Studentpad

MHT-CET-XI CHEMISTRY 2022-23

Time : 150 Min	Chem : Full Portion Paper	Marks : 50

Hints and Solutions

01) Ans: **A)** adsorbent

02) Ans: **C)** $Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$
Sol: Smaller the cation, greater is the degree of its hydration.
As the degree of hydration decreases from Li^+ to Cs^+, the hydration energy of alkali metals also decreases from Li to Cs^+.
Therefore the sequence in
$Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$

03) Ans: **C)** Stability of hydrides of alkali metals decreases form CsH to LiH
Sol: Stability of hydrides decrease from LiH to CsH.

04) Ans: **A)** 3
Sol: $\left[H^+\right]\sqrt{Ka.C} = \sqrt{1\times10^{-5}\times0.1} = \sqrt{10^{-6}}$
$\left[H^+\right] = 10^{-3}\ mol/dm^3 \quad \therefore pH = 3$

05) Ans: **D)** TI

06) Ans: **B)** biological fluids
Sol: Monovalent sodium and potassium ions and divalent magnesium and calcium ions are found in large proportions in biological fluids.
These ions perform important biological functions like maintenance of ion balance an nerve impulse conduction.

07) Ans: **C)** Salting
Sol: Salting is the most common chemical method to preserve fishes.

08) Ans: **B)** 32 hours
Sol: $1-\frac{1}{2}-\frac{1}{4}(0.25\,gm)$ i.e. 2 half lives=16 hr
$\therefore$ H.L.P. = 8 hrs
$48\,gm - 24 - 12 - 6 - 3\,gm$
4 half lives i.e. $8\times4 = 32\,hrs$ needed.

09) Ans: **A)** H_2^{2+}, He_2
Sol: $H_2^+ : \text{Bond order} = 0$
$He_2 : \text{Bond order} = \frac{2-2}{2} = 0$
So, both H_2^{2+} and He_2 do not exist.

10) Ans: **D)** (Absolute error/measurement being taken)
Sol: Relative error (RE) - when used as a measure of precision - is the ratio of the absolute error of a measurement to the measurement being taken. In other words, this type of error is relative to the size of the item being measured. RE is expressed as a percentage and has no units.

11) Ans: **C)** -9E
Sol: $E_3 = -E = -13.6\times\frac{Z^2}{3^2}$
$\Rightarrow -E = E_0\times\frac{Z^2}{9}\left[E_0 = -13.6\right]$
$\Rightarrow E_0 = \frac{-9E}{Z^2} \quad ...(i)$
According to question
$E_1 = -13.6\times\frac{Z^2}{1^2} = E_0\times Z^2 = \frac{-9E}{Z^2}\times Z^2 \Rightarrow E_1 = -9E$

12) Ans: **B)** neither has electron pair available for donation nor can accomodate electron since all shells of nitrogen are fully occupied
Sol: $(CH_3)_4\overset{+}{N}$ has no electron pair available for donation to act as nucleophile.
Valence shell of nitrogen to act as nucleophile.
Valence shell of nitrogen is completely filled and has no scope for acceptance of extra electrons to act as electrophile.

13) Ans: **B)** β rays
Sol: β rays.

14) Ans: **B)** n-pentane > 2-methylbutane > 2, 2-dimethylpropane
Sol: Branching of the chain makes the molecule more compact and thereby decreases the surface area. and the intermolecular forces become small in magnitude on account of branching.
Consequently, the boiling points of branched chain alkanes are less than the straight chain isomers.

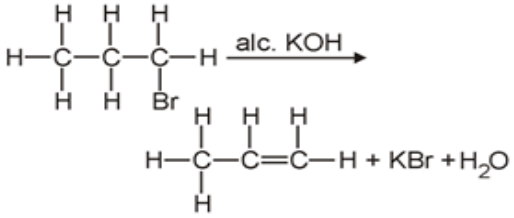
15) Ans: **C)** C<N<F<O
Sol: The second I.P. means removal of electron from a cation
C^{-1} (5e)=$1s^2 2s^2 2p^1$
N^{-1} (6e)=$1s^2 2s^2 2p^2$
O^{-1} (7e)=$1s^2 2s^2 2p^3$
F^{-1} (8e)=$1s^2 2s^2 2p^4$
$\therefore$ C<N<F<O.

16) Ans: **C)** $P_1T_2=P_2T_1$
Sol: Gay-lussac'c law state that,
$P \propto T$ (At constant volume)

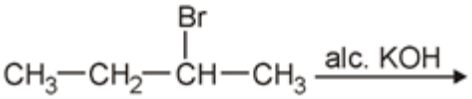
$\therefore \frac{P_1}{T_1} = \frac{P_2}{T_2}, \therefore P_1T_2 = P_2T_1$

17) Ans: **C)** two molecular orbital.
Sol: They will form one bonding M.O. and one anti-bonding M.O.

