NAVODAYA VIDYALAYA SAMITI - HYDERABAD REGION

SECOND PRE BOARD EXAMINATION, 2022-23

CLASS -**XII**

SUBJECT- **CHEMISTRY THEORY (043)**

SET : 2

MARKING SCHEME

Section A (1m each)

1. A
2. C
3. B
4. B
5. D
6. C
7. C
8. D
9. C
10. C
11. A
12. B
13. C
14. B
15. C
16. D
17. D
18. A

Section B

19. Nitro group is an electron withdrawing group. It decreases the electron density in O-H bond. As a result it is easier to lose a proton. It is stabilized by resonance. Hence Ortho nitro phenol is more acidic …….. 1m

    Methoxy group is an electron donating group. It increases the electron density in O-H bond. As a result it is not easier to lose a proton. Hence Ortho methoxy phenol is less acidic……. 1m

20. $CH_3CH_2CH_2CH_2Br$ faster by SN^2 mechanism 1m

    It is a primary halide and it has less steric hinderance……1m

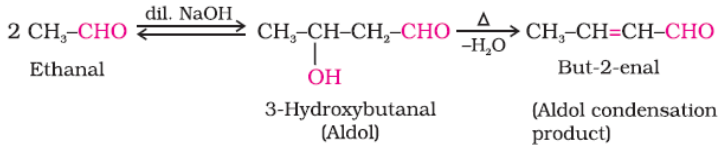
21.
$$\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1T_2}\right]$$
$$\log\frac{0.07}{0.02} = \left(\frac{E_a}{2.303 \times 8.314\,JK^{-1}mol^{-1}}\right)\left[\frac{700-500}{700\times500}\right]$$
$$0.544 = E_a \times 5.714 \times 10^{-4}/19.15$$
$$E_a = 0.544 \times 19.15/5.714 \times 10^{-4} = 18230.8\ J$$

Correct formula ……1/2m

Steps and substitution 1m

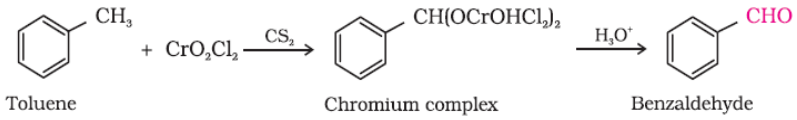
Correct answer……1/2 m

22. A (i)



…… 1m

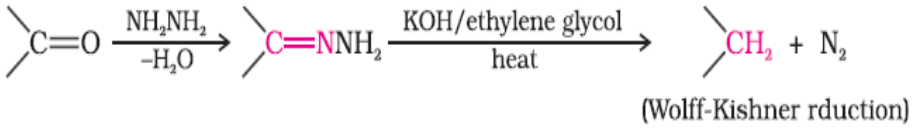
(ii)



……1m

or

B. (i)



…….1m

(ii)

……..1m

23. For a first order reaction

$$\log \frac{[R]_1}{[R]_2} = \frac{k(t_2 - t_1)}{2.303}$$

$$k = \frac{2.303}{(t_2 - t_1)} \log \frac{[R]_1}{[R]_2}$$

$$= \frac{2.303}{(60\ \text{min} - 0\ \text{min})} \log \frac{1.24 \times 10^{-2}\ \text{mol L}^{-1}}{0.20 \times 10^{-2}\ \text{mol L}^{-1}}$$

$$= \frac{2.303}{60} \log 6.2\ \text{min}^{-1}$$

$$k = 0.0304\ \text{min}^{-1}$$

Correct formula ……1/2m Steps and substitution 1m

Correct answer……1/2 m

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$$Ag^{+}_{(aq)} + e^{-} \longrightarrow Ag_{(s)}$$

$$108\ g$$

i.e., 108 g of Ag is deposited by 96487 C.

Therefore, 1.45 g of Ag is deposited by $= \frac{96487 \times 1.45}{108} C$

$= 1295.43$ C

Given,

Current = 1.5 A

$\therefore$ Time $= \frac{1295.43}{1.5} s$

= 863.6 s

= 864 s

= 14.40 min

Correct formula ……1/2m Steps and substitution 1m

Correct answer……1/2 m

25. A (i)

When an egg is boiled, the proteins present inside the egg get denatured and coagulate. After boiling the egg, the water present in it is absorbed by the coagulated protein through H-bonding.

……1m

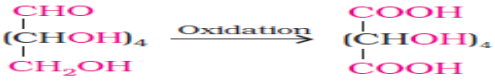
(ii)

When a nucleotide from the DNA containing thymine is hydrolyzed, thymine β-D-2-deoxyribose and phosphoric acid are obtained as products.

