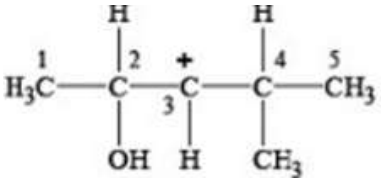
Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

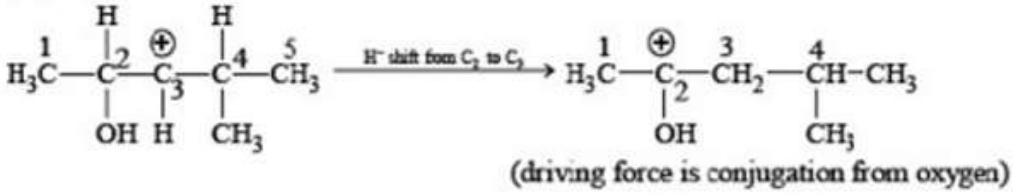
CBSE Board
Class XI
Chemistry
Sample Paper 2

Q1. In the following carbocation H/CH_3 that is most likely to migrate to the positively charged carbon is



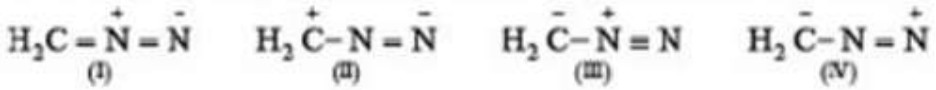
(a) $CH_3\ at\ C-4$
(b) $H\ at\ C-4$
(c) $CH_3\ at\ C_3$
(d) $H\ at\ C-2$

Sol. (d)



(driving force is conjugation from oxygen)

Q2. The correction stability order of the following resonance structure is



(a) $(I) > (II) > (IV) > (III)$
(b) $(I) > (III) > (II) > (IV)$
(c) $(II) > (I) > (III) > (IV)$
(d) $(III) > (I) > (IV) > (II)$

Sol. (b)

On the basis of stability of resonating structures.

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q3. STATEMENT – 1 : Alkali metals dissolves in liquid ammonia to give blue solution because
STATEMENT - 2 : Alkali metals in liquid ammonia give solvated species of the type $[M(NH_3)_a]^+$ (M = alkali metals)

(a) Statement -1 is True, Statement – 2 is True, Statement – 2 is a correct explanation for Statement – 1
(b) Statement -1 is True, Statement -2 is True, Statement -2 is NOT is correct explanation for Statement -1
(c) Statement – 1 is True, Statement -2 is False
(d) Statement -1 is False, Statement -2 is True

Sol. (b)
Blue colour is due to solvated electrons.

Q4. $B\ (OH)_3 + NaOH \rightleftharpoons NaBO_2 + Na\ (B\ (OH)_4] + H_2O$ How this reaction cans is made to produce in forward direction?

(a) Addition of cis 1,2 diol
(b) Addition of borax
(c) Addition of trans 1,2 diol
(d) Addition of $Na_2\ HPO_4$

Sol. (a)
Due to formation of chelated complex, the reaction moves in forward direction.

Q5. STATEMENT - 1: Bromobenzene upon reaction with Br_2/Fe gives 1, 4 – dibromobenzene as the major product and
STATEMENT – 2 : In bromobenzene, the inductive effect of the bromo group is more dominant than the mesomeric effect in direction the incoming electrophile.

(a) Statement -1 is True, Statement – 2 is True, Statement – 2 is a correct explanation for Statement – 1
(b) Statement -1 is True, Statement -2 is True, Statement -2 is NOT is correct explanation for Statement -1
(c) Statement – 1 is True, Statement -2 is False
(d) Statement -1 is False, Statement -2 is True

Sol. (c)
In bromobenzene, it is the mesomeric effect which directs the incoming electrophile.

