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Uva Provincial Education Department – Badulla.

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General Certificate of Education (Advanced Level) Examination - Practice Test 2026

රසායන විද්‍යාව - I
Chemistry - I

02 E I

Grade 13

කාලය : පැය දෙකයි
Time : Two hours

Instructions :

- This paper consists of 11 pages.
- Periodic table printed on page 11 can be detached if necessary.
- Answer **all** the questions.
- **Use of calculators is not allowed**.
- Write your index Number given on the back of the answer sheet carefully.
- In each of the questions 1 to 50, pick one of the alternatives from (1), (2), (3), (4), (5) which is correct or most appropriate and mark your response on the answer sheet with a cross (X)in accordance with the instructions given on the back of the answer sheet.

Universal gas constant $R = 8.314\ JK^{-1}mol^{-1}$ Plank's constant $h = 6.626 \times 10^{-34}\ Js$
Avogadro constant $N_A = 6.022 \times 10^{23}\ mol^{-1}$ Velocity of light $C = 3 \times 10^{8}\ ms^{-1}$

01. The scientists responsible for following investigations,
    I. Number of positive charges on the nucleus increases in atoms by single electron unit.
    II. Under appropriate conditions, matters behave as a wave and stream of particles.
    (1) Albert Einstein, Jeffry Morsley
    (2) Jeffry Morsley, Leui De-broglie
    (3) Rutherford, Max plank.
    (4) Rutherford, Niel bohr
    (5) J.J.Thompson, Leui De-broglie

02. Number of electrons with n = 3 and ℓ = 1 for Sc^{3+} is,
    (1) 2 (2) 8 (3) 6 (4) 12 (5) 1

03. Intermolecular interactions correctly represent by,
    (1) $NaCl_{(S)}$ / $H_2O_{(\ell)}$ – H – bond
    (2) $ICl_{(s)}$ – dispersion forces
    (3) $I_{2(s)}$ – dipole – dipole interactions.
    (4) $I_{2(s)}$ / $H_2O_{(\ell)}$ – dipole – induced dipole interaction
    (5) $HBr_{(g)}$ / $Ar_{(g)}$ – ion – induced dipole interactions.

04. K_P for the reaction at 600K is $4 \times 10^6\ Pa^2$.

$$NH_4Cl_{(s)} \rightleftharpoons NH_{3(g)} + HCl_{(g)}$$

0.01 mol of solid NH_4Cl in 5 dm^3 vessel heat at 600K. Dissociation amount of NH_4Cl is,
    (1) 0.1 (2) 0.2 (3) 0.3 (4) 0.01 (5) 0.02

05. X and Y are successive elements in same period. X^{2+} and Y^{3+} are isoelectronic two ions. Details of the ions given as follows.

Ion	X^{2+}	Y^{3+}
Number of protons	12	c
Number of neutrons	12	d
Number of electrons	a	e
Mass number	b	27

Correct relationship is,

(1) a = 12, b = 12, c = 12, d = 10, e = 24

(2) a = 10, b = 24, c = 14, d = 13, e = 12

(3) a = 10, b = 24, c = 13, d = 14, e = 10

(4) a = 10, b = 27, c = 14, d = 13, e = 10

(5) a = 12, b = 24, c = 14, d = 13, e = 10

06. Increasing order of electronegativity in N atom in the chemical species NF_3, NH_2NH_2 , NH_2OH and NH_3 correctly represent by,

(1) $NH_3 < NH_2NH_2 < NH_2OH < NF_3$

(2) $NF_3 < NH_3 < NH_2NH_2 < NH_2OH$

(3) $NH_3 < NH_2OH < NH_2NH_2 < NF_3$

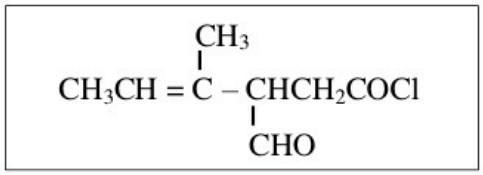
(4) $NH_2NH_2 < NH_2OH < NH_3 < NF_3$

(5) $NF_3 < NH_2OH < NH_2NH_2 < NH_3$

07. Siderite mineral contain $FeCO_3$, $CaCO_3$ and other impurities in trace amounts. 8.40g of siderite sample heated to obtain constant mass. Mass of residue 5.10 g. The residue dissolved in dilute H_2SO_4 and resultant solution titrated with 0.4 $moldm^{-3}$ $KMnO_4$ solution and end point reading is 25.00 cm^3. Molar ratio between $FeCO_3 : CaCO_3$ is, (Fe = 56, Ca = 40, O = 16)

(1) 1 : 1 (2) 2 : 1 (3) 1 : 2 (4) 3 : 1 (5) 1 : 3

08. IUPAC name of the compound is,



(1) 3 – formyl – 3 – methyl hexanoyl chloride

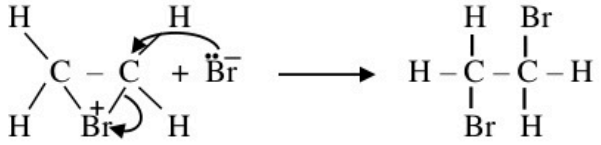
(2) 3 – oxo – 3 – methyl hexanoyl chloride

(3) 3 – oxo – 3 – methyl – 4 – hexenoyl chloride

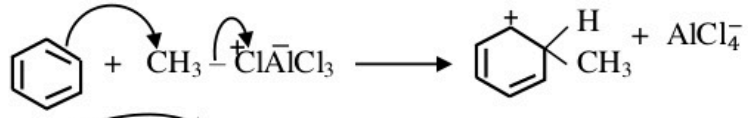
(4) 3 – formyl – 4 – methyl – 4 – hexenoyl chloride

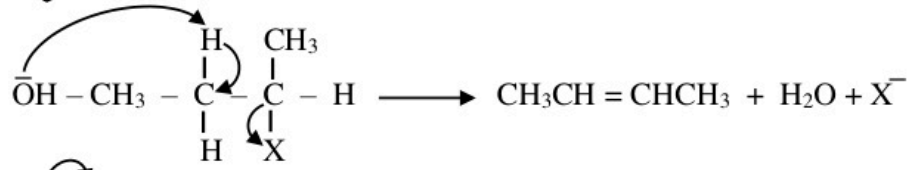
(5) 4 – methyl – 3 – oxo – 4 – hexenoyl chloride

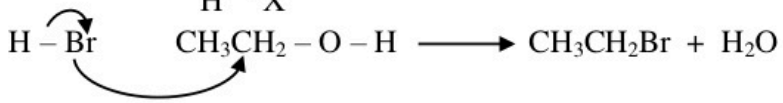
09. The step that do not occurs in a mechanism is,

(1) 

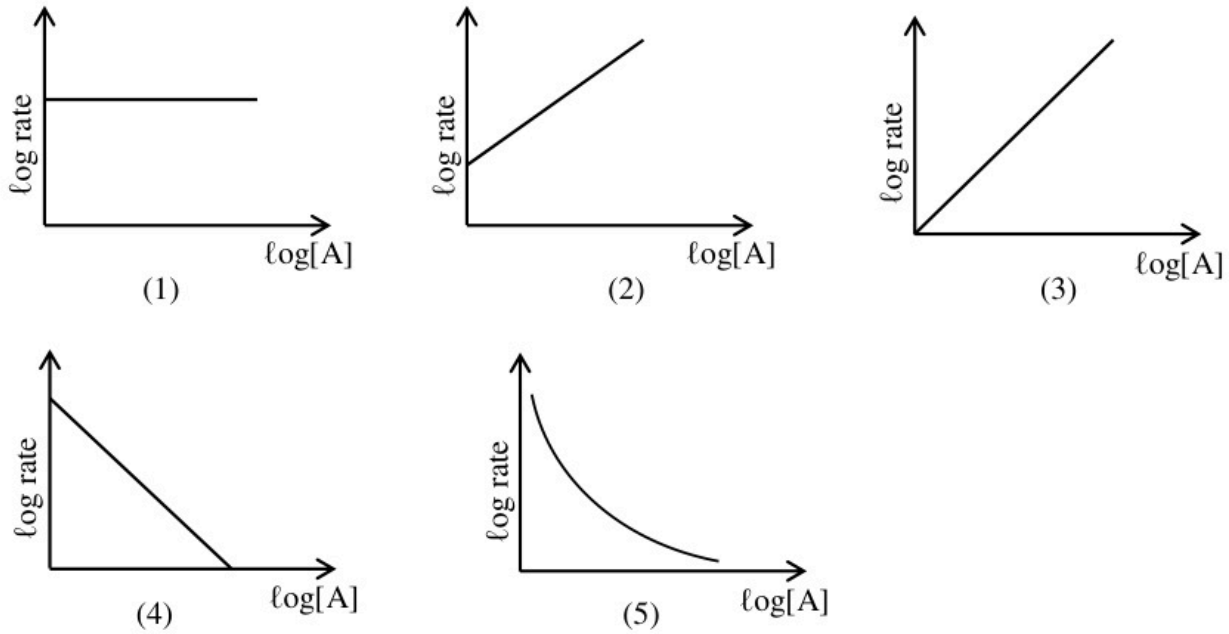
(2)

(3) 

(4) 

(5) 

10. Consider the first order reaction A → P take place at T temperature. Which of the graph correctly represent ℓog[A] vs ℓog rate at T temperature is,



11. Shape of SF_2, SF_3^+, SF_3^- and SF_4^{2-} correctly represent by,
    (1) Angular, pyramidal, T - shape, and square planer.
    (2) Linear, trigonal planer, pyramidal, square planer.
    (3) Linear, pyramidal, T - shape, square planer.
    (4) Angular, trigonal planer, pyramidal and tetrahedral.
    (5) Angular, pyramidal, T - shape, tetrahedral.

12. 25.00 cm^3 of $Fe(NO_2)_2$ solution taken in to titration flask and diluted with dil. H_2SO_4 and titrated with 0.04 $moldm^{-3}$ $KMnO_4$ solution. Required volume of $KMnO_4$ is 30.00 cm^3. Concentration of $Fe(NO_2)_2$ solution is ($moldm^{-3}$),
    (1) 0.01 (2) 0.12 (3) 0.024 (4) 0.048 (5) 0.24

13. 200 cm^3 of 0.5 $moldm^{-3}$ HCl solution added with 4.0 g of NaOH in thermo resistant vessel. What is the change in temperature inside the vessel.

Neutralization enthalpy of acid = –57 $KJmol^{-1}$
Specific heat capacity of solution. = 4.2 J g^{-1} K^{-1}
Density of solution = 1.0 g cm^{-3}

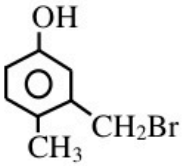
(1) 8.2 ^0C (2) 6.8 ^0C (3) 5.6 ^0C (4) 4.2 ^0C (5) 3.0 ^0C

14. 30.0 cm^3 of 0.2 $moldm^{-3}$ monoprotic weak acid titrated with 0.2 $moldm^{-3}$ NaOH solution at 25^0C when 15.0 cm^3 of NaOH added, pH of the solution is 5.0 Dissociation constant of weak acid K_a, and pH at equivalence point at 25^0C is,

(1) 2.5×10^{-4} $moldm^{-3}$ and pH = 5
(2) 2.5×10^{-5} $moldm^{-3}$ and pH = 9
(3) 1×10^{-5} $moldm^{-3}$ and pH = 9
(4) 1×10^{-5} $moldm^{-3}$ and pH = 5
(5) 1×10^{-6} $moldm^{-3}$ and pH = 9

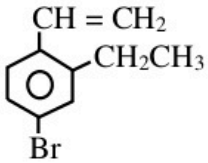
15. Which of the following compound can be used to prepare Grignard solution?

(1) $H-C\equiv C-\underset{\underset{Br}{|}}{CH}\,CH_3$

(2) 

(3) $CH_3-\overset{\overset{O}{\|}}{C}-CH_2CH_2CH_2Cl$

(4) $CH_3\underset{\underset{NH_2}{|}}{CH}\,C\equiv C-CH_2CH_2Br$

(5) 

16. At constant temperature $NO_{2(g)}$, $CO_{(g)}$ react as follows in according to following mechanism k_1 and k_2 are rate constants.

$NO_{2(g)} + NO_{2(g)} \xrightarrow{k_1} NO_{3(g)} + NO_{(g)}$ —— (1) (slow)
$NO_{3(g)} + CO_{2(g)} \xrightarrow{k_2} NO_{2(g)} + CO_{2(g)}$ —— (1) (fast)

Incorrect statement regarding above reaction is,

(1) Speed of the overall reaction, depend only on rate constant k_1.
(2) $NO_{3(g)}$, act as intermediate.
(3) Rate law is $R = k\,[NO_{2(g)}]^2\,[CO_{(g)}]$.
(4) CO, contribute for the reaction, after rate determining step and therefore not included in the rate law.
(5) Rate constant for overall reaction is $k = k_1$.

17. $PbCl_{2(s)}$ is in a test tube added with K_2CrO_4 solution and yellow precipitate is form. Following ideas forwarded to explain above observation.

I The reaction take place is $PbCl_{2(s)} + CrO_4^{2-} \longrightarrow PbCrO_{4(s)} + 2Cl^-_{(aq)}$
II K_{sp} $PbCrO_{4(s)}$ > K_{sp} $PbCl_{2(s)}$
III K_{sp} $PbCrO_{4(s)}$ < K_{sp} $PbCl_2$
IV $CrO^{2-}_{4(aq)}$ ion concentration decreases.
V $Cl^-_{(aq)}$ ion concentration decreases.

(1) I, III and IV (2) I, II and IV (3) II, IV and V
(4) I, IV and V (5) I, II and V

18. Consider the equilibrium,

$CCl_{4(\ell)} \rightleftharpoons CCl_{4(g)}$

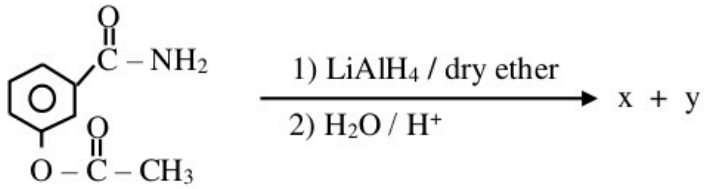
Calculate the normal boiling point of $CCl_{4(\ell)}$ using following data.

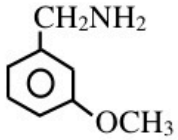
	ΔH_f^θ kJmol^{-1}	ΔS^θ JK^{-1} mol^{-1}
$CCl_{4(\ell)}$	–128	214
$CCl_{4(g)}$	–95	309

(1) 0 ^{0}C (2) 347 K (3) 347^{0}C (4) 25 ^{0}C (5) 173 K

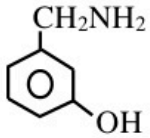
19. Incorrect statement regarding 3d elements,
   (1) The elements from Sc to Mn, release all 3d and 4S electrons to obtain highest oxidation state.
   (2) A solution containing Co^{2+} and Cu^{2+} added with NH_4Cl / NH_3 and send with $H_2S_{(g)}$, both CoS and CuS get precipitated.
   (3) Electronegativity of 3d elements less than P block elements in same period.
   (4) Coloured aqueous solutions formed by all the ion except Sc and Zn.
   (5) Least melting point is in element Zn.

20. x and y respectively,

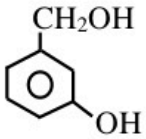


(1) 

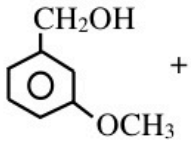
+ CH_3COOH

(2) 

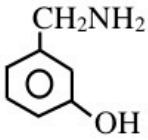
+ CH_3COOH

(3) 

+ CH_3CH_2OH

(4) 

+ CH_3OH

(5) 

+ CH_3CH_2OH

21. A, B and C electrodes forms following two electrochemical cell.

$A_{(s)} / A^{2+}_{(aq)} // B^{3+}_{(aq)} / B_{(s)}$; $E^\theta_{cell} = 0.2V$ —— (1)

$B_{(s)} / B^{3+}_{(aq)} // C^{2+}_{(aq)} / C_{(s)}$; $E^\theta_{cell} = 0.51V$ —— (2)

$B^{3+}_{(aq)} / B_{(s)}$ $E^\theta = -0.74$ V

Incorrect statement is,
   (1) Standard electrode potential of $A_{(s)} / A^{2+}_{(aq)}$ is – 0.94V.
   (2) Electrons in A electrode, move to B electrode in cell ①.
   (3) Electrons in C electrode move to B electrode in cell ②.
   (4) Standard electrode potential is – 0.23V in $C_{(s)} / C^{2+}_{(aq)}$.
   (5) As $A^{2+}_{(aq)}$ concentration increases, electromotive force increases in the cell ①.

