AVIRAL CLASSES
CREATING SCHOLARS
JEE (ADVANCED), PMT & FOUNDATIONS

UTS- NEET -2020
MOCK TEST-04 SOLUTION

ANSWER KEY

Que	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	**2**	**1**	**4**	**1**	**3**	**4**	**3**	**1**	**2**	**4**	**3**	**2**	**1**	**3**	**3**	**2**	**2**	**1**	**4**	**3**
Que	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	**3**	**3**	**3**	**1**	**2**	**1**	**2**	**2**	**3**	**2**	**1**	**4**	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**3**
Que	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**1**	**2**	**1**	**3**	**2**	**4**	**4**	**2**	**3**	**4**	**3**	**3**	**1**
Que	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Ans.	**3**	**4**	**1**	**3**	**3**	**1**	**2**	**2**	**2**	**2**	**2**	**4**	**2**	**1**	**3**	**2**	**3**	**2**	**2**	**2**
Que	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans.	**2**	**2**	**3**	**3**	**1**	**1**	**4**	**1**	**4**	**1**	**3**	**1**	**1**	**4**	**4**	**2**	**3**	**3**	**3**	**1**
Que	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	**3**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**4**	**2**	**2**	**3**	**1**	**3**	**2**	**2**	**2**	**3**	**3**
Que	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
Ans.	**1**	**1**	**1**	**4**	**4**	**3**	**3**	**3**	**4**	**4**	**2**	**1**	**4**	**1**	**4**	1	**2**	**2**	**1**	**4**
Que	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
Ans.	**3**	**2**	**4**	**4**	**2**	**2**	**3**	**3**	**2**	**2**	**4**	**2**	**3**	**1**	**3**	**1**	**2**	**4**	**3**	**2**
Que	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	**4**	**4**	**3**	**3**	**2**	**3**	**4**	**4**	**4**	**4**	**1**	**3**	**3**	**1**	**3**	**1**	**4**	**3**	**4**	**3**

1.

Wavelengh of the ray

$$\lambda = \frac{hc}{E}$$

$$= 0.826 \text{ Å}$$

since $\lambda < 100$ Å

so it is X-ray

2.

$$\mu = \frac{\sin\left(\frac{\delta_m + A}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

$\because \mu = \cot(A/2)$

$$\therefore \cot(A/2) = \frac{\sin\left(\frac{\delta_m + A}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

$$\Rightarrow \cos(A/2) = \sin\left(\frac{\delta_m + A}{2}\right)$$

$$\Rightarrow 90° - A/2 = \frac{\delta_m + A}{2}$$

$$\Rightarrow \delta_m = 180° - 2A$$

3.

As speed of electrons is increased so wavelength of electrons will decreases. Therefore the angular width ($\propto \lambda$) of the central maximum of diffrection pattern will decrease.

4.

A is feebly repelled ⇒ A is diamagnetic
B is feebly attracted ⇒ B is paramagnetic
C is strongly attracted ⇒ C is ferromagnetic
D remains unaffected ⇒ D is non-magnetic

5.

Energy of incident photon = 6.2 + 5 = 11.5 eV

Corresponding wave length $\lambda = \frac{12400}{11.5} = 1078Å$

⇒ UV region

6.

$$\vec{A} \cdot \vec{B} = 0$$

$$\cos \omega t \cos \frac{\omega t}{2} + \sin \omega t \sin \frac{\omega t}{2} = 0$$

$$\cos\left(\omega t - \frac{\omega t}{2}\right) = 0 \Rightarrow \cos\frac{\omega t}{2} = 0$$

$$\Rightarrow \frac{\omega t}{2} = \frac{\pi}{2} \Rightarrow t = \frac{\pi}{\omega}$$

7.