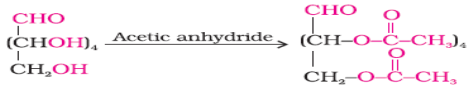
……..1m

(ii) ……1m

OR

B. (i) 

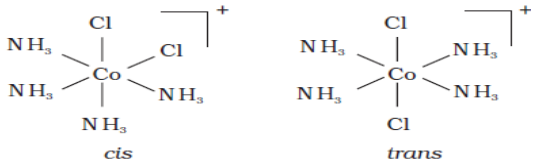
……1m

(ii) 

……1m

Section C

26. (i) structures of cis and trans isomers (½ m each)



(ii) Electronic configuration for d^4 ion if $\Delta 0 > P$ is $t_{2g}^4 e_g^0$ (low spin complex is formed).....1m

In both $[Fe(H_2O)_6]^{3+}$ and $[Fe(CN)_6]^{3-}$, Fe exists in the +3 oxidation state i.e., in d^5 configuration.

d^5 ↑ ↑ ↑ ↑ ↑

Since CN^- is a strong field ligand, it causes the pairing of unpaired electrons. Therefore, there is only one unpaired electron left in the *d*-orbital.

↑↓ ↑↓ ↑

Therefore,

$$\mu = \sqrt{n(n+2)}$$
$$= \sqrt{1(1+2)}$$
$$= \sqrt{3}$$
$$= 1.732\,BM$$

On the other hand, H_2O is a weak field ligand. Therefore, it cannot cause the pairing of electrons. This means that the number of unpaired electrons is 5.

Therefore,

$$\mu = \sqrt{n(n+2)}$$
$$= \sqrt{5(5+2)}$$
$$= \sqrt{35}$$
$$\simeq 6\,BM$$

(iii) …1m

27.

The elevation (ΔT_b) in the boiling point = 354.11 K – 353. 23 K = 0.88 K
Substituting these values in expression (2.33) we get

$$M_2 = \frac{2.53\ K\ kg\ mol^{-1} \times 1.8\ g \times 1000\ g\ kg^{-1}}{0.88\ K \times 90\ g} = 58\ g\ mol^{-1}$$

Therefore, molar mass of the solute, $M_2 = 58\ g\ mol^{-1}$

Correct formula 1m

Steps and substitution 1m

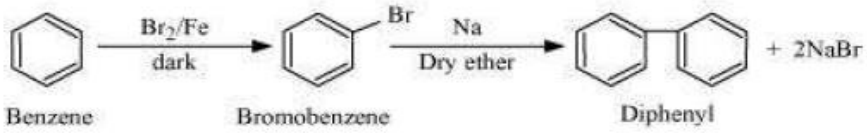
Correct answer.....1 m

$$2CH_3CH_2CH_2CH_2-Cl+2Na \xrightarrow[-2NaCl]{\text{dry ether}} CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_3$$

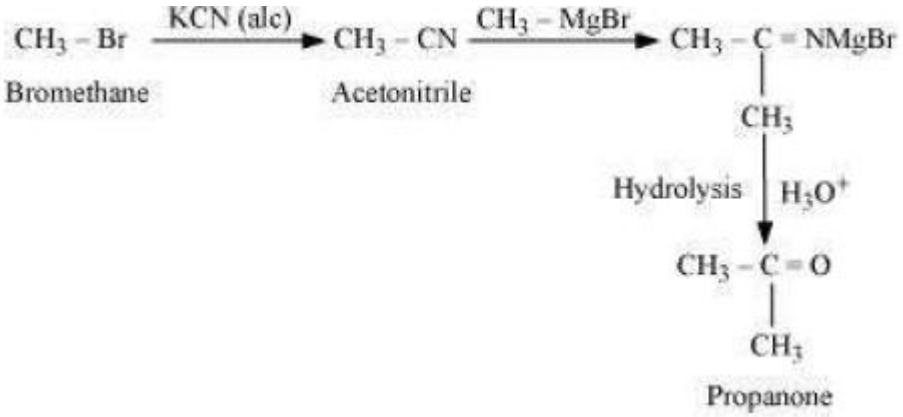
1 – Chlordrutane — n – Octane

28(a)

……1m



(b) ……..1m



(C)

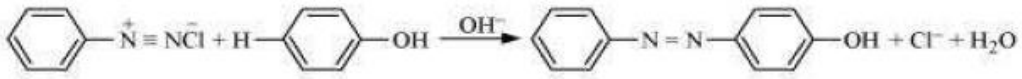
…….1m

29 a. $(CH_3)_3N$ has lower boiling point than $CH_3—NH_2$. (1/2m)

Reason: $(CH_3)_3N$ has weak dipole dipole forces where as $CH_3—NH_2$ shows strong intermolecular H bonding 1/2m

b.

