



தேசிய வெளிக்கள நிலையம் தொண்டைமான்
முன்றாம் தவணைப் பரீட்சை - 2024
National Field Work Centre, Thondaimanaru
3rd Term Examination - 2024

இரசாயனவியல்
Chemistry

Three Hours 10 Min

Gr. 12 (2024)

02

E

I

Part - I

❖ Answer all questions.

01) Select the incorrect statement about fundamental matters

- (1) The ratio of the charge to mass ($\frac{e}{m}$) of cathode ray particles obtained from different gases was found to be exactly same
- (2) Positive ions and electron in turn strike more atoms creating more positive ions in discharge tube
- (3) Mass of an electron is 1840 times greater than mass of a proton
- (4) Mass of a proton is 1.007276 amu.
- (5) Neutron was discovered by Sir James Chadwick

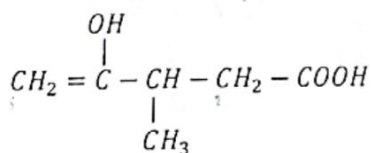
02) The correct electron configuration of As [Z = 33]

- (1) (Ar)4s²4p³
- (2) (Ar)3d¹⁰4s²4p³
- (3) (Ar)4d¹⁰5s²5p³
- (4) (Kr)5s²5p³
- (5) (Kr)4d¹⁰5s²5p³

03) The increasing order of atomic radius of Li, Mg, K, Ca

- (1) Li < Mg < K < Ca
- (2) Li < Mg < Ca < K
- (3) Mg < Li < Ca < K
- (4) Mg < Li < K < Ca
- (5) Li < Ca < Mg < K

04) What is the IUPAC name of following compound



- (1) 4 - hydroxy - 3 - methyl - 4 - pentenoic acid
- (2) 4 - hydroxy - 3 - methyl - 4 - pentenoic acid
- (3) 2 - hydroxy - 3 - methyl - 1 - pentenoic acid
- (4) 3 - methyl - 4 - hydroxy - 4 - pentenoic acid
- (5) 4 - hydroxy - 3 - methyl - 4 - pentenoic acid

05) An organic compound X, it has only C, H, O and molecular weight of the compound is 155. X did not react with Na_2CO_3 but it react with excess PCl_5 and give a product of molecular weight of the product is 210.5. how many hydroxyl groups present in X.

- (1) 1 (2) 2 (3) 3 (4) 4 (5) 5

06) Select the correct statement about SO_2 and H_2S

- (1) When SO_2 react with H_2S SO_2 act as redacing agent.
 (2) H_2S didn't give any precipitate with metal ions in basic medium.
 (3) When SO_2 react with $\text{H}^+/\text{K}_2\text{Cr}_2\text{O}_7$ obtained green colour turbid solution as product
 (4) When H_2S react with H^+/KMnO_4 obtained colourless turbid solution as product
 (5) SO_2 act as only reducing agent

07) Select correct statement

- (1) Cr has 6 unpaired electrons in ground state
 (2) All three C - O bond length are equation HCO_3^- .
 (3) 5 orbital are associated with azimuthal quantum number $\ell = 0$ in Ca [$Z = 20$]
 (4) The effective nuclear charge of N $>$ F
 (5) There is 5 stable resonance structures can be drawn for PO_4^{3-}

08) Calculate the w/w % of H_2SO_4 , concentration of H_2SO_4 , 5.5 mol dm^{-3} and density is 1.1 g cm^{-3} .

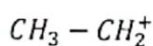
(H - 1 S - 32 O - 16)

- (1) 98% (2) 60% (3) 52% (4) 49% (5) 21%

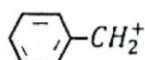
09) Which reaction release more heat energy when it form 1 mol of H_2O as product ($\text{H}^+ + ^-\text{OH} \rightarrow \text{H}_2\text{O}$)

- (1) $\text{H}_2\text{SO}_4 + \text{Ba}(\text{OH})_2$ (2) $\text{H}_2\text{SO}_4 + \text{NaOH}$
 (3) $\text{CH}_3\text{COOH} + \text{NaOH}$ (4) $\text{HNO}_3 + \text{KOH}$
 (5) $\text{CH}_3\text{COOH} + \text{NH}_4\text{OH}$

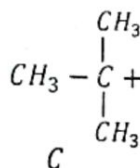
10) Consider following Carbocation's



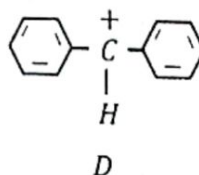
A



B



C



D

Select the correct increasing order of stability.

