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 மொறட்டுவை பல்கலைக்கழகப் பொறியியற் பீட தமிழ் மாணவர்கள் | MORA E-TAMILS 2019 | Tamil Students, Faculty of Engineering, University of Moratuwa | MORA E-TAMILS 2019
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கல்விப் பொதுத் தராதரப் பத்திர(உயர் தர) முன்னோடிப் பரீட்சை - 2017 General Certificate of Education (Adv.Level) Pilot Examination - 2017

இரசாயனவியல்
 Chemistry

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02

E

I

இரண்டு மணித்தியாலம்
 Two hours

Instructions:

- ❖ This paper consists of **12** pages. (Periodic table is also provided)
- ❖ Answer **all** the questions.
- ❖ **Use of calculator is not allowed.**
- ❖ **Write your index number** in the space provided in the answer sheet.
- ❖ 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 $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$

Avagadroconstant $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$

Planck's constant $h = 6.626 \times 10^{-34} \text{ Js}$

Speed of light $c = 3 \times 10^8 \text{ ms}^{-1}$

01. The energy of a photon relates with a certain electromagnetic radiation is $6.62 \times 10^{-22} \text{ kJ}$. The wavelength of this radiation is,

- (1) $3 \times 10^{-4} \text{ nm}$ (2) $3 \times 10^{-7} \text{ nm}$ (3) $3 \times 10^2 \text{ nm}$ (4) $3 \times 10^5 \text{ nm}$ (5) $3 \times 10^{-5} \text{ nm}$

02. The increasing order of first ionization enthalpies of the elements N, F, Ar, Cl, Al and K is

- (1) $K < Al < Cl < Ar < N < F$ (2) $K < Al < Ar < Cl < N < F$ (3) $K < Al < Cl < N < F < Ar$
 (4) $K < Al < N < F < Cl < Ar$ (5) $K < Al < Cl < N < Ar < F$

03. The IUPAC name of the compound X is $\text{H} - \overset{\text{O}}{\underset{\text{[X]}}{\text{C}}} - \text{CH} = \text{CH} - \overset{\text{COOH}}{\underset{\text{NH}_2}{\text{C}}} - \text{CH}_2 - \text{CH}_3$

- (1) 3- amino-2-formylhex-4-en-3-oic acid (2) 4-formyl-2-amino-2-ethylpent-3-enoic acid
 (3) 2-amino -2-ethyl-4-formylbut -3-enoic acid (4) 2-amino-2-ethyl -5-oxopent-3-enoic acid
 (5) 2-ammine-2-ethyl-5-oxopent-3-enoic acid

04. The **incorrect** statement regarding third period elements and their respective compounds is,

- (1) The acidic nature of their highest oxidation state oxides increases along the period from left to right.
 (2) In the oxy acids formed by elements Si, P, S and Cl, those elements are found in sp^3 hybridization.
 (3) The ability to form covalent compounds by these elements increases along the period from left to right.
 (4) When considering their stable ions, Al and Si have the smallest and largest radii respectively.
 (5) The ability to polarize the electron cloud of a certain anion by Na, Mg and Al ions increases in the order of Na, Mg and Al.

05. Which of the following set of quantum number is **not possible** for the valence electron of the most stable ion of Sc?

(1) $(3, 2, -1, +\frac{1}{2})$

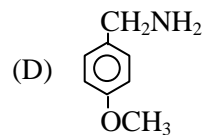
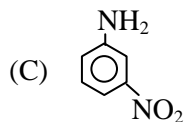
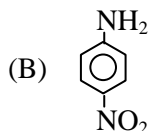
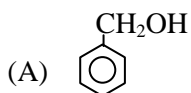
(2) $(3, 0, 0, +\frac{1}{2})$

(3) $(3, 1, 0, -\frac{1}{2})$

(4) $(3, 1, -1, +\frac{1}{2})$

(5) $(3, 0, 0, -\frac{1}{2})$

06.



The correct increasing order of basic strength of the above given compounds is,

(1) $D < B < C < A$

(2) $A < B < C < D$

(3) $B < C < A < D$

(4) $C < B < D < A$

(5) $C < B < A < D$

07. At a certain temperature the solubility of $\text{Ba}_3(\text{PO}_4)_2$ in $0.1 \text{ mol dm}^{-3} \text{ Ba}(\text{NO}_3)_2$ and $0.1 \text{ mol dm}^{-3} \text{ Na}_3\text{PO}_4$ solutions are S_1 and S_2 respectively. Which of the following is a correct relationship for S_1 in terms of S_2 ?

(1) $S_1 = (10S_2^3)^{1/2}$

(2) $S_1 = \left(\frac{5}{2}S_2^3\right)^{1/2}$

(3) $S_1 = \left(\frac{270}{4}S_2^3\right)^{1/2}$

(4) $S_1 = (270S_2^3)^{1/2}$

(5) $S_1 = \left(\frac{45}{2}S_2^3\right)^{1/2}$

08. When 0.8 g of solid mixture of KHCO_3 and CaCO_3 containing 75% KHCO_3 by mass is heated to high temperature until complete decomposition, the volume of CO_2 gas collected under STP condition is (K – 39, Ca – 40, C – 12, O – 16, H – 1)

(1) 0.1792 dm^3

(2) 0.0672 dm^3

(3) 0.112 dm^3

(4) 0.0448 dm^3

(5) 0.168 dm^3

09. Which of the following statements is **incorrect** regarding the S block elements,

(1) They contain valence electrons only in S orbitals.

(2) Ca, Sr and Ba cause an increase in the pH when they are mixed with both NaOH and HCl solutions

(3) He belongs to S block

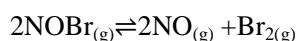
(4) Among the S-block elements, Cs and H can be considered as the best reducing and oxidizing agent respectively.

(5) All react with water and release H_2 gas at room temperature.

10. Which of the following gives the correct information regarding the central Sulphur atom of an asymmetrical dibasic oxy acid $\text{H}_2\text{S}_2\text{O}_2$?

	Oxidation number	Hybridization	Geometrical Shape	Electron Pair Geometry
(1)	+2	sp^3	Tetrahedral	Tetrahedral
(2)	+4	sp^3	Trigonal Pyramidal	Tetrahedral
(3)	+4	sp^3	Tetrahedral	Tetrahedral
(4)	+2	sp^3	Trigonal Pyramidal	Tetrahedral
(5)	+2	sp^2	Tetrahedral	Tetrahedral

11. A sample of 1 mol $\text{NOBr}_{(\text{g})}$ is dissociated and reached equilibrium in a closed vessel of volume 1 dm^3 . If x mol of $\text{NOBr}_{(\text{g})}$ is dissociated at equilibrium, the equilibrium constant K_c is,



(1) $\frac{x}{2(1-x)}$

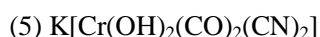
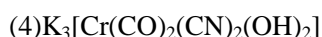
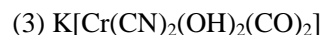
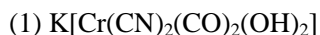
(2) $\frac{x^3}{2(1-x)^2}$

(3) $\frac{2(1-x)^2}{x^3}$

(4) $\frac{x^3}{(1-x)^2}$

(5) $\frac{x^2}{2(1-x)}$

12. The chemical formula of Potassium dicarbonyldicyanidodihydroxidochromate(iii) according to IUPAC rules is



13. A sample of 13.2 g C_7H_{16} containing dissolved Sulphur is mixed with 1.3 mol O_2 in a closed vessel and it is completely combusted and then system is allowed to cool. 14.4 g water is obtained. Assuming that none of the gaseous state products obtained in this reaction dissolved in water, find the total number of moles of O_2 , CO_2 and SO_2 found at the end of combustion.

(1) 0.75

(2) 0.8

(3) 0.85

(4) 0.9

(5) 0.95

14. Ice and water can exist in equilibrium at 0°C temperature and 1 atm pressure. At 0°C the entropy change that occurs when 1 mole of ice is converted into water is $22\text{ J mol}^{-1}\text{K}^{-1}$. What is the enthalpy change that occurs when 54g water is completely fused into ice at the same temperature and pressure

(1) -6 kJ mol^{-1}

(2) -18 kJ mol^{-1}

(3) 6 kJ mol^{-1}

(4) 0.6 kJ mol^{-1}

(5) 18 kJ mol^{-1}

15. Two ideal solutions containing liquids A and B are prepared at a certain temperature. When these solutions are in the equilibrium with their vapours, the mole fractions of A in liquid phase are 0.6 and 0.3 respectively. The vapour pressures of these two solutions are P_1 and P_2 respectively. The saturated vapour pressures of A and B are P_A^0 and P_B^0 respectively. Which of the following relationships regarding this solution is correct?