Change in momentum,

$$\Delta p = \int F dt$$

= Area of F-t graph

$$= \frac{1}{2} \times 2 \times 6 - 3 \times 2 + 4 \times 3$$

= 12 N-s

8.

$$n' = n\left(\frac{v + v_t}{v - v_t}\right) = 1000\left(\frac{330+220}{330-220}\right)$$

$$= 1000 \times \frac{550}{110} = 5000 \text{ Hz}$$

9.

Molecular mass M = 4.0 g

$$v_{sound} = \sqrt{\frac{\gamma RT}{M}} \Rightarrow \gamma = \frac{Mv^2}{RT} = 1.6$$

So, $C_p = \gamma C_v = 1.6 \times 5.0 = 8.0 \text{ J K}^{-1} \text{ mol}^{-1}$

10.

$$MK_1^2 = \frac{1}{2}MR^2 \Rightarrow K_1 = \frac{R}{\sqrt{2}}$$

$$MK_2^2 = MR^2 \Rightarrow K_2 = R \Rightarrow \frac{K_1}{K_2} = \frac{1}{\sqrt{2}}$$

11.

According to ideal gas equation

$$P = \frac{\rho RT}{M} \Rightarrow M = \frac{\rho RT}{P}$$

$$\text{so } \frac{M_A}{M_B} = \frac{\rho_A}{\rho_B} \cdot \frac{T_A}{T_B} \cdot \frac{P_B}{P_A} = (1.5)(1)\left(\frac{1}{2}\right)$$

$$\Rightarrow \frac{M_A}{M_B} = \frac{3}{4}$$

12.

$$\frac{5}{R} = \frac{\ell_1}{100-\ell_1} \text{ and } \frac{5}{R/2} = \frac{1.6\ell_1}{100-1.6\ell_1}$$

⇒ R = 15Ω

13.

Speed of light $c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$ Dimension $[LT^{-1}]$

14.

Additional kinetic energy = $TE_2 - TE_1$

$$= -\frac{GMm}{2R_2} - \left(-\frac{GMm}{2R_1}\right) = \frac{1}{2}GmM\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

15.

Net work done = work done by gravitational force + work done by spring force

$$= mg(h + d) - \frac{1}{2}Kd^2$$

16.

For two particles to collide, the direction of the relative velocity of one with respect to other should be directed towards the relative position of the other particle

i.e. $\frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} \rightarrow$ direction of relative position of 1 w.r.t. 2.

& $\frac{\vec{v}_2 - \vec{v}_1}{|\vec{v}_2 - \vec{v}_1|} \rightarrow$ direction of velocity of 2 w.r.t. 1

so for collision of A & B

$$\frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} = \frac{\vec{v}_2 - \vec{v}_1}{|\vec{v}_2 - \vec{v}_1|}$$

17.

$$\eta = \frac{V_S I_S}{V_P I_P} \Rightarrow 0.9 = \frac{V_S(6)}{3\times 10^3} \Rightarrow V_S = 450V$$

As $V_P I_P = 3000$ so $I_P = \frac{3000}{200} A = 15A$

18.

$$\frac{mv^2}{R} = qvB \Rightarrow R = \frac{mv}{qB}$$

So $\nu = \frac{1}{T} = \frac{v}{2\pi R} = \frac{qB}{2\pi m} \Rightarrow B = \frac{2\pi m\nu}{e}$

Kinetic energy $K = \frac{1}{2}mv^2 = \frac{1}{2}m(2\pi R\nu)^2$

$= 2\pi^2 m\nu^2 R^2$

19.

Electric field inside a conducting spherical shell is zero.

20.

$$\theta = \omega t + \frac{1}{2}\alpha t^2 = (2)(2) + \frac{1}{2}(3)(2)^2$$

$$= 4 + 6 = 10 \text{ rad}$$

21.

Water in capillary never overflows

22.

As surface area decreases so energy is released.

Released energy

$= 4\pi R^2 T[n^{1/3}-1]$ where $R = n^{1/3} r$

$= 4\pi R^3 T\left[\frac{1}{r} - \frac{1}{R}\right]$

$= 3VT\left[\frac{1}{r} - \frac{1}{R}\right]$

23.