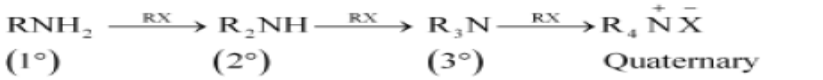
(i)



Benzenediazonium chloride — Phenol — *p*-Hydroxyazobenzene (Orange dye)

…….1m

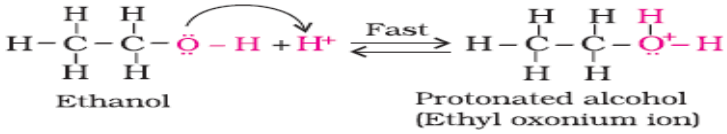
(ii)



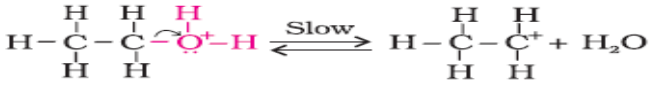
……. 1m

30

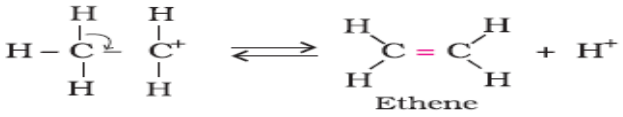
Step 1: Formation of protonated alcohol.



Step 2: Formation of carbocation: It is the slowest step and hence, the rate determining step of the reaction.

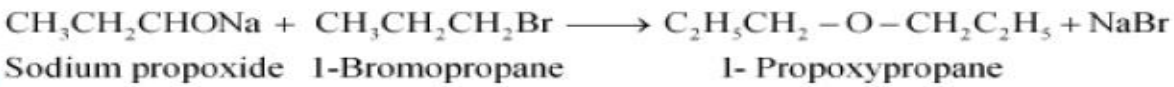


Step 3: Formation of ethene by elimination of a proton.



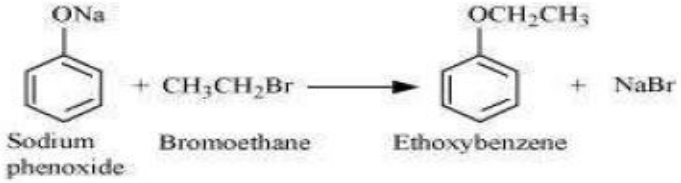
mechanism with three steps: 1m for each step

OR

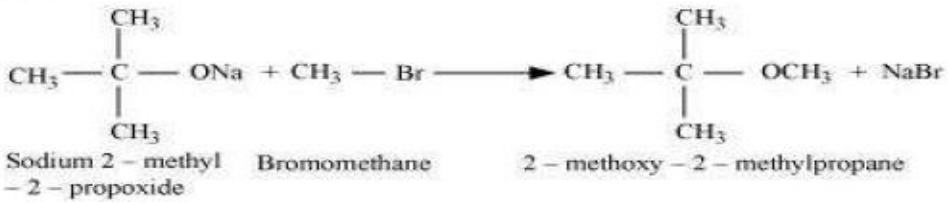


(i)

(ii)



(iii)



Three equations : 1m for each

$$M = \frac{\text{No. of moles}}{\text{Litres of solution}} = \frac{6.02 \times 10^{22}}{6.02 \times 10^{23}} \times \frac{1000}{50}$$

$= 2M$

31. (a) ……..1m

(b) 'B' will have lower vapour pressure because its boiling point is higher……..1m

(c) Maximum boiling azeotropes ……1m

(d) (*i*) $i > 1$, because dissociation takes place. …….. ½ m

(*ii*) $i < 1$, because association takes place…….. 1/2m

32. (a) Phosphodiester linkage…….. 1m

(b) Guanine ……. 1m

(c) Lactose…….1m

(d) Globular protein……..1m

33. A. a.

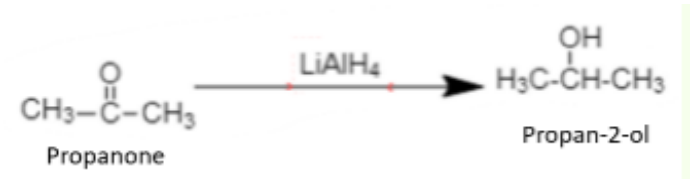
As the compound A gives a positive 2, 4-DNP test but negative Tollen's test, it is a ketone. Since on oxidation, it gives an acid B, of molecular formula $C_3H_6O_2$, it is $CH_3CH_2COCH_2CH_3$ and B is CH_3CH_2COOH. As C is obtained by Kolbes decarboxylation of B, C is $CH_3CH_2\ CH_2\ CH_3$.

