



The Open University of Sri Lanka
Foundation Programme/Courses in Science - 2014/2015
Faculty of Natural Sciences, Department of Chemistry
Chemistry I – CMF2205

Final Examination – 3 Hours

Date - 17th November 2015

Time: 9.30 am - 12.30 pm.

Instruction to candidates.

- The paper consists of two parts, Part A (25 MCQ) and Part B (6 essay type questions, four (4) to be answered).
- Mobile phones must be switched off and kept away during examination.
- The use of a non programmable electronic calculator is permitted

$$\text{Planck's constant, } h = 6.63 \times 10^{-34} \text{ J s}$$

$$\text{Velocity of light } C = 3 \times 10^8 \text{ m s}^{-1}$$

$$\text{Avogadro constant } L = 6.023 \times 10^{23} \text{ mol}^{-1}$$

$$1 \text{ atmosphere} = 760 \text{ torr} = 10^5 \text{ Nm}^{-2}$$

$$\text{Gas constant } R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$$

$$\ln_e = 2.303 \log_{10}$$

1 H 1.008 2 He 4.003																	
3 Li 6.939	4 Be 9.012																
11 Na 22.99	12 Mg 24.31																
13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95												
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.71	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80

PART - A

ANSWER ALL QUESTIONS

- Choose the most correct answer to each question and mark a cross "X" over the answer on the answer sheet.
- Use a PEN (not a pencil) in answering.
- Any answer with more than one cross will not be counted.

01. For which element below is the radius of its ion greater than that of the atom?

කුමන මූල ද්‍රව්‍යයේ අයනයේ අරය එහි පරමාණුවේ අරයට වඩා විශාල වේද?

- (i) F (ii) K (iii) Na (iv) Ca (v) Al

02. Na^+ , Mg^{2+} , Si^{4+} , and Al^{3+} are isoelectronic, their ionic size will follow the order of.

Na^+ , Mg^{2+} , Si^{4+} , සහ Al^{3+} සම ඉලෙක්ට්‍රෝනික අයනවල විශාලත්වය වෙනස් වන පිළිවෙල වනුයේ

- (i) $\text{Na}^+ > \text{Mg}^{2+} > \text{Si}^{4+} > \text{Al}^{3+}$ (ii) $\text{Na}^+ > \text{Al}^{3+} > \text{Mg}^{2+} > \text{Si}^{4+}$ (iii) $\text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+} > \text{Si}^{4+}$
 (iv) $\text{Si}^{4+} > \text{Al}^{3+} > \text{Mg}^{2+} > \text{Na}^+$ (v) $\text{Na}^+ > \text{Si}^{4+} > \text{Mg}^{2+} > \text{Al}^{3+}$

03. The electronic transition in the hydrogen atom that emits a photon of highest energy is,

හයිඩ්‍රජන් පරමාණුවේ පහත කුමන සංක්‍රමණය සඳහා ඉහළම ශක්ති සහිත ප්‍රෝටෝනයක් පිට කරයි ද?

- (i) $n=2$ to $n=1$ (ii) $n=3$ to $n=2$ (iii) $n=2$ to $n=3$
 (iv) $n=1$ to $n=2$ (v) $n=4$ to $n=3$

04. Which group below contain elements in all three states of matter at STP?

සම්මත උෂ්ණත්ව හා පීඩනයේදී කුමන කාණ්ඩයට අයත් මූලද්‍රව්‍ය පදාර්ථයේ අවස්ථා තුනම පෙන්වූම් කරයි ද?

- (i) Noble gases (ii) Halogens (iii) Alkaline earth metals
 (iv) Transition elements (v) Alkali metals

05. Electronic configuration of five elements are as follows. Which is expected to be

most metallic? / පහත දී ඇති ඉලෙක්ට්‍රෝන වින්‍යාසය අනුව කුමන මූලද්‍රව්‍ය බොහෝවිට ලෝහ ලක්ෂණ පෙන්වයි ද?

- (i). 2,8,4 (ii). 2,8,18 (iii). 2,8,8,2 (iv). 2.8.8.7 (v). 2,8,5

06. A,B,C are elements of third period. Oxide of A is ionic, B produced a giant molecule and C

is amphoteric. A,B,C will have atomic number in the order, A,B,C යනු තුන් වන ආවර්තයට අයත් මූලද්‍රව්‍ය වේ. A හි ඔක්සයිඩය අයනික ද B මගින් යෝධ අණුක ව්‍යුහයක් සහිත අණුවක් ලැබෙන අතර C උභයගුණී වේ. A,B,C වල පරමාණුක ක්‍රමාංකය වෙනස්වන පිළිවෙල වනුයේ

- (i). $A < B < C$ (ii). $B < C < A$ (iii). $C < A < B$ (iv). $B < A < C$ (v). $A < C < B$

07. Which one of the following does not react with sodium hydroxide solution?
 කෝඩියම් හයිඩ්‍රොක්සයිඩ් සමග ප්‍රතික්‍රියා නොකරන මූලද්‍රව්‍ය වනුයේ
 (i). Be (ii). Cu (iii). Al (iv). Cl_2 (v). Zn
08. Sodium superoxide NaO_2 is prepared by reacting Na_2O_2 with O_2 at high pressures. How much of Na_2O_2 is required to prepare 11 g of NaO_2 ?
 කෝඩියම්වල සුපර් ඔක්සයිඩයක් වූ (NaO_2) Na මූලද්‍රව්‍ය භාවිතයෙන් කෙලින්ම පිළියෙල කල නොහැක. එය සාදනුයේ Na_2O_2 මගිනි. NaO_2 11 g ක් පිළියෙල කිරීමට කොපමණ Na_2O_2 අවශ්‍ය වේ ද?
 (i). 5.5 g (ii). 7.8 g (iii). 11 g (iv). 3.9 g (v). 78 g
09. Bonding present between the carbon atoms in graphite is/
 මිනිරන් වල කාබන් පරමාණු අතර පවතින බන්ධන වර්ගය වනුයේ
 (i) metallic/ ලෝහක (ii) ionic / අයනික (iii) covalent / සහසංයුජ
 (iv) dipole/ ද්විධ්‍රැව (v) polar/ ධ්‍රැවීය
10. In a polar bond / ධ්‍රැවීය බන්ධනවල
 (i) electrons are equally shared./ ඉලෙක්ට්‍රෝන සමව හවුලේ තබා ගනී.
 (ii) electrons are unequally shared./ වෙනස් ඉලෙක්ට්‍රෝන ගණනක් පරමාණු අතර පවතී.
 (iii) electrons are shared between atoms in an homonuclear molecule.
 සම න්‍යෂ්ටික අණුවල පරමාණු අතර ඉලෙක්ට්‍රෝන හවුලේ තබා ගනී.
 (iv) electrons are shared between atoms with similar electronegativity.
 විද්‍යුත් සෘණතාවයට අනුකූලව පරමාණු අතර ඉලෙක්ට්‍රෝන හවුලේ තබා ගනී.
 (v) None of the above/ ඉහත සඳහන් කිසිවක් නොවේ.
11. Which one of the following molecules does not have resonance forms?
 පහත දී ඇති කුමන අණුව/අයන සඳහා සම්ප්‍රයුක්ත ව්‍යුහ නොපවතී ද?
 (i) CO_2 (ii) SO_2 (iii) O_3 (iv) CH_3OH (v) CO_3^{2-}
12. What is the hybridization of carbon atom in CH_4 molecule?
 CH_4 අණුවේ කාබන් පරමාණුවේ මුහුම්කරණය කුමක් ද?
 (i) sp (ii) sp^2 (iii) sp^3 (iv) sp^3d (v) None of the above
13. When the number of electron pairs on the central atom is six, then geometry of the molecule is/
 ඉලෙක්ට්‍රෝන යුගල හයක් මධ්‍ය පරමාණුවේ අඩංගුව ඇති අණුවේ ජ්‍යාමිතිය වනුයේ
 (i) octahedral/ අෂ්ටිකලීය (ii). trigonal pyramidal / ත්‍රිශානති පිරමීඩාකාරය
 (iii) tetrahedral/ චතුස්කලීය (iv) square pyramidal /වතුරප්‍රාකාර පිරමීඩය
 (v) linear/ රේඛීය
14. Which one of the following sets gives the correct symbols for SI units?
 සියළුම SI ඒකක සඳහා වූ සංකේත වල නිවැරදි ආකාරය වනුයේ
 (i) km, kg, s, K, mol, A, cd (ii) m, g, s, K, mol, A, cd (iii) m, kg, s, K, mol, A, cd
 (iv) m, kg, s, $^{\circ}\text{C}$, mol, A, cd (v) km, kg, s, $^{\circ}\text{C}$, mol, A, cd

15. Sodium metal reacts with ammonia gas under certain conditions giving hydrogen gas and sodamide (NaNH_2) only. How much of molecular hydrogen will be produced by 23 g of sodium in this reaction? සෝඩියම් ලෝහය ඇමෝනියා සමඟ විශේෂ තත්ත්ව යටතේදී ප්‍රතික්‍රියාවෙන් හයිඩ්‍රජන් සහ සෝඩාමයිඩ් (NaNH_2) පමණක් සාදයි. සෝඩියම් මූලද්‍රව්‍ය 23 g හා ප්‍රතික්‍රියා කිරීමෙන් ලබාදෙන හයිඩ්‍රජන් ප්‍රමාණය කොපමණ ද?