Q6. Assuming that Hund's rule is violated, the bond order and magnetic nature of the diatomic molecule B_2 is

(a) 1 and diamagnetic

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

(b) 0 and diamagnetic
(c) 1 and paramagnetic
(d) 0 and paramagnetic

Sol. (a)

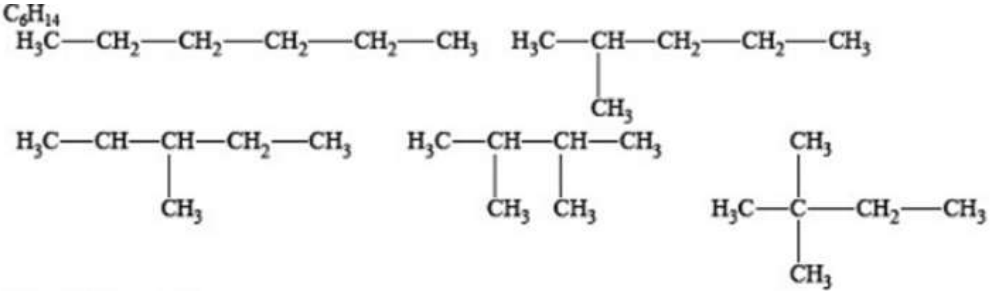
$B_2\ (10) = \sigma_{1s^2}\sigma^*_{1s^2}\sigma_{2s^2}\sigma^*_{2s^2}\pi_{2p_x^2}$

Bond order $= \frac{6-4}{2} = 1$ (nature diamagnetic as no unpaired electron)

Q7. The number of structural isomers for C_6H_{14} is

(a) 3
(b) 4
(c) 5
(d) 6

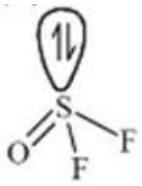
Sol. (c)



Q8. The species having pyramidal shape is

(a) SO_3
(b) BrF_3
(c) SiO_3^{2-}
(d) OSF_2

Sol. (d)



Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q9. The term that corrects for the attractive forces present in real gas in the van der Waals equation is

(a) nb

(b) $\frac{an^2}{V^2}$

(c) $-\frac{an^2}{V^2}$

(d) $-nb$

Sol. (b)

The measure of force of attraction for 'n' moles of real gas $\left(\frac{n^2a}{V^2}\right)$

$$\left(P+\frac{n^2a}{V^2}\right)(V-nb)=nRT$$

Q10. Given that the abundance of isotope ^{54}Fe, ^{56}Fe and ^{57}Fe are 5%, 90% and 5% respectively, the atomic mass of Fe is

(a) 55. 85

(b) 55.95

(c) 55.75

(d) 56.05

Sol. (b)

$$\bar{A}=\frac{\sum A_i x_i}{\sum x_i}$$

$\bar{A} = 54 \times 0.05 + 56 \times 0.90 + 57 \times 0.05$ (where $\bar{A}$ is atomic mass of Fe)

$\bar{A} = 55.95$

Q11. Aqueous solution of NaS_2O_3 on reaction with Cl_2 gives

(a) $Na_2S_4O_6$

(b) $NaHSO_4$

(c) $NaCl$

(d) $NaOH$

Sol. (b)

$Na_2S_2O_3 + 4Cl_2 + 5H_2O \rightarrow 2NaHSO_4 + 8HCl$

Q12. Hyper conjugation involves overlap of the following orbitals

(a) $\sigma - \sigma$

(b) $\sigma - p$

(c) $p - p$

(d) $\pi - \pi$

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Sol. (b)

Hyper conjugation involves overlap of $\sigma - p$ orbitals.

