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THE OPEN UNIVERSITY OF SRI LANKA

B. Sc. DEGREE PROGRAMME 2015/ 2016

LEVEL 3 - FINAL EXAMINATION

CMU1121 - PRACTICAL CHEMISTRY

DURATION: 2 HOURS

Date: Thursday, 5th January 2017 Time: 9.30 a.m. – 11.30 a.m.

Answer ALL (04) questions. ප්‍රශ්න සියල්ලටම පිළිතුරු සපයන්න.
Use the space provided to write your answers to each question in one medium.
සපයා ඇති ඉඩ ප්‍රමාණය තුල ඔබගේ පිළිතුරු එක් මාධ්‍යයකින් පමණක් සපයන්න.

01. (A) Write down the formula of /පහත සංයෝගවල රසායනික සූත්‍රය ලියන්න.

(i) Ferrous ammonium sulphate/ෆෙරස් ඇමෝනියම් සල්ෆේට් .....

(ii) Potassium thiosulphate/පොටෑසියම් තයෝසල්ෆේට් .....

(iii) Borax/බොරැක්ස් ..... **(12 marks)**

(B) (i) You wish to carry out the test for nitrate ions using the sodium carbonate extract after neutralizing a portion with dil HCl during qualitative analysis.
ගුණාත්මක විශ්ලේෂණයේදී තනුක HCl අම්ලය මගින් උදාසීනීකරණය කල සෝඩියම් කාබනේට් නිස්සාරකයෙන් කොටසක් උපයෝගී කර ගනිමින් ඔබ නයිට්‍රේට් අයන සඳහා පරීක්ෂා කරනු ලබයි.

(α) Explain why you neutralize the extract?

ඔබ එම නිස්සාරකය උදාසීනීකරණය කරන්නේ ඇයි දැයි පහදන්න.

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(β) State the test and expected observation in testing for nitrate ions in this extract. Assume that bromide and iodide ions are not present in the extract.
මෙම නිස්සාරකය යොදා ගනිමින් නයිට්‍රේට් අයන සඳහා සිදුකරන පරීක්ෂණය සහ එහිදී බලාපොරොත්තු විය හැකි නිරීක්ෂණය ලියා දක්වන්න. (එම නිස්සාරකයේ බ්‍රෝමයිඩ් හා අයඩයිඩ් අයන නැතැයි උපකල්පනය කරන්න)

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(ii) 'A gas turns lime water milky'. Write down an equation corresponding to this observation.
'වායුවක් මඟින් හුණු දියර කිරිපාට කරවයි.' එම නිරීක්ෂණයට අදාල සමීකරණය ලියා දක්වන්න.

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.....**(24 marks)**

(C) You are provided with an inorganic salt **(X)** containing the chloride of the following cations Ca^{2+}, Fe^{3+}. With the aid of chemical test/s, how would you distinguish between the two cations?
Ca^{2+}හා **Fe^{3+}** යන කැටායන වල ක්ලෝරයිඩ අඩංගුවන **(X)** නම් වූ අකාබනික සංයෝගයක් ඔබට සපයා ඇත. රසායනික ප්‍රතික්‍රියාවක් /ප්‍රතික්‍රියා භාවිත කරමින් ඔබ මෙම කැටායන දෙක වෙන් කර හඳුනා ගන්නේ කෙසේ ද?

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(12 marks)

(D) (i) Write down the expected observation when dil HNO_3 and silver nitrate is added to
තනුක HNO_3 හා $AgNO_3$ සිල්වර් නයිට්‍රේට් පහත ද්‍රාවණවලට එකතු කලවිට බලාපොරොත්තු විය හැකි නිරීක්ෂණ ලියා දක්වන්න.

(α) a solution containing NaI only
NaI පමණක් පවතින ද්‍රාවණයකට

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(β) a solution containing NaCl only
NaCl පමණක් පවතින ද්‍රාවණයකට

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(γ) to a solution containing both NaI and NaCl
NaI සහ NaCl දෙකම අඩංගු ද්‍රාවණයකට

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(ii) State the expected observation if the solution in (γ) is treated with chlorine water followed by the addition of CCl_4.
ඉහත (γ) හි ද්‍රාවණයට, ක්ලෝරීන් දියරය සහ පසුව CCl_4 එකතු කල විට ඔබ බලාපොරොත්තු විය හැකි නිරීක්ෂණ දක්වන්න.