PAST PAPERS WIKI

22. ΔH value and ΔG value of following reactions given at T temperature.

I. $2CH_{4(g)} \longrightarrow C_2H_{4(g)} + 2H_{2(g)}$; $\Delta H = 202\ kJmol^{-1}$ $\Delta G = 170\ kJmol^{-1}$

II. $2CH_{4(g)} + O_{2(g)} \longrightarrow C_2H_{4(g)} + 2H_2O_{(g)}$; $\Delta H = -282\ kJmol^{-1}$ $\Delta G = -208\ kJmol^{-1}$

III. $2CH_{4(g)} + 2C_{(s)} \longrightarrow 2C_2H_{4(g)}$; $\Delta H = 254\ KJmol^{-1}$ $\Delta G = 234\ kJmol^{-1}$

Incorrect statement regarding following statements,

(1) Only the method used to synthesis $C_2H_{4(g)}$ from $CH_{4(g)}$ is reaction II.
(2) Reaction I has positive entropy change.
(3) Reaction III has positive entropy change.
(4) Reactions I, II and III can be used to synthesis $C_2H_{4(g)}$ from $CH_{4(g)}$.
(5) Reaction I spontaneous at a temperature less than T.

23. Incorrect statement regarding $C_6H_5NH_2$ (Aniline) is,

(1) Liberate NH_3 with aqueous NaOH.
(2) Forms white precipitate with Br_2.
(3) React with nitrous acid lower than temperature of 5^0C to form diazonium salt.
(4) Basicity is less than $CH_3CH_2NH_2$.
(5) React with CH_3COCl forming amide.

24. Incorrect statement regarding a liquid boiling in closed container at constant temperature,

(1) Interactions between gas molecules are less than interactions between liquid molecules.
(2) Evaporation occurs until complete liquid is disappear.
(3) Evaporation take place at constant rate in the upper surface of liquid.
(4) Vapour pressure decreases as the interaction between the liquid molecules are stronger.
(5) Saturated vapour pressure of a liquid is due to collision of particles with the wall of the container at liquid vapour equilibrium.

25. Consider the data provided for the electro chemical cell at 25^0C.
Cell reaction, E^{θ}_{cell} and number of electron transfer in the complete reaction correctly represent by,

$NO^-_{3(aq)} + 4H^+_{(aq)} + 3e \rightleftharpoons NO_{(g)} + 2H_2O_{(\ell)}$; $E^{\theta}_{cell} = 0.96V$

$Cr_2O^{2-}_{7(aq)} + 14H^+_{(aq)} + 6e \rightleftharpoons 2Cr^{3+}_{(aq)} + 7H_2O$; $E^{\theta} = 1.33\ V$

	Equilibrium cell reaction	$E^{\theta}_{cell}(V)$	Number of electrons transfer
(1)	$6H^+_{(aq)} + Cr_2O^{2-}_{7(aq)} + 2NO_{(g)} \rightleftharpoons 2Cr^{3+}_{(aq)} + 2NO^-_{3(aq)} + 3H_2O_{(\ell)}$	+0.37V	12
(2)	$6H^+_{(aq)} + Cr_2O^{2-}_{7(aq)} + 2NO_{(g)} \rightleftharpoons 2Cr^{3+}_{(aq)} + 2NO^-_{3(aq)} + 3H_2O_{(\ell)}$	–0.37V	12
(3)	$2NO^-_{3(aq)} + 6H^+_{(aq)} + Cr_2O^{2-}_{7(aq)} \rightleftharpoons 2NO_{(g)} + 2Cr^{3+}_{(aq)} + 3H_2O_{(\ell)}$	0.74V	6
(4)	$6H^+_{(aq)} + Cr_2O^{2-}_{7(aq)} + 2NO_{(g)} \rightleftharpoons 2NO^-_{3(aq)} + 2Cr^{3+} + 3H_2O_{(\ell)}$	0.37V	12
(5)	$6H^+_{(aq)} + Cr_2O^{2-}_{7(aq)} + 2NO_{(g)} \rightleftharpoons 2NO^-_{3(aq)} + 2Cr^{3+}_{(aq)} + 3H_2O_{(\ell)}$	–0.74V	9

26. $CuSO_4$ aqueous solution electrolyzed with Cu electrodes using a current of 1.93 A within 10 minutes. Mass of cathode increased by, ($1F = 96500\ Cmol^{-1}$) (Cu = 63.5)

(1) 190.5 mg (2) 381 mg (3) 6 mg (4) 1158 mg (5) 12 mg

27. x and y are organic compounds. x and y react with following three reagents and observations are given below.

Reagent	Observation	
	x	**y**
1. Anhydrous $ZnCl_2$ and conc.HCl	Immediate turbidity is given	NO turbidity.
2. 2, 4 - DNP	Forms a coloured precipitate.	Form a coloured precipitate.
3. NH_3 / $AgNO_3$	forms a silver mirror	No change.

x and y respectively,

(1) $CH_3COCH_2CH_2CH_2OH$ and $CH_3-C(OH)(CH_3)-CH_2CH_2CHO$

(2) $CH_3C(OH)(CH_3)-CH_2CH_2CH_3$ and $CH_3COCH_2CH_2CH_2OH$

(3) $CH_2=CH-C(=O)-CH_2OH$ and $CH_3CH(OH)CH_2CH_2C(=O)-OH$

(4) $CH_3C(OH)(CH_3)-CH_2CH_2CHO$ and $CH_3C(=O)-CH_2CH_2CH_2OH$

(5) $H-C(=O)-CH_2CH_2C(=O)-CH_3$ and $CH_3-C(=O)-CH_2C(OH)(H)-CH_3$

28. Incorrect statement regarding H_2O_2 is,
(1) Boiling point of H_2O_2 is greater than H_2O.
(2) H_2O_2 oxidized by H^+ / $K_2Cr_2O_7$ and forms H_2O.
(3) H_2O_2 react with H^+ / KI and liberate I_2.
(4) H_2O_2 is polar molecule.
(5) Two OH groups of the molecule exist in two different planes.

29. Saturated AgCl aqueous solution added with NH_3 solution. Concentration of NH_3 in the solution is 0.01 $moldm^{-3}$.

25^0C $[Ag(NH_3)_2]^+_{(aq)} \rightleftharpoons Ag^+_{(aq)} + 2NH_{3(aq)}$

$K_c = 6.2 \times 10^{-8}\ mol^2\ dm^{-6}$

25^0C $AgCl_{(s)}$ $K_{sp} = 1.6 \times 10^{-9}\ mol^2\ dm^{-6}$

Concentration of $[Ag(NH_3)_2]^+$ in the solution is, ($moldm^{-3}$).

(1) 0.025 (2) 0.25 (3) 0.054 (4) 0.645 (5) 0.0645

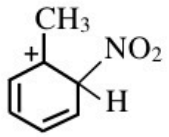
30. Which of the following solution shows minimum change in pH by adding 1.0 cm^3 of 1.0 $moldm^{-3}$ HCl solution for each of the solution.
(1) 0.1 $moldm^{-3}$ HCl 20 cm^3
(2) 1.0 $moldm^{-3}$ CH_3COONa 20 cm^3
(3) 1.0 $moldm^{-3}$ NaOH 20 cm^3
(4) 0.1 $moldm^{-3}$ NH_4Cl 20 cm^3
(5) 1.0 $moldm^{-3}$ CH_3COOH 20 cm^3

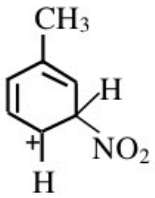
- For each of the questions **31** to **40**, one or more responses out of the four responses **(a), (b), (c), (d)** given is/are correct. Select the correct response / responses. In accordance with the instructions given on your answer sheet, mark.
  (a) If only (a) and (b) are correct.
  (b) If only (b) and (c) are correct.
  (c) If only (c) and (d) are correct.
  (d) If only (a) and (d) are correct.
  (e) If any other number of combination of responses is correct.

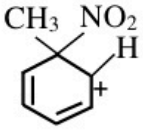
Summary of above instructions.

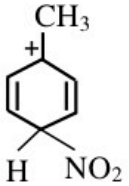
(1)	(2)	(3)	(4)	(5)
Only (a) and (b) are correct	Only (b) and (c) are correct	Only (c) and (d) are correct	Only (d) and (a) are correct	Any other number of combination of responses is correct.

31. Consider the mechanism take place between methyl benzene and conc. HNO_3 / conc. H_2SO_4. Which of the following structure/s correctly represent the ion/ions formed during the reaction.

(a) 

(b) 

(c) 

(d) 

32. Following equilibrium occurs in rigid closed vessel at given temperature.

$$2NO_{(g)} + O_{2(g)} \rightleftharpoons 2NO_{2(g)} \; ; \; \Delta H < O$$

Correct statement/s regarding the above system.

(a) When excess $NO_{2(g)}$ added to the system at above temperature, amount of $NO_{(g)}$ increases and value of equilibrium constant changes.

(b) When the temperature of the system increases amount of $NO_{(g)}$ increases and value of equilibrium constant decreases.

(c) Excess $NO_{(g)}$ added to the system at above temperature, amount of $NO_{2(g)}$ increases and value of equilibrium constant does not change.

(d) When excess $NO_{2(g)}$ added to the system, amount of $O_{2(g)}$ increases and value of equilibrium constant increases.

33. Correct statement/s is/are,

(a) Temperature of 450^0C used in production process of H_2SO_4 by contact process.

(b) Pt/Rh used as a catalyst in the manufacturing process of HNO_3.

(c) Glycerol is the by-product during manufacturing of soap.

(d) CO_2 gas not liberated to atmosphere during production of TiO_2.

34. Correct statement/s regarding S block elements.

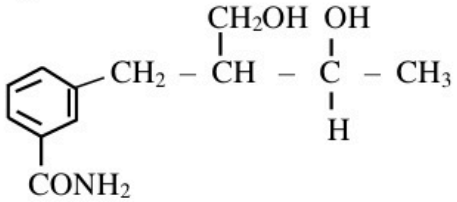
(a) Down the group I, the reaction rate of elements with air increases.

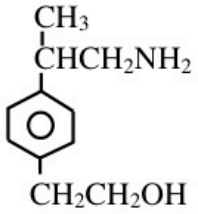
(b) Hardness of elements in group II is higher than group I.

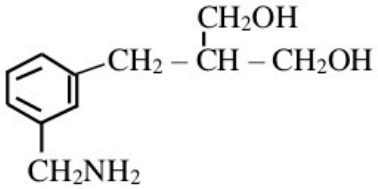
(c) Electronegativity of group II elements less than electronegativity of group I.

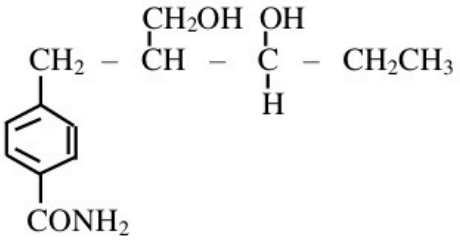
(d) Second ionization energy of group II elements greater than second ionization energy of group I.

35. Compound A heated with aqueous NaOH and ammonia gas liberated. Compound A added with acidified $K_2Cr_2O_7$ and the product formed gives coloured precipitate with 2, 4 – dinitrophenyl hydrazine. A added with PCC and the product formed gives silver mirror with tollen's reagent. A may be,

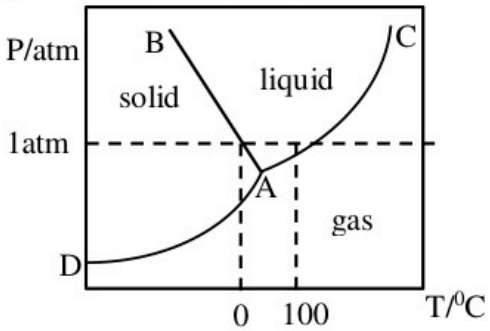
(a) 

(b) 

(c) 

(d) 

36. Phase diagram of M pure liquid given in the following diagram.



Correct statement/s regarding above is,
(a) A is the triple point of M liquid.
(b) To converted gas in to liquid, temperature should higher than 100^0C and pressure should greater than 1.0 atm.
(c) When the pressure of the system gradually decreases from 1 atm, liquid phase cannot be detected.
(d) When the temperature of the system gradually increases, the equilibrium between liquid phase and gas phase remain unchanged.

37. Correct statement regarding acid rain.
(a) CO_2 dissolved in rain water and forms H_2CO_3 which contribute for acid rain.
(b) SO_2 and SO_3 gases are responsible for acid rain.
(c) Acid rain damage statues and other artistic creations made by marble.
(d) pH of water and concentration of heavy metals in reservoirs increases due to acid rain.

38. Correct statement/s regarding NH_3.
(a) $NH_{3(g)}$ oxidize by atmospheric oxygen and forms NO.
(b) $NH_{3(g)}$ cannot be act as oxidizing agent.
(c) With presence of Pt / Rh catalyst $NH_{3(g)}$ oxidize to form NO and NH_2.
(d) $N_{2(g)}$ needed for habour process (NH_3 production) obtain by fractional distillation of air.

39. Enthalpy change for the following reaction at 25^0C is, $\Delta H = -2219.9\ kJmol^{-1}$.

$$C_3H_{8(g)} + 5O_{2(g)} \longrightarrow 3CO_{2(g)} + 4H_2O_{(\ell)}$$

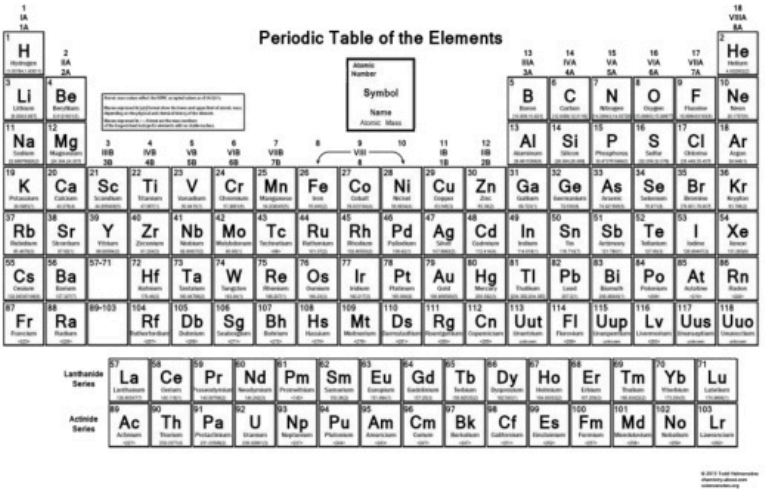
Correct statement regarding enthalpy change of the reaction at 25^0C is,
(a) The reaction is exothermic and liberated energy used as a fuel.
(b) 44g of $C_3H_{8(g)}$ liberated $2219.9\ kJmol^{-1}$ of energy.
(c) 88g of $C_3H_{8(g)}$ liberated $4439.8\ kJmol^{-1}$ of energy.
(d) 44g of $C_3H_{8(g)}$ absorbed $2219.9\ kJmol^{-1}$ of energy.

40. Correct statement regarding polymers.
    (a) PVC is addition polymer.
    (b) Polystyrene is addition and thermoplastic polymer.
    (c) Backelite is condensation and thermoplastic polymer.
    (d) Nylon 6, 6 is condensation and thermoplastic polymer.