(1) $P_B^0 = 2P_2 - P_1$

(2) $P_A^0 + P_B^0 < P_1 + P_2$

(3) $P_A^0 = 2P_2 - P_1$

(4) $P_A^0 = \frac{1}{2}(5P_1 - 4P_2)$

(5) $P_B^0 = 2P_1 - P_2$

16. A buffer solution with $\text{p}^{\text{H}} = 6$ is prepared by mixing equal volumes of mono basic weak acid HA with certain concentration and NaOH with another certain concentration. The ratio between the concentrations of the acid and base mixed in this solution is ($K_a = 1 \times 10^{-5}\text{ mol dm}^{-3}$)

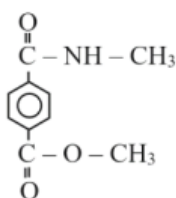
(1) 3:7

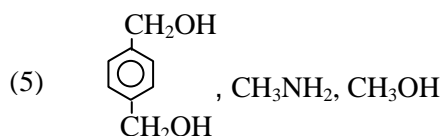
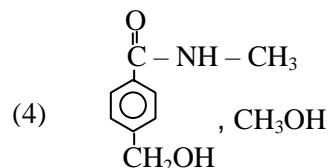
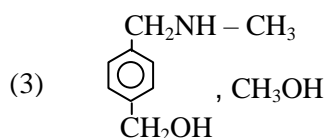
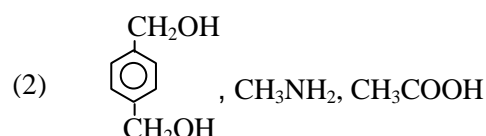
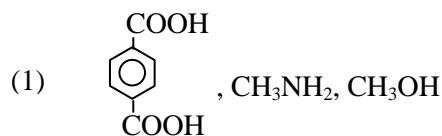
(2) 10:11

(3) 11:12

(4) 7:3

(5) 11:10

17. The products obtained when  is reacted with LiAlH_4 and then hydrolyzed



18. K_1 and K_2 are forward and backward rate constants of equilibrium reaction $2\text{P}_{(\text{g})} + \text{Q}_{(\text{g})} \xrightleftharpoons[K_2]{K_1} 3\text{R}_{(\text{g})}$. Which of the following statements is correct regarding this equilibrium?

- (1) The increase in concentration of P and Q increases the rate constant K_1 , while the increase of concentration of R increases the rate constant K_2 .
- (2) The ratio K_2/K_1 gives the equilibrium constant K_c .
- (3) $\frac{\Delta[\text{P}_{(\text{g})}]}{\Delta t} = \frac{1}{2} \frac{\Delta[\text{Q}_{(\text{g})}]}{\Delta t}$
- (4) When pressure is increased by reducing the volume of the system, both forward and backward rates increase but equilibrium position does not change.
- (5) The decrease in the concentration of R will increase the rate of forward

19. Two electric cells are constructed by using electrodes A, B and C. The e.m.f of the cell constructed by using A and B is 1.1V and the e.m.f of the cell constructed by using B and C is 2.72V. The reduction potential of B is $E_{B_{(\text{aq})}^{2+}/B_{(\text{s})}}^\circ = 0.34\text{V}$. If B acts as positive electrode in both cells, the standard e.m.f of the cell constructed by using electrodes A and C is

- (1) 3.14V (2) 1.62V (3) 4.5V (4) 2.3V (5) 3.82V

20. How many resonance structures can be drawn to the molecule N_2O_2 (Skeletal structure $\text{O}-\text{N}-\text{N}-\text{O}$)

- (1) 2 (2) 3 (3) 5 (4) 6 (5) 7

21. Which of the following statements regarding 3d transition elements is true?

- (1) The oxy anions of Cr, CrO_4^{2-} and $\text{Cr}_2\text{O}_7^{2-}$ are stable in acidic medium and basic medium respectively.
- (2) The oxide MnO_2 of Mn is amphoteric in nature and acts as a very good oxidizing agent in neutral medium.
- (3) 4s orbital is found as empty in all the stable positive ions of these elements.
- (4) Only Ti and Mn can form dioxides among these elements.
- (5) V, Cr and Mn take their highest oxidation states by the formation positive ions by losing electrons.

22. $\text{PCl}_{5(g)}$ is taken in a closed vessel and allowed to dissociate at a certain temperature and an equilibrium is obtained.



Cl_2 gas is passed into this equilibrium system at constant temperature and allowed to attain equilibrium again. Which of the following correctly gives the change in forward and backward rates of new equilibrium, when compared with the initial equilibrium?

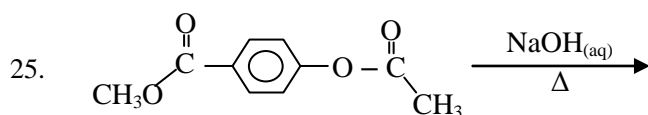
	Rate of forward	Rate of backward
(1)	Increases	Decreases
(2)	Decreases	Increases
(3)	Decreases	Decreases
(4)	Increases	Increases
(5)	Does not change	Increases

23. The standard enthalpy of formation of $\text{N}_2\text{O}_{5(s)}$ is 11.3kJmol^{-1} . Which of the followings is correct regarding the reaction $2\text{N}_{2(g)} + 5\text{O}_{2(g)} \rightarrow 2\text{N}_2\text{O}_{5(s)}$ at 25°C ?

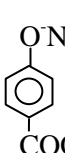
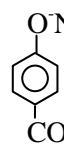
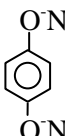
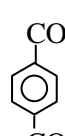

	ΔG^θ	ΔS^θ
(1)	Positive	Positive
(2)	Negative	Negative
(3)	Positive	Negative
(4)	Negative	Positive
(5)	Positive	Zero

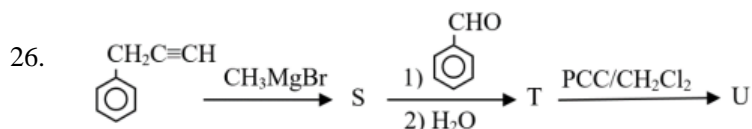
24. 3d transition metals L, M and N react with Cl_2 and each gives yellow coloured anhydrous chloride solid separately. When water is added to the chloride compounds of L, M and N separately they give blue, yellow and green colour solutions respectively. The metals L, M and N respectively are

- | | | |
|----------------|----------------|----------------|
| (1) Ni, Co, Fe | (2) Ni, Mn, Cr | (3) Ni, Cu, Fe |
| (4) Cu, Co, Cr | (5) Cu, Fe, Ni | |

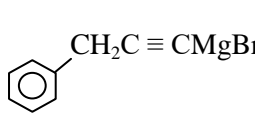
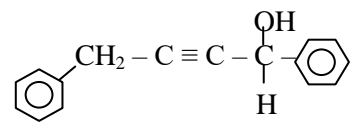
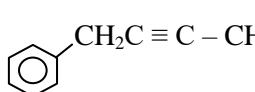
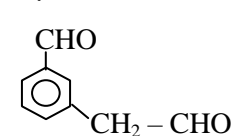
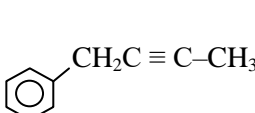
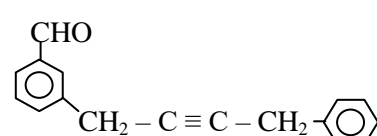
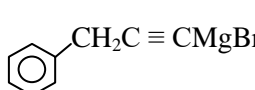
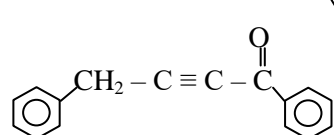
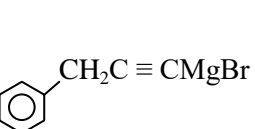
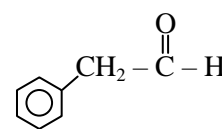