24.

By conservation of angular momentum

$I_t\omega_i = (I_t + I_b)\omega_f \Rightarrow \omega_f = \left(\frac{I_t}{I_t + I_b}\right)\omega_i$

loss in kinetic energy $= \frac{1}{2}I_t\omega_i^2 - \frac{1}{2}(I_t + I_b)(\omega_f^2)$

$= \frac{1}{2}\left(\frac{I_b I_t}{I_b + I_t}\right)\omega_i^2$

25.

26.

$v = \beta x^{-2n}$

so $\frac{dv}{dx} = -2n\beta x^{-2n-1}$

Now $a = v\frac{dv}{dx} = (\beta x^{-2n})(-2n\beta x^{-2n-1})$

$\Rightarrow a = -2n\beta^2 x^{-4n-1}$

27.

$$\left(\frac{\lambda_{Lyman}}{\lambda_{Balmer}}\right)_{max} = \frac{\left(\frac{1}{2^2} - \frac{1}{3^2}\right)}{\left(\frac{1}{1^2} - \frac{1}{2^2}\right)} = \frac{5/36}{3/4} = \frac{5}{27}$$

28.

$$\frac{Q}{A} = \sigma T^4 \Rightarrow T = \left(\frac{Q}{\sigma 4\pi R^2}\right)^{1/4}$$

29.

Net external force on system is zero

so $\vec{v}_{cm}$ = zero

30.

Energy released $= 28 - 2\times 2.2 = 28 - 4.4 = 23.6$ MeV

31.

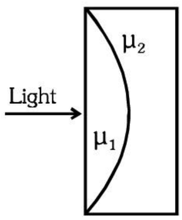
$$\Delta U = n C_V \Delta T \quad \& \quad T = \frac{PV}{nR}$$

$$\text{so} \quad \Delta T = T_2 - T_1 = \frac{P_2V_2 - P_1V_1}{nR}$$

$$\text{so} \quad \Delta U = \frac{nR}{\gamma - 1}\left(\frac{P_2V_2 - P_1V_1}{nR}\right) = \frac{P_2V_2 - P_1V_1}{\gamma - 1}$$

$$\Rightarrow \Delta U = \frac{-8\times 10^3}{2/5} = -20 \text{ kJ}$$

32.

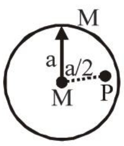


Equivalent focal length is given by $\frac{1}{f_{eq}} = \frac{1}{f_1} + \frac{1}{f_2}$

$$\frac{1}{f_{eq}} = (\mu_1 - 1)\left(\frac{1}{\infty} - \frac{1}{-R}\right) + (\mu_2 - 1)\left(\frac{1}{-R} - \frac{1}{\infty}\right)$$

$$\Rightarrow f_{eq} = \frac{R}{\mu_1 - \mu_2}$$

33.



$$V_p = \frac{-GM}{a} + \left(\frac{-GM}{a/2}\right) = \frac{-3GM}{a}$$

34.

$$V_3 = 220 \text{ volt}, \; I = \frac{220}{100} = 2.2\text{A}$$

35.

$\phi = \vec{E}\cdot\vec{S} = ES\cos 90^\circ = 0$ ($\therefore$ area vector is $\perp^r$ to $\vec{E}$)

36.