- In question Nos. **41** to **50** two statements are given in respect of each question. From the table below, select the correct response out of the responses (1), (2), (3), (4) and (5) that best fits the two statements and mark appropriately on your answer sheet.

Response	1st statement	2nd statement
(1)	True	True, and correctly explains the 1st statement correctly.
(2)	True	True, but does not explains the first statement.
(3)	True	False
(4)	False	True
(5)	False	False

	First statement	Second statement
41.	First ionization energy of group I in the periodic table decreases from top to bottom.	Down the group atomic radius increases and, the attraction force of nucleus to outer most electron decreases.
42.	All the aldehydes and Ketones undergoes self-ionization with NaOH.	Number of carbon atoms in the carbon chain doubled, by condensation reaction.
43.	Ideal solution obey Rault law.	Enthalpy change or volume change do not occurs in ideal solution.
44.	The boiling point of CH_3COOH is higher than the boiling point of $CH_3CH_2CH_2OH$.	The only type of intermolecular attraction force present in both compounds is hydrogen bonding.
45.	N_2O gas is responsible for increase of global temperature.	Action of denitrifying bacteria on the nitrogen compounds added to soil as fertilizer in agriculture produces nitrous oxide (N_2O).
46.	Neutral solution do not formed at equivalence point in the titration of aqueous HCOOH with NaOH.	$HCOO^-$ react with H_2O forming OH^-.
47.	CH_3CONH_2 warmed with NaOH and ammonia gas liberated.	Basicity of CH_3CONH_2 greater than $CH_3CH_2NH_2$.
48.	Solubility of $Ni(OH)_2$ at pH = 6 is greater than pH = 9.	At higher pH, concentration of OH^- ions in the solution higher and has common ion effect.
49.	Major two steps are chlorination and oxidation in the process of TiO_2 production.	TiO_2 is not affected for global warming.
50.	SO_2 gas cannot act as oxidizing agent.	SO_2 gas send through acidic $K_2Cr_2O_7$ solution orange colour converted to clear green colour solution.



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Uva Provincial Education Department – Badulla.

රසායන විද්‍යාව - II
Chemistry - II

අධ්‍යයන පොදු සහතික පත්‍ර උසස් පෙළ විභාගය - පෙරහුරු පරීක්ෂණය 2026
General Certificate of Education (Advanced Level) Examination - Practice Test 2026

02 E II

පැය තුනයි
Three hours

Grade 13

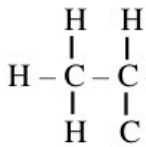
අමතර කියවීම් කාලය - මිනිත්තු 10 යි.
Additional Reading Time - 10 minutes

Use additional reading time to go through the question paper, select the questions and decide on the questions that you give priority in answering.

Index number :

* A periodic table is provided on page 13.
* Use of calculators is not allowed.
* Universal got constant R = 8.314 $JE^{-1}mol^{-1}$
* Avogadro constant N_A = 6.022 x 10^{23} mol^{-1}
* In answering this paper, you may represent alkyl groups in a condensed manner.

Example



– Group may be shown $CH_3CH_2^-$

○ **PART A – Structured Essay (Pages 02 – 07)**

* **Answer all** the questions on the question paper itself.
* Write your answer in the space provided for each question. Please note that the space provided is sufficient for the answer and that extensive answers are not expected.

○ **PART B and PART C - Essay (Pages 08 – 13)**

* Answer four questions selecting two questions from each part. Use the papers supplied for this purpose.
* At the end of the time allotted for this paper, tie the answers to the three Parts **A**, **B** and **C** together so that Part **A** is on top and hand them over to the Supervisor.
* You are permitted to remove **only** Parts **B** and **C** of the question paper from the Examination Hall.

For Examiner's Use only.

Part	Questions No.	Marks
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
C	8	
	9	
	10	

Total	
In numbers	
In Letters	

Code numbers

Marking Examiner 1	
Marking Examiner 2	
Checked by :	
Supervised by :	

Part A – Structured Essay

(1).a). State whether following statement are true or false.

i). Different gases, generate positive rays particals with different masses, and different charges. (.....)

ii). Cr^{3+} ion has only three electrons with $\ell = 2$. (.....)

iii). Electron pair geometry of $BrOF_3$ molecule is square pyramidal. (.....)

iv). Radius of Ba^{2+} us greater than radius of Mg^{2+} ion. (.....)

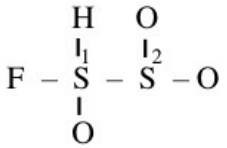
v). Electron gain energy of Beryllium has positive value. (.....)

vi). First ionization energy of Be, Mg, Na, B and Al varies as Be > B > Mg > Al > Na. (.....)

vii). Phenol has highest boiling point among orthonitrophenol, paranitrophenol and phenol. (.....)

viii). The Vander Waals radius of I_2 is less than the covalent radius of I_2. (.....)

b). i). Draw the most acceptable lewis dot – dash diagram for S_2O_3FH molecule.



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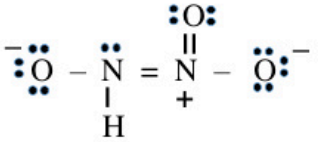
ii). State the oxidation states of S according to above structure.

S^1 ..... S^2 .....

iii). Stable lewis dot dash diagram for $HN_2O_3^-$ ion given as follows. Draw another two lewis dot – dash structures (resonance structures) for above molecule. Indicate the stability of each of the structure.



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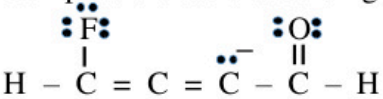
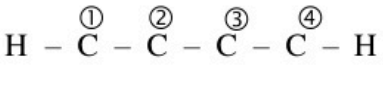
iv). Complete the table according to the labeled structure.





		C^1	C^2	C^3	C^4
I	Number of VSEPR pair around the atom.				
II	Electron pair geometry around the atom.				
III	Shape around the atom.				
IV	Hybridization of the atom.				

Parts (v) to (vii) are based on the Lewis dot-dash structure given in part (iv). The labeling of the atoms is the same as in part (iv).

v). Identify atomic / hybrid orbitals responsible for formation of σ bond.

i) $C^1 - F$ C^1 ……. F ……..

ii) $C^1 - H$ C^1 ……. H ……..

iii) $C^1 - C^2$ C^1 ……. C^2 ……..

iv) $C^2 - C^3$ C^2 ……. C^3 ……..

v) $C^3 - C^4$ C^3 ……. C^4 ……

vi) $C^4 - O$ C^4 ……. O ……

vii) $C^4 - H$ C^4 ……. H ……

vi). Identify the atomic orbitals responsible for formation of π bond.

i) $C^1 - C^2$ C^1 ……. C^2 ……..

ii) $C^2 - C^3$ C^2 ……. C^3 ……..

iii) $C^4 - O$ C^4 ……. O ……..

vii). Mention the approximate bond angles around C^1, C^2, C^3 and C^4 atoms.

C^1 …… C^2 …… C^3 ……. C^4 ……..

vii) Arrange he increasing order of electronegativity of C^1, C^2, C^3 and C^4 atoms.

.....

c). Arrange the following species into increasing order, the property given in the parenthesis.

i). NH_3, NOCl, NF_3, NH_4^+, NH_2^- (bond angle)

.....

ii). KBr, NaCl, NaF, LiF, LiCl (ionic characters)

.....

(2).a). X is P block element. X shows range of oxidation numbers. X act as a bleaching agent, and used to disinfectant in water. Hydride of X shows strong acidic properties.

i). Identify X element.

.....

ii). Write the electron configuration of X as $1S^2\ 2S^2$ ……

.....

iii). Write three oxidation states of X.

.....

iv). X element react with cold dilute NaOH and hot concentrated NaOH. Write balanced equations for each.

X with NaOH (dil) .....

X with NaOH (conc) .....

v). Draw three oxo – acids formed by X. Give IUPAC name.

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vi). Write the reaction of X with water.

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vii). What is the type of reaction mention in (vi).

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viii).I. Write a name of polymer including above element X.

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II. Draw the structure of above polymer.

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ix). Write the X anion with $AgNO_3$.

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x). Write an experiment and observation to confirm the above product. Write relevant equation.

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b). Y is P block element. Y is third abundant element in earth crust. Y react with HCl and NaOH.

i) Identify Y element.

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ii) Write the configuration of Y element as $1S^2\ 2S^2$.

.....

.....

iii) Y react with both HCl and NaOH. Write balanced chemical equations.

Y with HCl - .....

Y with NaOH - .....

iv) Y and NaOH used to identify NO_3^- ions in aqueous solution. Write relevant ionic equation.

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v) Write the gas liberated in above (iv). .....

vi) Write an experiment and observation used to identify above (v) mention gas.

Test - .....

Observation - .....

vii) Write the chemical formula for existence of stable ion of Y in aqueous solution.

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Write IUPAC name.

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viii) Using a balanced equation explain whether the aqueous solution of Y is acidic or basic?

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ix) Write a method to confirm the existence of above ion in the solution.

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x) Write three industrial uses of Y.

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(3). a). A and B volatile liquids forms an ideal solution. At constant temperature, in a rigid closed vessel molar ratio between A and B is 1 : 3 in liquid phase, which is in equilibrium with its vapour, total vapour pressure is 2 x 10^4 Pa. At the same temperature A : B molar ratio is 3 : 1 in liquid phase which is equilibrium with its vapour, total vapour pressure is 1.5 x 10^4 Pa.

i). Write a relationship between vapour pressure of A (P_A), saturated vapour pressure of A (P_A^0) and mole fraction of A in liquid phase.

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ii). Calculate saturated vapour pressure of A and B.

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iii). Calculate the mole fraction of A and B in vapour phase when the A : B molar ratio is 1 : 3 in liquid phase.

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iv). Calculate the mole fraction of A and B in vapour phase when the A : B molar ratio 3 : 1 in the liquid phase.

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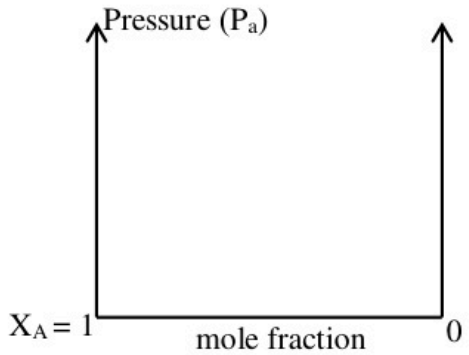
v). Draw vapour pressure, composition phase diagram at constant temperature for above two instances. Indicate relevant pressures.



b). At 25^0 C Ni^{2+} concentration in the solution is 0.1 $moldm^{-3}$. Ni^{2+} should precipitate as NiS, sending H_2S through the solution. H_2S concentration in the solution maintain as 0.1 $moldm^{-3}$. (NiS $K_{SP} = 3.0 \times 10^{-21}$ $moldm^{-6}$)

i) Calculate minimum concentration should have to precipitate Ni^{2+} ion.

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ii) Calculate the value of $[H_3O^+_{(aq)}]^2\ [S^{2-}_{(aq)}]$.

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iii) Calculate minimum pH value should have in the solution to precipitate NiS.

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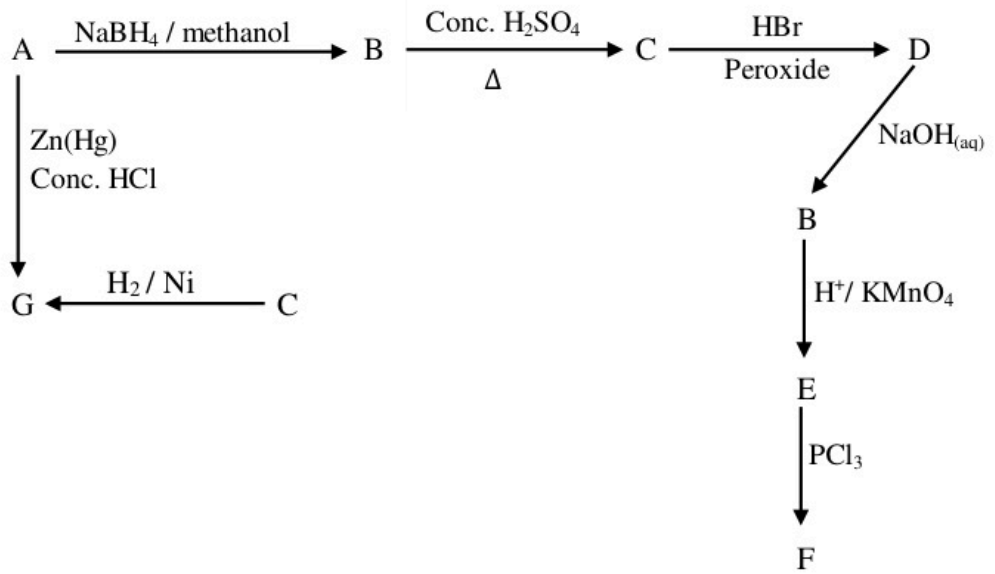
(H_2S first ionization constant (K_{a_1}) = 9.1×10^{-8} $moldm^{-3}$ and
Second ionization constant (K_{a_2}) = 1×10^{-19} $moldm^{-3}$)

(4).a). Consider the following sequence of reactions.

- A is a optically inactive, branched molecule compound with a molecular formula C_4H_8O.
- C is a compound with molecular formula C_4H_8 which do not shows geometrical isomerism.
- Molecular formula of E is $C_4H_8O_2$, which is optically inactive. E compound react with aqueous Na_2CO_3 and releases CO_2.



i) Draw structures of A, B, C, D, E, F and G.

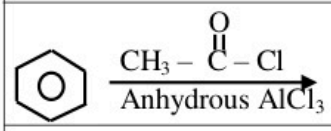
A B C D

E F G

ii) Compound C subjected to react with conc. H_2SO_4 and heated with H^+/H_2O to obtain X. X can be converted to y (Alkyl bromide) by one step.
Identify X and Y. Write the reagent used to convert X to Y.

X Y reagent

b). i). Write the type of reaction for following reactions as
nucleophilic addition (A_N), electrophilic addition (A_E), neucleopilic substitution (S_N), electrophilic addition (S_E), Elimination (E). Mention major product in the lable.

	reaction	Type of reaction	Major product
i)	$CH_3C \equiv C - H \xrightarrow[\text{dil. } H_2SO_4]{HgSO_4}$		
ii)			
iii)	$CH_3 - CH_2 - \overset{O}{\overset{\|\|}{C}} - CH_3 \xrightarrow{HCN}$		

ii). Write the mechanism for the reaction (ii).

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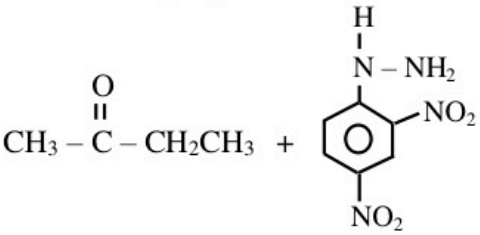
iii). Write the major product K for the following reaction.