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(iii) Give relevant chemical equations for the observation of experiment stated in (ii) for solution (γ).
(γ) ද්‍රාවණය සඳහා ඔබ ඉහත (ii) හි පරීක්ෂණයේදී සඳහන් කල නිරීක්ෂණයට අදාල රසායනික ප්‍රතික්‍රියා ලියා දක්වන්න.

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(20 marks)

(E) (i) Write down the expression for solubility product of a sparingly soluble salt of the form A_xB_y with the aid of a balanced chemical equation.
A_xB_y යන ජලයේ මඳ වශයෙන් ද්‍රාව්‍ය ලවණයක ද්‍රාව්‍යතා ගුණිතය සඳහා ප්‍රකාශනයක් තුලිත රසායනික සමීකරණය භාවිතයෙන් ලියා දක්වන්න.

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(ii) A student added dimethyl glyoxime (HDMG) to a solution of Ni^{2+} ions expecting the formation of a bright pink precipitate Ni $(DMG)_2$ based on the equilibrium reaction shown below. However, a precipitate was **NOT** observed. Explain.

පහත දක්වා ඇති සමතුලිත ප්‍රතික්‍රියාව පදනම් කර ගනිමින් Ni^{2+}අඩංගු ද්‍රාවණයකට ශිෂ්‍යයෙක් ඩයිමෙතිල් ග්ලයොක්සිම් (HDMG) එකතු කර, Ni $(DMG)_2$ ලෙස තීව්‍ර රෝස පාට අවක්ෂේපයක් සෑදේ යයි බලාපොරොත්තු විය. කෙසේ වුවද ඔහු විසින් අවක්ෂේපයක් නිරීක්ෂණය නොකරන ලදී. පැහැදිලි කරන්න.

$Ni^{2+}(aq) + 2HDMG\ (aq) \rightleftharpoons Ni\ (DMG)_2\ (s) + 2H^+\ (aq)$

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(32 marks)

02. Nimal an undergraduate student, wanted to determine the concentration of a HCl solution by carrying out an acid-base titration.
විශ්වවිද්‍යාල සිසුවෙකු වන නිමල්ට, අම්ල-භෂ්ම අනුමාපනයක් මගින් HCl ද්‍රාවණයක සාන්ද්‍රණය සෙවීමට අවශ්‍යව ඇත.

(A) The only bases found in the laboratory was NaOH and Na_2CO_3. He selected Na_2CO_3 to prepare the basic solution for the titration. Do you agree with his choice? Give reasons for your answer.

විද්‍යාගාරය තුල සොයා ගත හැක්කේ NaOH හා Na_2CO_3 භෂ්ම දෙක පමණි. ඔහු එම අනුමාපනය සඳහා අවශ්‍ය භාෂ්මික ද්‍රාවණය සාදා ගැනීම සඳහා Na_2CO_3 යොදා ගත්තේ ය. ඔහුගේ එම තෝරා ගැනීම සමග ඔබ එකග වේ ද? ඔබගේ පිළිතුර සඳහා හේතු ඉදිරිපත් කරන්න.

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(10 marks)

(B) Calculate the weight of Na_2CO_3 required to prepare 250.0 mL of 0.1000 M Na_2CO_3 solution.
සාන්ද්‍රණය 0.1000 M වූ Na_2CO_3 ද්‍රාවණයෙන් 250.0 mL ක් සාදා ගැනීම සඳහා අවශ්‍ය Na_2CO_3 වල ස්කන්ධය ගණනය කරන්න. (Na = 23.00, C = 12.00, O = 16.00) **(10 marks)**

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(C) Write down all the necessary steps that he followed in weighing the above calculated amount, if you are provided with pure Na_2CO_3.
ඔහුට සංශුද්ධ Na_2CO_3 සපයා ඇති නම්, ඉහත ගණනය කරන ලද Na_2CO_3 හි ස්කන්ධ මැනීමේ දී අනුගමනය කළ යුතු සියළුම අවශ්‍ය පියවරයන් ලියා දක්වන්න.