Once the capacitor is charged, its charge will be constant Q = CV

When dielectric slab is inserted

$$C'_{New} = KC$$

$$E = \frac{Q^2}{2C} \Rightarrow E_{New} = \frac{1}{K} E_{initial}$$

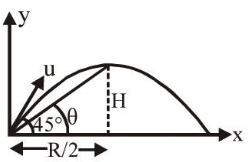
$$V = \frac{Q}{C} \text{ so } V_{new} = \frac{1}{K} V$$

37.

$$k = \frac{2\pi}{\lambda} = \frac{2\pi}{2\pi} = 1 \text{ and } \omega = 2\pi f = (2\pi)\left(\frac{1}{\pi}\right) = 2$$

So equation of wave y = sin(kx – ωt) = sin(x – 2t)

38.



$$\tan\theta = \frac{H}{\frac{R}{2}} = \frac{\frac{u^2\sin^2 45^\circ}{2g}}{\frac{2u^2\sin 45^\circ\cos 45^\circ}{2g}} = \frac{\tan 45^\circ}{2} = \frac{1}{2}$$

$$\Rightarrow \theta = \tan^{-1}\left(\frac{1}{2}\right)$$

39.

$$R_{AB} = \frac{R}{2} = \left(\frac{1}{2}\right)(\pi r \times 12)$$

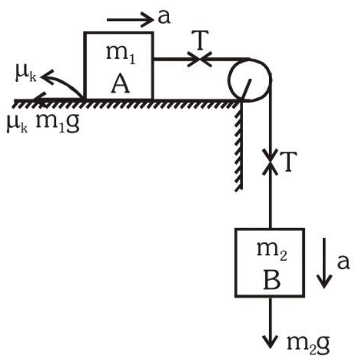
$$= \left(\frac{1}{2}\right)(\pi \times 10 \times 10^{-2} \times 12) = 0.6\,\pi\,\Omega$$

40.

IN SHM if $v = v_{max}$ then $a = 0$

$v = 0$ then $a = a_{max}$

41.



For the motion of both blocks

$m_2g - T = m_2a$

$T - \mu_k m_1g = m_1a \Rightarrow$

$$a = \frac{(m_2 - \mu_k m_1)g}{m_1 + m_2}$$

For the block of mass 'm_2'

$$m_2g - T = m_2\left[\frac{m_2 - \mu_k m_1}{m_1 + m_2}\right]g$$

$$T = m_2g - \left[\frac{m_2 - \mu_k m_1}{m_1 + m_2}\right]m_2g = m_2g\left[\frac{m_1 + \mu_k m_1}{m_1 + m_2}\right]$$

$$\Rightarrow \quad T = \frac{m_1 m_2(1 + \mu_k)g}{m_1 + m_2}$$

42.

According to question $n_1\lambda_1 = n_2\lambda_2$

So $\frac{n_1}{n_2} = \frac{\lambda_2}{\lambda_1} = \frac{10000}{12000} = \frac{5}{6}$

so minimum n_1 and n_2 are 5 and 6 respectively.

$$X_{min} = \frac{n_1\lambda_1 D}{d} = \frac{5(12000 \times 10^{-10})(2)}{2 \times 10^{-3}}$$

$= 6 \times 10^{-3}$ m = 6 mm

43.

Time(min)	0	2	4
Active nuclie of P	$4N_0$	N_0	$N_0/4$
Active nuclie of Q	N_0	$N_0/2$	$N_0/4$

$$\text{Amount of R} = \left(4N_0 - \frac{N_0}{4}\right) + \left(N_0 - \frac{N_0}{4}\right) = \frac{9}{2}N_0$$

44.

$$I_g = \frac{3}{50 + 2950} \propto 30, \; I_g' = \frac{3}{50 + R} \propto 20$$

$$\Rightarrow \frac{50 + R}{50 + 2950} = \frac{3}{2} \Rightarrow 50 + R = 4500$$

$$\Rightarrow R = 4450\Omega$$

45.

Wien's displacement law $\lambda_m T = b$

46.

Given

$\nu = 8 \times 10^{15}\ s^{-1}$

$\lambda = ?$

$$\lambda = \frac{c}{\nu} = \frac{3 \times 10^8}{8 \times 10^{15}} \text{m/s} = 3.75 \times 10^{-8} \text{ m.}$$

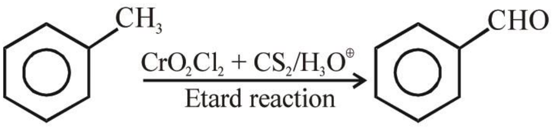
47.