K

Part B – Essay

Answer two questions only. (Each question carries 15 marks)

(5).a). 1 mol of $AB_{(g)}$ is in 1 dm^3 volumetric flask. After t, time following equilibrium reach at 700K.

$$2AB_{(g)} \rightleftharpoons A_{2(g)} + B_{2(g)}$$

At equilibrium 0.8 mol of $AB_{(g)}$ is in the mixture.

i). Calculate K_c at 700K.

ii). Draw the variation of concentration of $AB_{(g)}$, $A_{2(g)}$ and $B_{2(g)}$ with the time.

iii). At 700K, 0.01 mol of $A_{2(g)}$ added to the system which is at equilibrium. Draw the variation of concentration in each gas on the same graph.

iv) At 1000K, equilibrium constant for the reaction is 2.6×10^{-2}. Predict the sign of ΔH for the forward reaction.

v) What is the direction of equilibrium as temperature decreases. What is the principal used to explain above variation.

vi) At 1000K 1dm^3 vessel added with $AB_{(g)}$, $A_{2(g)}$ and $B_{2(g)}$, 0.75 mol, 0.1 mol and 0.50 mol respectively. Calculate Q_c and predict the direction of reaction to reach an equilibrium.

b). Consider the thermodynamic data given at 27^0C. (not under standard states)

	ΔH ($kJmol^{-1}$)	ΔS ($JK^{-1}\ mol^{-1}$)
$C_{(s)} + H_2O_{(g)} \longrightarrow CO_{(g)} + H_{2(g)}$	130	140
$CO_{2(g)} + H_{2(g)}$ $CO_{(g)} + H_2O_{(g)}$	40	50

Consider the reaction,

$2CO_{(g)} \rightleftharpoons C_{(s)} + CO_{2(g)}$ and answer the following questions.

i) State the sign of ΔS with reason.

ii) Calculate ΔH_{rxn} and ΔS_{rxn} for the above reaction.

iii) Predict the spontaneity of the reaction with suitable calculation.

iv) Draw the variation of Gibbs free energy vs extent of reaction for the above reaction at 27^0C, in a graph.
Mark the composition of the mixture as X in the graph which can be used to determine equilibrium constant.

c). I) Write the thermochemical equations for the followings.

i) Standard sublimation enthalpy of Mg = 150 $kJmol^{-1}$

ii) Standard formation enthalpy of $MgBr_{2(s)}$ = – 524 $kJmol^{-1}$

iii) First ionization enthalpy of Mg = +738 $kJmol^{-1}$

iv) Second ionization enthalpy of Mg = 1451 $kJmol^{-1}$

v) Standard election gain enthalpy of $Br_{(g)}$ = – 325 $kJmol^{-1}$

vi) Standard atomization enthalpy of bromine = +112 $kJmol^{-1}$

II). Draw the suitable Born-habour cycle and calculate lattice dissociation enthalpy of $MgBr_{2(S)}$.

(6).a). i) Rate of reaction increases as the temperature increases. Briefly explain.

ii) Consider the elementary reaction

$2A_{(g)} \longrightarrow 3B_{(g)}$; $\Delta H < O$

Activation energy of the revere reaction is 120 $kJmol^{-1}$.

Activation energy of the forward reaction 40 $kJmol^{-1}$.

(I) Calculate enthalpy change (ΔH) for the reaction.

(II) Draw the energy profile for the above reaction and mark activated complex.

(III) At a given temperature known amount of $A_{(g)}$ introduced into a closed rigid vessel and measure the initial pressure as P_0. Initial rate of the reaction is R_0. Pressure of the system after t time is Pt. Rate of the reaction is half of initial value.

Show that $\frac{Pt}{P_0}$ is $\frac{3\sqrt{2}-1}{2\sqrt{2}}$.

b). At 25^0C, 25.0 cm^3 of 0.2 $moldm^{-3}$ Na_2CO_3 solution titrated with 0.1 $moldm^{-3}$ HCl solution using suitable indicator.

(H_2CO_3 dissociation constant K_{a_1} and K_{a_2} 4.3×10^{-7} $moldm^{-3}$ and 4.7×10^{-11} $moldm^{-3}$. Ionic product of water ($K_w = 1 \times 10^{-14}$ mol^2dm^{-6})

i) Calculate pH of the Na_2CO_3 solution before adding HCl.
$\left(\frac{10}{4.7} = 2.13\,,\ \frac{10}{4.3} = 2.33,\ \sqrt{42.6} = 6.53\right)$

ii) Find volume of HCl at first equivalence point.

iii) Calculate pH at first equivalence point. $\left(\sqrt{15.6} = 3.95\right)$

c). i) Mention 03 requirements should fulfill to apply distribution law to immiscible two liquids.

ii) Following procedure used to determine, distribution coefficient of HA weak acid between ether and water. 10g of solid HA in reagent bottle added with 100 cm^3 ether and 100 cm^3 water. The solution shaked well and kept to separate in to layers. Some amount of undissolved HA is at the bottom of reagent bottle. 25.00 cm^3 of ether layer and 50.00 cm^3 of water layer separated and titrated with 0.1 $moldm^{-3}$ NaOH solution using phenolphthalein as the indicator. Required NaOH volumes are 4.50 cm^3 and 27.00 cm^3 respectively.
Calculate K_D of HA between ether and water at 25^0C.

(7). The following electrochemical cell was constructed to study the electrochemical behavior of the reaction $3Ag^+_{(aq)} + Al_{(s)} \longrightarrow Al^{+3}_{(aq)} + 3Ag_{(s)}$ at 25^0C. The cell consist of and Ag electrode in a beaker with 1.0 $moldm^{-3}$ $AgNO_{3(g)}$ solution and a $Al_{(s)}$ electrode in another beaker filled with a 1.0 $moldm^{-3}$ $Al(NO_3)_3$ solution. The two – half cells were connected Via a salt – bridge filled with saturated $KNO_{3(g)}$ solution and a voltmeter.

$Al^{+3}_{(aq)} / Al_{(s)} = -1.66V$ and $Ag^+_{(aq)} / Ag_{(s)} = 0.79V$

(i) Draw a sketch of electrochemical cell.

(ii) Identify the anode and the cathode of the cell and write the respective half reactions.

(iii) Identify positive and negative terminal of the cell.

(iv) Calculate E^{θ}_{cell} at 25^0C.

(v) Write two functions of salt bridge.

(vi) You have provided aqueous solutions of KNO_3, NaCl, $NaNO_3$ and KOH. Identify most suitable substance for salt bridge. State reasons.

(vii) Give IUPAC notation for the cell.

(viii) At 25^0C cell operates for 20 minutes and 0.324 g of $Ag_{(s)}$ deposited on $Ag_{(s)}$ electrode.

I. Calculate number of Ag moles deposited. (Ag 108 $gmol^{-1}$)

II. Consider constant current pass through the cell within 20 minutes. Calculate the current pass through the cell. (1F = 96500 $Cmol^{-1}$).

b). (i) P, Q, R and S are coordination compounds of Ni(II), with octahedral geometry. Write the structural formula using the suitable species given in the list.

Ni^{+2}, K^{+}, H_2O, SO_4^{-2} , NO_3^{-} , I^{-}

P - Only neutral ligands coordinated to central metal cation. P gives one ion to the aqueous solution. Exist as positively charged complex ion.

Q - Two types of ligands coordinated to central metal ion. The ligands are neutral ligands and mono atomic anionic ligands. Q aqueous solution added with NaOH and Al dust. NH_3 gas liberated and form two ions in aqueous solution.

R - Similar number of neutral ligands and similar number of poly atomic anionic ligand connected to central metal cation. Elements in the anion belongs to same period. R gives two ions to the aqueous solution.

S - Only neutral ligands connected to the central metal cation. Aqueous solution of S added with $BaCl_2$ white precipitate is formed and it does not dissolved in dilute acids. S provided two ions in the aqueous solution.

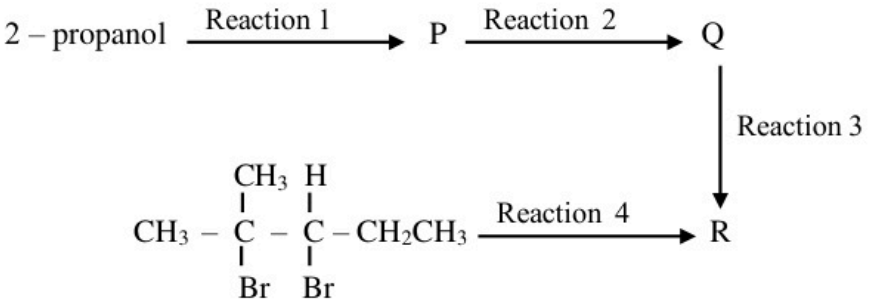
(ii) Write IUPAC names of P, Q, R and S.

(iii) Write a test to identify mono atomic anion connected to central metal cation, in above coordination compounds. Consider aqueous solution of anion is provided.

Part C - Essay

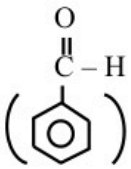
Answer only two questions.

(8).a). i). Following sequence of reactions given to synthesis compound S using only initial compound as 2 – propanol.



Complete the above sequence of reactions, using only the reagent given in the list. Draw the structures of the compounds P, Q and R.

Reagent list :-
Conc. HCl, PCC, (Pyridinium chloro chromate, Br_2 / CCl_4 , dilute KOH, Zn (Hg)

b). Consider the reaction between benzaldehyde  and conc. HNO_3 with presence of conc. H_2SO_4.

i) Draw the most possible products formed in above reaction.

ii) Mention the main product of the above reaction.

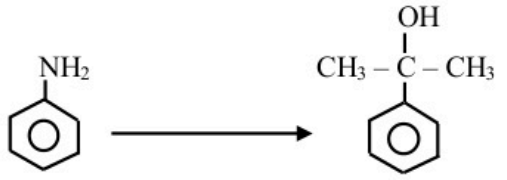
iii) Explain the stability of main product with use of resonance structures.

c). Consider the compounds ethanoic acid (A), Propanone (B), Propanal (C), 2 – propanol (D).

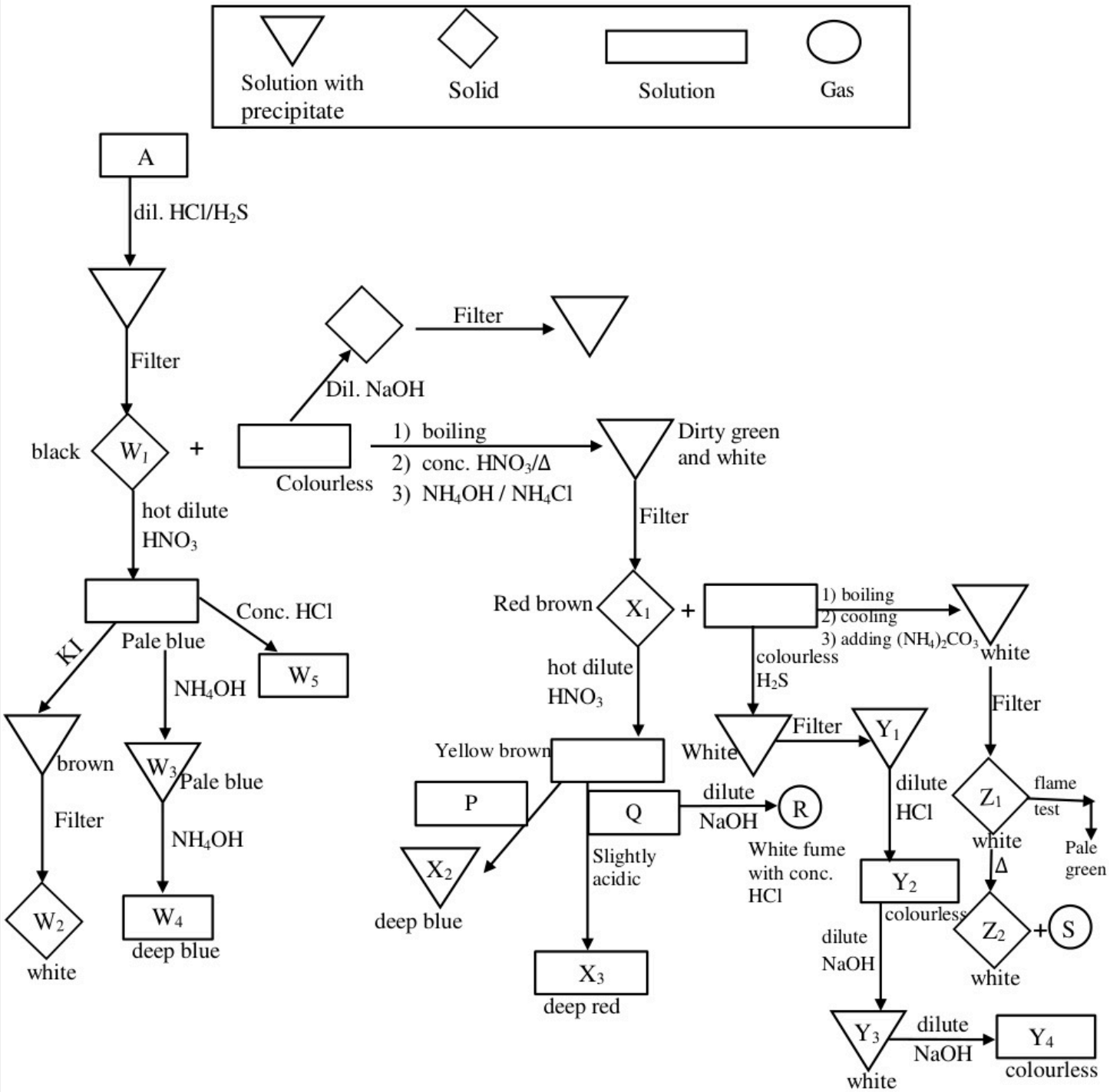
i) Arrange the above compounds in to decreasing order of boiling point.

ii) Explain the reason for above variation of boiling point.

d). Do the following conversion not more than 05 steps.



(9). a). Following question based on cationic analysis. A aqueous solution contain cationic of each metal, W, X, Y and Z. Using following sequence, analyse A. The symbols represent as follows.



$W_1 – W_5$, $X_1–X_3$, $Y_1–Y_4$, and Z_1, Z_2 are compounds/species of the metal cations W, X, Y, and Z.
P and Q are reagents, while R and S are gases.
Identify W_1, W_2, W_3, W_4, W_5, X_1, X_2, X_3, Y_1, Y_2, Y_3, Y_4, Z_1, Z_2, P, Q, R, and S.
(Note: Write only the chemical formulas. Chemical equations and explanations are not required.)

b). A sample contains FeO, Cr_2O_3 and inert impurities. The following procedure I and II were carried out to find out the mass percentages of FeO and Cr_2O_3.

Procedure 01 :

Initially 2.0g of this sample is taken and dissolved in dil.HCl. Then excess NaOH is added to the resultant solution. Then it is boiled with excess amount of H_2O_2. The precipitate T_1 obtained during this was filtered and dried and kept for further analysis in procedure 02. Then excess amount of $BaCl_2$ is added to the above filtrate "F" and the obtained precipitate T_2 was filtered, dried and weighed. The mass of precipitate was 0.632g.

Procedure 02 :

The precipitate T_1 from procedure 01 is dissolved in dil. H_2SO_4. Then excess amount of KI is added to the above solution. The T_2 formed was immediately titrated with 0.2 $moldm^{-3}$ $Na_2S_2O_3$ solution using starch as an indicator. The volume of $Na_2S_2O_3$ required to reach the end point was 25.0 cm^3. (Fe – 56, O – 16, Cr – 52, Ba – 137)

i). Write balanced ionic or complete equations for all reactions taking place in each of the above procedure.

ii). Determine mass percentage of FeO and Cr_2O_3.

(10).a).Following species are main product formed by industrial processes.

NH_3, H_2SO_4, HNO_3, NaOH

i). Name the industrial process used for manufacture of each of above product.

ii). I. Identify the raw material used for production of soap and write other raw materials needed for production of soap.

II. Write the main steps of the production of soap.

III. Write relevant balanced reaction of the process above.

IV. What is the main by-product of above process.

iii). Consider the major steps involved in production of NaOH.

I. Write the balanced equations for the process.

II. Draw the fully labeled diagram for the cell used for above process.

III. Write two uses of NaOH.

b). i). Explain briefly the following statements.

I. Combustion of diesel and coal is responsible for acid rain.

II. Ozone layer can be protected by using HFC instead of CFC in refrigerators.

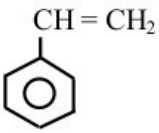
III. What is the importance of use of sustainable energy sources during the production of bio diesel.

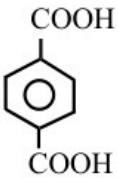
ii). I. What are the gases responsible for global warming.

II. Write three adverse effects of global warming.

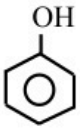
III. Write three precautions can be taken to minimize global warming.

c). Following examples shows the raw materials used for the production of polymers.