Q13. The synthesis of 3- octyne is achieved by adding a bromoalkane into a mixture of sodium amide a alkyne. The bromoalkane and alkyne respective are

(a) $BrCH_2CH_2CH_2CH_2CH_3 \; and \; CH_3CH_2C \equiv CH$

(b) $BrCH_2CH_2CH_3 \; and \; CH_3CH_2CH_2C = CH$

(c) $BrCH_2CH_2CH_2CH_2CH_3 \; and \; CH_3C \equiv CH$

(d) $Br\; CH_2CH_2CH_2CH_3 \; and \; Ch_3CH_2C \equiv CH$

Sol. (d)

$$CH_3-CH_2-C\equiv CH \xrightarrow{NaNH_2} CH_3-CH_2-C\equiv C^-Na^+$$

$$CH_3-CH_2-CH_2-CH_2\boxed{Br+Na^+} \; {}^-C\equiv C-CH_2-CH_3 \longrightarrow \underset{\text{3-octyne}}{CH_3-CH_2-CH_2-CH_2-C\equiv C-CH}$$

Q14. The compound(s) that exhibit(s) geometrical isomerism is(are)

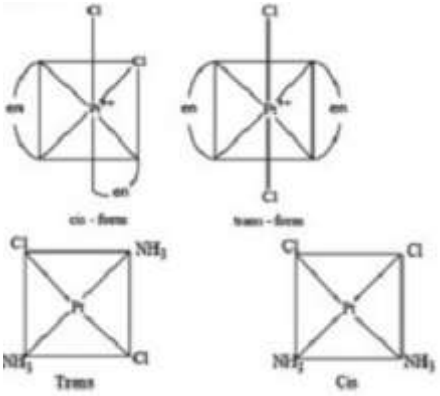
(a) $[Pt(en)Cl_2]$

(b) $[Pt(en)_2]Cl_2$

(c) $[Pt\;(en)_2\;Cl_2]Cl_2$

(d) $[Pt\;(NH_3)_2Cl_2]$

Sol. (c, d)



Q15. When benzene sulfonic acid and p – nitrophenol are treated with $NaHCO_3$, the gases released respectively are

(a) $SO_2\; NO_2$

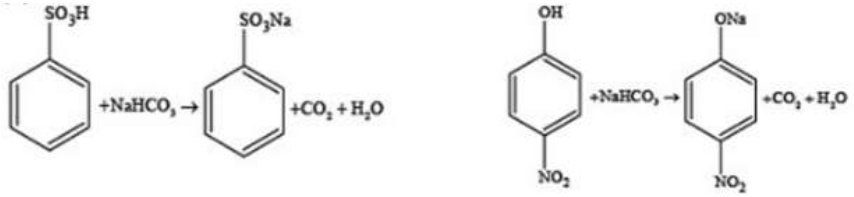
(b) SO_2, NO

(c) SO_2, CO_2

(d) CO_2, CO_2

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Sol. (d)



Q16. Among the following the paramagnetic compound is

(a) Na_2O_2

(b) O_3

(c) N_2O

(d) KO_2

Sol. (d)

$O_2^{2-} = \sigma 1s^2\, \sigma^* 1s^2, \sigma 2s^2\, \sigma^* 2s^2, \sigma 2p_z^2, \pi 2p_x^2 = \pi 2p_y^2, \pi^* 2p_x^2 = \pi^* 2p_y^2$

Number of unpaired electrons = 0.

$N \equiv N \longrightarrow O$ Number of unpaired electrons = 0

$O=\overset{\oplus}{O}-\overset{\ominus}{O} \longleftrightarrow O=O \longrightarrow O$ Number of unpaired electrons = 0

$O_2^- = \sigma 1s^2, \sigma^* 1s^2 \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2, \pi 2p_x^2 = \pi 2p_y^2, \pi^* 2p_x^2 = \pi^* 2p_y^1$

Number of unpaired electrons = 1

Thus O_2^- is paramagnetic.

Q17. A monatomic ideal gas undergoes a process in which the ratio of P to V at any instant is constant and equal to 1. What is the molar heat capacity of the gas?