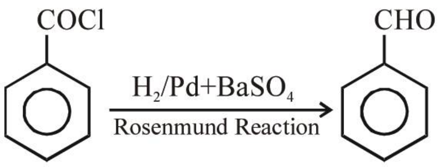
$$\Delta T_f = i \times K_f \times \frac{W_{solute} \times 1000}{M_{solute} \times W_{solvent}}$$

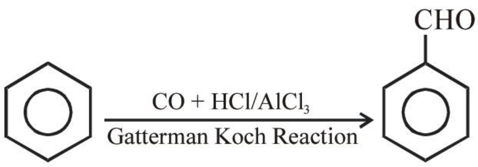
$$3.82 = i \times 1.86 \times \frac{5 \times 1000}{142 \times 45} \Rightarrow i = 2.63$$

48.

In presence of Zn – Hg and conc. HCl reduction is useful specially for aldehyde and ketone but carboxylic group remains uneffected

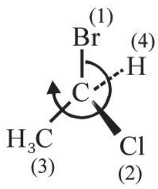






49.

Acc. to CIP Rule : The priority of atoms are : Br > Cl > CH_3 > H



Clockwise rotation (R) configuration

50.

Maximum MP in 3d series is shown by Cr. because of maximum no. of unpaired e^- and hence maximum extent of d–d ovelapping.

51.

$$W = \frac{nR}{\gamma - 1}(T_2 - T_1)$$

Therefore $-6R = 1\left(\frac{R}{\gamma - 1}\right)\Delta T = \frac{3}{2}R\Delta T$

$\Rightarrow \Delta T = -4 \Rightarrow T_{final} = (T - 4)K$

52.

Given

(1) $Cu^{2+}_{(aq)} + e^- \rightarrow Cu^{+}_{(aq)}$ $\Delta G_1 = -1 \times 0.15 \times F$

(2) $Cu^{+}_{(aq)} + e^- \rightarrow Cu_{(s)}$ $\Delta G_2 = -1 \times 0.50 \times F$

$Cu^{+2}_{(aq)} + 2e^- \rightarrow Cu$ $E^\circ = ?$

$\Delta G_3 = -2 \times F \times E^\circ_3$

eq. (1) + eq. (2) = eq. (3)

$\Delta G_3 = \Delta G_1 + \Delta G_2$

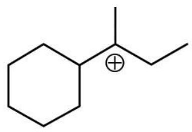
$-2 \times F \times E^\circ_3 = -1 \times 0.15 \times F + (-1 \times 0.5 \times F)$

$\Rightarrow$ $E^\circ_3 == 0.325$ V

53.

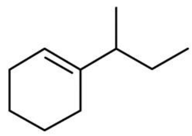
Nylon-2-nylon-6 is a biodegradable polymer

54.



Intermediate carbocation (more stable).

No rearangement in C+ takes place.

So  product is not possible.

55.

Given ions

	(i) C_2^{2-}	(ii) He_2^+	(iii) O_2^-	(iv) NO
Total e^-	14	3	17	15
Bonding e^-	10	2	10	10
Anti bondinge^-	4	1	7	5
B.O.	$\frac{10-4}{2}$ = 3	$\frac{2-1}{2}$ = 0.5	$\frac{10-7}{2}$ = 1.5	$\frac{10-5}{2}$ = 2.5

56.

57.