The main products of the above reaction is,

- (1)  + CH₃OH + CH₃COO⁻Na⁺ (2)  + CH₃O⁻Na⁺ + CH₃COO⁻Na⁺
- (3)  + CH₃OH + CH₃COO⁻Na⁺ (4)  + CH₃O⁻Na⁺
- (5)  + CH₃COO⁻Na⁺



The structures of **S** and **U** in the above reaction scheme respectively are,

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

27. The **incorrect** statement regarding H_2O_2 is

- (1) It is a light blue coloured viscous liquid
- (2) The dissociation of it in the presence of light is a disproportionation reaction
- (3) It gives O_2 as a product when it acts as a reducing agent.
- (4) When reacting with PbS solid, it gives PbO and a pale yellow coloured sulphur residue
- (5) The resultant dipole moment of this compound is greater than that of water

28. An electric cell is constructed by connecting $\text{Cu}_{(s)}/\text{Cu}^{2+}_{(aq)}$ electrode and $\text{Ag}_{(s)}, \text{AgCl}_{(s)}/\text{Cl}^{-}_{(aq)}$ electrode

$$E^{\circ}_{\text{Cu}^{2+}_{(aq)}|\text{Cu}_{(s)}} = 0.34\text{V}$$

$$E^{\circ}_{\text{AgCl}_{(s)}, \text{Ag}_{(s)}|\text{Cl}^{-}_{(aq)}} = 0.22\text{V}$$

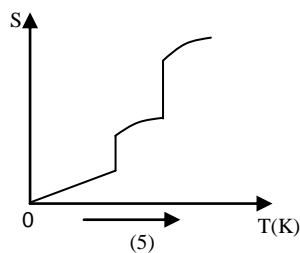
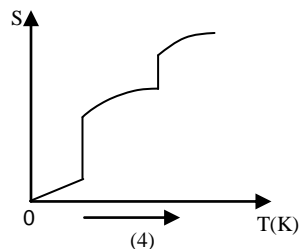
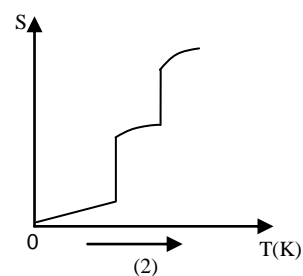
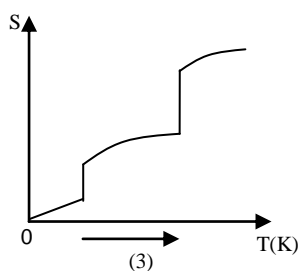
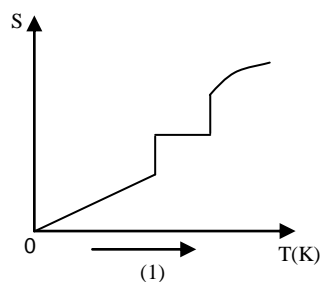
The correct statement regarding the above cell is

- (1) e.m.f of this cell is 0.56V.
- (2) Cu acts as negative electrode in this cell
- (3) The cell reaction of this cell is $2\text{Ag}_{(s)} + \text{CuCl}_{2(aq)} \rightarrow 2\text{AgCl}_{(s)} + \text{Cu}_{(s)}$
- (4) Electric current flows from $\text{Ag}_{(s)}, \text{AgCl}_{(s)}/\text{Cl}^{-}_{(aq)}$ to $\text{Cu}_{(s)}/\text{Cu}^{2+}_{(aq)}$ electrode.
- (5) There will be no change in the electric current when the distance between the electrodes is reduced.

29. The correct statement regarding $\text{C}_6\text{H}_5\text{CONH}_2$ is,

- (1) When reacted with Acetyl Chloride, a substituted amide is obtained as a product.
- (2) It reacts with Nitrous acid and gives white colour precipitate with $\text{N}_2(\text{g})$ liberation.
- (3) It dissolves in dil. $\text{HCl}_{(aq)}$ by forming a salt
- (4) It is reduced by NaBH_4 and it gives $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$ as product
- (5) It is a stronger base than $\text{C}_6\text{H}_5\text{NH}_2$.

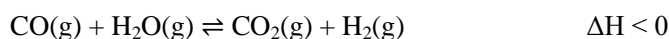
30. Which of the following graphs correctly represent the variation of entropy(S) of water with temperature(T)



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

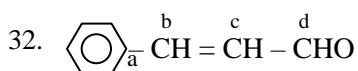
1	2	3	4	5
Only (a) and (b) are correct	Only (b) and (c) are correct	Only (c) and (d) are correct	Only (d) and (a) are correct	Any other number of combination of responses is correct

31. Consider the following reaction.



This reaction takes place in a rigid closed vessel at a particular temperature and equilibrium is obtained. The equilibrium pressure is $1 \times 10^6 \text{ Pa}$ and $P_{\text{CO}} = P_{\text{H}_2\text{O}} = 2 \times 10^5 \text{ Pa}$. Which of the following statement(s) is/are correct?

- Initial pressure is $1 \times 10^6 \text{ Pa}$.
- $K_p = 2.25$
- Both the equilibrium pressure and P_{CO} decrease with the addition of solid anhydrous CaCl_2
- K_p increases with the increase of temperature.



Which of the following statement(s) is/are true regarding the above molecule?

- The carbon atoms denoted by a, b, c and d are found on the same plane.
- All the carbon atoms in this molecule are found in sp^2 hybridization.
- 7 carbon atoms of this molecule are found on same plane.
- The bond length between the carbon atoms of the benzene ring and bond length between the carbon atoms denoted by b and c are equal.

33. Reaction(s) related with the production of iron is/are

- $\text{FeO}_{(\text{s})} + \text{CO}_{(\text{g})} \rightarrow \text{Fe}_{(\text{l})} + \text{CO}_{2(\text{g})}$
- $\text{CaCO}_{3(\text{s})} + \text{SiO}_{2(\text{s})} \rightarrow \text{CaSiO}_{3(\text{l})} + \text{CO}_{(\text{g})}$
- $\text{Fe}_3\text{O}_{4(\text{s})} + \text{CO}_{(\text{g})} \rightarrow \text{Fe}_2\text{O}_{3(\text{s})} + \text{CO}_{2(\text{g})}$
- $\text{CaO}_{(\text{s})} + \text{Al}_2\text{O}_{3(\text{s})} \rightarrow \text{Ca}(\text{AlO}_2)_{2(\text{l})}$

34. The rate law of the reaction $A_{(g)} + B_{(g)} \rightarrow C_{(g)} + D_{(g)}$ is $R = K[B_{(g)}]$. Which of the following statement(s) is/are true regarding this reaction
- (a) Rate of reaction does not depend on the concentration of A.
 - (b) It is a first order reaction
 - (c) The concentration of A does not change during the reaction
 - (d) Here, the unit of rate constant is s^{-1} .
35. Which of the following statement(s) is/are correct regarding isomers?
- (a) All the aldehyde molecules react with KCN/dil. H_2SO_4 and form optically active products
 - (b) The product formed by the reaction of 2-pentenal with $NaBH_4$, shows geometrical isomerism
 - (c) 2-pentene reacts with HBr and forms positional isomers as products
 - (d) The groups in the asymmetrical center of an organic molecule should have different masses.
36. Which of the following statement(s) is/are correct regarding 0.2 mol dm^{-3} monobasic weak acid solution of HA ($K_a = 1 \times 10^{-5} \text{ mol dm}^{-3}$, $K_w = 1 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$)
- (a) When 10 cm^3 of this solution is diluted up to 1 dm^3 by adding distilled water, p^{OH} value drops by one unit.
 - (b) When 0.2 mol dm^{-3} NaOH solution is added drop by drop to 10 cm^3 of above solution, the degree of ionization of HA increases in the resultant solution .
 - (c) When 0.2 mol dm^{-3} HCl solution is added drop by drop to a 10 cm^3 of above solution, the degree of ionization of HA decreases in the resultant solution
 - (d) The p^H of the resultant solution obtained in the equivalent point of titration by using 10 cm^3 of this acid with 0.2 mol dm^{-3} NaOH solution is 9.

37. Consider the following reaction



Which of the following statement(s) is/are correct regarding this reaction?