- (1) $A < B < D < C$ (2) $A < C < B < D$ (3) $B < A < C < D$
 (4) $B < A < D < C$ (5) $A < C < D < B$

11) 8g of X liquid goes as vapour completely at 27°C , Volumes of vessel is 2.1 dm^3 and pressure of the system is $3 \times 10^5 \text{ Pa}$, Select Which one is more suitable to X.

- (1) ethanol (2) ethane (3) acetone
 (4) methanol (5) chloroform

12) Select of the correct statement about cation quality analysis test.

- (1) In group I test, if Hg^{2+} is present in the cation it will give white clour precipitate with HCl .
- (2) In group II test is Ni^{2+} is present it in the cation it will give black colour precipitate with acidic H_2S
- (3) In group II test, if Fe^{3+} Present in the cations it will be reduced Fe^{2+} by H_2S
- (4) Only Zn^{2+} , Mn^{2+} , CO^{2+} Can be formed precipitate with H_2S in basic medium
- (5) In group V when $(NH_4)_2CO_3$ was added $CaCO_3$, $SrCO_3$, $BaCO_3$, $MgCO_3$, Canbe formed as precipitate.

13) Calculate the standard formation enthalpy change (ΔH_f^0) of $CH_4(g)$ in $kJmol^{-1}$ by using the following datas.

Standard sublimation enthalpy change of $C_{(s)}$ $\Delta H_{sub}^0 = +750 kJmol^{-1}$

Standard enthalpy change of atomization $\Delta H_{atm}^0 = +216 kJmol^{-1}$

Standard enthalpy change of bond dissociation $C - H = +416 kJmol^{-1}$

- (1) +50 (2) -48 (3) -46 (4) +40 (5) -50

14) $CH_3CONH_2 \xrightarrow{I. LiAlH_4} A \xrightarrow{II. H^+/H_2O} B \xrightarrow{NaNO_2+HCl} C \xrightarrow{H^+/KMnO_4} D$

the structures of A,B and C respectively are

- (1) A - $CH_3CH_2NH_2$ B - $CH_3CH_2N_2Cl$ C - CH_3CH_2OH
- (2) A - CH_3CH_2OH B - CH_3CHO C - CH_3CH_2COOH
- (3) A - $CH_3CH_2NH_2$ B - CH_3CH_2OH C - CH_3CH_2COOH
- (4) A - $CH_3CH_2NH_2$ B - CH_3CH_2OH C - CH_3CHO
- (5) A - $CH_3CH_2NH_2$ B - CH_3CH_2OH C - CH_3COOH

15) Which one is the incorrect statement about H_2O_2

- (1) Black colour Pbs can be Oxidized as white colour $PbSO_4$ by H_2O_2
- (2) H_2S Can be Oxidized as H_2SO_4 by H_2O_2
- (3) Cr^{3+} can be oxidized as CrO_4^{2-} in basic medium by H_2O_2
- (4) MnO_4^- Can be reduced as Mn^{2+} by H_2O_2
- (5) $20cm^3 O_2$ Can be obtained by decomasition of $1 cm^3$ "20 Volume" Strength $H_2O_{2(aq)}$ in STP condition.

❖ The questions 16 – 20, use the following instructions.

1) Only (a) and (b) are correct	2) Only (b) and (c) are correct	3) Only (c) and (d) are correct	4) Only (a) and (d) are correct	5) Any other Combination.
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16) Which of the following statement is / are true.

- a) A Volume of a given mass of ideal gas at $25^\circ C$ will have a volume 3 times its volume at constant pressure and temperature will be $621^\circ C$
- b) NH_3 can be never liquefied by changing its temperature and pressure.
- c) In CO_2 different temperature and pressure at which the solid and its gas reach equilibrium cannot be observed.
- d) The *Maxwel – Boltzman* speed distribution curve of an ideal gas is asymmetric about the maximum point

17) which of the following step / steps in the $CH_4 + Cl_{2(g)}$ reaction.