SO_2 number of moles = $\frac{64}{64}$ = 1 mole

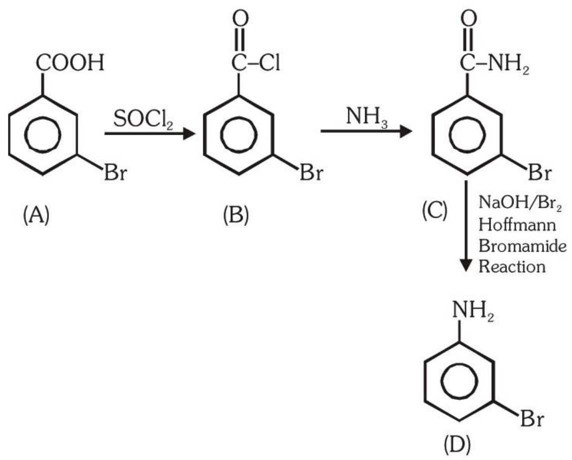
CO_2 number of moles = $\frac{44}{44}$ = 1 mole

O_3 number of moles = $\frac{48}{48}$ = 1 mole

H_2 number of moles = $\frac{8}{2}$ = 4 mole

H_2 gas maximum number of moles, so it has maximum number of molecules.

58.



59.

60.

$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + Cr_2O_3 + 4\,H_2O$

do not produces O_2.

61.

62.

$Ba(OH)_2 \rightleftharpoons Ba^{+2} + 2OH^-$

S 2S

$p^H = 12 \Rightarrow p^{OH} = 2$

$[OH^-] = 10^{-2}$ M = 2S

$\therefore S = \frac{10^{-2}M}{2}$

Now for $Ba(OH)_2$ $K_{sp} = 4S^3$

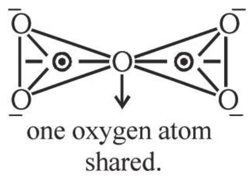
$= 4\left(\frac{10^{-2}}{2}\right)^3 = 5 \times 10^{-7}$

63.

$\overset{5}{H_3C}-\overset{4}{CH}=\overset{3}{CH}-\overset{2}{C}\equiv\overset{1}{CH}$

Pent-3-en-1-yne

64.



$Si_2O_7^{6-}$

Pyrosilicate

65.

66.

$t_{1/2} = \frac{0.693}{K} = \frac{\ell n2}{K}$ (Because $\ell n2 = 2.303 \log 2$)

67.

$P_T = P_AX_A + P_BX_B$

$= P_AX_A + P_B(1 - X_A)$

$= P_AX_A + P_B - P_BX_A$

$P_T = P_B + X_A(P_A - P_B)$

68.

$C_6H_5CH_2Br \xrightarrow{\text{(i) Mg ether}} \overset{-}{C_6H_5CH_2}\overset{+}{MgBr} \xrightarrow{H^{\oplus}} C_6H_5CH_3$

69.

70.

$Cu^{2+} + KCN \longrightarrow Cu(CN)_2 \longrightarrow Cu^+CN^- + \frac{1}{2}(CN)_2$

$\downarrow$ XS KCN

$K_3[Cu(CN)_4]$

* CN^- is a pseudo halide & hence reduces Cu^{2+} to Cu^{+1}

71.

$\because PV = nRT = \frac{m}{M_W}RT \therefore \frac{\rho}{P} = \frac{M_W}{RT}$

$\Rightarrow \frac{\rho}{P} \propto \frac{1}{T}$

72.

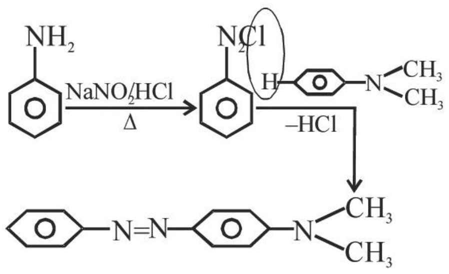
$$\rho = \frac{Z \times M}{N_A \times a^3} \quad \text{for FCC, } Z = 4$$

$a = 404$ pm $= 404 \times 10^{-10}$ cm.

$$2.72 = \frac{4 \times M}{6.02 \times 10^{23} \times (404 \times 10^{-10})^3}$$

$M = 27\ \text{gmol}^{-1}$

73.