(i). 11.5 g (ii). 0.5 g (iii). 2 g (iv). 23 g (v). 1 g

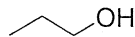
16. The concentration of a NaCl solution is given as 117 mg dm^{-3} . What is the concentration of NaCl in that solution in mol dm^{-3} ? සෝඩියම් ක්ලෝරයිඩ් ද්‍රාවණයක සාන්ද්‍රණය 117 mg dm^{-3} වේ. එම NaCl ද්‍රාවණයේ සාන්ද්‍රණය mol dm^{-3}

(i). 0.002 (ii). 2000 (iii). 0.117 (iv). 2×10^{-4} (v). 6.8445

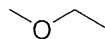
17. The balanced redox reaction between Fe^{2+} and MnO_4^- in an acidic medium is / ආම්ලික මාධ්‍යයේදී Fe^{2+} සහ MnO_4^- අයන අතර රෙඩොක්ස් ප්‍රතික්‍රියාව සඳහා තුලිත සමීකරණය වනුයේ

- (i) $5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 5\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{2+}(\text{aq}) + 5\text{Fe}^{3+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$
(ii) $3\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{2+}(\text{aq}) + 3\text{Fe}^{3+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$
(iii) $5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{2+}(\text{aq}) + 5\text{Fe}^{3+}(\text{aq}) + 8\text{H}_2\text{O}(\text{l})$
(iv) $5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{2+}(\text{aq}) + 5\text{Fe}^{3+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$
(v) $5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{3+}(\text{aq}) + 5\text{Fe}^{3+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$

18. Consider the three compounds given below and the statements that follow. පහත සංයෝග තුන සලකන්න.



A



B



C

- (a) Only A and C are structural isomers/ A හා C පමණක් ව්‍යුහ සමාවයවික වේ.
(b) A, B and C are all isomers/ A, B හා C සියල්ලම සමාවයවික වේ.
(c) Only A and B are functional group isomers/ A හා B පමණක් ක්‍රියාකාරී කාණ්ඩ සමාවයවික වේ.
(d) Only A and C are positional isomers/ A හා C පමණක් ස්ථානීය සමාවයවික වේ.

Correct statement/s is/are, / නිවැරදි වගන්ති/ය වනුයේ

- (i). (a) only (ii). (b) only (iii). (a) and (d) (iv). (b) and (d) (v). (b), (c) and (d)

19. Select the **incorrect** statement out of the following. / පහත ප්‍රකාශන වලින් වැරදි ප්‍රකාශය වන්නේ

- (i) Carbon dioxide is produced when alkanes undergo incomplete combustion. ඇල්කේන් අසම්පූර්ණ දහනයෙන් කාබන් ඩයොක්සයිඩ් ලැබේ.
(ii) High molecular weight hydrocarbons can be broken into smaller hydrocarbons at high temperatures and pressures. / ඉහළ උෂ්ණත්වයේදී හා පීඩනයේදී අණුක ස්කන්ධය ඉහළ හයිඩ්‍රොකාබන ඊට වඩා කුඩා හයිඩ්‍රොකාබනවලට කැඩිය හැක.

- (iii) *iso*-octane is a very good fuel which does not cause knocking in engines.
අයිසෝ ඔක්ටේන් ඉතා හොඳ ඉන්ධනයකි. එබැවින් එය එන්ජින්වල පිලිගැනුම ඇති නොකරයි.
- (iv) Cycloalkane rings become unstable when the internal bond angle is lesser than the tetrahedral bond angle./ චතුස්තලීය ඛන්ධන කෝණයට වඩා චක්‍රීය ඇල්කේනයේ ඛන්ධන කෝණය අඩුවන නිසා චක්‍රීය ඇල්කේනවල ස්ථායීතාවය අඩුවේ.
- (v) Alkanes are water insoluble because they are non-polar compounds.
ඇල්කේන නිර්ධ්‍රැවීය සංයෝග නිසා ජලයේ අද්‍රාව්‍ය වේ.

20. In Baeyer's test, the reagent used to identify alkenes is
ඇල්කීන හඳුනා ගැනීමට යොදා ගන්නා බේයර් ප්‍රතිකාරකය වනුයේ

- (i) Br₂ water (ii) acidic KMnO₄ (iii) AgNO₃
(iv) Br₂ in CCl₄ (v) alkaline KMnO₄

21. Some information about two acids is given below./ අම්ල දෙකකට අදාළ දත්ත පහත දී ඇත.

Acid අම්ලය	Dissociation constant (K _a) mol dm ⁻³ විඝටන නියතය	Concentration සාන්ද්‍රණය
Acetic acid ඇසිටික් අම්ලය	1.8 × 10 ⁻⁵	0.1 M
Carbonic acid කාබොනික් අම්ලය	4.3 × 10 ⁻⁷	0.1 M

What is **incorrect** out of the following? පහත ඒවායින් කුමක් වැරදි වේද ?

- (i) Acetic acid is stronger than carbonic acid./ ඇසිටික් අම්ල කාබනික් අම්ලයට වඩා ප්‍රබලය.
- (ii) In acetic acid solution [H⁺]=1.3 × 10⁻³ M
ඇසිටික් අම්ල ද්‍රාවණයේ හයිඩ්‍රජන් අයන සාන්ද්‍රණය [H⁺]=1.3 × 10⁻³ M
- (iii) pH of acetic acid solution is less than that of carbonic acid solution. /ඇසිටික් අම්ල ද්‍රාවණයේ pH අගය කාබොනික් අම්ල ද්‍රාවණයේ pH අගයට වඩා අඩුය.
- (iv) In acetic acid solution the pH= 1.8 /ඇසිටික් අම්ල ද්‍රාවණයේ pH අගය 1.8 වේ.
- (v) Both the above acids are weaker than HCl./ඉහත අම්ල දෙකම HCl අම්ලයට වඩා දුර්වල අම්ල වේ.

22. Which one of the following reactions produce a basic salt?
පහත කුමන ප්‍රතික්‍රියාව මගින් භාෂ්මික ලවණයක් ලබා දෙයිද?

- (i) NaOH + CH₃COOH → (ii) NaOH + HCl →
(iii) HNO₃ + KOH → (iv) CH₃COOH + NH₄OH →
(v) HCl + NH₄OH →

23. The pH of 0.005 M Mg(OH)₂ solution is / සාන්ද්‍රණය 0.005 M වූ Mg(OH)₂ ද්‍රාවණයක pH අගය වනුයේ

- (i) 5 (ii) 12 (iii) 2 (iv) 9 (v) 14

24. Constant volume of 0.01 M NaOH was titrated with 0.02 M acetic acid and the end point reading was 15.00 cm³. What is the volume of NaOH taken and the indicator used respectively?
 සාන්ද්‍රණය 0.01 M වූ NaOH ද්‍රාවණයක නියත පරිමාවක් සාන්ද්‍ර 0.02 M ඇසිටික් අම්ල ද්‍රාවණයකින් අනුමාපනයේදී අන්ත ලක්ෂ්‍යය සඳහා 15.00 cm³ අවශ්‍ය බව අනුමාපනය සඳහා ගන්නා ලද NaOH පරිමාව සහ යොදන ලද දර්ශකය කුමක් ද?

- (i) 15.0 cm³ and methyl orange / 15.0 cm³ සහ මෙතිල් ඔරේන්ජ්
- (ii) 15.0 cm³ and phenolphthalein / 15.0 cm³ සහ පිනොප්තලින්
- (iii) 30.0 cm³ and methyl orange / 30.0 cm³ සහ මෙතිල් ඔරේන්ජ්
- (iv) 30.0 cm³ and phenolphthalein / 30.0 cm³ සහ පිනොප්තලින්
- (v) 15.0 cm³ and methyl red / 15.0 cm³ සහ මෙතිල් රෙඩ්

25. Which one of the following statements is incorrect?/ පහත ප්‍රකාශවලින් වැරදි ප්‍රකාශය වනුයේ

- (i) When temperature is increased solubility of a solid compound is also increased.
 සෘණ ද්‍රව්‍යයක ද්‍රාව්‍යතාව උෂ්ණත්වය සමග වැඩිවේ.
- (ii) When a common ion is added precipitation takes place at a lower concentration.
 පොදු අයනයක් එක් කිරීමේ අඩු සාන්ද්‍රණයේදී අවක්ෂේප වේ.
- (iii) When pressure is increased, solubility of a gas is also increased.
 පීඩනය වැඩි කිරීමේදී වායුවක ද්‍රාව්‍යතාවය වැඩිවේ.
- (iv) All nitrates are soluble./ සියලුම නයිට්‍රේට් ද්‍රාව්‍ය වේ.
- (v) Precipitation takes place when the solubility product exceeds ionic product.
 ද්‍රාව්‍යතා ගුණිතය අයනික ගුණිතයට වඩා වැඩි වූ විට අවක්ෂේප වේ.

PART – B

Answer only four (04) questions.

01. (a) The mass of a proton is 1840 times greater than the mass of an electron. The mass and the charge of an electron are 9.11×10^{-31} kg and -1.60×10^{-19} C respectively.
 ප්‍රෝටෝනයක ස්කන්ධය ඉලෙක්ට්‍රෝනයේ ස්කන්ධය මෙන් 1840 වාරයක් වේ. ඉලෙක්ට්‍රෝනයේ ස්කන්ධය හා ආරෝපණ පිළිවෙලින් 9.11×10^{-31} kg සහ -1.60×10^{-19} C වේ.

- (i) Calculate the mass of a proton./ ප්‍රෝටෝනයේ ස්කන්ධය ගණනය කරන්න.
 (ii) Calculate charge to mass ratio (e/m) of a proton.
 ප්‍රෝටෝනයේ ආරෝපණය ස්කන්ධය දරණ අනුපාතය (e/m) ගණනය කරන්න.

(24 Marks)

- (b). Complete the following table. /පහත වගුව පුරවන්න.