- a) $CH_4 + \dot{Cl} \rightarrow CH_3Cl + \dot{H}$
- b) $CH_2Cl_2 \rightarrow HCl \rightarrow CHCl_3 + H_2$
- c) $\dot{C}H_3 + Cl_2 \rightarrow CH_3Cl + \dot{Cl}$
- d) $CH_3Cl + \dot{Cl} \rightarrow \dot{C}H_2Cl + HCl$

18) Which is / are the electron pair geometry as trigonalbipyramidal

- a) IF_5
- b) SF_4
- c) I_3^-
- d) $BrO_2F_4^-$

19) Some of the reactions associated with $NH_{3(g)}$ as product

- a) $NH_4^+ + ^-OH \longrightarrow$
- b) $NO_3^- + Al + ^-OH \longrightarrow$
- c) $NO_3^- + Fe + ^-OH \longrightarrow$
- d) $NO_2^- + Al + ^-OH \longrightarrow$

20) Which of the following thermo chemical changes is / are correct?

- a) ΔH_c° of $C_2H_6 \Rightarrow C_2H_{6(g)} + \frac{7}{2}O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(l)}$
- b) ΔH_{atom}° of $Ca \Rightarrow Ca_{(s)} \rightarrow Ca_{(g)}$
- c) ΔH_L° of $KF_{(s)} \Rightarrow KF_{(s)} \rightarrow K_{(aq)}^+ + F_{(aq)}^-$
- d) ΔH_f° of $N_{(g)} \Rightarrow N_{2(g)} \rightarrow 2N_{(g)}$

❖ Instructions for questions 21 – 25.

Response	1st	2 nd statement
1	True	True, and correctly explains the 1 st statement
2	True	True, but doesn't explain the 1 st statement
3	True	False
4	False	True
5	False	False

	statement I	statement II
21)	Boiling point of $CH_3CH_2CH_2CH_3$ is greater than $CH_3 - CH - CH_3$ $\quad \quad \quad $ $\quad \quad \quad CH_3$	Surface area of <i>n</i> -butane is greater than 2-methylpropane.
22)	Grignard reagent can be formed from $HC \equiv C - CH_2 - CH_2Br$.	Grignard reagents produce from alkylhalide
23)	$N_{2(g)}$ and $H_{2(g)}$ can be obtained from $NH_{3(g)}$.	$NH_{3(g)}$ under goes disproportionation reaction
24)	5 atoms are plane in PCl_5 .	PCl_5 is pentagonal shape
25)	OF_2 can be formed	OF_2 is denoted as difluorine monoxide.



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02

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IIB

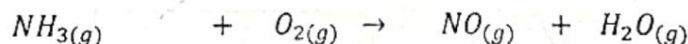
Essay Questions

❖ Answer any two questions only

- 01) (a) Thermo chemical data of $N_{2(g)}$, $H_{2(g)}$, $NH_{3(g)}$ are given below
 ΔH_D^0 (Std bond dissociation enthalpy change)

	ΔH_D^0 $KJmol^{-1}$	S^0 $Jmol^{-1}K^{-1}$
N_2	950	192
H_2	431	131
$N-H$	390	-
NH_3	-	193

- (i) Calculate standard formation enthalpy change ΔH_f^0 of $NH_{3(g)}$
- (ii) Calculate standard entropy change ΔS^0 of above reaction
- (iii) Calculate ΔG^0 above reaction.
- (iv) Express the spontaneous of above reaction at 27^0C and what will happen to spontaneous of the reaction with increasing temperature.
- (v) When $NH_{3(g)}$ react with $O_{2(g)}$ form $NO_{(g)}$ and $H_2O_{(g)}$ as products. Calculate the enthalpy change of the following reaction by using above and below data.



	$O_{2(g)}$	$NO_{(g)}$	$H_2O_{(g)}$
$\Delta H_f^0 (kJmol^{-1})$	0	+ 90	- 242

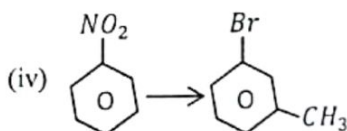
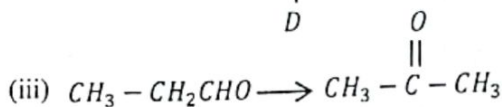
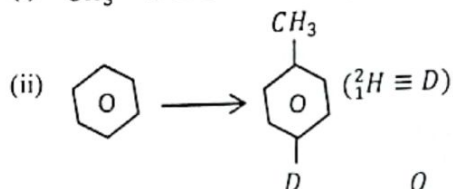
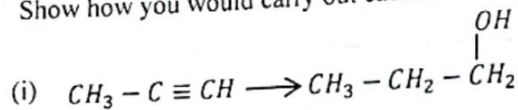
- (vi) Calculate the ΔH_R^0 (in $kJmol^{-1}$) of above reaction products H_2O as in liquid state [$H_2O_{(l)}$]
 $H_2O_{(l)} \rightarrow H_2O_{(g)} \Delta H_{vap}^0 = +44 kJmol^{-1}$