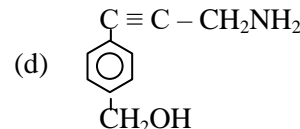
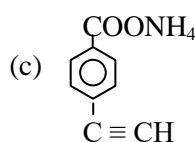
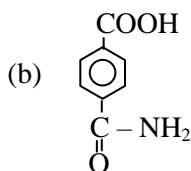
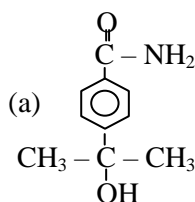
- (a) As heat loss takes place to the environment, the average kinetic energy of product molecules is lesser than that of reactant molecules at the given temperature.
- (b) In this reaction, energy is absorbed during the formation of products from the activated intermediate complex
- (c) This change is spontaneous at any given temperature.
- (d) The difference in the enthalpies of reactant molecules and product molecules is the enthalpy change of the reaction.

38. Which of the following statement(s) is/are correct regarding chemical kinetics?

- (a) For a certain temperature increase, the reaction involving liquid molecules shows the greatest increase in the rate than the reaction involving gaseous molecule.
- (b) In an elementary reaction, most of the factors affecting the rate of reaction also affect the activation energy of that reaction.
- (c) In a complex reaction, the step with the highest activation energy is the rate determining step.
- (d) The relationship among the rates of each components involving in the reaction is determined by their stoichiometric coefficient

39. Which of the following compound(s) involve/involves to both reactions given below

- i. Gives NH_3 with hot NaOH solution.
- ii. Releases white fume with PCl_5 .





40. Which of the following statement(s) is/are false regarding polymers?

- (a) Natural polymers are addition polymers.
- (b) Teflon is a polymer resistive to high temperature due to the presence of halogen substitution
- (c) NH_3 gas evolves when Nylon polymer is heated with NaOH solution.
- (d) PVC, Styrene and Poly propene are thermoplastic condensation polymer.

- In questions No. 41 to 50 two statements are given in respect of each question. From the Table given below, select the 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	First statement	Second statement
(1)	True	True, and correctly explains the first statement
(2)	True	True, but does not correctly explains the first statement
(3)	True	False
(4)	False	True
(5)	False	False

	First statement	Second statement
41	Na_3N is not produced in the reaction between Na and N_2 .	The third ionization energy of Na is much greater than the first ionization energy of it.
42	The rate of reaction of para nitro benzaldehyde with a certain nucleophile is greater than that of meta nitro benzaldehyde.	NO_2 makes greater increase in the electronegativity of carbon atoms in ortho and para positions when compared with the carbon atom in meta position.
43	Boyl's Temperature (T_B) of $\text{CO}_{2(g)}$ is greater than that of $\text{N}_{2(g)}$.	Critical temperature (T_C) of $\text{N}_{2(g)}$ is greater than that of $\text{CO}_{2(g)}$.
44	The solubility of all salts of alkali earth metals decreases along the group from top to bottom.	As the ionic size of ions of alkali earth metals increases down the group, lattice energy of the salts decreases.
45	 -CH ₂ Cl gives precipitate with AgNO_3 quickly than  -CH ₂ -CH ₂ Cl	NO_3^- acts as a nucleophile in the hydrolysis reaction of organic halogen compounds.
46	Unit of rate constant can be deduced by considering the balanced chemical equation of an elementary reaction.	The molecularity of reaction in an elementary reaction is equal to the order of the reaction relative to those reactants.
47	High pressure is applied in order to obtain high yield in the production of sulphuric acid through contact process.	$2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{SO}_{3(g)}$ is an endothermic reaction occurring with the reduction of number of moles.
48	But-2-ene is an unsaturated hydrocarbon which shows the diastereomerism	The two diastereomers of But-2-ene are stereoisomers which are mirror images to each other
49	Boiling point of an ideal solution shows a linear variation with its composition.	In an ideal solution, attractive forces found among individual species are equal to the attractive force found among various species.
50	Molecules of water vapour contribute to Global warming.	Water vapour molecules are greenhouse gas.

1	1 H																	2 He						
2	3 Li	4 Be																	5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg																	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr						
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe						
6	55 Cs	56 Ba	La-Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn						
7	87 Fr	88 Ra	Ac-Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub	113 Uut	...										

57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

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கல்விப் பொதுத் தராதரப் பத்திர(உயர் தர) முன்னோடிப் பரீட்சை - 2017
 General Certificate of Education (Adv.Level) Pilot Examination - 2017

இரசாயனவியல்
 Chemistry

II
 II

02

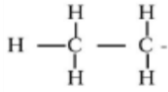
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II

மூன்று மணித்தியாலம்
 Three hours

Instructions :

- This question paper consists of 18 pages.
- Use of calculators is not allowed.
- Universal gas constant
 $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$
- Avagadro constant
 $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$
- Alkyl groups can be written in short form as follows.
- Eg : CH_3CH_2- can be written as



❖ Part A – Structured Essay (Pages 2 - 10)

- Answer all the questions on the question paper itself.
- Write your answers 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 – Essay (Pages 11 - 18)

- Answer **four** questions altogether choosing **two** questions from each section. Use the answer sheets provided for this purpose.
- Annex part B and C to A placing part A on top and hand it over to the examination Supervisor at the end of the given time.
- You are permitted to remove only Parts **B** and **C** of the question paper from the Examination Hall.

Index No. :

For Examiner's Use Only

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

Final Marks

In Numbers	
In Letters	

Code Numbers

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

Part A – Structured Essay

Answer **all four** questions on this paper it self
(Each question carries **10** marks)

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01.(a) Arrange the following in the **increasing** order of the property indicated in parenthesis.

i. S, C, H, Br (electro negativity)

.....<.....<.....<.....

ii. Ag^+ , Mg^{2+} , Zn^{2+} , Fe^{2+} (Ability to act as an oxidizing agent in aqueous solution)

.....<.....<.....<.....

iii. AgI, AgBr, AgCl, AgF (covalent character)

.....<.....<.....<.....

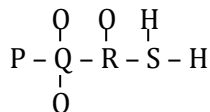
iv. CH_4 , HCl, PH_3 , H_2S (boiling point)

.....<.....<.....<.....

v. SOCl_2 , XeF_2 , ICl_4^- , CO_3^{2-} (number of repulsive units around the central atom)

.....<.....<.....<.....

(b) Elements P, Q, R and S are nonmetals with atomic number less than 20. The corresponding maximum stable valences are 7, 6, 4 and 5. R and S have maximum electro negativity in their respective groups. The fundamental structure of the molecule H_2RQPSO_3 formed by these elements is given below.



i. Identify the elements P, Q, R and S.

P - Q -

R - S -

ii. Draw the most acceptable Lewis structure for this molecule.

.....
.....
.....
.....

iii. Draw six resonance structures for this molecule. (excluding the structure draw in the part (ii) above)

.....
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iv. State the following regarding Q, R and S atoms in the table given below using the structure drawn in part (ii) above

Do not write anything here.

1. Electron pair geometry (arrangement of electron pair) around the atom
2. Shape around the atom
3. Hybridization of the atom
4. Approximate value of bond angle around the atom.

		Q	R	S
1.	Electron pair geometry			
2.	Shape			
3.	Hybridization			
4.	Bond angle			

v. Identify the atomic/ hybrid orbital involved in the formation of the following σ – bond in the Lewis structure draw in part (ii) above

P – Q : P..... Q.....
 Q – R : Q..... R.....
 R – S : R..... S.....

vi. 1. Among the elements Q and R in the above molecule, which is more electronegative?

.....

2. State two main factors which determine the electro negativity of an atom in a molecule.

.....

(c) Consider the halogen hydrides HCl, HBr and HI.

1. Give the increasing order of the strength of London forces

.....<.....<.....

2. Give the increasing order of the strength of dipole-dipole interactions

.....<.....<.....

3. Give the increasing order of boiling points

.....<.....<.....

4. Which interaction mainly contributes for the increase of boiling point

.....

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anything
here.

02.a) S block element M dissolves in NaOH and gives solution A and a gaseous product X. When HCl is added drop by drop to the solution A a white colour precipitate B is formed even though it dissolves in excess of reagent and gives a clear solution C. At high temperatures, M reacts with gas X and gives white colour solid D. D reacts with water and gives product B and same gas X. .

i. Identify the element M

.....

ii. Identify the compounds A, B, C and D and gas X.

.....

iii. Give the balanced chemical equations related with the formation of the above compounds A, B, C and D.

.....

iv. Give three properties in which M differs from other members of the same group

.....