Symbol/සංකේතය	Z(Atomic Number)/ පරමාණුක ක්‍රමාංකය	A (RAM)/ සාපේක්ෂ අණුක ස්කන්ධය	No of Electrons/ ඉලෙක්ට්‍රෝන ගණන	Net Charge / මුළු ආරෝපණය
${}^{24}_{12}\text{Mg}^{2+}$				
${}^{64}_{29}\text{Cu}$				
${}^{27}_{13}\text{Al}^{3+}$				

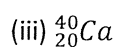
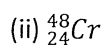
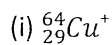
(12 Marks)

- (c) The energy required to remove one mole of electrons from a metal is 213.8 kJ
 ලෝහයෙන් ඉලෙක්ට්‍රෝන මවුලයක් ඉවත් කිරීම සඳහා අවශ්‍ය ශක්තිය වනුයේ 213.8 kJ වේ.
 (i) How much energy is required to remove a single electron from the metal?
 එම ලෝහයෙන් එක් ඉලෙක්ට්‍රෝනයක් ඉවත් කිරීමට කොපමණ ශක්තියක් අවශ්‍ය වේද?

- (ii) Calculate the wavelength (in nm) of radiation capable of doing above process (i)
 ඉහත (i) ක්‍රියාවලියට අවශ්‍ය තරංගයේ තරංග ආයාමය (nm) වලින් ගණනය කරන්න.

(24 Marks)

- (d) Write the electronic configuration for following elements/ions ($1s^2 2s^2 \dots$)
 ($1s^2 2s^2 \dots$) ආකාරයට පහත මූලද්‍රව්‍යවල ඉලෙක්ට්‍රෝන වින්‍යාසයන් ලියන්න.



(18 Marks)

- (e) Barium -142 is a beta emitter. Calculate half-life of Barium if a 32.0 g of sample of this isotope decay to 1.0 g in 130 minutes. / 32.0 g ස්කන්ධයක් වූ Ba සාම්පලයක් β කිරණ විමෝචනය කරමින් මිනිත්තු 130 කදී 1.0 g වක් දක්වා ක්‍ෂයවේ නම් බෙරියම්හි අර්ධ ජීව කාලය ගණනය කරන්න.

(22 Marks)

02. (a) Write two advantages of Mendeleev's periodic table.

මෙන්ඩලිව් ආවර්තිතා වගුවේ වාසි දෙකක් ලියන්න.

(10 Marks)

- (b) The first, second and third ionization energies for calcium (Ca) are 590.0, 1145.0 and 4910.0 kJ mol⁻¹ respectively. Explain why there is a marked difference between the values for the second and third ionization energy of calcium (Ca). / කල්සියම්වල පළමු, දෙවන හා තුන්වන අයනීකරණ ශක්ති පිළිවෙලින් 590.0, 1145.0 සහ 4910.0 kJ වේ. (Ca) හි දෙවන හා තුන්වන අයනීකරණ ශක්ති අතර පෙන්වන පැහැදිලි වෙනසට හේතු පැහැදිලි කරන්න.

(12 Marks)

- (c) Give relevant balanced chemical equations to show the reaction of පහත ප්‍රතික්‍රියාවලට අදාළ තුලිත රසායනික සමීකරණ දෙන්න.

(i) Al

(ii) Al₂O₃

With dilute HCl acid. / තනුක HCl සමග දැක්වන ප්‍රතික්‍රියාව

(20 Marks)

- (d) Calculate the oxidation states of (S) sulphur in following compounds.

පහත සංයෝගවල (s) සල්ෆර්වල ඔක්සිකරණ අංකය ගණනය කරන්න.

(i) SO₃²⁻

(ii) S₂F₁₀

(iii) S₂O₃²⁻

(iv) S₂Cl₂

(v) SO₄²⁻

(20 Marks)

- (e) Write down the equation for the reaction between Ca(OH)₂ and CO₂ and comment on the observation. What will happen if excess CO₂ is bubbled through this solution?

Ca(OH)₂ සමග CO₂ පෙන්වනු ලබන ප්‍රතික්‍රියාවේ නිරීක්ෂණ ලියන්න. වැඩිපුර CO₂ බුබුලනය කළ විට ලැබෙන සිද්ධතා කුමක් ද?

(20 Marks)

- (f) Write down the balanced Chemical equations for the thermal decomposition of LiNO₃, KNO₃ and CaCO₃/LiNO₃, KNO₃ සහ CaCO₃වල තාප විශ්ලේෂණයට අදාළ තුලිත රසායනික සමීකරණ ලියන්න.

(18 Marks)

03. (a) (i) What is meant by the term "electronegativity" of an atom?

පරමාණුවක විද්‍යුත් ඍණතාවය යන පදයේ තේරුම කුමක් ද?

- (ii) Electronegativity values of some elements are given below.

මූලද්‍රව්‍ය කිහිපයක විද්‍යුත් ඍණතාවයේ අගයන් පහත දී ඇත.

K- 3.0,

H- 2.1

C-2.5

Cl-0.8

Giving reasons, identify the following bonds as ionic, polar covalent or covalent bond.

පහත සංයෝගවල ඇති බන්ධන වර්ගය අයහික, ධ්‍රැවීය සහසංයුජ හෝ සහසංයුජ යන්න හේතු දෙමින් පැහැදිලි කරන්න.

• K-Cl

• C-Cl

• H-H

(21 Marks)

- (b) (i) Draw the Lewis structures for H₂O, CHCl₃, SF₄, PCl₅ and state whether they obey the octet rule.

H₂O, CHCl₃, SF₄, PCl₅ සඳහා ලුවීස් ව්‍යුහ ඇඳ අෂ්ටක නියමය පිළිපදිද යන්න සඳහන් කරන්න.

(24 Marks)

- (c) Draw all the reasonable resonance structures and resonance hybrid for the sulphate ion, SO_4^{2-} .
 SO_4^{2-} අයන සඳහා සම්ප්‍රයුක්ත ව්‍යුහ හා සම්ප්‍රයුක්තයේ මුහුම්කරණය අඳින්න. (20 Marks)
- (d) The boiling points of Group V hydrides are given below/පස්වන කාණ්ඩයේ හයිඩ්‍රයිඩ සඳහා වූ තාපාංක පහත වගුවේ දී ඇත.

Hydride/හයිඩ්‍රයිඩය	Boiling point (K)/ තාපාංකය
Ammonia,/ ඇමෝනියා NH_3	240
Phosphine,/ පොස්පින් PH_3	185
Arsine, AsH_3 /ඇසින්	218
Stibene, /ස්ටිබින් Sb	256
Bismuthene,/බිස්මියුතින් BiH_3	295

- (i) Explain the steadily rising trend in the boiling points from phosphine to bismuthene.
ස්ටිබින් සිට බිස්මියුතින් වල තාපාංක කෙලින් වශාල ලෙස වැඩිවීමට හේතු දෙන්න.
- (ii) Explain why the boiling point of ammonia does not follow this trend.
ඇමෝනියාවල මේ ආකාරයට තාපාංකය වෙනස්වීම නොවීමට හේතු දෙන්න. (25 marks)
- (e) Iodine, I_2 , has a crystal lattice structure at room temperature,
 I_2 සඳහා කාමර උෂ්ණත්වයේදී ස්පටිකරූපී ව්‍යුහයක් ඇත.
- (i) What type of bond holds together iodine atoms in an iodine molecule?
අයඩින් අණුවේ අයඩින් පරමාණු අතර පවතින බන්ධන වර්ගය මොනවා ද?
- (ii) What forces act between the iodine molecules in a crystal lattice?
ස්ථිටික ව්‍යුහයන් තුල වූ අයඩින් අණුවක අයඩින් අතර ඇති බල වර්ග මොනවා ද? (10 marks)

04. (a) The density of a gas is 0.084 g cm^{-3} . Express the density in SI units.
වායුවක ඝනත්වය 0.084 g cm^{-3} නම් එය SI ඒකක වලින් දෙන්න. (10 Marks)

- (b) An organic compound X shows that the mass percentages of carbon, hydrogen and nitrogen presents are 48.65%, 13.60% and 37.75% respectively./ X නමැති කාබනික සංයෝගයක කාබන් හයිඩ්‍රජන් සහ නයිට්‍රජන් පිළිවෙලින් 48.65%, 13.60% සහ 37.75% ප්‍රතිශතයන් පවතී.

- (i) Deduce the empirical formula of compound X./ X හි ආණුභාවික සූත්‍රය නිර්ණය කරන්න.
- (ii) If the molar mass of the compound X is 149 g mol^{-1} deduce the molecular formula of compound X./ X හි සාපේක්ෂ අණුක ස්කන්ධය 149 g mol^{-1} වේ නම් X හි අණුක ව්‍යුහය නිර්ණය කරන්න.

(24 Marks)

- (c) Write down the chemical name of the following: /පහත සංයෝගවල රසායනික නම් ලියන්න.

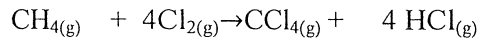
(i) $CaSO_3$ (ii) $AgNO_3$ (iii) $Al_2(SO_4)_3$ (iv) $Ca_3(PO_4)_2$

(16 Marks)

- (d) Write the balanced chemical equation for oxidation of Fe^{2+} ions by $\text{Cr}_2\text{O}_7^{2-}$ ions in an aqueous acidic solution./ Fe^{2+} හා $\text{Cr}_2\text{O}_7^{2-}$ අයන අතර ආම්ලික මාධ්‍යයේ සිදුවන ප්‍රතික්‍රියාව සඳහා තුලිත රසායනික සමීකරණය ලියන්න.

(10 Marks)

- (e) Dichlorodifluoromethane is prepared by the following consecutive reactions.
ඩයික්ලෝරොඩිෆ්ලෝමීතේන් ලබාගනුයේ පහත ප්‍රතික්‍රියා දෙක මගිනි.