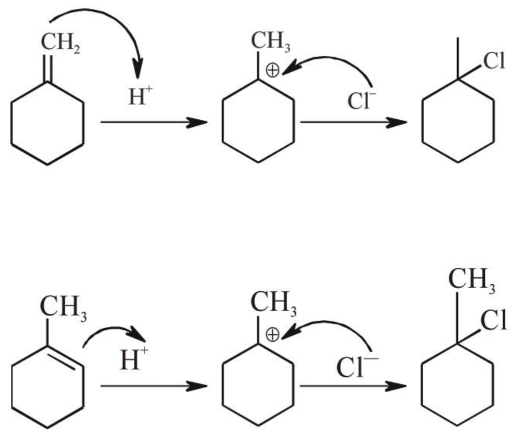


74.
75.

$BeCO_3 < MgCO_3 < CaCO_3 < K_2CO_3$ = Thermal stability order

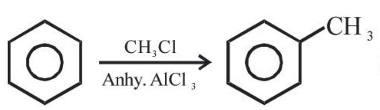
Size of cation ↑
Polarization ↓
Thermal stability ↑

76.
77.



78.

It is friedal craft alkylation.



(Toluene)

79.

Bleaching powder is actually a mixture of calcium hypochlorite $Ca(ClO)_2$ and the basic chloride $CaCl_2.H_2O$ with slaked lime $Ca(OH)_2$. Generally represented by $CaOCl_2$ but active ingredient is $Ca(ClO)_2$.

80.

Cr^{3+} ion is a most stable in aqueous solution due to. t_{2g} half filled configuration.

81.
82.

After leaving Cl^-, due to resonance, π bond is also transferred

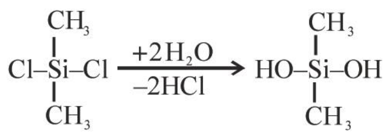
83.

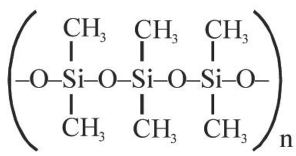
Magnitude of negative charge minimum in "a" because of % of s-character maximum. So it more stable (sp-hybridisation)

84.

+ve charge ∝ 1/Ionic radius

85.



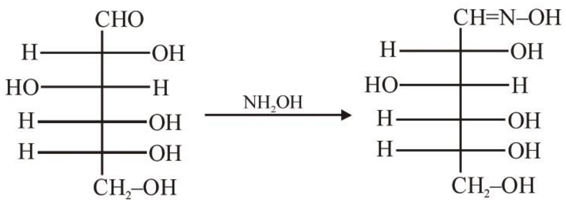


(Straight chain polymer)

86.

87.

Glucose reacts with hydroxyl amine to form an oxime.



D(+)glucose

88.

Dissociation of ether by acid (HI) is favoured by SN² mechanism

$$CH_3\text{–}\underset{\underset{CH_3}{|}}{CH}\text{–}CH_2\text{–}O\text{–}CH_2\text{–}CH_3 + HI \longrightarrow$$

$$CH_3\text{–}\underset{\underset{CH_3}{|}}{CH}\text{–}CH_2\text{–}OH + CH_3\text{–}CH_2\text{–}I$$

89.

Hypophosphorous Acid H_3PO_2 is a monobasic Acid

90.

(1) $[Co(OX)_2(OH)_2]$ $\Rightarrow$ Co^{+5} $t_{2g}^4e_g^0$ UPE = 2

(2) $[Ti(NH_3)_6]^{+3}$ $\Rightarrow Ti^{+3}$ $t_{2g}^1e_g^0$ UPE = 1

(3) $[V(gly)_2(OH)_2(NH_3)_2]^+$ $\Rightarrow$ V^{+5} $t_{2g}^2e_g^0$ UPE = 0

(4) $[Fe(en)(bpy)(NH_3)_2]^{+2}$ $\Rightarrow$ Fe^{+2} $t_{2g}^6e_g^0$ UPE = 0