(b) (i) Following solids/solutions are found in the given reagent bottles



State the compounds related with the following observations in the cages given.

A. When BaCl_2 solution is added, yellow colour precipitate is obtained

B. When excess water is added and diluted, bluish violet colour solution is observed

C. With dil HCl solution Pale yellow colour turbid solution is obtained

D. When diluted by adding water, thick white colour precipitate is obtained. This precipitate dissolves in dil HCl.

E. Blue colour solution is obtained when con.HCl is added as excess.

F. When KI solution is added a precipitate is obtained. On heating precipitate dissolves and gives a clear solution.

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(ii) Give the relevant balanced chemical equation for the above observations A to F.

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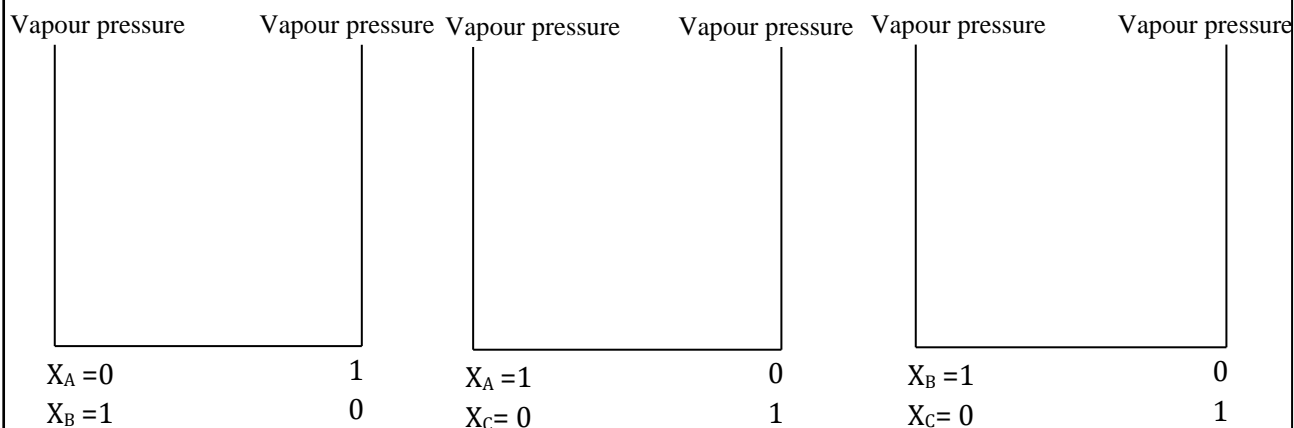
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03.(a) A, B and C are completely miscible volatile liquids. At their pure states the vapour pressure and standard boiling points are P_A^0 , P_B^0 and P_C^0 and T_A^0 , T_B^0 and T_C^0 respectively. Here $T_A^0 < T_B^0 < T_C^0$. By mixing liquids one with another, solutions A-B, A-C and B-C are obtained. The vapour pressures of these solutions are P_{AB} , P_{AC} , P_{BC} respectively. The vapour pressures calculated assuming that the above solutions are obeying the Raoult's Law are x, y and z and the observed vapour pressures at the same temperature are p, q and r. The relationships between the calculated and observed vapour pressures are $p > x$, $q = y$ and $r < z$.

i. Denote P_A^0 , P_B^0 and P_C^0 in the vertical axis.

ii. Draw the variation of P_A , P_B and P_C in the graph and denote them. (In the solution P_A – Vapour pressure of A, P_B – Vapour pressure of B, P_C – Vapour pressure of C)

iii. Draw the variation of total vapour pressure P_{AB} , P_{AC} and P_{BC} on the axis and denote them.



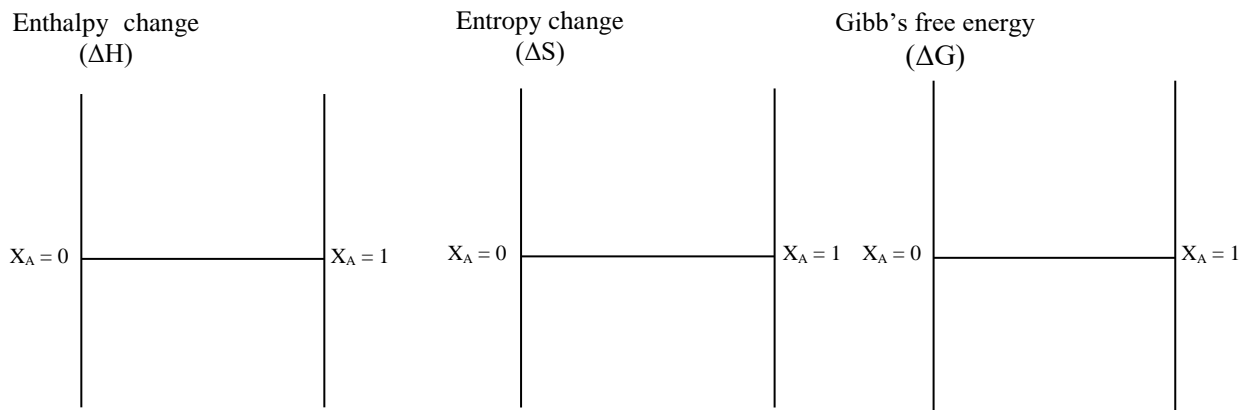
iv. Complete the following table regarding the above solutions

	Solution A - B	Solution A - C	Solution B - C
Type of solution			
Temperature change			

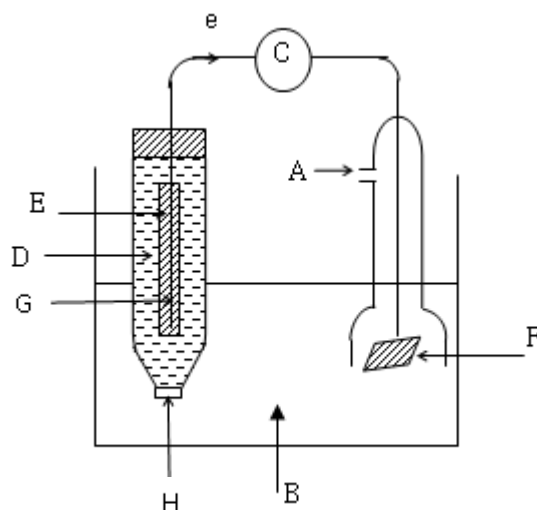
v. Draw the following graphs regarding the resultant solutions obtained by mixing liquids A and C without changing the total number of moles.

1. Enthalpy change vs composition
2. Entropy vs composition
3. Gibb's free energy vs composition

Do not write anything here.



(b) The following diagram shows a cell constructed using standard $\text{Pt(s)}/\text{Cl}_2(\text{g})$, $\text{Cl}^-(\text{aq})$ electrode and Ag(s) , $\text{AgCl(s)}/\text{Cl}^-(\text{aq})$ electrode. Direction of electron flow through the external circuit is shown in the figure given below.



i. Identify the parts A to F denoted in the above standard cell. State the physical state, concentration and pressure in required places.

A.....

B.....

C.....

D.....

E.....

F.....

G.....

H.....

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write
anything
here.

- ii. Give the cell reaction takes place in this cell.

- iii. State the appropriate cell notation for this cell.

.....

- iv. The standard enthalpy change and standard entropy change of this cell are -254kJmol^{-1} and $-116\text{Jmol}^{-1}\text{K}^{-1}$ respectively. The relationship between the standard Gibb's free energy change (ΔG^θ) and standard electromotive force (E^θ_{cell}) is $\Delta G^\theta = -nFE^\theta_{\text{cell}}$

Here,

n - the number of moles of electrons participated in the oxidation or reduction in the balanced reaction.

F - Faraday constant (96500Cmol^{-1})

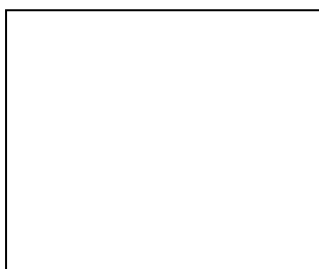
If $E^\theta_{\text{Cl(s)/Cl}^-(\text{aq})} = +1.36\text{V}$, then find the standard reduction potential of electrode

$$E^\theta_{\text{Ag(s), AgCl(s)/Cl}^-(\text{aq})}$$
This image shows a full page of white paper with horizontal dotted lines, typical of primary school writing paper. The lines are evenly spaced and run across the entire width of the page. There are no margins, text, or other markings present.