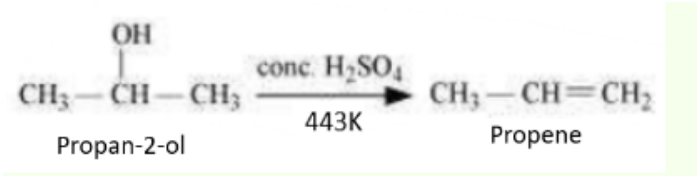
Therefore A = Pentan -3 one, $CH_3CH_2CO\ CH_2CH_3$

B = Propanoic acid CH_3CH_2COOH

And C = Butane $CH_3CH_2CH_2CH_3$ ……..3 m

b. (i) Propanone to Propene





…….1m

(ii) Benzoic acid to Benzaldehyde

..... 1m

OR

B. **: a.**

Since B gives a negative Tollen's test but positive Iodoform test, it is methyl ketone, i.e, $CH_3CO\ CH_2CH_2CH_3$.

Also it is formed by oxidation of A.

Therefore A is secondary alcohol i.e, $CH_3\ \underset{OH}{CH}\ CH_2\ CH_2\ CH_2CH_3$ on reduction B gives pentane with Zn –Hg/ HCl.

Therefore C is $CH_3CH_2CH_2CH_2CH_3$

Therefore

A = $CH_3CHOH\ CH_2CH_2CH_3$

B = $CH_3CO\ CH_2CH_2CH_3$

C= $CH_3CH_2CH_2CH_2CH_2CH_3$

b. (i) Iodoform test :Propanal has an aldehydic functional group and propanone is a methyl ketone. Propanal on reaction with sodium hypoiodite does not form a yellow coloured precipitate. But propanone on reaction with sodium hypoiodite form a yellow coloured precipitate ……. ½ m

Relevant Chemical equation …….1/2 m

Or Tollen's reagent, Bennedict solution and Fehling solution are all used to distinguish between aldehydes and ketones. Propanal(CH_3CH_2CHO) is an aldehyde and thus gives positive test with all the three reagents whereas propanone(CH_3COCH_3) is a ketone and thus does not give any results with the three reagents……..1/2 m

Relevant chemical equation ……..1/2 m

(ii) Phenol gives violet colour with neutral $FeCl_3$ while benzoic acid gives buff colured ppt. Benzoic acid react with NaHCO3 and form CO_2 gas ,But does not react with $NaHCO_3$…….1/2 m

Relevant chemical equation ……1/2 m

34. (a) 'Y'is for CH_3COOH. …….. 1m

(b) 'X' is equal Λ° (limiting molar conductivity)……. 1m

(c) $\Lambda_m = \Lambda^\circ_m - A\sqrt{C}$ …….. 1m

(d) Slope = –A ……. 1m

(e) Λm for weak electrolyte increases sharply on dilution because both number of ions as well as mobility of ions increases. 1m

35. (1)

(a) Scandium (Sc) and Zinc (Zn)…… 1m

(b) It is because Cu^{2+} has one unpaired electron and undergoes d-d transition by absorbing light from visible region and radiate blue colour, where as Zn^{2+} is colourless due to absence of unpaired electron……1m

(c) It is due to smaller atomic size and higher ionisation enthalpies…….. 1m

(d) Density goes on increasing from Sc to Cu because atomic mass increase more than atomic volume…..1m

(e) 'Ce' shows +4 oxidation state because it has stable electronic configuration…….1m

OR

(II) (a) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 7H_2O + 6Fe^{3+}$ …… 1m

(b) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO^{4-} + MnO_2 + 2H_2O$ ……1m

(c) It is because neither they nor their ions have incompletely filled *d*-orbitals….. 1m

(d)Zinc has lowest enthalpy of atomisation due to weak metallic bond which is due to absence of unpaired electrons. …….. 1m

(e) (*i*) Both show contraction, lanthanoid and actinoid contraction.

(*ii*) Both form coloured ions and undergo $f \cdot f$ transition. ……. 1m