(a) $\frac{4R}{2}$

(b) $\frac{3R}{2}$

(c) $5R/2$

(d) 0

Sol. (a)

Q18. The value of $\log_{10} K$ *for a reaction* $A \rightleftharpoons B$ *is*
$(Given: \ \Delta_1 H^+_{298K} = -54.07\ KJ\ mol^{-1}, \Delta_1 S^+_{298K} = 10 JK^{-1}\ mol^{-1}$ *and* $R = 8.314\ JK^{-1}\ mol^{-1}, 2.303 \times 8.314 \times 5298 = 5705)$

(a) 5

(b) 10

(c) 95

(d) 100

Sol. (b)

$\Delta G^+ = \Delta H^+ - T\Delta S^+ = -54.07 \times 1000 - 298 \times 10 = -57050\ J\ mol^{-1}$

$-\ 57050 = -5705 \log_{10} K$

$\log_{10} K = 10$

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q19. (I) 1, 2 –dihydroxy benzene (II) 1, 3 – dihydroxy benzene (III) 1, 4- dihydroxy benzene (iv) Hydroxy benzene

The increasing order of boiling points of above mentioned alcohols is

(a) $I < II < III < IV$

(b) $I < II < IV < III$

(c) $IV < I < II < III$

(d) $IV < II < I < III$

Sol. (c)

Q20. The species having bond order different from that in CO is

(a) NO^-

(b) NO^+

(c) CN^-

(d) N_2

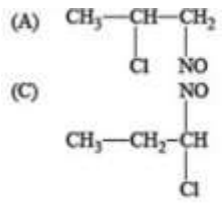
Sol. (a)

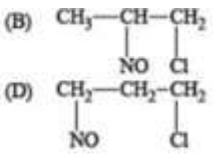
NO^- $(16\ electron\ system)$

Bond order – 2

$No^+, CN^-\ and\ N_2\ are\ isocelectric\ with\ CO\ therefore\ all\ have\ same\ bond\ order\ (=3)$

Q21. $CH_3 - CH = CH_2 + NOCl \rightarrow P$ Identify the abduct.





Sol. (A)

$NO^+\ Cl^- \rightarrow Markonikov's\ Addition$

Q22. The percentage of p – character in the orbitals forming P – P bonds in P_4 is

(a) 25

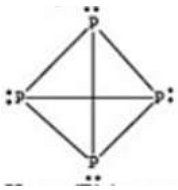
(b) 33

(c) 50

(d) 75

Sol. (d)

P is sp^3 hybridized in P_4.



Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q23. The IUPAC name of C_6H_5COCl is

(a) Benzoyl chloride
(b) Benzene chloro ketone
(c) Benzene carbonyl chloride
(d) Chloro Phenyl kertone

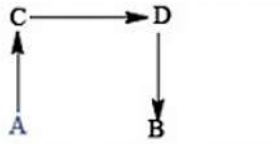
Sol. (c)

Q24. $Ag^+ + NH_3 \rightleftharpoons [Ag\ (NH_3)^+]; K_1 = 3.5 \times 10^{-3}$
$[Ag\ (NH_3)]^+ + NH_3 \rightleftharpoons [Ag\ (NH_3)_2]^+ ;\ K_2 = 1.7 \times 10^{-3}$
Then the formation constant of $[Ag(NH_3)_2]^+$ *is*

(a) 6.08×10^{-6}
(b) 6.08×10^{6}
(c) 6.08×10^{-9}
(d) *None*

Sol. (a)

Q25. The direct conversation of A to B is difficult; hence it is carried out by the following shown path.



Given $\Delta S_{(A\to C)} = 50$ e.u.
$\Delta S_{(C\to D)} = 30$ e.u.
$\Delta S_{(B\to D)} = 20$ e.u.
where e.u. is entropy unit
then $\Delta S_{(A\to B)}$ is

(a) $+100\ e.u.$
(b) $+60\ e.u.$
(c) $-100\ e.u.$
(d) $-60\ e.u.$

Sol. (b)
$\Delta S_{(A+B)} = \Delta S_{(A+C)} + \Delta S_{(C+D)} - \Delta S_{(B\to D)} = 50 + 30 - 20$

Q26. $N_2 + 3H - 2 \rightleftharpoons 2NH_3$
Which is correct statement if N_2 is added at equilibrium condition?