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(12 marks)

(D) He decided to fill the burette with the acid solution of which the concentration should be determined but not with the base. Do you agree with his decision? Give reasons for your answer.
ඔහු භෂ්ම ද්‍රාවණයෙන් නොව, සාන්ද්‍රණය සෙවිය යුතු අම්ල ද්‍රාවණයෙන් බියුරෙට්ටුව පිරවීමට තීරණය කරන ලදී. මෙම තීරණය සමග ඔබ එකඟද? ඔබගේ පිළිතුරට හේතු දක්වන්න.

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(10 marks)

(E) Write down all the necessary steps that he followed in measuring 10.0mL of 0.1000 M Na_2CO_3 solution into the titration flask.
0.1000 M Na_2CO_3 ද්‍රාවණයෙන් 10.0mL ක පරිමාවක් අනුමාපන ප්ලාස්කුවට මැනීම සඳහා ඔහු අනුගමනය කල යුතු අවශ්‍ය සියළුම පියවර ලියා දක්වන්න.

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(15 marks)

(F) The burette was filled with the acid and the titration flask had 10.0 mL of 0.1000 M Na_2CO_3 solution with two drops of phenolphthalein indicator. State three important things that you should check just before starting to titrate.

බියුරෙට්ටුව අම්ලවලින් පුරවා ඇති අතර අනුමාපන ප්ලාස්කුව තුල සාන්ද්‍රණය 0.1000 M Na_2CO_3 ද්‍රාවණයෙන් 10.0 mLප්‍රමාණයක් හා ෆීනෝප්තලීන් දර්ශකයෙන් බිංදු දෙකක් අඩංගු වේ. ඔබ අනුමාපනය ආරම්භ කිරීමට පෙර ඔබ විසින් සොයා බැලිය යුතු වැදගත් කරුණු තුනක් (03) දක්වන්න.

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(12 marks)

(G) The end point readings (mL) he got for the above titration is listed in the order he got.

ඉහත අනුමාපනය සඳහා ඔහු ලබා ගත් අන්ත ලක්ෂ පරිමාවන් (mL) වලින් පිළිවෙලින් පහත දක්වා ඇත. 31.80, 32.05, 31.50, 31.95, 32.50

(i) What are the readings that you would select to calculate the average end point reading?

ඉහත අනුමාපනයේ මධ්‍යයන (average) අන්ත ලක්ෂ්‍යය සෙවීමට ඔබ තෝරා ගතයුතු අගයන් මොනවා ද?

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(05 marks)

(ii) Calculate the concentration of the acid solution showing all the necessary steps.

අවශ්‍ය සියළුම පියවරයන් සඳහන් කරමින් අම්ල ද්‍රාවණයේ සාන්ද්‍රණය ගණනය කරන්න.

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(16 marks)

(iii) State the difference between the equivalence point and the end point.

අන්ත ලක්ෂය හා සමතුලිතතා ලක්ෂය අතර ඇති වෙනස ලියා දක්වන්න.

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(10 marks)

03. Answer both parts **A** and **B** / **A** සහ **B** කොටස් දෙකටම පිළිතුරු සපයන්න.

A. A student was asked to purify an organic solid with small amount of impurities (labelled as **A**) by recrystallization. He was given the following instructions. Give reasons briefly why he has to follow each of them.

'පුනර්ස්ඵටිකීකරණය'මඟින් සංශුද්ධ කිරීම සඳහා අපද්‍රව්‍ය කුඩා ප්‍රමාණයක් අඩංගු **A** නම් වූ කාබනික ඝන ද්‍රව්‍යයක් ශිෂ්‍යයකුට ලබා දී ඇත. ඔහුට පහත උපදෙස් සපයා තිබේ. ඔහු එම උපදෙස් එකිනෙකක් අනුගමනය කළ යුතු හේතුව සැකෙවින් ලියා දක්වන්න.

i. Solid **A** should not be soluble in the solvent at room temperature.
A නම් වූ ඝන ද්‍රව්‍ය කාමර උෂ්ණත්වයේ දී ද්‍රාවකය තුල දිය නොවිය යුතුය.