HCHO, $CH_2{=}CHCl$, 

, 

, $HOCH_2CH_2OH$

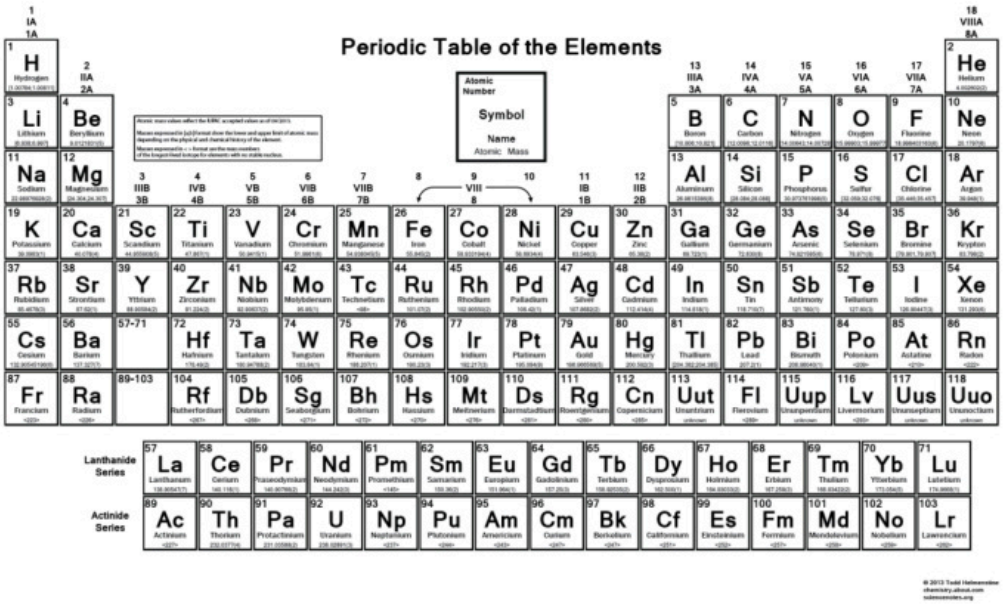


, $H_2N(CH_2)_6NH_2$, $HOOC(CH_2)_4COOH$

i). What are the monomers used for PVC, polystyrene?

ii). Identify the monomers used to manufacture PET (Poly Ethylene Terephthalate) and Nylon 6, 6. Then name this polymers as addition and condensation polymers.

iii). Name the polymer with three dimensional network structure. Identify monomers used to synthesis this polymer.



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අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ), 13 ශ්‍රේණිය, අවසාන වාර පරීක්ෂණය - 2026

General Certificate of Education (Ad.Level), Grade 13 Final Term Test, 2026

විෂයය අංකය 02 **විෂය** **රසායන විද්‍යාව**

ලකුණු දීමේ පටිපාටිය - I පත්‍රය

ප්‍රශ්න අංකය	පිළිතුරු අංකය	ප්‍රශ්න අංකය	පිළිතුරු අංකය	ප්‍රශ්න අංකය	පිළිතුරු අංකය
1	2	19	4	37	2
2	3	20	5	38	3
3	4	21	3	39	5
4	2	22	4	40	4
5	3	23	1	41	1
6	1	24	2	42	4
7	2	25	1	43	2
8	4	26	2	44	3
9	5	27	4	45	1
10	2	28	2	46	1
11	1	29	5	47	2
12	4	30	1	48	1
13	2	31	1	49	3
14	3	32	2	50	4
15	5	33	5		
16	3	34	1		
17	1	35	4		
18	2	36	5		

මුළු ලකුණු = 100

ඌව පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව
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අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ), 13 ශ්‍රේණිය, අවසාන වාර පරීක්ෂණය - 2026

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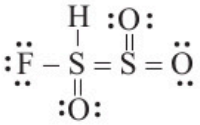
Chemistry Marking - Scheme

(01) (a) (i) සත්‍ය (ii) සත්‍ය (iii) අසත්‍ය (iv) අසත්‍ය

(v) සත්‍ය (vi) සත්‍ය (vii) අසත්‍ය (viii) අසත්‍ය **(04×8 = 32)**

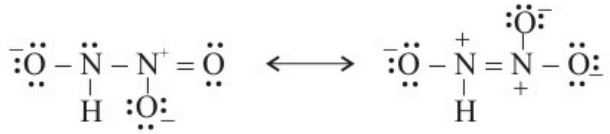
(b) (i)



(06)

(ii) $S^1 = +2$ $S^2 = +4$ **(02×2 = 04)**

(iii)



(06)

අඩු ස්ථායී අස්ථායී

(iv)

	C^1	C^2	C^3	C^4
i.	3	2	3	3
ii.	තලීය ත්‍රිකෝණාකාර	රේඛීය	තලීය ත්‍රිකෝණාකාර	තලීය ත්‍රිකෝණාකාර
iii.	තලීය ත්‍රිකෝණාකාර	රේඛීය	කෝණික	තලීය ත්‍රිකෝණාකාර
iv.	sp^2	sp	sp^2	sp^2

(01×16 = 16)

(v)

C^1 -	sp^2	F -	sp^3 / 2p
C^1 -	sp^2	H -	1s
C^1 -	sp^2	C^2 -	sp
C^2 -	sp^2	C^3 -	sp^2
C^3 -	sp^2	C^4 -	sp^2
C^4 -	sp^2	H -	1s

(01×12 = 12)

(vi)

C^1 -	2p	C^2 -	2p
C^2 -	2p	C^3 -	2p
C^4 -	2p	O -	2p

(01×06 = 06)

(vii) C^1 - $120^\circ(\pm1)$ C^2 - 180° C^3 - 118°

C^4 - $120^\circ(\pm1)$ **(01×04 = 04)**

(viii) $C^1 < C^4 < C^3 < C^2$ **(04)**

(c) (i) $NF_3 < NH_2^- < NH_3 < NH_4^+ < NOCl$ **(05)**

(ii) $LiCl < LiF < NaCl < NaF < KBr$ **(05)**

(02) (a) (i) Cl (ක්ලෝරීන්) **(04)**

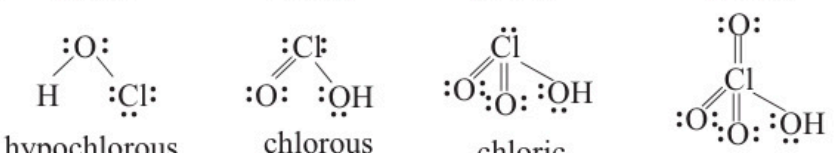
(ii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$ **(04)**

(iii) +1 , +3, +5, +7 (ඕනෑම තුනක්) **(01×3=03)**

(iv) $Cl_2 + 2NaOH \longrightarrow NaCl + NaOCl + H_2O$ **(04)**
(සිසිල් තනුක)

$3Cl_2 + 6NaOH \longrightarrow 5NaCl + NaClO_3 + 3H_2O$ **(04)**
(උණු සාන්ද්‍ර)

(v) HOCl, $HClO_2$, $HClO_3$, $HClO_4$



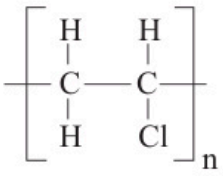
hypochlorous acid, chlorous acid, chloric acid, perchloric acid **(01 ×09 = 09)**

(vi) $Cl_2 + H_2O \longrightarrow HCl + HClO$ **(04)**

(vii) ද්විධාකරණ ප්‍රතික්‍රියාව **(03)**

(viii) I. PVC or Polyvinyl chloride **(03)**

II.



(03)

(ix) I. $Cl^- + AgNO_3 \longrightarrow AgCl\downarrow + NO_3^-$ **(03)**
සුදු

II. $AgCl + 2NH_3 \longrightarrow [Ag(NH_3)_2]^+ + Cl^-$ **(06)**

AgCl වලට තනුක NH_3 ද්‍රාවණයක් එක් කළ විට එය ද්‍රාවණය වීම
(හෝ අවර්ණ ද්‍රාවණයක් ලැබීම)

50

(b) (i) Al **(04)**

(ii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$ **(04)**

(iii) $2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$ **(04)**

$2H_2O + 2Al + 2NaOH \longrightarrow 2NaAlO_2 + 3H_2$ **(04)**

(iv) $3NO_3^- + 5OH^- + 8Al + 2H_2O \longrightarrow 8AlO_2^- + 3NH_3$ **(04)**

(v) NH_3 **(03)**

(vi) * නෙස්ලර් ප්‍රතිකාරකය පෙඟවූ පෙරහන් කඩදාසියක් ගැටීමට සැලැස්වීම. **(03)**

* එය දුඹුරු පැහැයට හැරීම **(03)**

හෝ

සාන්ද්‍ර HCl පෙඟවූ වීදුරු කූරක් ගැටීමට සැලසීම.

* සන සුදු දුමාරයක් ඇති වීම.

(vii) $Al^{3+} + 6H_2O \longrightarrow [Al(H_2O)_6]^{3+}$ **(04)**

hexaaquaaluminium(III) ion **(03)**

(viii) $[Al(H_2O)_6]^{3+}_{(aq)} + H_2O_{(l)} \longrightarrow [Al(H_2O)_5OH]^{2+}_{(l)} + H_3O^+_{(aq)}$ **(04)**

හෝ

$[Al(H_2O)_5OH]^{2+}_{(aq)} + H_2O_{(l)} \longrightarrow [Al(H_2O)_4(OH)_2]^+_{(aq)} + H_3O^+_{(aq)}$

(ix) Al^{3+} අයන ද්‍රාවණයකට NaOH එක් කළ විට සුදු ජෙලටිනීය අවක්ෂේපයක් ලැබේ. **(04)**

(x) * සැහැල්ලු ලෝහයක් ලෙස ගුවන් යානා හා වාහනවල කොටස් සඳහා

* සුදු පැහැති තීන්ත නිෂ්පාදනය

* මිශ්‍ර ලෝහ සෑදීම

* ආහාර ඇසුරුම් සඳහා

(ඕනෑම 3ක් සඳහා) **(02×03 = 06)**

ලකුණු **50**

(03) (a) (i) $P_A = X_A P_A^o$ **(05)**

(ii) 2×10^4 Pa $= 0.25\ P_A^o + 0.75\ P_B^o$ ——— ① **(05)**

1.5×10^4 Pa $= 0.75\ P_A^o + 0.25\ P_B^o$ ——— ② **(05)**

② × 3 —— ① $2\ P_A^o = 2.5 \times 10^4$ Pa

$P_A^o = 1.25 \times 10^4$ Pa **(05)**

① න් $0.75\ P_B^o = 2 \times 10^4$ Pa $- 0.25 \times 1.25 \times 10^4$ Pa

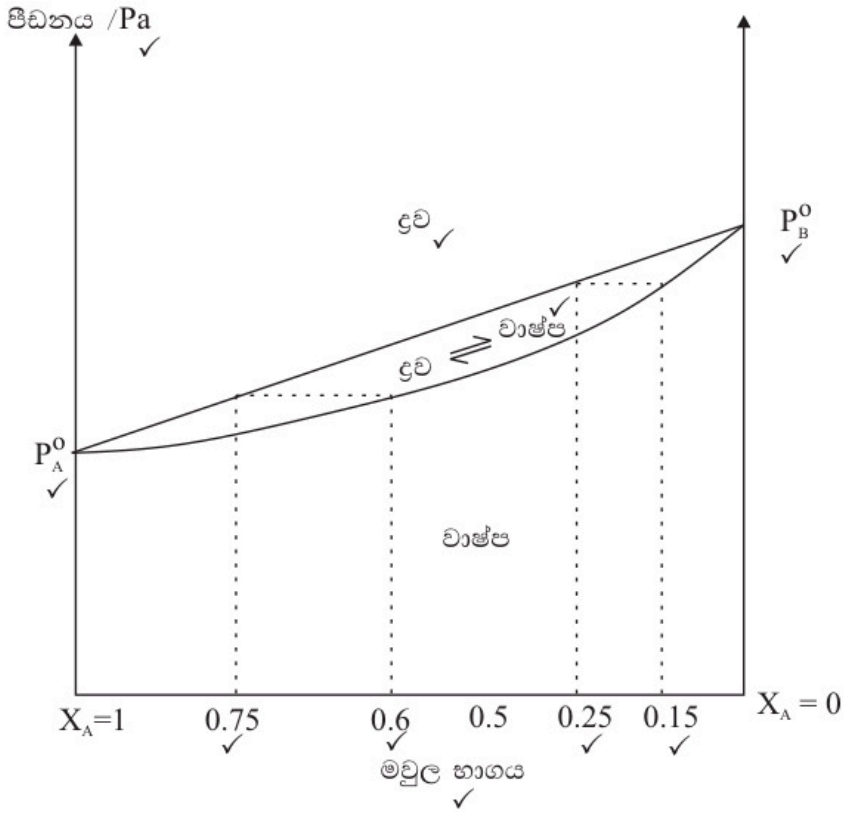
$P_B^o = 2.25 \times 10^4$ Pa **(05)**

(iii) $Y_A = \dfrac{P_A}{P_T} = \dfrac{0.25 \times 1.25 \times \cancel{10^4}\ \text{Pa}}{2 \times \cancel{10^4}\ \text{Pa}} = 0.15$ (හෝ 0.16) **(05)**

එවිට $Y_B = 0.85$ **(05)**

(iv) $Y_A = \dfrac{P_A}{P_T} = \dfrac{0.75 \times 1.25 \times \cancel{10^4}\ \text{Pa}}{1.5 \times \cancel{10^4}\ \text{Pa}} = 0.1$ (හෝ 0.6) **(05)**

එවිට $Y_B = 0.38$ (හෝ 0.4) **(05)**



(02×10=20)

65

(b) (i) $NiS\ (s) \rightleftharpoons Ni^{2+}\ (aq) + S^{2-}\ (aq)$ **(03)**

$Ksp = [Ni^{2+}\ (aq)][S^{2-}\ (aq)]$ **(02)**

$$[S^{2-}\ (aq)] = \frac{3 \times 10^{-21}\ mol^2\ dm^{-6}}{0.1\ mol\ dm^{-3}}$$

$$= \underline{\underline{3 \times 10^{-20}\ mol\ dm^{-3}}}$$ **(03+01)**

(ii) $H_2S\ (aq) + H_2O\ (l) \rightleftharpoons HS^-\ (aq) + H_3O^+\ (aq)$ ——— ① **(03)**

$HS^-\ (aq) + H_2O\ (l) \rightleftharpoons S^{2-}\ (aq) + H_3O^+\ (aq)$ ——— ② **(03)**

① + ②

$H_2S\ (aq) + 2H_2O\ (l) \rightleftharpoons S^{2-}\ (aq) + 2H_3O^+\ (aq)$

$$K = K_{a_1} \cdot K_{a_2}$$
$$= 9.1 \times 10^{-8} \times 1 \times 10^{-19}\ mol^2\ dm^{-6}$$
$$= 9.1 \times 10^{-27}\ mol^2\ dm^{-6}$$ **(02+01)**

$$K = \frac{[S^{2-}\ (aq)][H_3O^+\ (aq)]}{[H_2S\ (aq)]}$$ **(03)**

$$\therefore\ [S^{2-}\ (aq)][H_3O^+\ (aq)]^2 = 9.1 \times 10^{-27} \times 0.1\ mol^3\ dm^{-9}$$
$$= \underline{\underline{9.1 \times 10^{-28}\ mol^3\ dm^{-9}}}$$ **(04+01)**

(iii) $$[H_3O^+\ (aq)]^2 = \frac{9.1 \times 10^{-28}}{3 \times 10^{-20}} = 3.03 \times 10^{-8}\ mol^2\ dm^{-6}$$

$[H_3O^+\ (aq)] = 1.74 \times 10^{-4}\ mol\ dm^{-3}$ **(02+01)**

$pH = -log\ [H_3O^+\ (aq)]$ **(02)**

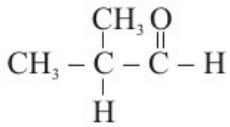
$= -log\ (1.74 \times 10^{-4})$

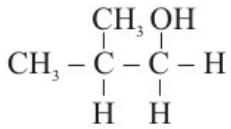
$= 4 - 0.24$

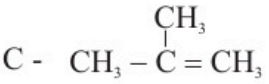
$\underline{\underline{= 3.76}}$ **(03+01)**