(b)

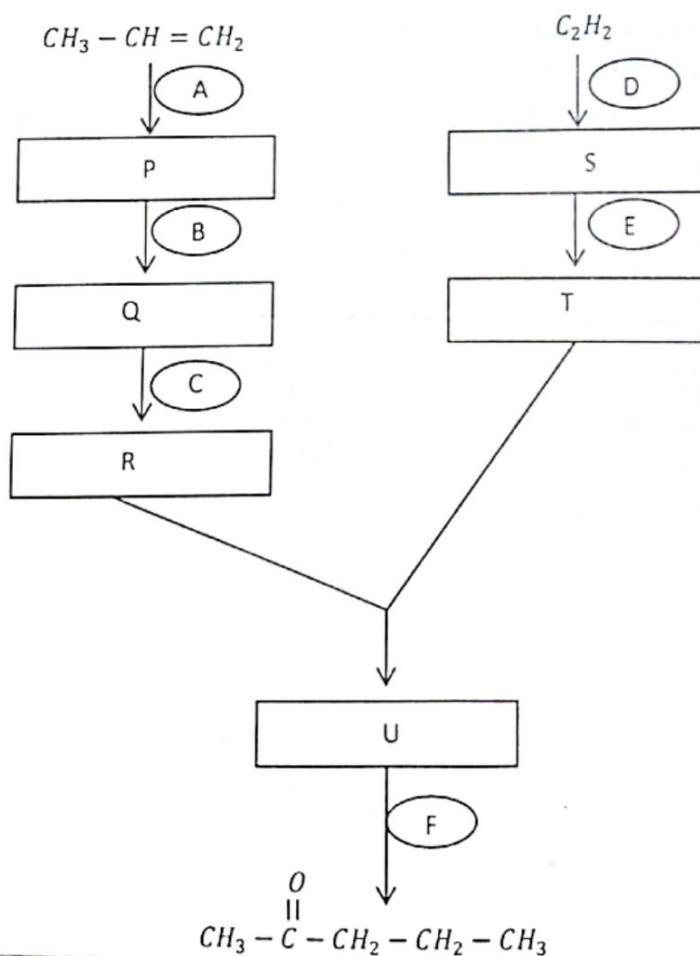
- (i) Explain the critical temperature of gases
- (ii) Consider $O_{2(g)}$ and $CO_{2(g)}$, which one has higher critical temperature give the reason.
- (iii) $CO_{2(g)}$ and $O_{2(g)}$ gas mixture is present in rigid volume at 27^0C volume percentage of 40% CO_2 and 60% O_2 . Total pressure of system $1 \times 10^5 Pa$
 - (1) Calculate the partial pressure of O_2 , CO_2
 - (2) Calculate the average molecular mass of gas mixture.
 - (3) Calculate the density of the gas mixture.

02) (a) Hydrocarbon X given CO_2 and H_2O during the combustion as mole ratio of $CO_2:H_2O$ 1:1

- (1) (i) Give the empirical formula of X?
 - (ii) Find out the molecular formula of X [molecular weight 56]
 - (iii) Draw all possible structure of X
 - (iv) X when treated with $Br_2(CCl_4)$ give a product, that product treated with $alcKOH$ obtain product Y. when Y react with Na give $H_2(g)$ and Z deduce Y, Z and correct structure of X.
- (2) Show how you would carry out each of the following conversions.

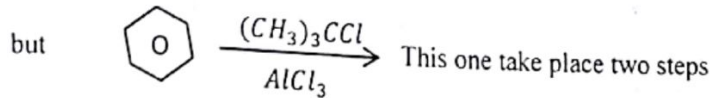
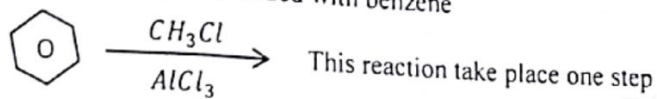


(b) Using only the chemical given in the list show how you would carry out the following conversation.