How many moles of Cl_2 must be consumed to produce 35.0 moles of $\text{CCl}_2\text{F}_2(\text{g})$.
 $\text{CCl}_2\text{F}_2(\text{g})$ - මොල 35.0 ක් සෑදීම සඳහා අවශ්‍ය Cl_2 මොල ගණන කොපමණ ද?

(10 Marks)

- (f) A solution was made by dissolving 3.42 g of pure Barium hydroxide $\text{Ba}(\text{OH})_2$ contained in exactly 100 cm^3 of water. 25.0 cm^3 of this solution required 22.4 cm^3 of hydrochloric acid solution for complete neutralization when titrated using phenolphthalein as an indicator.

$\text{Ba}(\text{OH})_2$ බේරියම් හයිඩ්‍රොක්සයිඩ් 3.42 g ක් ජලය 100 cm^3 ක දිය කිරීමෙන් සාදාගන්නා ලද ද්‍රාවණයේ 25.0 cm^3 ක් සම්පූර්ණයෙන් උදාසීන කිරීමට හිඩ්‍රොජන අම්ලයේ ද්‍රාවණය හමුවේ හයිඩ්‍රොක්ලෝරික් අම්ලය 22.4 cm^3 ක් විය. (Ba = 137, O = 16, H = 1)

- (i) Write the balanced equation for the titration reaction.
අනුමාපනයට අදාළ තුලිත සමීකරණය ලියන්න.

- (ii) Calculate the concentration of the barium hydroxide solution.
 $\text{Ba}(\text{OH})_2$ ද්‍රාවණයේ සාන්ද්‍රණය ගණනය කරන්න.

(25 Calculate the amount of Barium hydroxide present in 25.0 cm^3 of solution
 $\text{Ba}(\text{OH})_2$ 25.0 cm^3 ක් තුළ ඇති $\text{Ba}(\text{OH})_2$ ප්‍රමාණය ගණනය කරන්න.

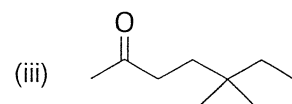
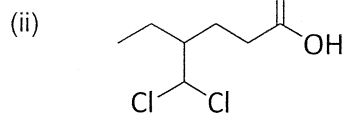
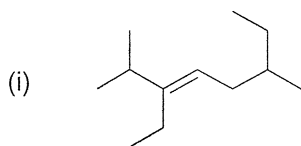
(26 Calculate the amount of HCl required to neutralization
උදාසීන කිරීමට අවශ්‍ය HCl ප්‍රමාණය ගණනය කරන්න.

(27 Calculate the concentration of the hydrochloric acid solution
හයිඩ්‍රොක්ලෝරික් අම්ලයේ සාන්ද්‍රණය ගණනය කරන්න.

(30 Marks)

05. (a) Name the following compounds systematically according to the IUPAC nomenclature.

IUPAC ක්‍රමයට පහත සංයෝග නාමකරණය කරන්න



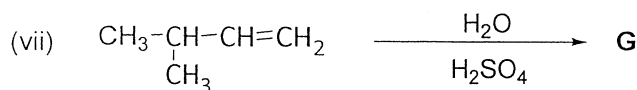
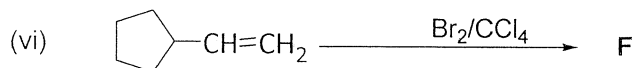
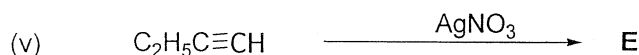
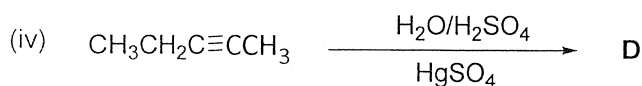
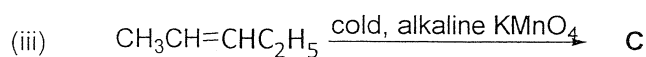
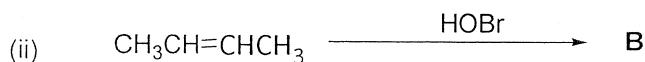
(15 marks)

(b) Draw all the possible structural isomers for the molecular formula $C_2H_2Br_2$ and name them.

$C_2H_2Br_2$ සඳහා වූ ව්‍යුහ සමාවයවික ඇඳ ඒවා නම් කරන්න.

(10 marks)

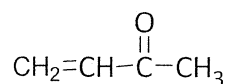
(c) Predict the major products of the following reactions./ පහත ප්‍රතික්‍රියාවල ප්‍රධාන වලයන් දෙන්න.



(d) Draw all possible resonance structures for the following compound.

පහත සංයෝග සඳහා ඇති සියලුම සම්ප්‍රයුක්ත ව්‍යුහ ඇඳන්න.

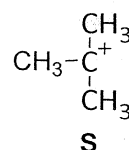
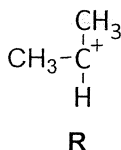
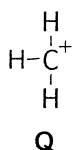
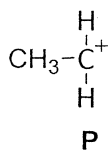
(35 marks)



(e) Arrange the following carbocations (P- S) in the decreasing order of their stability giving reasons.

(P- S) දක්වා වූ සංයෝගය සඳහා වූ සංතේජ ස්ථායීතාවය අඩුවන පිළිවෙලට හේතු දෙමින් සකසන්න.

(20 marks)



(20 marks)

06. (a) Consider 500 cm^3 of acetic acid solution containing 0.200 moles of acetic acid and 25.0 cm^3 of 0.1 mol dm^{-3} KOH solutions in separate containers. The dissociation constant value of acetic acid is $1.74 \times 10^{-5} \text{ mol dm}^{-3}$.

ඇසිටික් අම්ලය 0.200 මොල ප්‍රමාණයක් 500 cm^3 ක් තුළ ඇත්ත වූ ද්‍රාවණයක් හා 0.1 mol dm^{-3} KOH ද්‍රාවණයක 25.0 cm^3 ක් භාජන දෙකක ඇති බව සලකන්න. අම්ලයේ විඝටන නියතය $1.74 \times 10^{-5} \text{ mol dm}^{-3}$ නම්

- Write an equation to show the ionization of acetic acid in water at equilibrium and identify the Bronsted-Lowry acids and bases./ ජලය මාධ්‍යයේදී ඇසිටික් අම්ලයේ අයනීකරණයට අදාළ සමීකරණය ලියන්න. එහි බ්‍රොන්ස්ට්ට් හා ලෝරි වාදයට අනුව අම්ල සහ ක්ෂේම හඳුනා ගන්න.
- Calculate the hydrogen ion concentration in acetic acid solution. ඇසිටික් අම්ලයේ ඇති හයිඩ්‍රජන් අයන සාන්ද්‍රණය ගණනය කරන්න.
- Calculate the pH of the KOH solution? Show all the steps in the calculation. KOH ද්‍රාවණයේ pH අගය ගණනය කරන්න. (පියවර සියල්ල ඇතිව)
- The KOH solution was titrated with the acetic acid solution. Calculate the volume of acetic acid required to react with KOH./ KOH ද්‍රාවණය හා ඇසිටික් අම්ල ද්‍රාවණය අනුමාපනයේ දී අවශ්‍ය ඇසිටික් අම්ලයේ පරිමාව ගණනය කරන්න.
- Suggest suitable indicator for the above titration in (iv). ඉහත අනුමාපනය සඳහා සුදුසු දර්ශකයක් යෝජනා කරන්න. (50 marks)

- (b) (i) The solubility-product constant, K_{sp} , of AgBr is 5×10^{-13} at 298 K.

298 K දී AgBr වල ද්‍රාව්‍යතා ගුණිතය K_{sp} , අගය 5×10^{-13}

Write the expression for the solubility-product constant, K_{sp} , of AgBr at 298 K.

298 K දී AgBr වල ද්‍රාව්‍යතා ගුණිතය K_{sp} , සඳහා සමීකරණය ලියන්න.

- (ii) Calculate the value of $[\text{Ag}^+]$ in 50.0 mL of a saturated solution of AgBr at 298 K.

AgBr සංතෘප්ත ද්‍රාවණයක මි.ලි.50 ක් තුළ ඇති $[\text{Ag}^+]$ අයන සාන්ද්‍රණය ගණනය කරන්න.

- (iii) Calculate the minimum volume of distilled water, in cm^3 , necessary to completely dissolve a 0.00287 g sample of AgCl(s) at 298 K.

AgCl(s) 0.00287 g ක් ප්‍රමාණයක් සම්පූර්ණයෙන්ම දිය කිරීම සඳහා අවශ්‍ය ආසුනේ ජලය පරිමාව cm^3 වලින් සොයන්න.

(K_{sp} of the AgCl at 298 K is $1.6 \times 10^{-9} \text{ mol}^2 \text{ dm}^{-6}$ and the molar mass of AgCl is 143.5 g mol^{-1} .)

298 K දී AgCl වල ද්‍රාව්‍යතා ගුණිතය $1.6 \times 10^{-9} \text{ mol}^2 \text{ dm}^{-6}$ AgCl වල අණුක ස්කන්ධය 143.5 g mol^{-1} .)