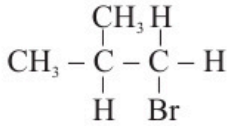
35

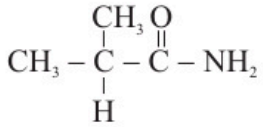
(04) (a)

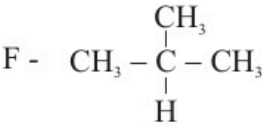
A - 

B - 

C - 

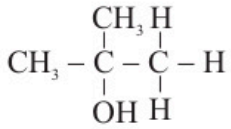
D - 

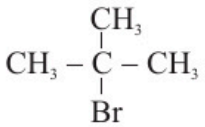
F - 

F - 

(06×07 = 42)

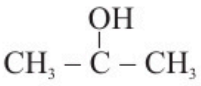
(b) (i)

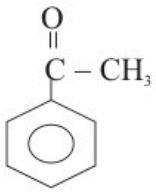
X - 

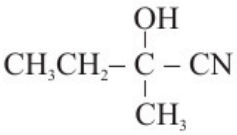
Y - 

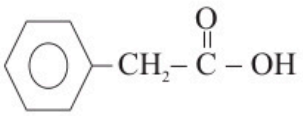
ප්‍රතිකාරකය HBr **(06 × 03 = 18)**

(ii)

I. A_E 

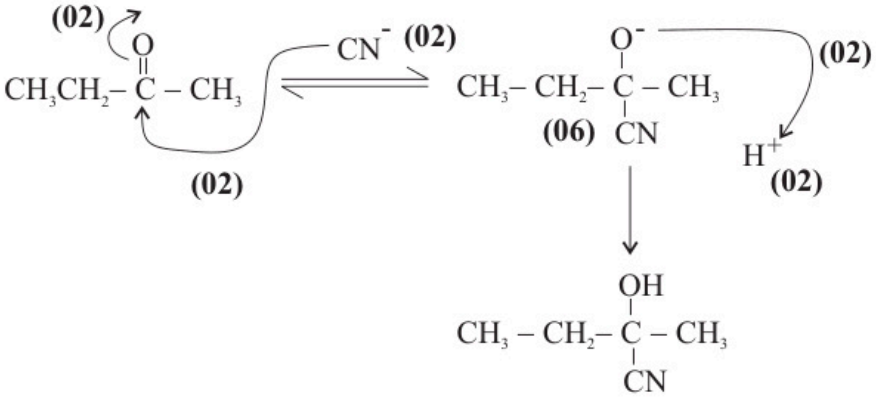
II. S_E 

III. A_N 

IV. S_N 

(03 × 08 = 24)

(c)



16

(05) (a) (i)

$$2AB\,(g) \rightleftharpoons A_2\,(g) + B_2\,(g)$$

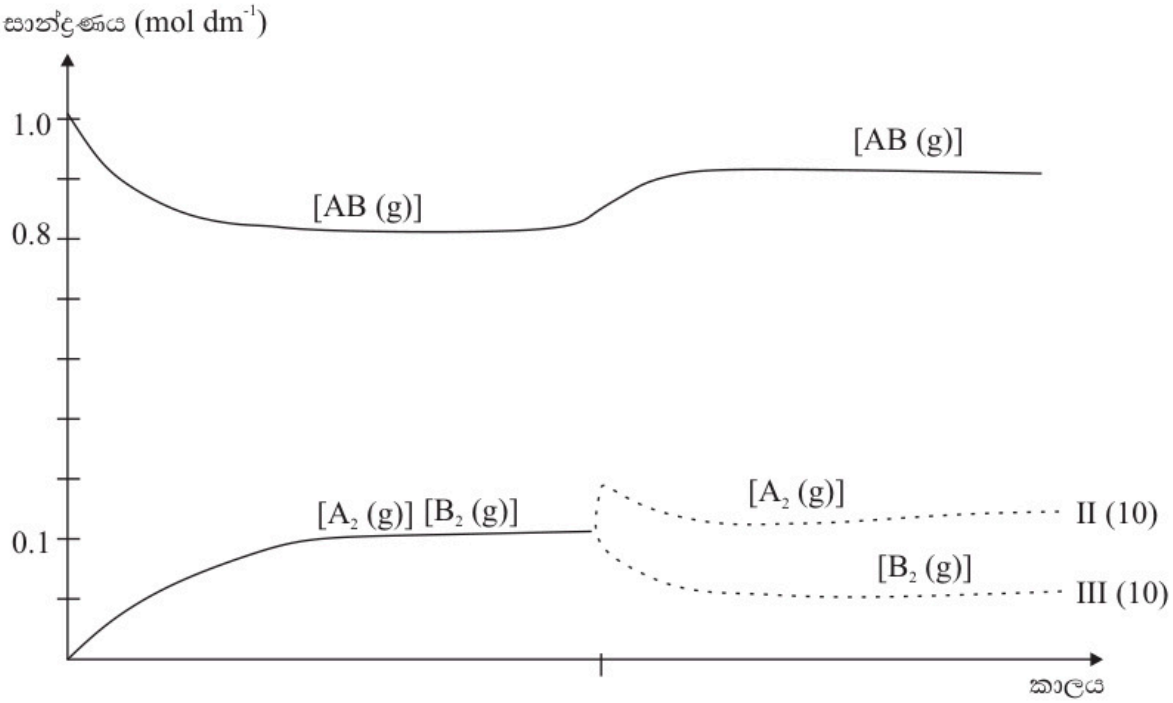
ආරම්භක සාන්ද්‍රණය	1.0 mol dm^{-3}		
වැය වූ සාන්ද්‍රණය	0.2 mol dm^{-3}		
සමතුලිත සාන්ද්‍රණය (mol dm^{-3})	0.8	0.1	0.1

$$Kc = \frac{[A_2\,(g)]\,[B_2\,(g)]}{[AB\,(g)]^2} = \frac{(0.1\ \text{mol dm}^{-3})^2}{(0.8\ \text{mol dm}^{-3})^2}$$

$$Kc = \underline{\underline{1.5625 \times 10^{-2}}}$$

(20)

(iii)



(iv) 700 K දී $Kc = 1.56 \times 10^{-2}$

1000 K දී $Kc = 2.6 \times 10^{-2}$

උෂ්ණත්වය වැඩි කළ විට K_c වැඩි වී ඇත.

උෂ්ණත්වය වැඩි කළ විට ඉදිරි ප්‍රතික්‍රියාව සිදු වී ඇත.

∴ ඉදිරි ප්‍රතික්‍රියාව තාප අවශෝෂක වේ.

$\Delta H = +$ වේ. **(10)**

(v) උෂ්ණත්වය අඩු කළ විට තාප දායක ප්‍රතික්‍රියාව වන ආපසු ප්‍රතික්‍රියාව සිදු වේ. එවිට සමතුලිතතා ලක්ෂය වමට නැඹුරු වේ. (ලේ චැට්ලියර් මූලධර්මය) **(10)**

(vi)

$$2AB\,(g) \rightleftharpoons A_2\,(g) + B_2\,(g)$$

	0.75 mol	0.10 mol	0.50 mol
සාන්ද්‍රණය (mol dm^{-3})	0.75	0.10	0.50

$$Qc = \frac{[A_2\,(g)][B_2\,(g)]}{[AB\,(g)]^2}$$

$$Qc = \frac{0.1\ mol\ dm^{-3} \times 0.5\ mol\ dm^{-3}}{(0.75\ mol\ dm^{-3})^2}$$

$Qc = 1.77 \times 10^{-2}$

1000 K දී $Kc = 2.6 \times 10^{-2}$

$Kc > Qc$

∴ සමතුලිත වීමට ඉදිරි ප්‍රතික්‍රියාව සිදු වේ. **(15)**

75

(b) (i) වායු අණු මවුල 2 කින් වායු අණු මවුල 1ක් සහ ඝනයක් සාදන බැවින් එන්ට්‍රොපිය අඩු වේ. එමනිසා ΔS ඍණ වේ. **(05)**

(ii) ① - $CO(g) + H_2(g) \longrightarrow C(s) + H_2O(g)$ $\Delta H = -130\ kJ\ mol^{-1}$

② - $CO(g) + H_2O(g) \longrightarrow CO_2(g) + H_2(g)$ $\Delta H = -40\ kJ\ mol^{-1}$

①+② $2CO(g) \rightleftharpoons C(s) + CO_2(g)$ $\Delta H = -170\ kJ\ mol^{-1}$

$\Delta H = \underline{\underline{-170\ kJ\ mol^{-1}}}$

$\Delta S = (-140 + -50)\ J\ K^{-1}\ mol^{-1}$

$\Delta S = \underline{\underline{-190\ J\ K^{-1}\ mol^{-1}}}$ **(15)**

(iii) $\Delta G = \Delta H - T\Delta S$

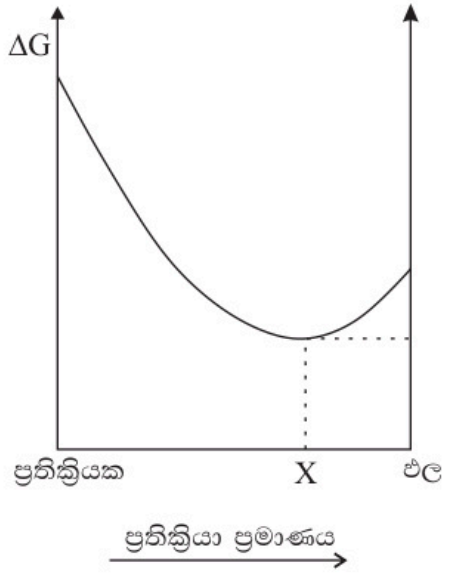
$\Delta G = -170\ J\ K^{-1}\ mol^{-1} - (300\ K \times -0.19\ kJ\ K^{-1}\ mol^{-1})$

$\Delta G = \underline{\underline{-113\ kJ\ mol^{-1}}}$

ΔG , ඍණ අගයක් බැවින්, 27°C දී ඉහත ප්‍රතික්‍රියාව ස්වයංසිද්ධව සිදු වේ.

(10)

(iv)



(05)

35

(c) (i) $Mg(s) \longrightarrow Mg(g)$ $\Delta H^{\theta}_{s} = 150\ kJ\ mol^{-1}$

$Mg(s) + Br_2(l) \longrightarrow MgBr_2(s)$ $\Delta H^{\theta}_{f} = -524\ kJ\ mol^{-1}$

$Mg(g) \longrightarrow Mg^{+}(g) + e$ $\Delta H^{\theta}_{IE_1} = +738\ kJ\ mol^{-1}$

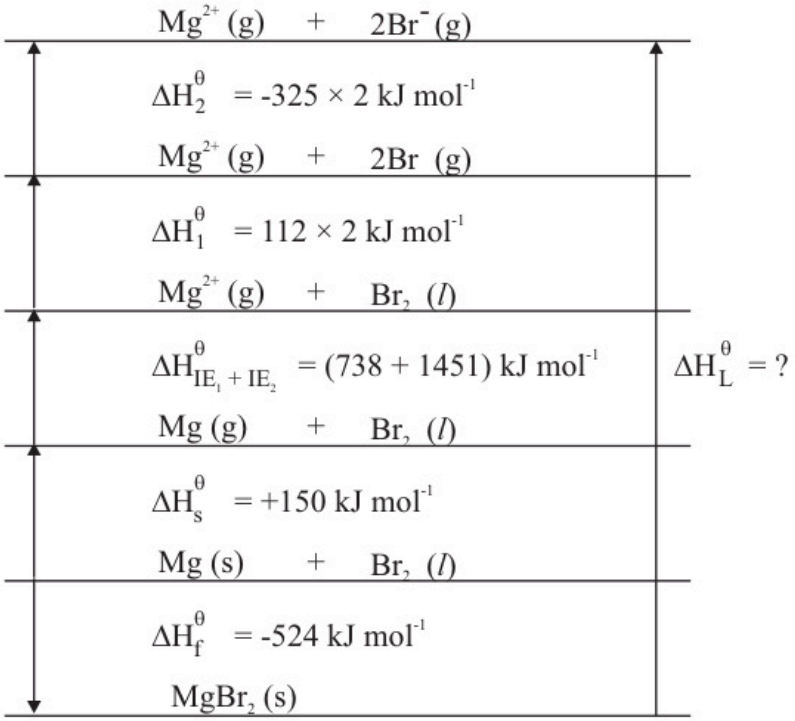
$Mg^{+}(g) \longrightarrow Mg^{2+}(g) + 2e$ $\Delta H^{\theta}_{IE_2} = +1451\ kJ\ mol^{-1}$

$Br(g) + e \longrightarrow Br^{-}(g)$ $\Delta H^{\theta}_{EG} = -325\ kJ\ mol^{-1}$

$\frac{1}{2} Br_2(l) \longrightarrow Br(g)$ $\Delta H^{\theta}_{at} = +112\ kJ\ mol^{-1}$

(03×06 = 18)

(b) (i)



(02×05 = 10)

(01× 06 = 06)

හේස් නියමය අනුව, $(150 + 738 + 1451 + 224 - 650)$ kJ mol^{-1} $= -524$ kJ mol^{-1} $+ \Delta H_L^\theta$

(03)

$\Delta H_L^\theta = 2437$ kJ mol^{-1} **(02 + 01)**

40

(06) (a) (i) * උෂ්ණත්වය ඉහළ යන විට අංශුවල මධ්‍යක චාලක ශක්තිය වැඩි වේ. එවිට අංශු වැඩි වේගයකින් චලනය වෙමින් ඒකක කාලයක් තුළ ඇති වන සංඝට්ටන සංඛ්‍යාව වැඩි කරයි. එවිට ප්‍රතික්‍රියා ශීඝ්‍රතාව වැඩි වේ.

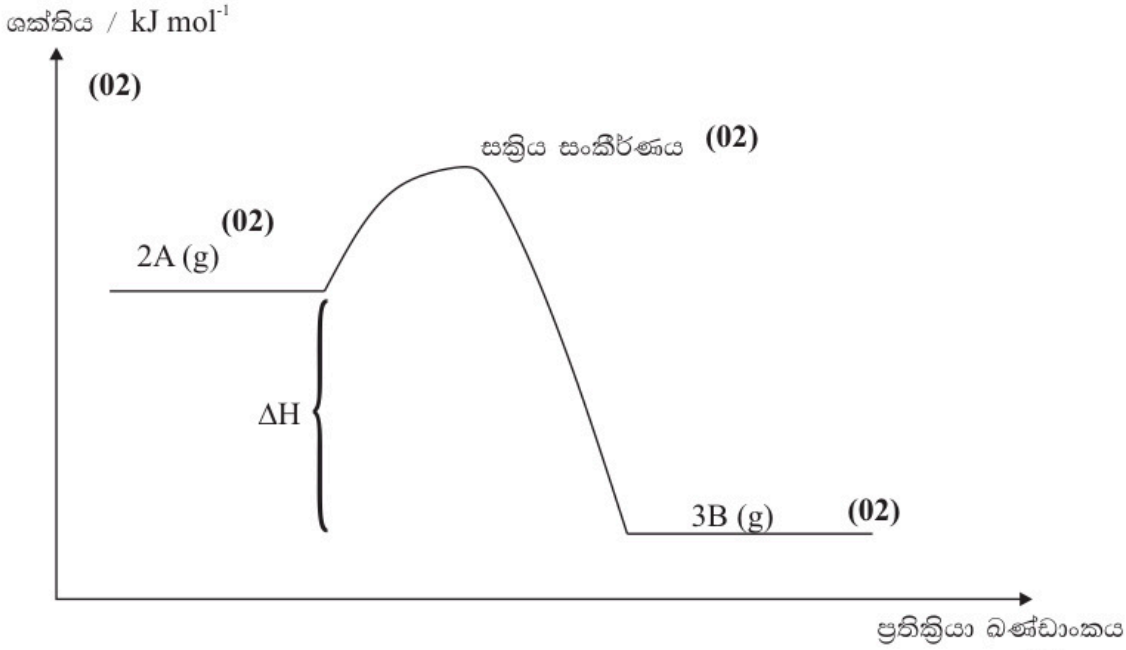
* උෂ්ණත්වය වැඩි වන විට සක්‍රියන ශක්තියට වඩා වැඩි ශක්තියකින් යුත් අණුවල භාගය වැඩි වන අතර එවිට සඵල සංඝට්ටන වැඩි වී ප්‍රතික්‍රියා ශීඝ්‍රතාව වැඩි වේ.