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ii. Amount of the solvent used to dissolve the solid should be a minimum.
ඝන ද්‍රව්‍ය දිය කිරීමට යොදා ගන්නා ද්‍රාවකයේ ප්‍රමාණය අවම විය යුතුය.

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iii. Hot filtration of the solution should not be done under suction.
ද්‍රාවණය උණුසුම් පෙරීම , චූෂණ පෙරණ ක්‍රමය යටතේ සිදු නොකල යුතුය.

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iv. Hot filtrate should not be cooled rapidly.

පෙරීමෙන් පසු ලැබුණ උණුසුම් පෙරනය සීඝ්‍ර සිසිලනයකට ලක් නොකල යුතුය.

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v. Pure crystals of **A** should not be dried in the oven at 120°C.
A හි සංශුද්ධ ස්ඵටික උෂ්ණත්වය 120°C පවතින උඳුනක වියළීම නොකළ යුතුය.

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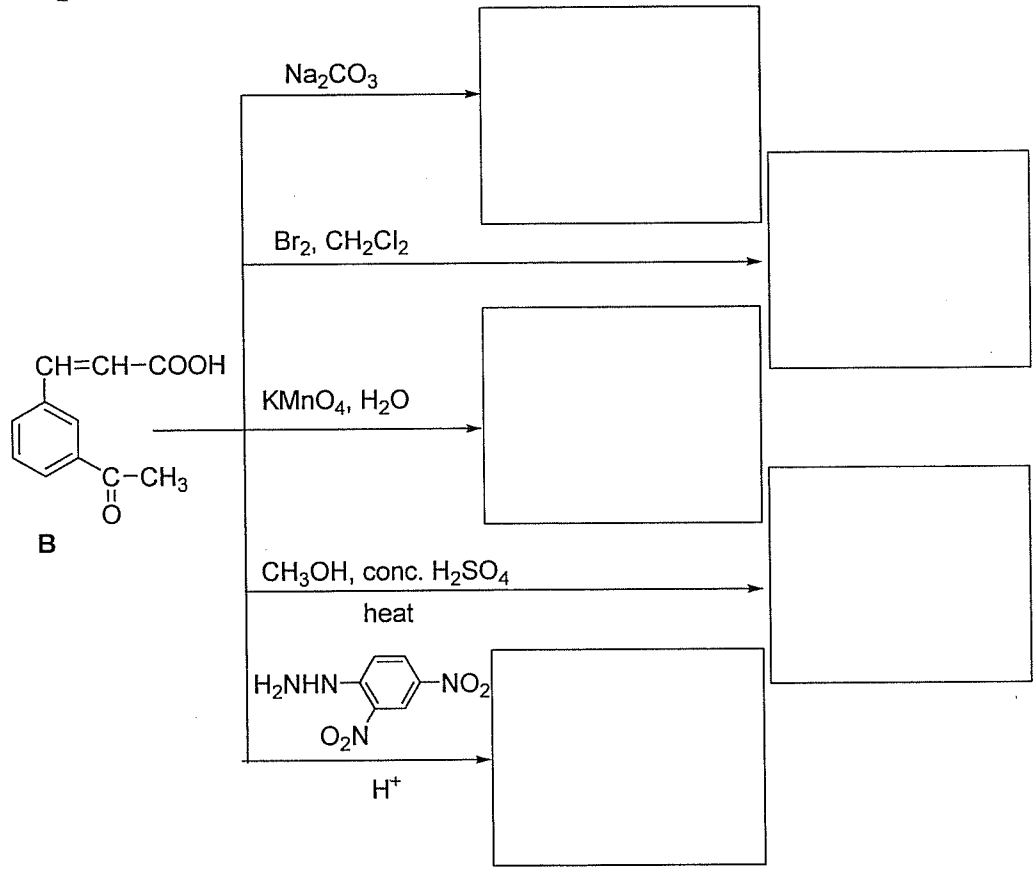
(50 marks)

B. Several chemical tests were done on a known organic compound (**B**) to confirm the presence of its functional groups. (**B**) නම් වූ දන්නා කාබනික සංයෝගයක් සඳහා එහි පවතින ක්‍රියාකාරී කාණ්ඩ සනාථ කර ගැනීම සඳහා විවිධ රසායනික පරීක්ෂණ කිහිපයක් සිදු කරන ලදී.