18) Ans: **A)** Dehydrohalogenation of an alkyl halide
Sol: Dehydrohalogenation of an alkyl halide gives alkene not alkane.



Dehydrohalogenation is a β - elimination and it is governed by Saytzeff rule according to which a more substituted alkene is obtained as major product.



$CH_3 - CH = CH - CH_3 + CH_3CH_2CH = CH_2$
2 – Butene (major) 1 – Butene (minor)

19) Ans: **D)** $0.0693\,year^{-1}$
Sol: $0.0693\,year^{-1}$

20) Ans: **D)** +6 and +6

Sol: Peroxomonosulphuric acid $H-O-O-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-OH$

1+x+2(-1)+2(-2)+(-2)+1=0; x=+6

Peroxodisulphuric acid $OH-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-O-O-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-OH$

1+(-2)+x+2(-2)+2(-1)+x+2(-2)+(-2)+1=0; x=+6

21) Ans: **B)** 35 dm^3
Sol: $C_2H_{6(g)} + \frac{7}{2}O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(g)}a$
1 volume 3.5 volume
$2\,dm^3$ $7\,dm^3$
For complete combustion of 2 dm^3 of ethane 7 dm^3 of oxygen is required.
$\because$ air contains 20% of oxygen
$\therefore$ 20 dm^3 of oxygen $\equiv$ 100 dm^3 of air
7 dm^3 of oxygen $= \frac{7\times100}{20} = 35$ dm^3 of air
Volume of air required is 35 dm^3

22) Ans: **C)** electronic configuration

23) Ans: **C)** 16
Sol: The expression is given as,
w=4 gm, R=8.314 $JK^{-1}\,mol^{-1}$
$V=5.60\times10^{-3}m^3$ T=546 K
$P=2.026\times10^{-5}\,N/m^{-2}$
We know that, Pv=nRT

$\frac{wRT}{Mol.wt}\quad\left(\because n=\frac{wt}{mol.\,wt}\right)$

$mol.\,wt. = \frac{wRT}{PV} = \frac{4\times8.314\times546}{2.026\times10^{-5}\times5.603\times10^{-3}}$

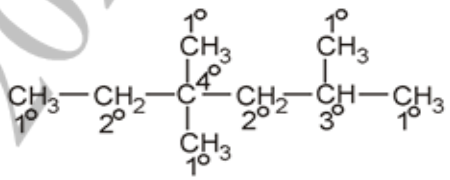
$= \frac{18158}{1135} = 16$

24) Ans: **A)** Chloramphenicol
Sol: Chloramphenicol is broad spectrum antibiotic, which is used in the treatment of typhoid, dysentery, acute fever.

25) Ans: **D)** distillation
Sol: The difference between the boiling point of oxygen and Nitrogen is frequently large to be separated by distillation.

26) Ans: **B)**

1^0	2^0	3^0	4^0
5	2	1	1



Sol:
1^0 carbon-A carbon atom attached to one carbon atom only is termed as 1^0 carbon or primary carbon.
2^0 carbon - A carbon atom attached to two carbon atoms is called 2^0 carbon or secondary carbon.
3^0 carbon -A carbon atom attached to three carbon atoms is called 3^0 carbon or tertiary carbon.
4^0 carbon -A carbon atom attached to four carbon atoms is called 4^0 carbon or quaternary carbon.

27) Ans: **D)** poor shielding effect of d-electrons of Ga atoms
Sol: Shielding of d electrons is poor than s as well as p electrons.

28) Ans: **A)** CH_3CN
Sol: In CH_3CN, the bond order between C and N is 3, thus its bond length is minimum.

29) Ans: **C)** 1

30) Ans: **A)** 3-Methylhexane
Sol: As per the IUPAC rule.

31) Ans: **A)** 5,6,3,3
Sol: $IO_3^- + aI^- + bH^+ \rightarrow cH_2O + dI_2$
Step 1 : $I^- \rightarrow I_2\,(\text{oxidation})$
$IO_3^- \rightarrow I_2\,(\text{reduction})$

Step 2 : $2IO_3^- + 12\,H^+ \rightarrow I_2 + 6H_2O$

Step 3 : $2\,IO_3^- + 12\,H^+ + 10e^- \rightarrow I_2 + 6H_2O$

$2I^- \rightarrow I_2 + 2e^-$

Step 4 : $2IO_3^- + 12H^+ + 10e^- \rightarrow I_2 + 6H_2O$

$\left[2I^- \rightarrow I_2 + 2e^-\right] \times 5$

Step 5 : $2IO_3^- + 10I^- + 12H^+ \rightarrow 6I_2 + 6H_2O$

$IO_3^- + 5I^- + 6H^+ \rightarrow 3I_2 + 3H_2O$

By comparing, a=5, b =6, c=3, d=3.