(05× 02 = 10)

(ii) I. $\Delta H = 40$ K J mol^{-1} $- 120$ K J mol^{-1}

$= -80$ K J mol^{-1} **(04 + 01)**

II.



(02)

(10)

(ii) I.

	2A (g) $\longrightarrow$	3B (g)
I/Pa	Po	
C/Pa	-2P	+3P
t කාලයේ දී /Pa	Po - 2P	3P

(05)

මුළු පීඩනය $= Po - 2P + 3P$

$= Po + P$

$\therefore P_t = Po + P$

$P = P_t - Po$ **(05)**

rate $= k[A(g)]^2$

rate α $P_A^2(g)$

$R_O \alpha P_o^2$ ——— ① **(05)**

$\frac{R_O}{2} \alpha (P_O - 2P)^2$

$\frac{R_O}{2} \alpha (3P_O - 2P_t)^2$ ——— ② **(05)**

$PV = nRT$

$P = \frac{n}{V} RT$

$P = CRT$

$P \alpha C$

$P_O - 2P = P_O - 2(Pt - P_O) = 3P_O - 2P_t$

$\frac{①}{②}$ $2 = \frac{P_O}{(3P_O - 2P_t)^2}$

$$\frac{P_O}{3P_O - 2P_t} = \sqrt{2}$$

$$P_O = 3\sqrt{2}P_O - 2\sqrt{2}P_t$$

$$2\sqrt{2}P = (3\sqrt{2}-1)P_O$$

$$\frac{P_t}{P_O} = \frac{3\sqrt{2}-1}{2\sqrt{2}}$$ **(10)** **(30)**

55

(b) (i) $CO_3^{2-}(aq) + H_2O\,(g) \rightleftharpoons HCO_3^-\,(aq) + OH^-(aq)$ **(05)**

I/	0.2	-	-	mol dm^{-3}
C/	$-x$	$+x$	$+x$	mol dm^{-3}
E/	$0.2 - x$	x	x	mol dm^{-3} **(05)**

$$K_{b_1} = \frac{[HCO_3^-\,(aq)][OH^-\,(aq)]}{[CO_3^{2-}(aq)]}$$ **(05)**

$$\frac{1 \times 10^{-14}\ mol^2\ dm^{-6}}{4.7 \times 10^{-11}\ mol\ dm^{-3}} = \frac{x^2}{0.2 - x}$$ **(05)**

$[OH^-(aq)]^2 = 2.13 \times 10^{-4} \times 0.2$ $(0.2 - x \approx 0.2)$ **(02)**

$[OH^-\,(aq)] = 6.53 \times 10^{-3}$ mol dm^{-3} **(03)**

$pOH = -log\,[OH^-\,(aq)]$

$= -log(6.53 \times 10^{-3})$

$= 2.18$

$pH = 14 - 2.18$

$= \underline{\underline{11.82}}$ **(05)**

30

(ii) පළමු සමකතා ලක්ෂ්‍යයේ දී HCl පරිමාව,

$C_1V_1 = C_2V_2$

$0.2\ mol\ dm^{-3} \times 25\ cm^3 = 0.1\ mol\ dm^{-3} \times V_2$

$V_2 = 50\ cm^3$ **(02)**

$CO_3^{2-} + H^+ \longrightarrow HCO_3^-$ **(03)**

$$[HCO_3^-] = \left(\frac{0.2}{1000} \times 25\right) \times \frac{1000}{75}\ mol\ dm^{-3}$$ **(02)**

$= \underline{\underline{0.067\ mol\ dm^{-3}}}$ **(03)**

10

(iii) $HCO_3^-(aq) + H_2O(l) \rightleftharpoons H_2CO_3(aq) + OH^-(aq)$ **(05)**

I/	0.067	-	-	mol dm^{-3}
C/	$-x$	$+x$	$+x$	mol dm^{-3}
E/	$0.067 - x$	x	x	mol dm^{-3} **(05)**

$$K_{b_2} = \frac{[H_2CO_3(aq)][OH^-(aq)]}{[HCO_3^-(aq)]}$$ **(05)**

$$\frac{1 \times 10^{-14}\ mol^2\ dm^{-6}}{4.3 \times 10^{-7}\ mol\ dm^{-3}} = \frac{x^2}{0.067 - x}$$ **(05)**

$[OH^-(aq)]^2 = 0.067 \times 2.33 \times 10^{-8}$ $(0.067 - x \sim 0.067)$ **(02)**

$[OH^-(aq)] = 15.6 \times 10^{-10}$ mol dm^{-3}

$[OH^-(aq)]^2 = 3.95 \times 10^{-5}$ mol dm^{-3} **(02+01)**

$pOH = -log\,[OH^-(aq)]$

$= -log(3.95 \times 10^{-5})$

$= 4.4$

$pH = 14 - 4.4$

$= 9.6$ **(05)**

30

70

(c) (i)
* උෂ්ණත්වය නියත විය යුතුයි.
* ද්‍රාවක දෙක තුළ ද්‍රාව්‍යයේ අණුක ස්වභාවය එකම විය යුතුයි.
* ද්‍රාවක දෙකෙහිම ද්‍රාව්‍යයේ සාන්ද්‍රණය අඩු විය යුතුයි.
* ද්‍රාවක අමිශ්‍ර විය යුතුයි.
* සමතුලිත අවස්ථාවට එළඹුණු පසු ද්‍රාව්‍යයේ සාන්ද්‍රණය මැන ගැනීම කළ යුතුයි.

(ඕනෑම තුනක්)

(02×03)

(ii) $NaOH(aq) + HA(aq) \longrightarrow NaA(aq) + H_2O(l)$ **(04)**

1 : 1

$$K_D = \frac{[HA]\ \text{ඊතර්}}{[HA]\ \text{ජලය}}$$ **(05)**

$$= \frac{\left(\frac{0.1}{1000} \times 4.5\right) \times \frac{1000}{25}\ mol\ dm^{-3}}{\left(\frac{0.1}{1000} \times 27\right) \times \frac{1000}{50}\ mol\ dm^{-3}}$$ **(04 + 01)**

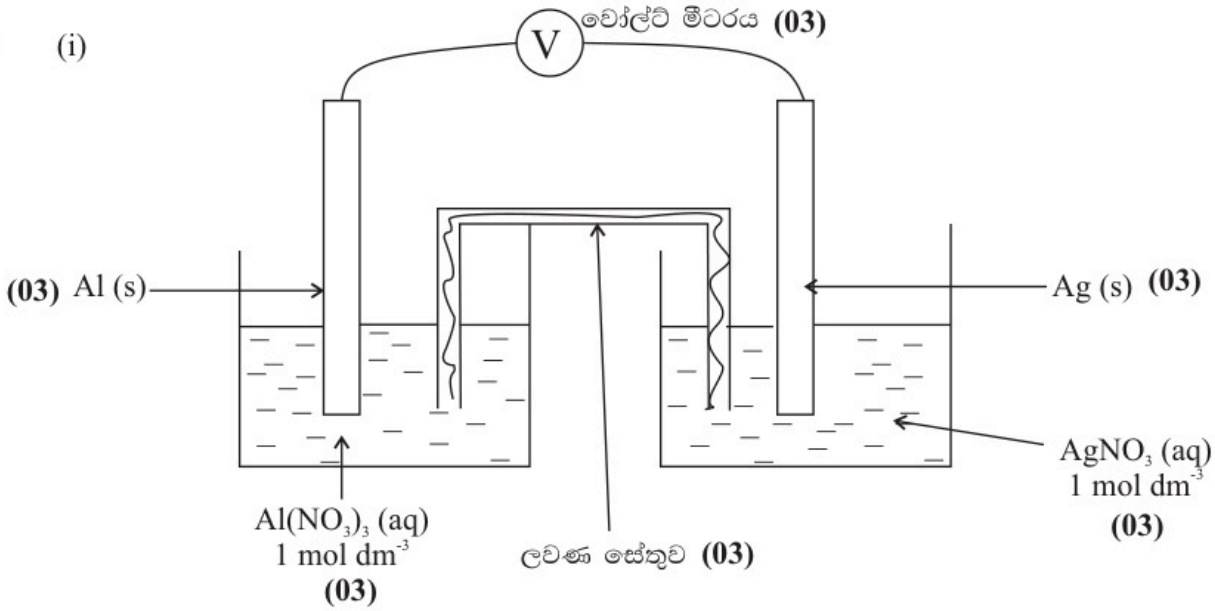
$$= \frac{9}{27}$$

$$= \frac{1}{3}$$

$= 0.33$ **(05)**

25

(07) (a) (i)



(ii) Al^{3+} (aq)/ Al (s) ඇනෝඩය **(02)**

ඇනෝඩ ප්‍රතික්‍රියාව

$Al (s) \longrightarrow Al^{3+} (aq) + 3e$ **(03)**

Ag^{+} (aq)/ Ag (s) කැතෝඩය **(02)**

කැතෝඩ ප්‍රතික්‍රියාව

$Ag+ (aq) + e \longrightarrow Ag (s)$ **(03)**

(iii) ධන අග්‍රය Ag **(02)** සෘණ අග්‍රය Al **(02)**

(iv) $E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode}$ **(04)**

$= 0.79 - (-1.66\ V)$ **(03)**

$= (0.79\ V + 1.66\ V)$

$= 2.45\ V$ **(03 + 01)**

(v) * ද්‍රාවණයේ විද්‍යුත් උදාසීනතාව පවත්වා ගැනීම **(02)**
* පරිපථයේ සංවෘත බව පවත්වා ගැනීම **(02)**

(vi) * KNO_3 වඩා සුදුසුයි. **(02)**
* K^{+} හා NO_3^{-} අයනවල සංචරණ වේග එක සමාන නිසා **(02)**

(vii) Al (s) | Al^{3+} (aq , mol dm^{-3} || Ag+ (aq , mol dm^{-3}| Ag (s) **(04)**

(viii) I. Ag මවුල ගණන $= \frac{0.324\ g}{108\ g\ mol^{-1}}$ **(03)**

$= 3 \times 10^{-3}$ mol **(03)**

II. $Ag^{+} (aq) + e \longrightarrow Ag (s)$ **(03)**

1 mol 1 mol

Q = It යෙදීමෙන් **(03)**

නිදහස්වන electron mol = 3×10^{-3} mol. **(03)**

electron/ mol $\longrightarrow$ 96500 C

$\therefore 3 \times 10^{-3}$ mol වලින් $\longrightarrow$ $3 \times 96500 \times 10^{-3}$ C **(03)**

නිදහස්වන ආකර්ෂණය = 289.5 C **(03)**

289.5 C = I × 20 × 60 S **(03)**

$I = \frac{289.5\ C}{1200\ S} = 0.24\ A$ (240 mA) **(03)**

80

(b) (i) P - $[Ni(H_2O)_6]^{2+}$ Q - $[Ni(H_2O)_5I]NO_3$

R - $K[Ni(H_2O)_3(NO_3)_3]$ S - $[Ni(H_2O)_6]SO_4$ **(10×04=40)**

(ii) P - hexaaquanickel(II) ion

R - potassium triaquatrinitratonickelate(II)

Q - pentaaquaiodidonickel(II) nitrate

S - hexaaquanickel(II) sulfate

(05×04=20)

(iii) <u>I^- හඳුනා ගැනීම</u>

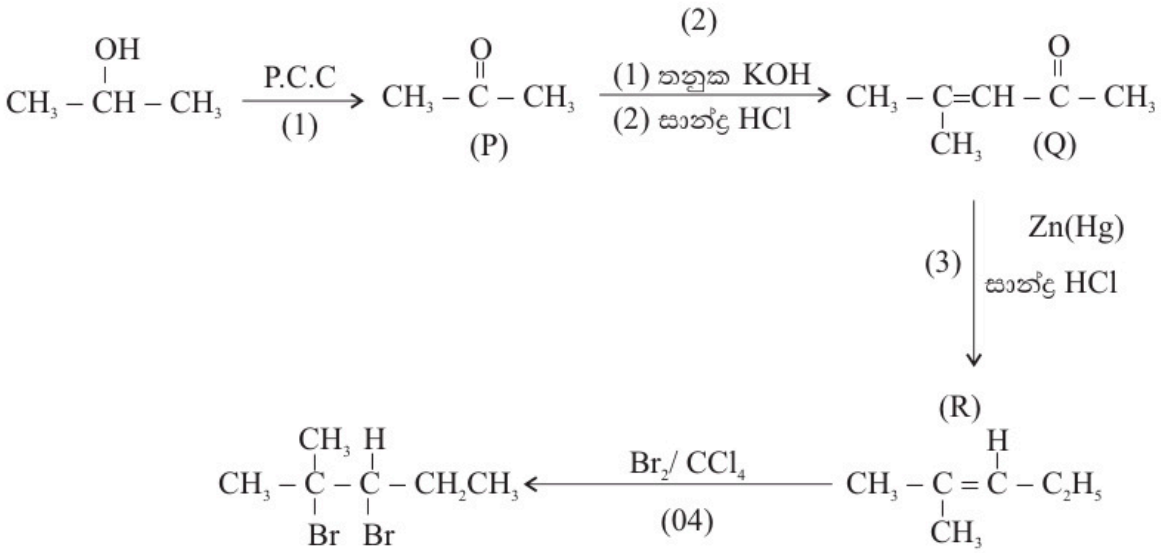
මෙම I^- අයන අඩංගු ද්‍රාවණයෙන් ස්වල්පයකට, $AgNO_3$ එකතු කරයි. කහපාට අවක්ෂේපයක් ලැබේ. එය සාන්ද්‍ර NH_3 තුළ අද්‍රාව්‍ය වේ.