04.(a) A, B, C and D are four structural isomers of $C_5H_{11}Cl$. B, C and D have the ability to rotate the plane of plane polarized light. The product E which is obtained in the reaction of A with $NaOH_{(aq)}$ gives immediate turbidity with anhydrous $ZnCl_2/Con.HCl$. When B, C and D are reacted with C_2H_5OH/KOH , products F, G and H are obtained respectively. H shows geometrical isomerism. When B is reacted with $NaOH_{(aq)}$ and then oxidized by PCC/CH_2Cl_2 , the product I obtained reduces the Tollen's Reagent.

i. Draw the structures of A, B, C, D, E, F, G, H and I in the cages given below.

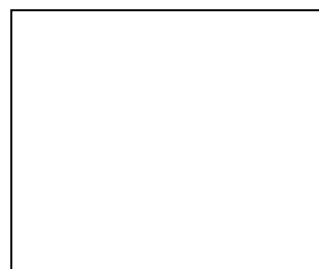
(It is not necessary to draw stereo isomeric forms)



A



B



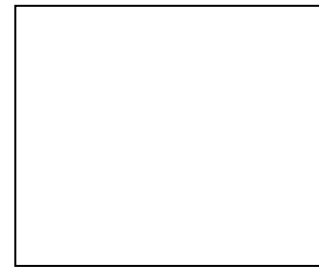
C



D



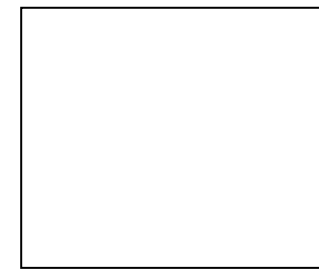
E



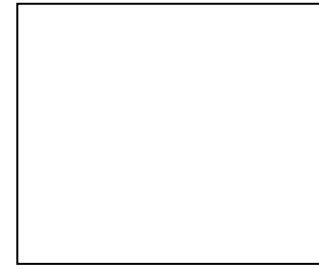
F



G



H



I

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ii. Draw the stereo isomeric forms of H in the following cages.

--

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iii. What are the products obtained when F is reacted with HBr?


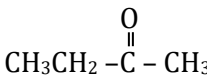
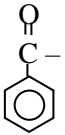


[illegible]

iv. Which one of the above products in part (iii) above is obtained as a main product? State the mechanism for the formation of this product.

[illegible]

Do not
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anything
here.

- (b) Draw the structures of the main products of the reactions given in the table below. Classify each of the given reactions as nucleophilic addition (A_N), electrophilic addition (A_E), nucleophilic substitution (S_N), electrophilic substitution (S_E), elimination (E), and other (Mo) in the appropriate cages.

Reaction number	Reactant	Reagent	Main product	Reaction type
1	 $\text{CH}=\text{CH}_2$	Br_2/CCl_4		
2	 $\text{CH}_3\text{CH}_2-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{CH}_3$	$\text{KCN}/ \text{dil H}_2\text{SO}_4$		
3	$\text{CH}_3-\text{CH}=\text{CH}_2$	$\text{HBr}/ (\text{CH}_3)_2\text{O}_2$		
4	 $\text{C}-\text{CH}_3$	2-4-DNPH		
5	 CH_2I	$\text{H}-\text{C}\equiv\text{C}^-\text{Na}^+$		
6	 COOH	$\text{C.HNO}_3/ \text{C. H}_2\text{SO}_4$		

கல்விப் பொதுத் தராதரப் பத்திர(உயர் தர) முன்னோடிப் பரீட்சை - 2017
General Certificate of Education (Adv.Level) Pilot Examination - 2017

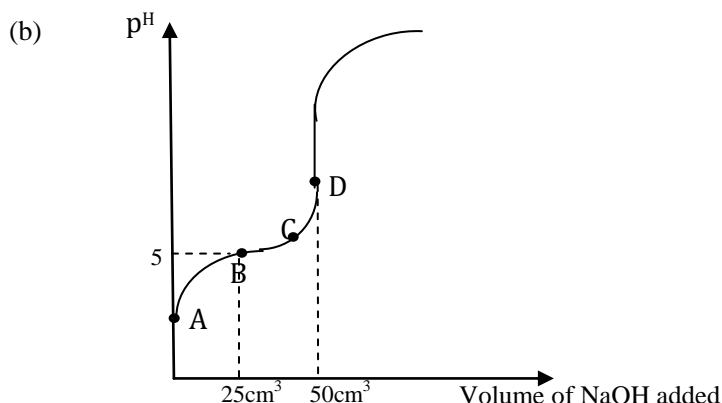
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Part B – Essay

(Each question carries **15** marks)

iv. Deduce whether this reaction is spontaneous or not at 25°C

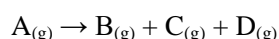
- 06.(a) i. Concentration of NH_4Cl aqueous solution is $C \text{ mol dm}^{-3}$. The ionization constant of NH_4OH is $K_b \text{ mol dm}^{-3}$ and the ionic product of water is k_w . Hence show that the p^H of NH_4Cl solution as $p^H = \frac{1}{2} p k_w - \frac{1}{2} p k_b - \frac{1}{2} \log_{10} C$
- ii. 0.66g of $(\text{NH}_4)_2\text{SO}_4$ solid is dissolved in water and made as 500cm^3 solution. Calculate the p^H of this solution at 25°C . ($k_b = 1 \times 10^{-5} \text{ mol dm}^{-3}$, $k_w = 1 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$) (N- 14, H- 1, S- 32, O- 16)
- iii. If 0.66g of $(\text{NH}_4)_2\text{SO}_4$ solid is dissolved in 1dm^3 of 0.1 mol dm^{-3} NH_4OH solution at 25°C , then find the p^H of this solution. (At 25°C k_b of $\text{NH}_4\text{OH} = 1 \times 10^{-5} \text{ mol dm}^{-3}$)
- iv. The solubility product of $\text{N}(\text{OH})_2$ at 25°C is $1 \times 10^{-10} \text{ mol}^3 \text{ dm}^{-9}$. Calculate the minimum number of moles of $\text{N}(\text{NO}_3)_2$ that should be added to the solution obtained in part (iii) above at 25°C in order to observe a precipitation in it.
- v. At 25°C , if 0.01 mol of MCl_2 solid is dissolved in the solution obtained in part (iii) above, conclude whether $\text{M}(\text{OH})_2$ is precipitated or not.
[Solubility product of $\text{M}(\text{OH})_2$ at 25°C is $4 \times 10^{-11} \text{ mol}^3 \text{ dm}^{-9}$]



The variation of the p^H in the solution during the titration of 25cm^3 mono basic weak acid HA with 0.1 mol dm^{-3} NaOH solution is given in the above graph.

(at 25°C $k_w = 1 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$)

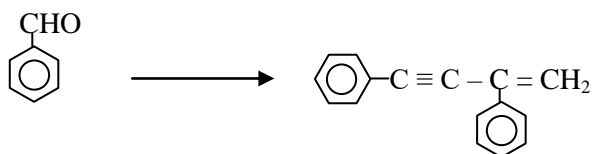
- What is the concentration of weak acid HA?
 - Calculate the ionization constant (K_a) of weak acid.
 - Calculate the p^H of the solution at equivalent point.
 - Explain with reason, what would happen to the degree of ionization of HA when adding NaOH ?
 - State a proper indicator for this titration.
- (c) At a particular temperature gas A dissociates and forms gases B, C and D.



Due to the dissociation of A, the pressure of the system at $t=0$, $t= 400\text{s}$ and $t=800\text{s}$ are 400kPa , 800 kPa and 1000 kPa respectively.

