzene

63. $C_6H_5NH_2 \xrightarrow{NaNO_2/HCl}{0°C}$ X $\xrightarrow{Cu_2(CN)_2}$ Y $\xrightarrow{H_2O/H^+}$ Z

1. C_6H_5COOH
2. $C_6H_5NH_2COOH$
3. $C_6H_5NHCH_3$
4. $C_6H_5CH_2NH_2$

64. $C_2H_5Br \xrightarrow{alc. KOH}$ A $\xrightarrow{Br_2}$ B $\xrightarrow{KCN}$ C in the reaction C is......

1. C_6H_5CN
2. C_2H_5CN
3. $CH_2=CH–CN$
4. $CN–CH_2–CH_2–CN$

65. (ring with NH₂) $\xrightarrow{CHCl_3, KOH}{\Delta}$ Intermediate $\xrightarrow{HCl}{300K}$ X in the reaction X is ......

1. (COOH / Cl benzene) 2. (NH₂ / COOH benzene) 3. (Cl / NHCH₃ benzene) 4.

ANSWERS

	1.1	2.4	3.1	4.3	5.1	6.3	7.4	8.1	9.1	10.4	11.1	12.3	13.1	14.2
	15.3	16.1	17.1	18.3	19.1	20.1	21.1	22.2	23.1	24.2	25.1	26.3	27.3	28.3	29.2	30.3
	31.2	32.2	33.2	34.3	35.4	36.3	37.1	38.1	39.2	40.1	41.2	42.4	43.3	44.2	45.4	46.2
	47.3	48.3	49.4	50.2	51.1	52.2	53.1	54.2	55.1	56.2	57.1	58.4	59.2	60.1	61.4	62.3
	63.2	64.3	65.2											

i. $H_2N-CH_2-\underset{\underset{\text{(glycine)}}{}}{\overset{O}{\overset{||}{C}}}-OH + HN-CH_2-COOH \xrightarrow{\underset{\text{(Coupling agent)}}{D.C.C}}$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad | \atop H$

$H_2N-C_2H-\underset{\text{peptide bond(gly-gly)}}{\overset{O}{\overset{||}{C}}-NH-CH_2-COOH}$

ii. $H_2N-CH_2-\overset{O}{\overset{||}{C}}-OH + NH_2-\underset{\underset{CH_3}{|}}{CH}-COOH \xrightarrow{\underset{\text{(Coupling agent)}}{D.C.C}}$

$\quad\quad$ glycine $\quad\quad\quad\quad$ alanine

$H_2N-C_2H-\overset{O}{\overset{||}{C}}-NH-\underset{\underset{CH_3}{|}}{CH}-COOH$
$\quad\quad$ **(gly-ala)**

19. Tripeptide Bond:

$H_2N-CH_2-COOH + H_2N-\underset{\underset{CH_3}{|}}{CH}-COOH + H_2N-\underset{\underset{\underset{H_3C}{|}}{CH-CH_3}}{|}{CH}-COOH$

$\quad\quad$ glycine $\quad\quad\quad$ (alanine) $\quad\quad$ valine

$\quad\quad\quad\quad\quad\quad$ (D.C.C.)

$H_2N-CH_2-\overset{O}{\overset{||}{C}}-NH-\underset{\underset{CH_3}{|}}{CH}-\overset{O}{\overset{||}{C}}-NH-\underset{\underset{\underset{H_3C}{|}}{CH-CH_3}}{|}{CH}-COOH$

$\quad\quad\quad\quad\quad\quad$ **(gly-ala-val)**

$H_2N-CH_2-\overset{O}{\overset{||}{C}}-OH + ph-CH_2O-\overset{O}{\overset{||}{C}}-Cl \rightarrow$

$\quad\quad\quad\quad\quad\quad ph-CH_2O-\overset{O}{\overset{||}{C}}NH-CH_2-COO$

$\quad\quad\quad\quad\quad\quad$ (SOCl$_2$/PCl$_5$

$ph\ CH_2O-\overset{O}{\overset{||}{C}}-NH-CH_2-\overset{O}{\overset{||}{C}}-Cl$

$\quad -HCl \downarrow\quad | \atop NH-H$

$\quad\quad\quad\quad\quad CH-CH_3$

$\quad\quad\quad\quad\quad COOH$ (alanine)

$ph\ CH_2O-\overset{O}{\overset{||}{C}}-NH-CH_2-\overset{O}{\overset{||}{C}}-NH-\underset{\underset{CH_3}{|}}{CH}-COO$

$\quad\quad\quad\quad\quad\quad \downarrow HOH$

$H_2N-CH_2-\overset{O}{\overset{||}{C}}-NH-\underset{\underset{CH_3}{|}}{CH}-COOH$
$\quad\quad\quad\quad\quad\quad$ (gly-ala)

13. **S contain amino acids:** Cysteine, cyst
Methionine.
I contain amino acids: Thyroxine
Heterocyclic amino acids: Pro
Hydroxyproline, Tryptophan, Histidine.
Imine group contain amino acids: Pro
hydroxyproline.