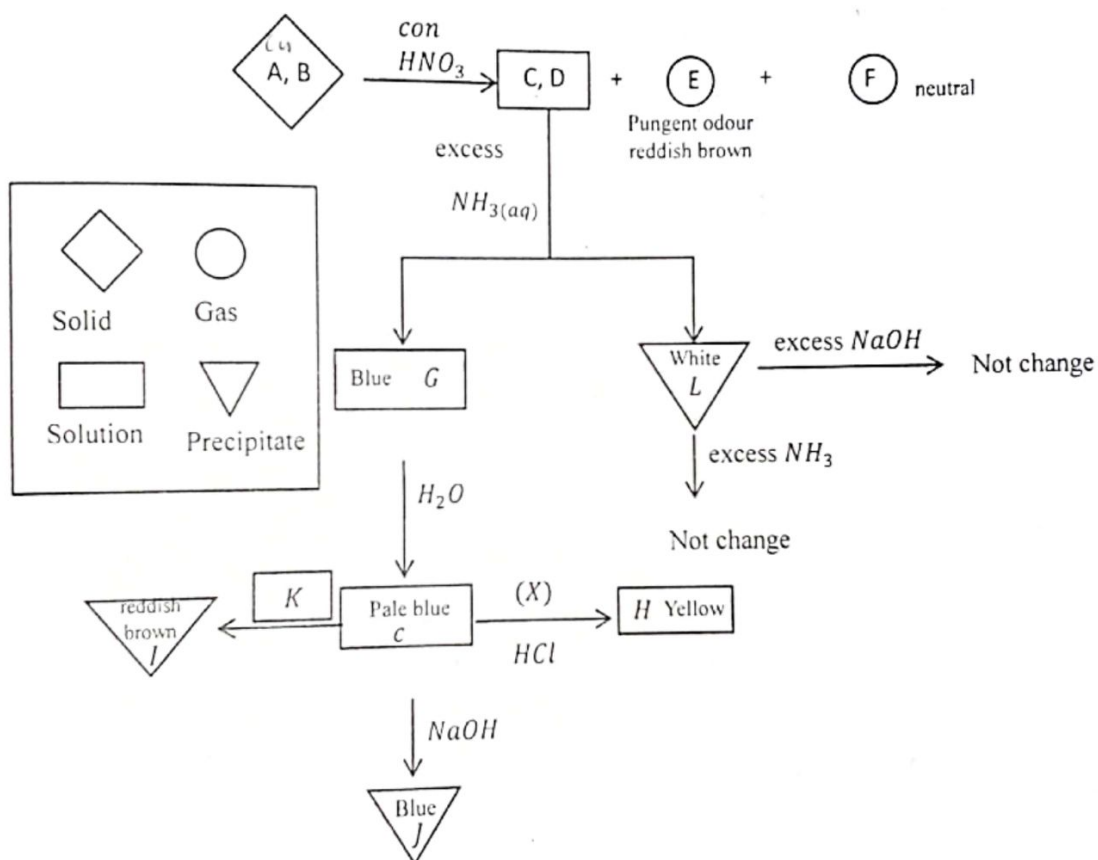
$H_2(g)$, Pd , $BaSO_4$, Sulfur quinoline, alc KOH , $Br_2(CCl_4)$, Na , $HgSO_4$, dil H_2SO_4 , HCl

(c) Explain electrophile bonded with benzene



03) (a) 2 metals A and B presence in a mixture of X. Write the chemical formula of the substances A – L given in the follow chart.

A- d block element, B- s block element



- Write the chemical formula of A -L
- Give the electronic configurations of A and B
- If use dil HNO_3 instead of con HNO_3 what will be happened.
- Give uses of metal B

- (b) 2g of impure FeC_2O_4 sample was dissolved in dil H_2SO_4 then it titrate against 0.1M $KMnO_4$ (MnO_4^-) at $65^\circ C$ as temperature. Needed volume of $KMnO_4$ is $60cm^3$ ($FeC_2O_4 = 144$)
- Deduce the one oxidizing agent and two reducing agents in this reaction
 - Give the reaction of MnO_4^- with FeC_2O_4
 - Calculate the mole amount of $KMnO_4$ and FeC_2O_4
 - Calculate the pure mass percentage of FeC_2O_4 [$FeC_2O_4 = 144$]
- (c) P and Q are strong acids. P dibasic acid Q mono basic acid. When P and Q react with each other P act as acid Q act as base
- Find out P and Q and write down the reaction
 - Explain how electrophile form from above reaction [show electron leap as arrows]