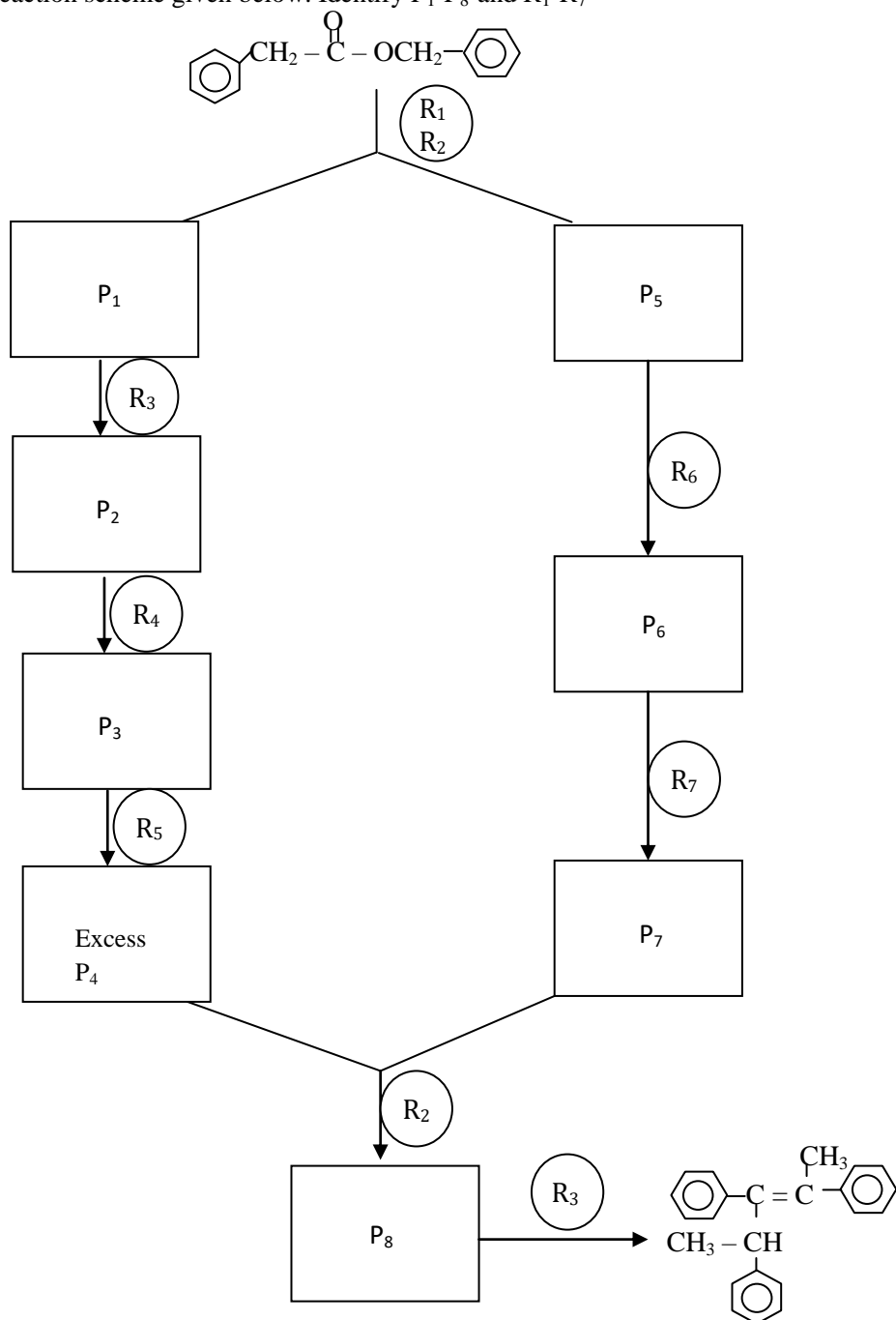
- Calculate the rate order of this reaction
- Calculate the pressure of the system after 1200s from the beginning of the reaction
- How long after the reaction has started, the partial pressure of A will be 25 kPa .

07. (a) Show how would carry out the following conversion using benzaldehyde as the starting material and using **only** the list of chemicals given below.


List of chemicals

H_2O , Br_2/CCl_4 , $\text{con H}_2\text{SO}_4$, CH_3MgBr / dry ether, alcoholic KOH , $\text{PCC} / \text{CH}_2\text{Cl}_2$

- (b) Complete the reaction scheme given below. Identify P_1 - P_8 and R_1 - R_7



- (c) i. Give the products obtained when $\text{CH}_3 - \overset{\text{O}}{\underset{\text{||}}{\text{C}}} - \text{Cl}$ reacts with $\text{C}_6\text{H}_5\text{O}^-\text{Na}^+$ and $\text{CH}_3\text{O}^-\text{Na}^+$
- ii. Among $\text{C}_6\text{H}_5\text{O}^-\text{Na}^+$ and $\text{CH}_3\text{O}^-\text{Na}^+$ which has higher tendency to act as a nucleophile? Give reason.
- iii. Give the reaction mechanism for the reaction between $\text{C}_6\text{H}_5\text{O}^-\text{Na}^+$ and $\text{CH}_3 - \overset{\text{O}}{\underset{\text{||}}{\text{C}}} - \text{Cl}$

Part C – Essay

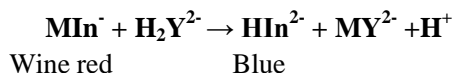
Answer **two** questions only
(Each question carries **15** marks;)

08. (a) When metal A is heated with non-metal B, white colour solid C is obtained. C dissolves in water and produces a gas D. When Flame test is carried out after the addition of HCl to C, it gives green colour flame. When gas D reacts with another gas E, element B and substance F are obtained, Here F is liquid at room temperature which converts the colourless anhydrous CuSO_4 crystal as blue colour. The product G obtained in the reaction between C and excess H_2O_2 , does not dissolve in dil. HNO_3
- Identify A, B, C, D, E, F and G
 - What are the possible products obtained in the reaction between element B and NaOH? Give the balanced chemical equations for the formation of those products.
- (b) The following tests are done to a mixture containing two metallic salts having same type of negative ion part and the relevant observations are given below.

	Tests	Observation
(1)	The salt sample is dissolved in excess dilute acetic acid	Clear solution is obtained with the liberation of colourless odourless gas.
(2)	For the resultant solution obtained in (1), excess NaOH is added.	Brown colour precipitate P_1 is obtained.
(3)	Ammonia solution is added to the precipitate P_1 obtained in (2)	Precipitate P_1 dissolved and a clear solution is obtained
(4)	K_2CrO_4 is added to the filtrate obtained in (2)	Yellow colour precipitate P_2 is obtained.
(5)	Dil. HCl is added to the precipitate P_2 obtained in (4)	White colour precipitate P_3 and orange colour solution are obtained
(6)	Excess concentrated HCl is added to the precipitate P_3 obtained in (5)	A colourless clear solution is obtained.
(7)	The gas obtained in (1) is passed through acidified KMnO_4	The colour of KMnO_4 solution does not change

- What are the metallic salts found in the above mixture? (reasons are not necessary)
- Write the chemical formula of precipitates P_1 , P_2 and P_3 .
- Give another one test to confirm the anion in the salt.

(c) The hardness of water rises due to the dissolved Ca^{2+} and Mg^{2+} salts in water. The temporary hardness of water is due presence of the bicarbonates of Ca^{2+} and Mg^{2+} and permanent hardness of water is due to the presence of chlorides and sulphate salts of these ions. Titrating the water sample with $\text{EDTA}[\text{H}_2\text{Y}^{2-}]$ is the most appropriate method to determine the amount of Ca^{2+} and Mg^{2+} ions. Erichrome black T is used as an indicator to clearly identify the endpoint of this titration. When the p^{H} of the solution is greater than 10, this indicator joins with metal ions and shows a wine red colour and at the same time, if this indicator is found with H^+ ions, it shows blue colour.



(Here M denotes Ca^{2+} or Mg^{2+} ions and In^- denotes the indicator)

A student follows the following procedures to determine the permanent hardness of water.

Procedure I :- 50 cm^3 of hard water sample is taken into a titration flask. $\text{NH}_4\text{Cl}/\text{NH}_4\text{OH}$ buffer solution is added to maintain the p^{H} at 10 and small amount of indicator is also added. The resultant solution obtained is titrated using 0.1 moldm^{-3} EDTA. The volume of EDTA required to change the colour of the solution from wine red to blue is 22 cm^3 .