i. Give the expected product in each of the reaction of **B** given below. **B** සඳහා සිදුකල පහත පරීක්ෂණ වලදී ලබා දේ යැයි බලාපොරොත්තු විය හැකි ඵලය ඇඳ දක්වන්න.



ii. **B** answers for the iodoform test. What is the expected observation for this test? **B** අයඩොෆෝම් පරීක්ෂාව සඳහා පිළිතුරු දේ. මෙම පරීක්ෂණයේ දී බලාපොරොත්තු විය හැකි නිරීක්ෂණය කුමක් ද?

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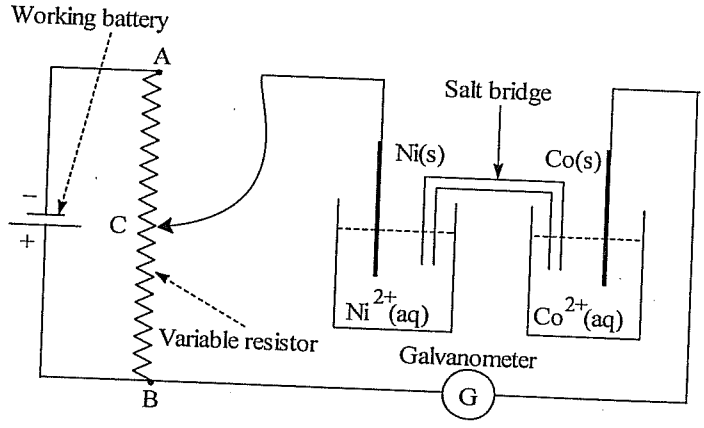
iii. Give the formula of the product which is responsible for this observation? මෙම නිරීක්ෂණ ලබාදීම සඳහා හේතුවන ඵලයේ සූත්‍රය ලියන්න.

.....**(50 marks)**

04. (A) At $25^{\circ}C$ a student prepared a galvanic cell by placing a cobalt wire in a $Co^{2+}(aq)$ solution and a nickel wire in a $Ni^{2+}(aq)$ solution, and bringing the electrical contact between the two solutions using a salt bridge. He measured the emf of the cell to be $0.10\ V$ using a potentiometer with the electrical connections as shown in the figure. During the experiment, the potential difference across the terminals of the working battery was found to be $1.00\ V$.

[At $25^{\circ}C$ the standard electrode potentials of $Ni(s)\left|Ni^{2+}(aq)\right.$ and $Co(s)\left|Co^{2+}(aq)\right.$ electrodes are $-0.23\ V$ and $-0.28\ V$, respectively.]

$25^{\circ}C$ දී ශිෂ්‍යයෙක් කෝබෝල්ට් කුරක් $Co^{2+}(aq)$ ජලීය ද්‍රාවණයක හා නිකල් කුරක් $Ni^{2+}(aq)$ ජලීය ද්‍රාවණයක ගිල්වා, එම ද්‍රාවණ අතර විද්‍යුත් සම්බන්ධතාවය ඇති කිරීම සඳහා ලවණ සේතුවක් ද යොදා ගනිමින් ගැල්වානික කෝෂයක් සාදන ලදී. ඔහු එම කෝෂයේ වි.ගා.බලය මැනීම සඳහා රූපයේ දක්වා ඇති පරිදි විද්‍යුත් සම්බන්ධතාවයන් ගොඩ නගා විභවමානයක් ආධාරයෙන් එහි වි.ගා.බ $0.10\ V$ ලෙස මනින ලදී. පරීක්ෂණය අතරතුරදී ක්‍රියාකාරී බැටරියෙහි (working battery) අග්‍ර දෙක අතර විභව අන්තරය $1.00\ V$ ලෙස පෙන්නුම් කරන ලදී. [$25^{\circ}C$ දී $Ni(s)\left|Ni^{2+}(aq)\right.$ හා $Co(s)\left|Co^{2+}(aq)\right.$ හි සම්මත ඉලෙක්ට්‍රෝඩ විභවයන් පිළිවෙලින් $-0.23\ V$ හා $-0.28\ V$ වේ.)