OBJECTIVE BITS

1. **The simplest amino acid is**
   1. Glycine
   2. Alanine
   3. Histidine
   4. Valine

2. **Proteins contain**
   1. only α-amino acids
   2. only β-amino acids
   3. only γ-amino acids
   4. only δ-amino acids

3. **An amino acid with a hydroxyl group is**
   1. Hydroxy proline
   2. Thyroxine
   3. Tyrosine, serine
   4. All of the above

4. **Amino acids are building blocks of**
   1. fats
   2. carbohydrates
   3. proteins
   4. none

5. **Aspartic acid contains**
   1. One amino group, one COOH group
   2. One -NH$_2$ group, two-COOH groups
   3. two-NH$_2$ groups, one-COOH group
   4. two-NH$_2$ groups only

6. **A peptide bond is**
   1. -CONH-
   2. -CO-CH$_2$-COC
   3. -CO-SH
   4. None

7. **Towards which of the following rea does glycine behave as an acid?**
   1. HNO$_2$
   2. C$_2$H$_5$OH
   3. HCl
   4. (CH$_3$CO)$_2$O

8. **Which one of the following is not optically**
   1. alanine
   2. glycine
   3. serine
   4. valine

Aminoacids

9. At the iso electric point, amino acids have
   1. high mobility
   2. high electric conductivity
   3. high solubility
   4. equal acid-base ionisation

10. An amino acid usually shows its lowest solubility
    1. in basic solution
    2. in acidic solution
    3. in aqueous solution
    4. at the isoelectric point

11. The arbitrary standard chosen for correlating the configuration of α–amino acids is
    1. L-valine
    2. D-valine
    3. L - alanine
    4. L-serine

12. Iodine containing amino acid is
    1. Histidine
    2. Thyroxine
    3. Valine
    4. Glutamine

13. An amino acid is synthesised by Strecker's mehod using ethanal as one of the reactants, the amino acid is
    1. Valine 2. Alanine 3. Leucine 4. Glycine

14. Which of the following is an essential amino acid?
    1. Leucine, Valine, Isoleucine
    2. Methionine, Arginine, Lysine, Histidine
    3. Threonine, Phenylalanine, Tryptophan
    4. All of the above

15. All of the natural amino acids
    1. are d-rotatory
    2. are l-rotatory
    3. have L-configuration
    4. have D-configuration

16. Which of the following amino acids contain indole group

17. Which of the statement is correct about natural α-amino acids?
    1. They belongs to D-series
    2. In nature they are present in racemic for
    3. In nature they are always present in optically active forms (except glycine)
    4. none of the above

18. α- amino acid may be prepared by
    1. Wurtz reaction
    2. Fischer's synthesis
    3. Gabriel synthesis
    4. Strecker synthesis

19. The $p_{k_{a_1}}$, and $p_{k_{a_2}}$ values of alanine are and 9.7 respectively. The isoelectric point of alanine is
    1. 6.0   2. 11.2
    3. 7.4   4. 12

20. Proteins are detected by
    1. Lucas test   2. Schiff's test
    3. Victor Meyer test   4. Biuret test

21. Rice is deficient in
    1. Leucine   2. Glycine
    3. Alanine   4. Lysine

22. Amino acids are
    1. basic   2. acidic
    3. amphoteric   4. not dipolar

23. The amino acids which has a non side chain is
    1. alanine   2. glycine
    3. serine   4. none

24. Cl
    |
    $CH_2-COOH + 2NH_3 \longrightarrow X + NH_4Cl$
    the compound X in the above reaction
    1. $C(NH_2)_3 - COOH$
    2. $CH_3 - COOH$
    3. $CH_2(NH_2)-COOH$
    4. none

25. At a higher pH the conjugate of glycine is

618

37. When sucrose is oxidised with conc. nitric acid, it gives
1. tartaric acid
2. adipic acid
3. oxalic acid
4. acetic acid

38. On acetylation, sucrose gives
1. penta acetyl derviative
2. octa–acetyl derivative
3. hexa–acetyl derivative
4. none

39. Which of the following is a laevorotatory compound?
1. glucose
2. mannose
3. fructose
4. arabinose

40. Which of the following tests is used to distinguish fructose from glucose?
1. Pinoff's test
2. Furfural test
3. Selivanoff's test
4. none

41. When solution of fructose is heated with ammonium molybdate and a few drops of acetic acid, a blue coloration is obtained. This is called as
1. Pinoff's test
2. Furfural test
3. Tollen's test
4. Fehling's test

42. When fructose is heated with conc. HCl it gives
1. tartaric acid
2. glycollic acid
3. laevulic acid
4. none of these

43. Which of the following compounds is reduced by fructose?
1. Fehling solution
2. Tollen's reagent
3. both 1 and 2
4. none

44. The change in specific rotation of an optically active solution without any change in other properties is known as
1. β– rotation
2. mutarotation
3. anomerisation
4. isomerisation

45. Glucose gives addition product with
1. NH_3
2. HCN
3. Na_2SO_4
4. none

46. The glucose is insoluble in
1. alcohol
2. ether
3. water
4. none

47. Which of the following compounds is a polysaccharide
1. raffinose
2. dextrin
3. maltose
4. glucose

48. When a polysaccharide yields only one kind of sugar after hydrolysis, it is called as
1. homopolysaccharide
2. heteropolysaccharide
3. monopolysaccharide
4. none

49. Lactose has the same molecular formula as
1. glucose
2. maltose
3. levulose
4. galactose

50. Milk sugar is commonly known as
1. maltose
2. glucose
3. lactose
4. fructose

ANSWERS

1.1	2.1	3.4	4.3	5.4	6.4	7.3	8.1	9.1	10.1	11.1	12.3	13.2	14.2	15.4	16.2
17.2	18.2	19.1	20.4	21.1	22.4	23.3	24.2	25.3	26.1	27.1	28.3	29.3	30.2	31.3	32.3
33.2	34.3	35.1	36.2	37.3	38.2	39.3	40.3	41.1	42.3	43.3	44.2	45.2	46.2	47.2	48.1
49.2	50.3														