(50 marks)

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The Open University of Sri Lanka
Foundation Programme/Courses in Science - 2014/2015
Faculty of Natural Sciences, Department of Chemistry
Chemistry I – CMF 2205
Final Examination – 3 Hours

17th November 2015

Time: 9.30 am - 12.30 pm

Instruction to candidates

- The paper consists of two parts, Part A (25 MCQ) and Part B (6 essay type questions, four (4) to be answered).
- Mobile phones must be switched off and kept away during examination.
- The use of a non programmable electronic calculator is permitted

பரீட்சார்த்திகளுக்கான அறிவுறுத்தல்கள்

- இவ்வினாத்தாள் இரண்டு பாகங்களைக் கொண்டது
பகுதி A (25 பஸ்தேர்வு வினாக்கள்) மற்றும்
பகுதி B (6 கட்டுரையமைப்பு வினாக்கள்)
பதிலளிக்க வேண்டிய வினாக்கள் 4
- கையடக்க தொலைபேசிப் பாவனை தடையானது
- செயல் நிரற்படுத்தப்படாத கணினிப் பாவனை அனுமதிக்கப்பட்டுள்ளது

Planck's constant, h; பிளாங்கின் மாறிலி $h = 6.63 \times 10^{-34} \text{ J s}$

Velocity of light, C; ஒளியின் வேகம் c = $3 \times 10^8 \text{ m s}^{-1}$

Avogadro constant, L; அவகாதரோ மாறிலி L = $6.023 \times 10^{23} \text{ mol}^{-1}$

1 atmosphere; 1 வளிமண்டல அழுக்கம் = 760 torr = 10^5 Nm^{-2}

Universal Gas constant, R; வாயு மாறிலி = $2.303 \log_{10}$

$$\ln_e = 2.303 \log_{10}$$

1 H 1.008																2 He 4.003																			
3 Li 6.939		4 Be 9.012														5 B 10.81		6 C 12.01		7 N 14.01		8 O 16.00		9 F 19.00		10 Ne 20.18									
11 Na 22.99		12 Mg 24.31														13 Al 26.98		14 Si 28.09		15 P 30.97		16 S 32.07		17 Cl 35.45		18 Ar 39.95									
19 K 39.10		20 Ca 40.08		21 Sc 44.96		22 Ti 47.90		23 V 50.94		24 Cr 52.00		25 Mn 54.94		26 Fe 55.85		27 Co 58.93		28 Ni 58.71		29 Cu 63.55		30 Zn 65.39		31 Ga 69.72		32 Ge 72.61		33 As 74.92		34 Se 78.96		35 Br 79.90		36 Kr 83.80	

Part A

Answer All Questions

- Choose the most correct answer to each question and mark a cross “X” over the answer on the answer sheet.
- Use a PEN (not a pencil) in answering.
- Any answer with more than one cross will not be counted.

அனைத்து வினாக்களுக்கும் விடையளிக்குக.

- ஒவ்வொரு வினாக்களுக்கும் மிகப் பொருத்தமான விடையைத் தெரிவு செய்து, விடைத்தாளிலுள்ள விடையின் மீது ‘x’ அடையாளமிடுக.
- பதிலளிப்பதற்கு பேனாவைப் பயன்படுத்தவும். ‘பென்சில் அல்ல’.
- ஒன்றிற்கு மேற்பட்ட புள்ளி இடப்பட்ட பதில்கள் ஏற்றுக்கொள்ளப்படாது.

1. For which element below is the radius of its ion greater than that of the atom?

பின்வரும் மூலகங்களில் எதனுடைய அயனாரையானது அதன் அணுவாரையிலும் பெரியதாகும்?

- i) F ii) K iii) Na iv) Ca v) Al

2. Na^+ , Mg^{2+} , Si^{4+} , and Al^{3+} are isoelectronic; their ionic size will follow the order of.

Na^+ , Mg^{2+} , Si^{4+} மற்றும் Al^{3+} ஆனவை சமதானிகளாகும். அவற்றின் அயன் பருமன்களது வரிசையானது,

- i) $\text{Na}^+ > \text{Mg}^{2+} > \text{Si}^{4+} > \text{Al}^{3+}$ ii) $\text{Na}^+ > \text{Al}^{3+} > \text{Mg}^{2+} > \text{Si}^{4+}$
 iii) $\text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+} > \text{Si}^{4+}$
 iv) $\text{Si}^{4+} > \text{Al}^{3+} > \text{Mg}^{2+} > \text{Na}^+$ v) $\text{Na}^+ > \text{Si}^{4+} > \text{Mg}^{2+} > \text{Al}^{3+}$

3. The electronic transition in the hydrogen atom that emits a photon of highest energy is,

உயர் சக்தியுடைய போட்டோனை காலல் செய்யும் ஐதரசன் அணுவினது இலத்திரனியல் மாற்றமானது,

- i) $n=2$ to $n=1$ ii) $n=3$ to $n=2$ iii) $n=2$ to $n=3$ iv) $n=1$ to $n=2$ v) $n=4$ to $n=3$

4. Which group below contains elements in all three states of matter at STP?

பின்வருவனவற்றுள் எந்த கூட்ட மூலகங்களானது நியம வெப்ப அழுக்கத்தில் (STP) பதார்த்தத்தின் மூன்று அவத்தையிலும் காணப்படும்.

- i) Noble gases ii) Halogens iii) Alkaline earth metals
iv) Transition elements v) Alkali metals

5. Electronic configuration of five elements is as follows. Which is expected to be most metallic?

ஐந்து மூலகங்களினது இலத்திரனியல் நிலையமைப்பானது பின்வருமாறு தரப்படின், இவற்றுள் எது கூடுதலான உலோகமாக எதிர்பார்க்கப்படுகின்றது?

- i) 2, 8, 4 ii) 2, 8, 18 iii) 2, 8, 8, 2 iv) 2, 8, 8, 7 v) 2, 8, 5

6. A, B, C are elements of third period. Oxide of A is ionic, B produced a giant molecule and C is amphoteric. A, B, C will have atomic number in the order,

A, B, C எனும் மூலகங்கள் மூன்றாம் ஆவர்த்தனத்திற்குரியவை. Aயினது ஒட்சைட்டு அயனிகுரியதாகும். Bயானது ஒரு இராட்சத மூலக்கூற்றை உருவாக்கும். C யானது ஈரியல்புடையது ஆயின், A, B, C என்பவற்றின் அணுவெண் வரிசையானது,

- i) $A < B < C$ ii) $B < C < A$ iii) $C < A < B$ iv) $B < A < C$
v) $A < C < B$

7. Which one of the following does not react with sodium hydroxide solution?

பின்வருவனவற்றுள் எது சோடியம் ஐதரொட்சைட்டு கரைசலுடன் தாக்கமுறாது?

- i) Be ii) Cu iii) Al iv) Cl_2 v) Zn

8. Sodium superoxide NaO_2 is prepared by reacting Na_2O_2 with O_2 at high pressures. How much of Na_2O_2 is required to prepare 11 g of NaO_2

Na_2O_2 ஆனது O_2 உடன் உயர் அழுக்கத்தில் தாக்கமடைவதன் மூலம் NaO_2 தயாரிக்கப்படுகின்றது. 11g NaO_2 தயாரிக்கத் தேவையான Na_2O_2 யாது?

- i) 5.5 g ii) 7.8 g iii) 11 g iv) 3.9 g v) 78 g

9. Bonding present between the carbon atoms in graphite is

காரியத்திலுள்ள காபன் அணுக்களிற்கிடையிலான பிணைப்பு யாது?

- i) உலோகப்பிணைப்பு ii) அயன் பிணைப்பு iii) பங்கீட்டுப் பிணைப்பு
iv) இருமுனைவு பிணைப்பு v) முனைவுப்பிணைப்பு

10. In a polar bond

முனைவுப் பிணைப்பில்,

- i) Electrons are equally shared.

இலத்திரன்கள் சமமாகப் பங்கிடப்படும்.

ii) Electrons are unequally shared.

இலத்திரன்கள் சமனற்றதாகப் பங்கிடப்படும்.

iii) Electrons are shared between atoms in a homonuclear molecule.

இலத்திரன்கள் (homo nuclear) மூலக்கூறுகளுக்கிடையே பங்கிடப்படும்.

iv) Electrons are shared between atoms with similar electronegativity.

இலத்திரன்கள் ஒரேயளவு மின்னெதிரியல்புள்ள அணுக்களுக்கிடையே பங்கிடப்படும்.

v) None of the above

மேற்குறிப்பிட்ட எவையுமல்ல.

11. Which one of the following molecules does not have resonance forms?

பின்வரும் மூலக்கூறுகளில் பரிவு அற்றது யாது?

(i) CO_2 (ii) SO_2 (iii) O_3 (iv) CH_3OH (v) CO_3^{2-}

12. What is the hybridization of carbon atom in CH_4 molecule

CH_4 மூலக்கூறில் காபன் அணுவினது கலப்பு யாது?

i) sp (ii) sp^2 (iii) sp^3 (iv) sp^3d (v) None of the above

13. When the number of electron pairs on the central atom is six, then geometry of the molecule is

மைய அணுவின் இலத்திரன் சோடி எண்ணிக்கை 6 எனின், அம்மூலக்கூறின் கேத்திரகணித கட்டமைப்பு யாது?

i) octahedral (ii) trigonal pyramidal (iii) tetrahedral

iv) square pyramidal v) linear

i) எண்முகி (ii) முக்கோண கூம்பகம் (iii) நான்முகி

iv) சதுர கூம்பகம் v) நேர்கோடு

14. Which one of the following sets gives the correct symbols for SI units?

பின்வருவனவற்றுள் சரியான SI அலகுகளைக் காண்பிக்கும் தொகுதி யாது?

i) km, kg, s, K, mol, A, cd ii) m, g, s, K, mol, A, cd

iii) m, kg, s, K, mol, A, cd

iv) m, kg, s, °C, mol, A, cd v) km, kg, s, °C, mol, A, cd

15. Sodium metal reacts with ammonia gas under certain conditions giving hydrogen gas and sodamide (NaNH_2) only. How much of molecular hydrogen will be produced by 23 g of sodium in this reaction?

குறிப்பிட்ட நிபந்தனையில் சோடியம் உலோகமானது அமோனியா வாயுவடன் தாக்கமடைந்து ஐதரசன் வாயு மற்றும் NaNH_2 (Sodamide) ஐ மட்டும் தோற்றுவிக்குமாயின், 23 g சோடியம் தாக்கமடைந்தால் பெறப்படும் ஐதரசன் மூலக்கூறு எவ்வளவு?