(i) Giving reasons identify the positive terminal of the cell.

ඉහත කෝෂයේ ධන අග්‍රය හේතු දක්වමින් හඳුනා ගන්න.

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(ii) Write down the **spontaneous** cell reaction (in the cell prepared by the student).

ශිෂ්‍යයා විසින් සාදන ලද කෝෂයේ ස්වයංසිද්ධ කෝෂ ප්‍රතික්‍රියාව ලියා දක්වන්න.

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(iii) What is the emf assigned to the cell reaction you have written in part (ii) above (under the conditions the student carried out the experiment).
ඔබ ඉහත (ii) කොටසේ දී ලියා දැක්වූ කෝෂ ප්‍රතික්‍රියාවට අදාල වි.ගා.බ. කුමක් ද? (ශිෂ්‍යයා පරීක්ෂණය සිදු කල තත්වයන් යටතේ දී)

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(iv) Giving reasons state which length (on the potentiometer wire) out of AC and BC is larger. Here C is the point where the jokey touches the potentiometer wire when there is no current in the galvanometer.
විභවමාන කම්බියෙහි AC හා BC අතරින් කවර කොටසක් දිගින් වැඩිද යන්න හේතු දෙමින් සඳහන් කරන්න. (මෙහි C යන ලක්ෂ්‍යය, ගැල්වනෝමීටරයේ ධාරාවක් ගමන් නොකරන අවස්ථාවේ විභවමානයේ jokey එක ස්පර්ශ වන ස්ථානයයි.)

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(50 marks)

B (i) List **four (04)** essential 'safety equipment' that you should look in a Chemistry laboratory before commencing any experiment.
රසායනික විද්‍යාගාරයක් තුලදී ඕනෑම පරීක්ෂණයක් ආරම්භ කිරීමට පෙර තිබෙදැයි ඔබ විසින් පරීක්ෂා කලයුතු අත්‍යවශ්‍ය ආරක්ෂිත උපකරණ හතරක් **(4)** ලැයිස්තු ගත කරන්න.

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(08 marks)

(ii) State **four (04)** 'personal protective' measures that you should use when working in a chemistry laboratory.
රසායන විද්‍යාගාරයක් තුලදී ඔබ විසින් භාවිත කලයුතු 'පෞද්ගලික ආරක්ෂක' විධි හතරක් (04) දක්වන්න.

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(iii) What does the label 'corrosive' on a label in a bottle containing chemical indicate. **(08 marks)**
රසායන ද්‍රව්‍ය අඩංගු බෝතල්වල ලේබලයේ දක්වා ඇති විඛාදක 'corrosive' යන්නෙහි තේරුම කුමක් ද?

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(iv) Give **two (02)** examples of corrosive chemicals. **(04 marks)**
'විඛාදක' යටතට අයත් රසායනික ද්‍රව්‍ය සඳහා උදාහරණ දෙකක් **(02)** දෙන්න.

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C. Write short answers for the following. **(04 marks)**
කෙටි පිළිතුරු ලියා දක්වන්න.

(i) Substances that give off vapours that readily ignite under usual working conditions are classified as,
සාමාන්‍ය තත්ව යටතේදී වාෂ්පයන් පිට කරමින් පහසුවෙන් ගිනි ගන්නා සුළු ද්‍රව්‍යයන් වර්ග කරනු ලබන්නේ .....

(ii) When someone has been exposed to chemical in the eyes, hands or arms he/she must first
යම් කෙනෙකුගේ ඇස්, අත්/බාහු රසායන ද්‍රව්‍යයකට නිරාවරණය වූ විටම ඔහු/ඇය පලමුව කල යුත්තේ .....

(iii) MSDS stand for / MSDS යනුවෙන් අදහස් වනුයේ
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(12 marks)

(iv) Explain how you would set up a water bath with a temperature of 20^0C.
20^0C උෂ්ණත්වයක පවතින ජල තාපකයක් ඔබ විසින් සකස් කරන්නේ කෙසේදැයි පැහැදිලි කරන්න.