32) Ans: **B)** critical temperature
Sol: The highest temperature at which liquefaction of gas first occurs is termed as critical temperature.

33) Ans: **D)** hydrogen bonding
Sol: It (boric acid) has BO_3 units which are bonded by hydrogen bonding.

34) Ans: **A)** 10 ml
Sol: $N_1V_1 = N_2V_2$

$0.001 \times V_1 = 0.0001 \times 900$

$V_1 = \dfrac{9 \times 10^{-2}}{10^{-3}} = 90$ ml

The original volume=90=10 ml

35) Ans: **A)** 3

Sol: $Cr(OH)_4^- + OH^- \rightarrow CrO_4^{2-} + H_2O$

Writing oxidation states, we have

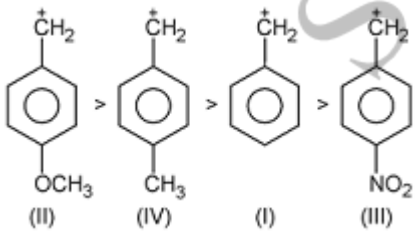
$[\overset{+3}{C}r(OH)_4]^- + 4OH^- \rightarrow [\overset{+6}{C}rO_4^{2-}] + 4H_2O$

To balance oxidation state of Cr on both sides, add $3e^-$ on R.H.S.

36) Ans: **B)** 200-500

37) Ans: **A)** 2.4 N_A

38) Ans: **C)** II > IV >I > III
Sol: Stability of carbocations is enhanced by
(i) presence of conjugation.
(ii) presence of group having +I effect.
Therefore, the correct order is



39) Ans: **B)** Ionic, polar covalent
Sol: In compound AC electronegativity difference is 2 (i.e. 3-1) hence bond is ionic.
In compound BC electronegativity difference is 0.5 (=-3-2.5) evidently the bond is polar covalent.

40) Ans: **B)** Be
Sol: $2Na + 2H_2O \rightarrow 2NaOH + H_2$

$2K + 2H_2O \rightarrow 2KOH + H_2$

All alkali metals decompose water with the evolution of hydrogen gas.

$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

$Be + 2H_2O \rightarrow$ no reaction

Ca, Sr, Ba and Ra decompose cold water readily with evolution of hydrogen.
Mg decomposes boiling water but Be is not attacked by water even at high temperatures as its oxidation potential is lower than the other members.

41) Ans: **A)** tertiary>secondary >primary

42) Ans: **D)** hydrogen bonding interactions.
Sol: Water is denser than ice due to hydrogen bonding interaction and structure of ice.

43) Ans: **C)** sp^2 hybridized

44) Ans: **C)** Sorption

45) Ans: **C)** 25-100
Sol: Crystalline phases are prepared at low temperature range such as 25-100 degree Celsius whereas much high temperatures would be required for a normal solid state synthesis. Crystals usually form at low temperatures but because of the release of heat of fusion during crystallization, the entropy of the universe increases so the second law of thermodynamics is not altered.

46) Ans: **B)** nuclear fission
Sol: $^{235}_{92}U + ^{1}_{0}n \rightarrow ^{94}_{36}Kr + ^{140}_{56}Ba + 2^{1}_{0}n + E$
Neutrons thus formed bring about further nuclear fission. Hence it results into chain reaction producing large amount of energy is released.

47) Ans: **B)** conformational isomerism
Sol: The different arrangements of atoms in space that result from the free rotation of groups about C-C bond axis are called conformational isomers and the phenomenon is known as conformational isomerism.

48) Ans: **B)** There is loss of electrons

49) Ans: **B)** 3.0×10^{-19} J

Sol: $E = \dfrac{hC}{\lambda} = \dfrac{6.6 \times 10^{-34} \times 3 \times 10^8}{660 \times 10^{-9}} = 3 \times 10^{-19}$ J

50) Ans: **A)** 53.78
Sol: $2(NH_4)_2HPO_4 \equiv P_2O_5$

$2(36 + 1 + 31 + 64) \equiv 62 + 80 = 264 = 142$

$\%P_2O_5 = \dfrac{\text{Wt. of } P_2O_5}{\text{Wt. of } s_9H} \times 100 = \dfrac{142}{264} \times 100 = 53.78\%$