- i) 11.5 g ii) 0.5 g iii) 2 g iv) 23 g v) 1 g

16. The concentration of a NaCl solution is given as 117 mg dm^{-3} . What is the concentration of NaCl in that solution in mol dm^{-3} ?

NaCl கரைசலின் செறிவானது 117 mg dm^{-3} எனத் தரப்படி அக்கரைசலினுள் NaCl இனது செறிவு mol dm^{-3} யில் யாது?

- i) 0.002 ii) 2000 iii) 0.117 iv) 2×10^{-4} v) 6.8445

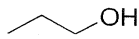
17. The balanced redox reaction between Fe^{2+} and MnO_4^- in an acidic medium is

Fe^{2+} மற்றும் MnO_4^- இற்கு அமில ஊடகத்திலான சமப்படுத்தப்பட்ட ஒட்சியேற்ற, தாழ்த்த தாக்கம் யாது?

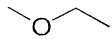
- i) $5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 5\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{2+}(\text{aq}) + 5\text{Fe}^{3+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$
 ii) $3\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{2+}(\text{aq}) + 3\text{Fe}^{3+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$
 iii) $5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{2+}(\text{aq}) + 5\text{Fe}^{3+}(\text{aq}) + 8\text{H}_2\text{O}(\text{l})$
 iv) $5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{2+}(\text{aq}) + 5\text{Fe}^{3+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$
 v) $5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) \rightarrow \text{Mn}^{3+}(\text{aq}) + 5\text{Fe}^{3+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$

18. Consider the three compounds given below and the statements that follow.

பின்வரும் மூன்று சேர்வைகளையும் கூற்றுக்களையும் கருதுக.



A



B



C

- a) Only A and C are structural isomers

A மற்றும் C என்பவை மாத்திரமே கட்டமைப்பு சமபகுதியங்களாகும்.

- b) A, B and C are all isomers

A, B மற்றும் C அனைத்தும் சமபகுதியங்களாகும்.

- c) Only A and B are functional group isomers

A மற்றும் B மாத்திரமே தொழிற்பாட்டு கூட்ட சமபகுதியங்களாகும்.

- d) Only A and C are positional isomers

A மற்றும் C மாத்திரமே (Positional) அமைப்பு சம்பகுதியங்களாகும்.

சரியான கூற்று / கூற்றுக்கள் எது / எவை?

- i) (a) only ii) (b) only iii) (a) and (d) iv) (b) and (d)
v) (b), (c) and (d)

19. Select the **incorrect** statement out of the following.

பின்வருவனவற்றுள் தவறான கூற்றைத் தெரிவு செய்க.

- i) Carbon dioxide is produced when alkanes undergo incomplete combustion.

அல்கேன்கள் பூரணமற்ற தகனத்திற்குள்ளாக்கப்படும் பொழுது (CO₂) காபனீரொட்சைட்டு பெறப்படும்.

- ii) High molecular weight hydrocarbons can be broken into smaller hydrocarbons at high temperatures and pressures.

உயர் வெப்ப மற்றும் அழுக்கத்தில் அதிக மூலக்கூற்று பருமனுடைய ஐதரோகாபன்களானது சிறு ஐதரோகாபன்களாக உடைக்கப்படலாம்.

- iii) Iso -octane is a very good fuel which does not cause knocking in engines.

Isn - octane ஆனது (என்ஜின்களில்) அடிப்புக்களை ஏற்படுத்தாத மிகச் சிறந்த எரிபொருளாகும்.

- iv) Cycloalkane rings become unstable when the internal bond angle is lesser than the tetrahedral bond angle.

cycloalkane சக்கரஅற்கேன் வளையங்களில் அவற்றில் அகபிணைப்பு கோணமானது, (tetrahedral) நான்முகி பிணைப்பு கோணத்திலும் சிறிதாக இருப்பின், Cycloalkane வளையங்கள் உறுதியற்றதாக மாற்றமடையும்.

- v) Alkanes are water insoluble because they are non-polar compounds.

அல்கேன்கள் முனைவற்ற சேர்வைகளாதலால் நீரில் கரையும் தகவற்றவை.

20. In Baeyer's test, the reagent used to identify alkenes is

(Baeyer's) பேயரின் சோதனையில் அற்கீன்களைக் கண்டறிய பயன்படுத்தப்படும் சோதனைப் பொருள் யாது?

- i) Br₂ நீர் ii) Br₂ / CCl₄ iii) அமில KMnO₄ iv) கார KMnO₄ v) AgNO₃

21. Some information about two acids is given below.

இரு அமிலங்கள் பற்றிய தரவுகள் கீழே தரப்பட்டுள்ளன.

Acid	Dissociation constant (K_a) mol dm ⁻³	Concentration
Acetic acid	1.8×10^{-5}	0.1 M
Carbonic acid	4.3×10^{-7}	0.1 M

What is **incorrect out** of the following?

பின்வருவனவற்றுள் தவறானது?

i) Acetic acid is stronger than carbonic acid.

அசற்றிக்கமில், காபோனிக்கமில்த்திலும் உறுதியானது.

ii) In acetic acid solution $[H^+] = 1.3 \times 10^{-3}$ M

அசற்றிக்கமில் கரைசலில் $[H^+] = 1.3 \times 10^{-3}$ M

iii) pH of acetic acid solution is less than that of carbonic acid solution.

அசற்றிக்கமில் கரைசலின் pH ஆனது காபோனிக்கமில் கரைசலின் pH இலும் குறைவானதாகும்.

iv) In acetic acid solution the pH= 1.3

அசற்றிக்கமில் கரைசலின் pH = 1.3

v) Both the above acids are weaker than HCl.

மேற்கூறப்பட்ட இரு அமிலங்களும் HCl ஐ விட மென்அமிலமாகும்.

22. Which one of the following reactions produces a basic salt?

பின்வருவனவற்றுள் கார உப்பைத் தோற்றுவிக்கும் தாக்கம் யாது?

i) $NaOH + CH_3COOH \longrightarrow$

ii) $NaOH + HCl \longrightarrow$

iii) $HNO_3 + KOH \longrightarrow$

iv) $CH_3COOH + NH_4OH \longrightarrow$

v) $HCl + NH_4OH \longrightarrow$

23. The pH of 0.005 M $Mg(OH)_2$ solution is

0.005 M $Mg(OH)_2$ கரைசலினது pH?

i) 5

ii) 12

iii) 2

iv) 9

v) 14

24. Constant volume of 0.01 M NaOH was titrated with 0.02 M acetic acid and the end point reading was 15.00 cm³. What is the volume of NaOH taken and the indicator used respectively?

மாறாக்கனவளவுடைய 0.01 M NaOH ஆனது 0.02 M அசற்றிக்கமிலத்துடன் நியமிக்கையில் பெறப்பட்ட முடிவுப்புள்ளி வாசிப்பானது 15.00 cm³. நியமிப்பிற்கு எடுக்கப்பட்ட NaOH இனது கனவளவு மற்றும் உபயோகித்த காட்டி என்பன முறையே

i) 15.0 cm³ and methyl orange

15.0 cm³ ஐ மெதைல் செம்மஞ்சள்

ii) 15.0 cm³ and phenolphthalein

15.0 cm³ ஐ பினோப்தலின்

iii) 30.0 cm³ and methyl orange

30.0 cm³ ஐ மெதைல் செம்மஞ்சள்

iv) 30.0 cm³ and phenolphthalein

30.0 cm³ ஐ பினோப்தலின்

v) 15.0 cm³ and methyl red

15.0 cm³ ஐ மெதைல் சிவப்பு

25. Which one of the following statements is **incorrect**?

பின்வரும் கூற்றுக்களில் தவறானது?

i) When temperature is increased solubility of a solid compound is also increased.

வெப்பநிலையானது அதிகரிக்கையில் திண்ம பதார்த்தங்களின் கரைதிறன் அதிகரிக்கும்.

ii) When a common ion is added precipitation takes place at a lower concentration.

பொதுஅயன் சேர்க்கப்படும்பொழுது குறைந்த செறிவுகளில் வீழ்படிவுகள் பெறப்படும்.

iii) When pressure is increased, solubility of a gas is also increased.

அழுக்கமானது அதிகரிக்கையில், வாயுவினது கரைதிறனும் அதிகரிக்கும்.

iv) All nitrates are soluble.

அனைத்து நைத்திரேற்றுக்களும் கரையும் தகவுடையவை.

v) Precipitation takes place when the solubility product exceeds ionic product.

கரைதிறன் பெருக்கமானது, அயன் பெருக்கத்தை மிஞ்சுகையில் வீழ்படிவாக்கம் நிகழும்

Part B - பகுதி B

Answer only four (04) questions

(4) வினாக்களுக்கு மட்டும் விடையளிக்குக.

1. a. The mass of a proton is 1840 times greater than the mass of an electron. The mass and the charge of an electron are 9.11×10^{-31} kg and -1.60×10^{-19} C respectively.

புரோத்தனின் திணிவானது இலத்திரனின் திணிவிலும் 1840 மடங்கு பெரியது. இலத்திரன் ஒன்றின் திணிவு மற்றும் ஏற்றம் முறையே 9.11×10^{-31} kg மற்றும் -1.60×10^{-19} C.

- i. Calculate the mass of a proton.

புரோத்தனின் திணிவைக் கணிக்க.

- ii. Calculate charge to mass ratio (e/m) of a proton.

புரோத்தனின் ஏற்றம்/திணிவு விகிதத்தைக் (e/m) கணிக்க.

(24 Marks)

- b. Complete the following table.

பின்வரும் அட்டவணையைப் பூர்த்திசெய்க.