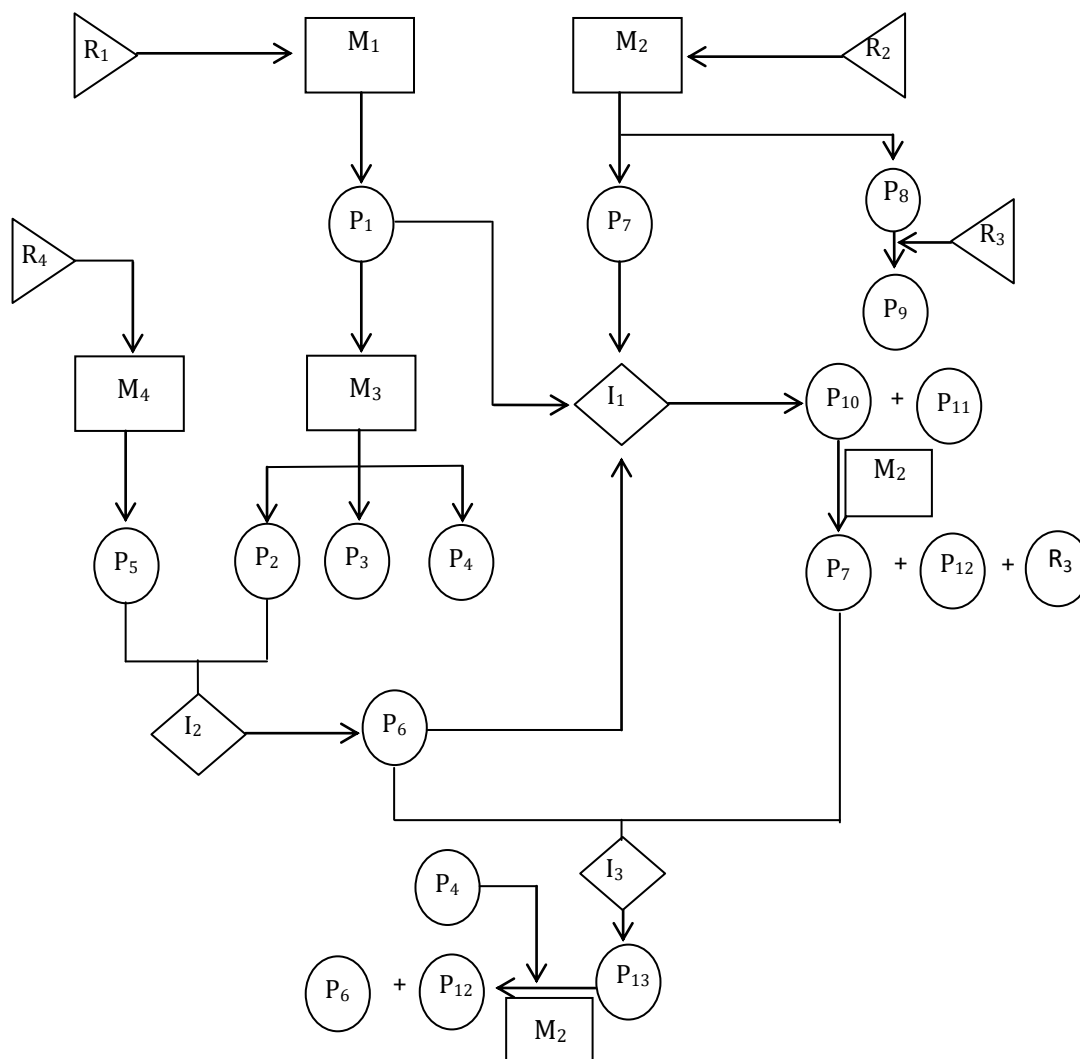
Procedure II:- Another 25 cm^3 sample of the above hard water sample is titrated using concentrated HCl of certain concentration by using methyl orange as the indicator. The volume of HCl required to change the colour of the solution from orange to red is 30 cm^3 .

Procedure III:- Excess amount of KIO_3 and KI are added to 20 cm^3 of the HCl solution used in procedure II. And the resultant solution obtained is titrated using 0.04 moldm^{-3} $\text{Na}_2\text{S}_2\text{O}_3$ in the presence of starch indicator and the required volume is 25 cm^3 .

Calculate the permanent hardness of the above mentioned hard water in terms of $\text{CaCO}_3 \text{ mgdm}^{-3}$.
(Ca- 40, C-12, O-16)

09. (a) Flow chart for the manufacture of some industrial products is shown below.

The following symbols are used to denote the natural resources used, process involved in the product formation, main industrial production procedures and the products obtained.



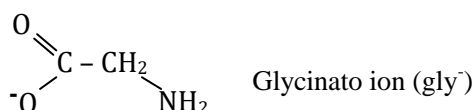
- P₃ is a gaseous state substance used in the purification of drinking water.
- P₉ is used in the identification CO₂ in the laboratory .
- P₁₀ is used in bakeries.
- P₁₃ is used to increase the yield of crops

- i. Give the natural raw materials R_1 , R_2 , R_3 and R_4 .
 - ii. Mention the methods M_1 , M_2 , M_3 and M_4 used to obtain the products.
 - iii. State the names of main industrial production method I_1 , I_2 and I_3 .
 - iv. Identify the products P_1 to P_{13} .
 - v. Give the balanced chemical equations related with the procedures in the industrial production I_2 and I_3 . State the temperature and pressure conditions used in those reaction procedure.
 - vi. Write the balanced chemical equation for the regeneration of P_6 which is used in the industrial production I_1 by using the two products mention in the above flow chat
 - vii. The central atom found in P_6 is in the lowest oxidation state of it. Show only using the balanced chemical equations, how the oxy acid belongs to highest oxidation state can be prepared from this.
 - viii. Give one usage for each P_2 , P_4 and P_{12}
- (b) Following questions are based on the carbon compounds which are influenced in the various environmental issues.
- i. State two main carbon compounds which contribute to the global warming.
 - ii. State two human practices for each compounds mentioned in part (i) above, which makes these compounds to reach atmosphere.
 - iii. What is the primary pollutant which causes the photo chemical smog?
 - iv. Give four possible carbon compounds that can be formed, when the above stated compounds in part (iii) undergoes photo chemical reaction.
 - v. Give the main carbon compound type which causes Ozone layer depletion. Draw the structures of three carbon compounds of this type which have only one carbon atom
 - vi. Explain using equations, how the compound mentioned in above part (v) causes ozone layer depletion.
 - vii. The most abundant acidic gas found in atmosphere is CO_2 . Will it contribute for acid rain? Briefly explain your answer.

10. (a) X, Y and Z are three coordination complex compounds of Cobalt. They have octahedral geometrical shape. All compounds are formed by one cobalt ion, bromide ions having covalent or/ and ionic bond and water molecules. In these three compounds the number of Bromide ions is found to be equal but the number of water molecules can change.

Excess $\text{AgNO}_3/\text{dilHNO}_3$ is added into resultant solution obtained by dissolving one mole of each X, Y and Z and the mass ratio of the dry masses of precipitate obtained is found to be 1:2:3.

- What is the precipitate obtained here? Give the colour of that precipitate?
- Give the structural formula of the coordination complex compounds X, Y and Z.
- What is the oxidation state of Cobalt in the above coordination complex compounds X, Y and Z?
- Give the IUPAC names of X, Y and Z.
- State the colour of Z.
- Negative ion formed by the ionization of glycine [an amino acid] is glycinate, And its structure is given below.



Glycinate ion forms the octahedral complex by joining with the above stated oxidation state Cobalt ion by making the attachment through both negatively charged oxygen and nitrogen atom. Write the structural formula of this and draw the structure of this compound.

Note: Consider the glycinate ion as gly^- , only in your structural formula

- (b) At temperature 25°C , 4 dm^3 of 1 mol dm^{-3} MgSO_4 solution is electrolyzed by using inert electrode X as cathode and pure Mg electrode as anode. Considering that 2mA current is used and the ions formed in the electrode spread all over the solution to form homogeneous solution answer the following questions.

(charge of 1mol electron = 96500 C mol^{-1})

- Draw the labeled diagram of the electric cell used in this electrolysis.
- State the balanced chemical equation for the reactions takes place at electrodes.
- How long the electrolysis should be continued to initiate the precipitation of Mg(OH)_2 ?
[At 25°C K_{sp} of $\text{Mg(OH)}_2 = 1 \times 10^{-12}\text{ mol}^3\text{ dm}^{-9}$]
- After electrolysis of 965 minute time duration the Mg(OH)_2 precipitate obtained is filtered and heated to high temperature to obtain a constant mass. What is the mass of the residue obtained here. (Mg – 24, O-16)
- What are the assumptions you have made in the calculations carried out in part (iii) and (iv)?