හෝ

I^- අයන අඩංගු ද්‍රාවණයකට $Pb(NO_3)_2$ ද්‍රාවණයක් එකතු කළ විට PbI_2 හි තද කහ පාට අවක්ෂේපයක් ලැබේ. එය උණු ජලයේ ද්‍රාව්‍ය වේ. සිසිල් කළ විට නැවත රන්වන් ස්ඵටික ලැබේ. **(10)**

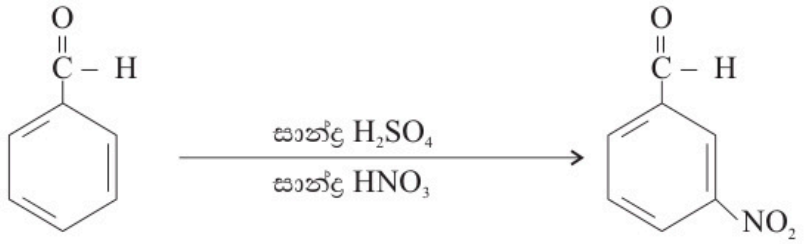
70

(08) (a)

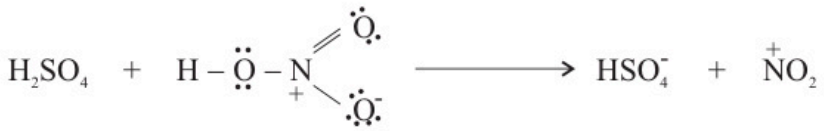


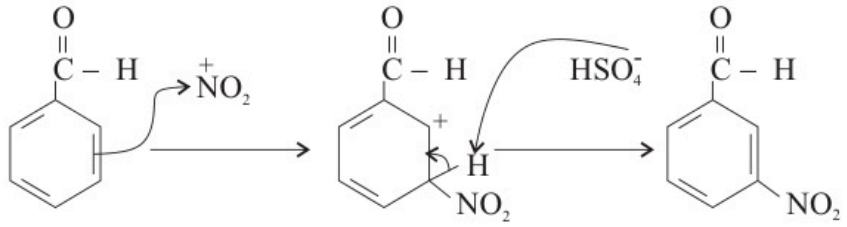
(05×07 = 35)

(b) (i)

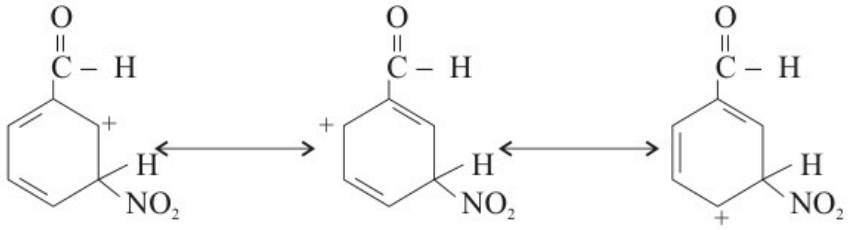


(10)

(ii) 



(03×07=21)

(iii) 

(03×03=09)

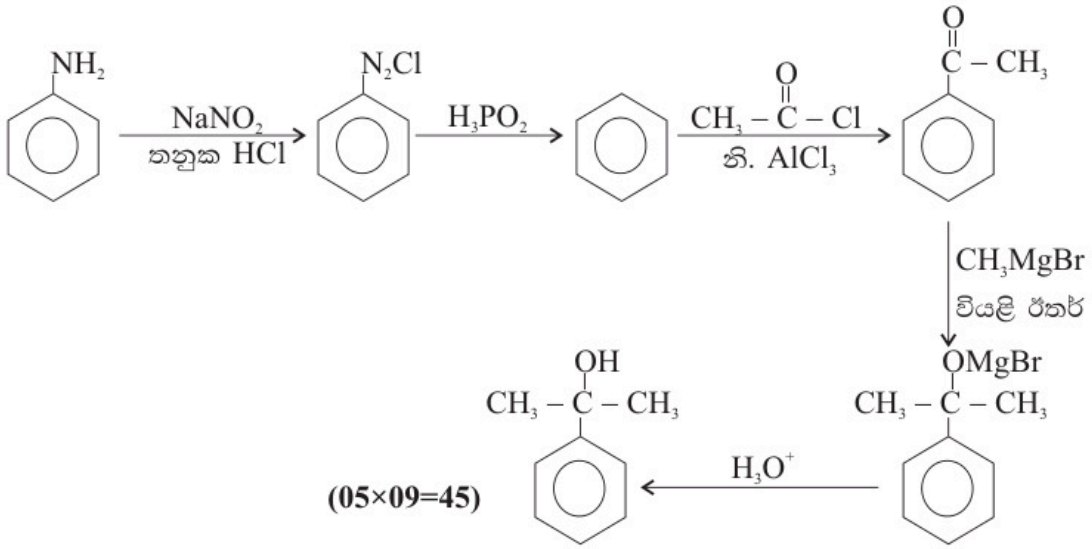
(මෙහි බෙන්සීන් වලයේ + ආරෝපණය මුළු C වලය පුරාම විස්ථානගත වේ. මේ නිසා ස්ථායී වේ.)

(02)

(c) (i) CH_3COOH > 2-propanol > 2-propanone > propanal **(10)**
(A) (D) (B) (C)

(ii) CH_3COOH වල අණු අතර ප්‍රබල H -බන්ධන ඇත. 2-propanol අණු අතර ද H - බන්ධන ඇති අතර ඒවා CH_3COOH අතර පවතින (ආකර්ෂණ බල) H-බන්ධන වලට වඩා දුබලයි. එමනිසා CH_3COOH හි ආකර්ෂණ බල ප්‍රබල වේ. $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ හා $CH_3CH_2-\overset{O}{\overset{\|}{C}}-H$ අණු තර ඇත්තේ ද්විධ්‍රැව-ද්විධ්‍රැව ආකර්ෂණ බලයි. හොඳින් ධ්‍රැවීකරණය වීම නිසා $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ අණු අතර ප්‍රබල ද්විධ්‍රැව බල පවතී.

(03×06=18)

(d) 

(05×09=45)

(09) (a) W_1 - CuS **(06)**

W_2 - CuI **(04)**

W_3 - $Cu(OH)_2$ **(04)**

W_4 - $[Cu(NH_3)_4]^{2+}$ **(04)**

W_5 - $[CuCl_4]^{2-}$ **(04)**

X_1 - $Fe(OH)_3$ **(06)**

X_2 - $Fe_4[Fe(CN)_6]_3$ or $KFe[Fe(CN)_6]$ **(04)**

X_3 - $Fe(SCN)_3$ or $[Fe(SCN)(H_2O)_5^{2+}]$ or $[Fe(SCN)]^{2+}$ **(04)**

Y_1 - ZnS **(06)**

Y_2 - $[Zn(H_2O_6]^{2+}$ **(04)**

Y_3 - $Zn(OH)_2$ **(04)**

Y_4 - Na_2ZnO_2 or ZnO_2^{2-} or $Na_2[Zn(OH)_4]$ or $[Zn(OH)_4]^{2-}$ **(04)**

Z_1 - $BaCO_3$ **(06)**

Z_2 - BaO **(04)**

P - $K_4[Fe(CN)_6]$ **(04)**

Q - NH_4SCN **(03)**

R - NH_3 **(02)**

S - CO_2 **(02)**

75

(b) ක්‍රියාවලිය -1

$FeO + 2HCl \longrightarrow FeCl_2 + H_2O$ **(03)**

$Cr_2O_3 + 6HCl \longrightarrow 2CrCl_3 + 3H_2O$ **(03)**

$FeCl_2 + 2NaOH \longrightarrow Fe(OH)_2 + 2NaCl$ **(03)**

$CrCl_3 + 3NaOH \longrightarrow Cr(OH)_3 + 3NaCl$ **(03)**

$2Fe(OH)_2 + H_2O_2 \longrightarrow 2Fe(OH)_3$ **(03)**

$2Cr(OH)_3 + 3H_2O_2 + 4OH^- \longrightarrow 2CrO_4^{2-} + 8H_2O$ **(07)**

$BaCl_2 + CrO_4^{2-} \longrightarrow BaCrO_4 + 2Cl^-$ **(03)**

ක්‍රියාවලිය -2

$2Fe(OH)_3 + 3H_2SO_4 \longrightarrow Fe_2(SO_4)_3 + 6H_2O$ **(03)**

$2Fe^{3+} + 2I^- \longrightarrow 2Fe^{2+} + I_2$ **(03)**

$I_2 + 2S_2O_3^{2-} \longrightarrow S_4O_6^{2-} + 2I^-$ **(03)**

$BaCrO_4$ මවුලික ස්කන්ධය $= 253\ g\ mol^{-1}$ **(01)**

$BaCrO_4$ මවුල ගණන $= \dfrac{0.632\ g}{253\ g\ mol^{-1}}$ **(01)**

$= \underline{\underline{2.5 \times 10^{-3}\ mol}}$ **(02)**

$CrO_4^{2-} . Cr_2O_3 = 2 : 1$

Cr_2O_3 මවුල ගණන $= 2.5 \times 10^{-3}\ mol \times ½$ **(02)**

$= 1.25 \times 10^{-3}\ mol$ **(02)**

Cr_2O_3 මවුලික ස්කන්ධය $= 152\ g\ mol^{-1}$ **(01)**

$Cr_2O_3\ \% = 1.25 \times 10^{-3} \times 152\ g\ mol^{-1}$ **(02)**

$= 0.19\ g$

$= \dfrac{0.19\ g}{2.0\ g} \times 100\%$ **(03)**

$= \underline{\underline{9.5\%}}$ **(03)**

$S_2O_3^{2-}$ මවුල ගණන $= \dfrac{0.2}{1000} \times 25\ cm^3$ **(02)**

$= 5 \times 10^{-3}\ mol$ **(02)**

$S_2O_3^{2-} : I_2 = 2 : 1$ **(01)**

$I_2 : Fe^{3+} = 1 : 2$ **(01)**

Fe^{3+} මවුල $= 5 \times 10^{-3}\ mol \times ½ \times 2$ **(02)**

$= 5 \times 10^{-3}\ mol$ **(02)**

$FeO : Fe^{3+} = 1 : 1$

FeO මවුල $= 5 \times 10^{-3}\ mol$

FeO මවුලික ස්කන්ධය $= 72\ g\ mol^{-1}$ **(01)**

FeO ස්කන්ධය $= 5 \times 10^{-3}\ mol \times 72\ g\ mol^{-1}$ **(02)**

FeO ස්කන්ධය $= 0.36\ g$

ස්කන්ධ ප්‍රතිශතය $= \frac{0.36\ g}{2.0\ g} \times 100\%$

$= 18\%$ **(02)**

75

(10) (a) (i) NH_3 - හේබර් ක්‍රමය

H_2SO_4 - ස්පර්ශ ක්‍රමය

HNO_3 - ඔස්වල්ඩ් ක්‍රමය

NaOH - පටල කෝෂ ක්‍රමය **(05×04 = 20)**

(ii) I. NaOH - ශාක තෙල් (පොල් තෙල්) **(02×02=04)**

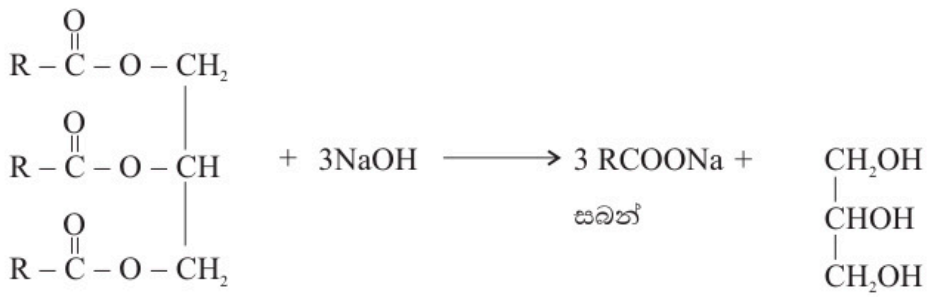
II. - සැපොනීකරණය

- ග්ලිසරින් ඉවත් කිරීම

- පිරිසිදු කිරීම

- නිමි සබන් බවට පත් කිරීම **(03×04=12)**

II.



(10)

II. ග්ලිසරින් / ග්ලිසරෝල් **(03)**

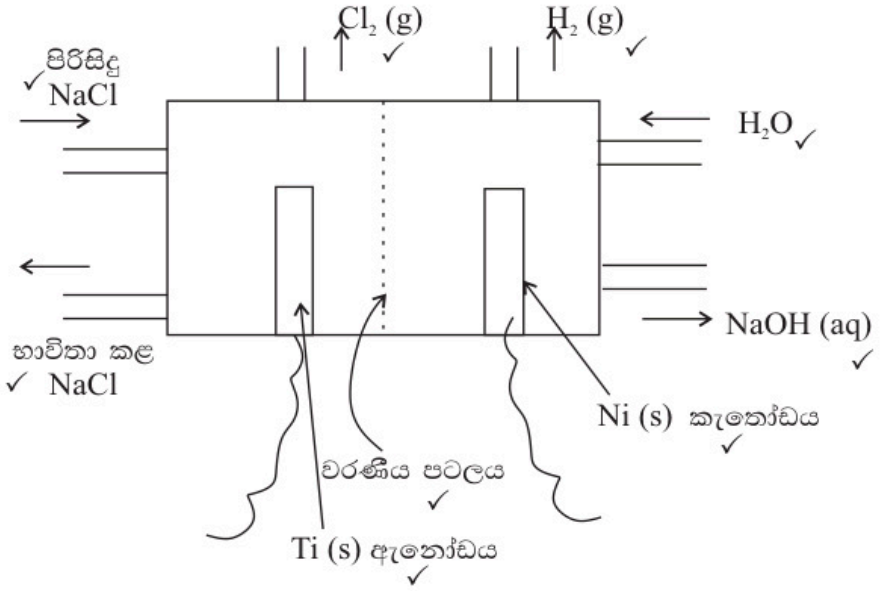
(iii) I. NaCl ජලීය ද්‍රාවණය විද්‍යුත් විච්ඡේදනය කිරීම **(03)**

ඇනෝඩය $2Cl^-(aq) \longrightarrow Cl_2\ (g)\ 2e$ —— ① **(03)**

කැතෝඩය $2H_2O\ (l) + 2e \longrightarrow H_2\ (g)\uparrow + 2OH^-(aq)$ —— ② **(03)**

$2NaCl\ (aq) + 2H_2O\ (l) \longrightarrow Cl_2\ (g) + H_2\ (g) + 2NaOH\ (aq)$ **(03)**

II.



(01×09=09)

III. - සබන් නිෂ්පාදනය
- ප්‍රබල භෂ්මයක් ලෙස
- කඩදාසි කර්මාන්තය
- අපජලය පිරියම් කිරීමේ දී බැර ලෝහ අයන ඒවායේ හයිඩ්‍රොක්සයිඩ ලෙස අවක්ෂේප වීමට

(03×02=06)

76

(b) (i) I. ඩීසල් හා ගල්අඟුරු දහනයේ දී එහි අපද්‍රව්‍ය ලෙස පවතින S දහනයෙන් SO_2 නිදහස් වේ. SO_2 වර්ෂා ජලයේ දිය වී ඔක්සිකරණය වී H_2SO_4 බවට පත් වේ. එය ප්‍රබල අම්ලයකි. එමනිසා අම්ල වැසිවලට හේතු වේ.

(03×02=06)

II. CFC භාවිතා කළ විට ශීතකරණ හා වායු සමීකරණ යන්ත්‍රවල අලුත්වැඩියාවේ දී හා ඉවත දැවීමේ දී වායුගෝලයට CFC එකතු වේ. එවිට ඉහළ වායුගෝලයට මේවා ගමන් කර Cl මුක්ත ඛණ්ඩක ඇති කරයි. එය ඕසෝන් ස්ථරයේ ඇති O_3 සමඟ ප්‍රතික්‍රියා සිදු වේ. එමනිසා එය විනාශ වේ.

(03×02=06)

III. ජෛව ඩීසල් නිෂ්පාදනය සඳහා ශාක තෙල් භාවිතා කරයි. එය නිතර අපට නිෂ්පාදනය කරගත හැකි සම්පතකි. එයින් පරිසරයට සිදුවන බලපෑම ද අඩු වේ.

(03×02=06)

(iii) I. CO_2, CH_4, N_2O, CFC, HCFC **(02×04 = 08)**

II. - ග්ලැසියර් දියවීයාම නිසා මුහුදු ජල මට්ටම වැඩි වීම.

- සාගර ජලය ප්‍රසාරණය වීම නිසා පහත් බිම් යට වීම.
- කාන්තාරකරණය
- මිරිදිය ජලාශ සිඳී යාම.
- නිතර ඇති වන සුළි කුණාටු
- කාලගුණික විපර්යාස
- වසංගත රෝග බෝ වීම. **(03×03=09)**

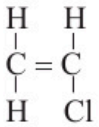
III. - පොසිල ඉන්ධන වෙනුවට විකල්ප බලශක්ති භාවිතා කිරීම.

- අපද්‍රව්‍ය නිසි පරිදි බැහැර කිරීම
- රසායනික පොහොර වෙනුවට , කොම්පෝස්ට් පොහොර යෙදීම.

(03×03=09)

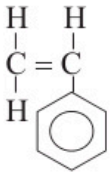
44

(c) (i) PVC



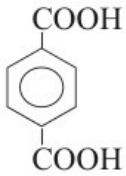
(04)

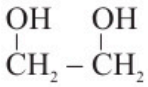
පොලිස්ටයිරින්



(04)

(ii) PET සංගණන බහුඅවයවික **(02)**



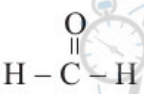


(04×02=08)

නයිලෝන් 6, 6 සංගණන බහුඅවයවික **(02)**

$HCOOC(CH_2)_4COOH$ $H_2N(CH_2)_6NH_2$ **(02×02=04)**

(iii) බේක්ලයිට් **(02)**



(02×02=04)

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