Symbol	Z (Atomic Number)	A (RAM)	No of Electrons	Net Charge
$^{24}_{12}\text{Mg}^{2+}$				
$^{64}_{29}\text{Cu}$				
$^{27}_{13}\text{Al}^{3+}$				

(12 Marks)

குறியீடு Z அணுவெண் A (RAM) இலத்திரன் எண்ணிக்கை மொத்தஏற்றம்

- c. The energy required to remove one mole of electrons from a metal is 213.8 kJ

ஒரு மூல் இலத்திரனை உலோகமொன்றிலிருந்து வெளியேற்றுவதற்குத் தேவையான சக்தி 213.8 kJ.

- i. How much energy is required to remove a single electron from the metal?

அவ்வுலோகத்திலிருந்து ஒரு தனி இலத்திரனை வெளியேற்றுவதற்குத் தேவையான சக்தி?

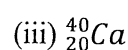
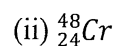
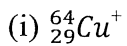
- ii. Calculate the wavelength (in nm) of radiation capable of doing above process (i)

மேற்குறித்த செயன்முறையைச் செய்வதற்குத் தகுதியான கதிர்வீச்சின் அலைநீளத்தை (nm) இல் கணிக்க.

(24 Marks)

- d. Write the electronic configuration for following elements/ions ($1s^2 2s^2$)

பின்வரும் மூலகங்கள் / அயன்களுக்கான இலத்திரனியல் நிலையமைப்பைத் தருக.



(18 Marks)

- e. Barium -142 is a beta emitter. Calculate half-life of Barium if a 32.0 g of sample of this isotope decay to 1.0 g in 130 minutes.

பேரியம் 142 ஆனது ஒரு β - காலி (β - emitter). இச்சமதானியின் 32.0 g மாதிரியானது 130 நிமிடத்தில் 1.0 g ஆக தேய்வடைந்திருப்பின் இப்பேரியத்தின் அரைவாழ்வுக் காலத்தை கணிக்குக.

(22 marks)

2. a. Write two advantages of Mendeleev's periodic table.

மென்டலீவின் ஆவர்த்தன அட்டவணையின் இரு நன்மைகளைத் தருக.

(10 marks)

- b. The first, second and third ionization energies for calcium (Ca) are 590.0, 1145.0 and 4910.0 kJ mol⁻¹ respectively. Explain why there is a marked difference between the values for the second and third ionization energy of calcium (Ca)

கல்சியத்தின் (Ca) முதலாம், இரண்டாம் மற்றும் மூன்றாம் அயனாக்கற்சக்திகள் முறையே 590.0, 1145.0 மற்றும் 4910.0 kJ mol⁻¹. இரண்டாம் மற்றும் மூன்றாம் அயனாக்கற்சக்திப் பெறுமானங்களுக்கிடையே குறிப்பிடத்தக்களவு வித்தியாசம் இருப்பது ஏன் என விளக்குக.

(12 marks)

- c. Give relevant balanced chemical equations to show the reaction of

பின்வருவனவற்றின் ஐதான HCl அமிலத்துடனான தாக்கத்திற்கான சமப்படுத்தப்பட்ட இரசாயனச் சமன்பாட்டைத் தருக.

(i) Al

(ii) Al₂O₃

With dilute HCl acid

(20 marks)

- d. Calculate the oxidation states of (s) sulphur in following compounds.

பின்வரும் சேர்வைகளில் கந்தகத்திற்கான ஒட்சியேற்ற நிலைகளைக் கணிக்குக.

i) SO₃²⁻ (ii) S₂F₁₀ (iii) S₂O₃²⁻ (iv) S₂Cl₂ (v) SO₄²⁻

(20 Marks)

- e. Write down the equation for the reaction between Ca(OH)₂ and CO₂ and comment on the observation. What will happen if excess CO₂ is bubbled through this solution?

Ca(OH)₂ மற்றும் CO₂ இற்கிடையிலான தாக்கத்திற்குரிய சமன்பாட்டை எழுதுக.

அவதானத்தைப் பற்றி எடுத்துரைக்குக.

மிகையான CO₂ வானது கரைசலினுள் செலுத்தப்பட்டால் ஏற்படும் விளைவு யாது?

(20 marks)

- f. Write down the balanced Chemical equations for the thermal decomposition of LiNO_3 , KNO_3 and CaCO_3 .

LiNO_3 , KNO_3 மற்றும் CaCO_3 என்பவை வெப்பமாக்கப்படும்போது பிரிகையுறுவதற்கான சமப்படுத்தப்பட்ட இரசாயனச் சமன்பாட்டை எழுதுக.

(18 marks)

3. a) i. What is meant by the term “electronegativity” of an atom?

அணுவொன்றின் “மின்னெதிரியல்பு” எனும் பதத்திலிருந்து விளங்குவது யாது?

- ii. Electronegativity values of some elements are given below.

சில மூலகங்களின் மின்னெதிரியல்பு பெறுமானங்கள் கீழே தரப்பட்டுள்ளது.

K - 3.0, H - 2.1, C - 2.5, Cl - 0.3

Giving reasons, identify the following bonds as ionic, polar covalent or covalent

பின்வருவனவற்றிலுள்ள பிணைப்புக்கள் அயன் பிணைப்பா, முனைவுப்பங்கீட்டுப் பிணைப்பா அல்லது பங்கீட்டுப் பிணைப்பா என அடையாளம் கண்டு அதை காரணத்துடன் விளக்குக.

- K-Cl
- C-Cl
- H-H

(21 marks)

- b. (i) Draw the Lewis structures for H_2O , CHCl_3 , SF_4 , PCl_5 and state whether they obey the octet rule.

H_2O , CHCl_3 , SF_4 மற்றும் PCl_5 இற்காக லூயிஸின் கட்டமைப்பை வரைந்து, அவை அட்டக விதிக்குட்பட்டவையா எனத் தருக.

(24 marks)

- c. Draw all the reasonable resonance structures and resonance hybrid for the sulphate ion, SO_4^{2-}

சல்பேற்று அயனிற்கான (SO_4^{2-}) அனைத்து பொருந்தக்கூடிய பிரிவுக்கட்டமைப்புக்கள் மற்றும் பிரிவுக்கலப்புக்களை வரைக.

(20 marks)

d. The boiling points of Group V hydrides are given below

கூட்டம் V ஐதரைட்டுக்களின் கொதிநிலை புள்ளிகளானது கீழே தரப்பட்டுள்ளது.

Hydride	Boiling point (K)
Ammonia, NH_3	240
Phosphine, PH_3	185
Arsine, AsH_3	218
Stibene, Sb	256
Bismuthene, BiH_3	295

ஐதரைட்டுக்கள்	கொதிநிலை புள்ளி (K)
அமோனியா NH_3	240
பொஸ்பீன் PH_3	185
ஆர்சின் AsH_3	218
ஸ்டீபின் Sb	256
பிஸ்முதீன் BiH_3	295

i. Explain the steadily rising trend in the boiling points from phosphine to bismuthene.

PH_3 இலிருந்து BiH_3 வரை படிப்படியாகக் கொதிநிலை அதிகரிக்கும் போக்கை விளக்குக.

ii. Explain why the boiling point of ammonia does not follow this trend.

NH_3 யினது கொதிநிலை இதிலிருந்து விலகியிருப்பதற்கான காரணத்தை விளக்குக.

(25 marks)

e. Iodine, I_2 , has a crystal lattice structure at room temperature,

அறைவெப்பநிலையில் அயடின் (I_2) ஆனது பளிங்குரு சாலகக் கட்டமைப்பை உடையது.

i. What type of bond holds together iodine atoms in an iodine molecule?

அயடின் மூலக்கூறில் அயடின் அணுக்கலானது எந்தப் பிணைப்பு வகையினால் சேர்க்கப்பட்டுள்ளது.

ii. What forces act between the iodine molecules in a crystal lattice?

பளிங்குரு சாலகத்தில் அயடின் மூலக்கூறுகளுக்கிடையில் தொழிற்படும் விசைகள் யாது?

(10 marks)

4. a. The density of a gas is 0.084 g cm^{-3} . Express the density in SI units.

வாயுவொன்றின் அடர்த்தியானது 0.084 g cm^{-3} .

இவ்வடர்த்தியை SI அலகில் தருக.

(10 marks)

- b. An organic compound X shows that the mass percentages of carbon, hydrogen and nitrogen presents are 48.65%, 13.60% and 37.75% respectively.

ஓர் சேதனச்சேர்வை X இலுள்ள கார்பன், ஐதரசன் மற்றும் நைதரசன் என்பவற்றின் திணிவு சதவீதமானது முறையே 48.69%, 13.60% மற்றும் 37.75% ஆகும்.

- i. Deduce the empirical formula of compound X.

சேர்வை X இற்குரிய அனுபவச்சூத்திரத்தை கண்டறிக.

- ii. If the molar mass of the compound X is 149 g mol^{-1} deduce the molecular formula of compound X.

சேர்வை X இனது மூலக்கூற்றுத்திணிவு 149 g mol^{-1} எனின், அச்சேர்வையினது மூலக்கூற்றுச் சூத்திரத்தைக் கண்டறிக. (24 marks)

- c. Write down the chemical name of the following:

பின்வருவனவற்றில் இரசாயனப் பெயர்களைத் தருக.

- (i) CaSO_3 (ii) AgNO_3 (iii) $\text{Al}_2(\text{SO}_4)_3$ (iv) $\text{Ca}_3(\text{PO}_4)_2$ (16 marks)

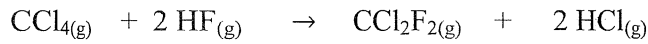
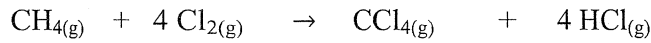
- d. Write the balanced chemical equation for oxidation of Fe^{2+} ions by $\text{Cr}_2\text{O}_7^{2-}$ ions in an aqueous acidic solution.