(a) The equilibrium will shift to forward direction because according to IInd law of thermodynamics the entropy must increases in the direction of spontaneous reaction
(b) The condition for equilibrium is $G_{N_2} + 3G_{N_3} = 2G_{NH_8}$ where G is Gibbs free energy per mole of the gaseous species measured at that partial pressure. The condition of equilibrium is

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

unaffected by the use of catalyst, which increases the rate of both the forward and backward to the same extent.

(c) The catalyst will increase the rate of forward reaction by α and that of backward reaction by ß.

(d) Catalyst will not alter the rate of either of the reaction.

Sol. (b)

Q27. The species present in solution when CO_2 is dissolved in water are

(a) $CO_2, H_3CO_3, HCO_3^-, CO_3^{2-}$

(b) H_2CO_3, CO_3^{2-}

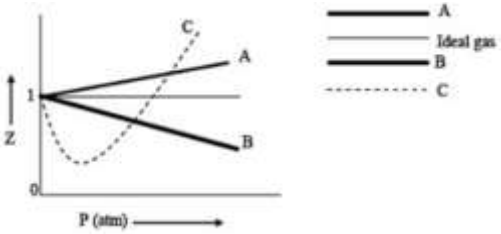
(c) CO_3^{2-}, HCO_3^-

(d) CO_2, H_2CO_3

Sol. (a)

$CO_2 + H_2O \rightleftharpoons H_2CO_3 \rightleftharpoons H^+ + HCO_3^- \rightleftharpoons H^+ + CO_3^{-2}$

Q28. The given graph represent the variation of Z (compressibility factor = PV / nRT) versus P, for the three real gases A, B and C. Identify the only incorrect statement.



(a) For the gas A, a = 0 and its dependence on P is linear at all pressure.

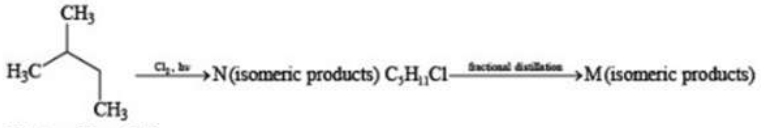
(b) For the gas B, b = 0 and its dependence on P is linear at all pressure.

(c) For the gas C, which is typical real gas for which neither a nor b = 0. By knowing the minimum and the point of intersection with z = 1, a and b can be calculated.

(d) At high pressure, the slope is positive for al real gases.

Sol. (b)

Q29.



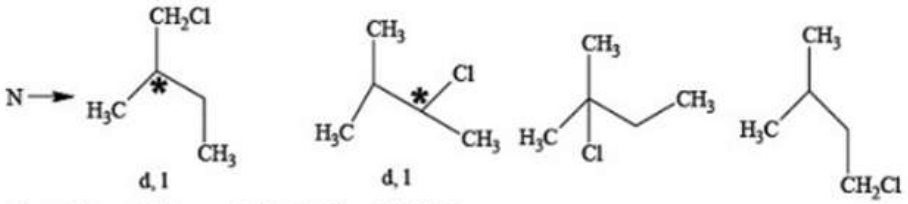
What are N and M?

(a) 6,6

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

(b) 6,4
(c) 4,4
(d) 3,3

Sol. (b)



M → d, l cannot be separated by fractional distillation.

Q30. What would be the pH of an ammonia solution if that of an acetic acid solution of equal strength is 3.2? Assume dissociation constant for NH_3 & acetic acid are equal.

(a) 3.2
(b) 6.4
(c) 9.6
(d) 10.8

Sol. (d)

pH of CH_3COOH = pOH of NH_3 solution $\because$ $K_a = K_b$

$\therefore$ pH of NH_3 solution = $14 - 3.2 = 10.8$