Fe^{2+} அயனானது அமில ஊடகத்தில் $\text{Cr}_2\text{O}_7^{2-}$ அயனினால் ஓட்சியேற்றப்படுவதற்கான சமப்படுத்தப்பட்ட இரசாயனச் சமன்பாட்டை எழுதுக.

(10 marks)

- e. Dichlorodifluoromethane is prepared by the following consecutive reactions

Dichlorodifluoromethane ஆனது பின்வரும் தொடரான தாக்கங்கள் மூலம் தயாரிக்கப்படும்.



How many moles of Cl_2 must be consumed to produce 35.0 moles of $\text{CCl}_2\text{F}_2(\text{g})$

35.0 மூல் $\text{CCl}_2\text{F}_2(\text{g})$ தயாரிப்பதற்கு, உபயோகப்படும் Cl_2 க்களின் மூல் எண்ணிக்கை யாது? (10 marks)

- f. A solution was made by dissolving 3.42 g of pure Barium hydroxide $\text{Ba}(\text{OH})_2$ contained in exactly 100 cm^3 of water. 25.0 cm^3 of this solution required 22.4 cm^3 of hydrochloric acid solution for complete neutralization when titrated using phenolphthalein as an indicator. ($\text{Ba} = 137, \text{O} = 16, \text{H} = 1$)

3.42 g தூய பேரியம் ஐதரொட்சைட்டை ($\text{Ba}(\text{OH})_2$) சரியாக 100 cm^3 நீரில் கரைப்பதன் மூலம் கரைசல் ஒன்று தயாரிக்கப்பட்டது. இக்கரைசலின் 25.0 cm^3 கனவளவை

பினோப்தலின் காட்டி முன்னிலையில் நியமிக்கையில் பூரண நடுநிலையாக்கத்திற்காக 22.4

cm³ ஐதரோக்குளோரிக்கமில் தேவைப்பட்டது. (Ba = 137, O = 16, H = 1)

i. Write the balanced equation for the titration reaction.

நியமிப்புத் தாக்கத்திற்கான சமப்படுத்தப்பட்ட சமன்பாட்டை எழுதுக.

ii. Calculate the concentration of the barium hydroxide solution.

பேரியம் ஐதரொட்சைட்டுக் கரைசலின் செறிவைக் கணிக்க.

iii. Calculate the amount of Barium hydroxide present in 25.0 cm³ of solution

25.0 cm³ கரைசலிலுள்ள பேரியம் ஐதரொட்சைட்டு அளவைக் கணிக்க.

iv. Calculate the amount of HCl required to neutralization

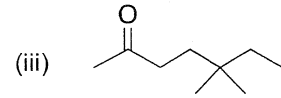
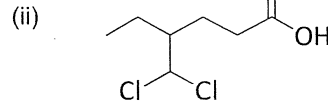
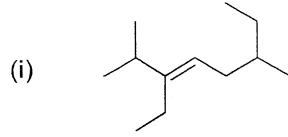
நடுநிலையாக்கத்திற்குத் தேவையான HCl இன் அளவைக் கணிக்க.

v. Calculate the concentration of the hydrochloric acid solution

ஐதரோக்குளோரிக்கமில் கரைசலின் செறிவைக் கணிக்க. (30 marks)

5. a. Name the following compounds systematically according to the IUPAC nomenclature.

பின்வரும் சேர்வைகளை IUPAC பெயரிட்டிற்கமைய முறையாகப் பெயரிடுக.



(15 marks)

b. Draw all the possible structural isomers for the molecular formula C₂H₂Br₂ and name them.

C₂H₂Br₂ எனும் மூலக்கூற்றுச் சூத்திரத்திற்குரிய அனைத்துக் கட்டமைப்பு

சமபகுதியங்களை வரைந்து அவற்றைப் பெயரிடுக.

(10 marks)

c. Predict the major products of the following reactions.

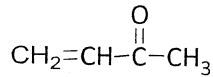
பின்வரும் தாக்கங்களின் பிரதான விளைவுகளை உய்த்தறிக.

- (i)  $\xrightarrow[\text{Zn/H}_2\text{O}]{\text{O}_3}$ A
- (ii) $\text{CH}_3\text{CH}=\text{CHCH}_3 \xrightarrow{\text{HOBr}}$ B
- (iii) $\text{CH}_3\text{CH}=\text{CHC}_2\text{H}_5 \xrightarrow{\text{cold, alkaline KMnO}_4}$ C
- (iv) $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CCH}_3 \xrightarrow[\text{HgSO}_4]{\text{H}_2\text{O/H}_2\text{SO}_4}$ D
- (v) $\text{C}_2\text{H}_5\text{C}\equiv\text{CH} \xrightarrow{\text{AgNO}_3}$ E
- (vi)  $\xrightarrow{\text{Br}_2/\text{CCl}_4}$ F
- (vii) $\text{CH}_3-\underset{\text{CH}_3}{\text{CH}}-\text{CH}=\text{CH}_2 \xrightarrow[\text{H}_2\text{SO}_4]{\text{H}_2\text{O}}$ G

(35 marks)

d. Draw all possible resonance structures for the following compound.

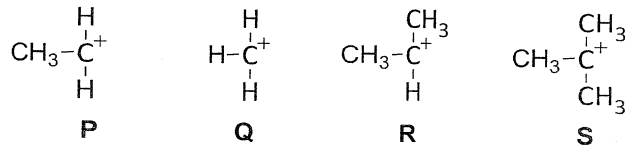
பின்வரும் சேர்வைக்குரிய அனைத்து பிரிவுக் கட்டமைப்புக்களையும் வரைக.



(20 marks)

e. Arrange the following carbocations (P- S) in the decreasing order of their stability giving reasons.

பின்வரும் காபோகற்றயன் (P - S) களை அவற்றின் உறுதித்தன்மை குறைந்து செல்லும் வரிசையில் ஒழுங்குபடுத்தி அதற்கான காரணத்தையும் விளக்குக.



(20 marks)

6. a. Consider 500 cm^3 of acetic acid solution containing 0.200 moles of acetic acid and 25.0 cm^3 of 0.1 mol dm^{-3} KOH solutions in separate containers. The dissociation constant value of acetic acid is $1.74 \times 10^{-5} \text{ mol dm}^{-3}$.

0.200 மூல் அசற்றிக்கமிலத்தைக் கொண்ட 500 cm^3 அசற்றிக்கமில் கரைசலும் 0.1 mol dm^{-3} , 25.0 cm^3 KOH கரைசலும் தனித்தனியே இரு கொள்கலன்களில் இருப்பதாகக் கருதுக.

அசற்றிக்கமிலத்தின் பிரிகை மாறிலி பெறுமானம் $1.74 \times 10^{-5} \text{ mol dm}^{-3}$.

- i. Write an equation to show the ionization of acetic acid in water at equilibrium and identify the Bronsted-Lowry acids and bases.

சமநிலையில் அசற்றிக்கமில்மானது நீருடன் அயனாக்கமடைவதைக் காண்பிக்கும் சமன்பாட்டை எழுதுக.

ii. Calculate the hydrogen ion concentration in acetic acid solution.

அசற்றிக்கமில் கரைசலிலுள்ள ஐதரசன் அயனின் செறிவைக் கணிக்குக.

iii. Calculate the pH of the KOH solution? Show all the steps in the calculation.

KOH கரைசலில் pH ஐக் கணிக்குக. கணிப்பிற்கான அனைத்துப் படிமுறைகளையும் தருக.

iv. The KOH solution was titrated with the acetic acid solution. Calculate the volume of acetic acid required to react with KOH.

KOH கரைசலானது அசற்றிக்கமில் கரைசலுடன் நியமிக்கப்பட்டது. KOH உடன் தாக்கமுறத் தேவையான அசற்றிக்கமில்லத்தின் கனவளவைக் கணிக்குக.

v. Suggest suitable indicator for the above titration in (iv).

மேற்குறிப்பிட்ட நியமிப்பிற்கு (iv) பொருத்தமான காட்டியை எடுத்துரைக்குக.

(50 marks)

b. The solubility-product constant, K_{sp} , of AgBr is 5×10^{-13} at 298 K.

298 K இல் AgBr இன் கரைதிறன் பெருக்க மாறிலியானது K_{sp} , 5×10^{-13} ஆகும்.

i. Write the expression for the solubility-product constant, K_{sp} , of AgBr at 298 K.

298 K இல் AgBr இன் கரைதிறன் பெருக்க மாறிலிக்கான கோவையை எழுதுக.

ii. Calculate the value of $[Ag^+]$ in 50.0 mL of a saturated solution of AgBr at 298 K.

298 K இல், 50.0 ml AgBr நிரம்பற் கரைசலிலுள்ள $[Ag^+]$ பெறுமானத்தைக் கணிக்குக.

iii. Calculate the minimum volume of distilled water, in cm^3 , necessary to completely dissolve a 0.00287 g sample of AgCl(s) at 298 K.

(K_{sp} of the AgCl at 298 K is $1.6 \times 10^{-9} \text{ mol}^2 \text{ dm}^{-6}$ and the molar mass of AgCl is 143.5 g mol^{-1} .)

298 K இல் 0.00287 g AgCl மாதிரியைப் பூரணமாக நீரில் கரைப்பதற்குத் தேவையான மிகக்குறைந்தளவு காய்ச்சி வடித்த நீரின் கனவளவு யாது?

(298 K இல் AgCl இன் K_{sp} ஆனது $1.6 \times 10^{-9} \text{ mol}^2 \text{ dm}^{-6}$ மற்றும் AgCl இன் மூலக்கூற்றுத் திணிவு 143.9 g mol^{-1})

(50 marks)