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(14 marks)

For official use	
Ques. No.	Marks
1	
2	
3	
4	
Total	

Index No: 00085

THE OPEN UNIVERSITY OF SRI LANKA

B. Sc DEGREE PROGRAMME 2015/ 2016

LEVEL 3 - FINAL EXAMINATION

CMU1121 - PRACTICAL CHEMISTRY

DURATION: 2 HOURS

Thursday, 5th January 2017 Time: 9.30 a.m. – 11.30 a.m

Answer all (04) questions.

எல்லா (04) வினாக்களுக்கும் விடை தருக.

Use the space provided to write your answers to each question in one medium.

ஒவ்வொரு வினாக்களுக்கும் தரப்பட்ட இடைவெளியில் ஒரு மொழியில் விடை எழுதுக.

1. (A) Write down the formula of; சூத்திரங்களை எழுதுக

(i) Ferrous ammonium sulphate .....

(i) பெரசு அமோனியம் சல்பேற்று .....

(ii) Potassium thiosulphate .....

(ii) பொட்டாசியம் தயோசல்பேற்று .....

(iii) Borax .....

(iii) போரக்ஸ் (வெண்காரம்) .....

(12 marks)

(B) (i) You wish to carry out the test for nitrate ions using the sodium carbonate extract after neutralizing a portion with dil HCl during qualitative analysis

நைத்திரேற்று அயன்கட்கு பண்பறிபகுப்பு மேற்கொள்வதற்காக சோடியம் காபனேற்று பிரித்தெடுப்பை ஐதான HCl ஆல் நடுநிலையாக்கி பயன்படுத்தி சோதிப்பதற்கு நீர் விரும்புகிறீர்.

(α) Explain why you neutralize the extract?

பிரித்தெடுப்பை ஏன் நீர் நடுநிலையாக்க வேண்டும்?

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(β) State the test and expected observation in testing for nitrate ions in this extract.

Assume that bromide and iodide ions are not present in the extract.

நைத்திரேற் அயன்களின் சோதனையை மேற்கொள்ளவதற்கான பரிசோதனை மற்றும் அதன் அவதானம் யாது? பிரித்தெடுப்பில் புரோமைட் அயன்கள் மற்றும் அயடைட் அயன்கள் காணப்படவில்லை எனக் கருதுக

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(ii) 'A gas turns lime water milky'. Write down an equation corresponding to this observation.

'ஒரு வாயு சுண்ணாம்பு நீரினைப் பால்நிறமாக்குகின்றது'. இக் கூற்றுடன் தொடர்புடைய சமன்பாட்டினை எழுதுக.

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(24 marks)

(C) You are provided with an inorganic salt **(X)** containing the chloride of the following cations Ca^{2+}, Fe^{3+}. With the aid of chemical test/s, how would you distinguish between the two cations?

உங்களிற்கு Ca^{2+} மற்றும் Fe^{2+} ஆகிய கற்றயன்களின் குளோரைட்டுகள் அடங்கிய ஒரு அசேதன சேர்வை X தரப்பட்டுள்ளது. இரசாயனப் பரிசோதனை/கள் இன் உதவியுடன் இவ்விரு கற்றயன்களையும் எவ்வாறு வேறுபடுத்துவீர்?

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(12 marks)

(D) (i) Write down the expected observation when dil HNO_3 and silver nitrate is added to

ஐதான HNO_3 யும், வெள்ளி நைத்திரேற்றும் சேர்க்கப்படும்போது, எதிர்பார்க்கப்படும் அவதானங்களைத் தருக.

(α) a solution containing NaI only

NaI யின் கரைசலுக்கு மட்டும்

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(β) a solution containing NaCl only

NaCl யின் கரைசலுக்கு மட்டும்

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(γ) to a solution containing both NaI and NaCl

NaI, NaCl இரண்டினையும் கொண்ட ஒரு கரைசலுக்கு

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(ii) State the expected observation if the solution in (γ) is treated with chlorine water followed by the addition of CCl_4.

(γ) இலுள்ள கரைசலுக்கு குளோரின் நீருடன் பரிகரிக்கப்பட்டு CCl_4 இனை சேர்த்தபின், எதிர்பார்க்கப்படும் அவதானங்களைத் தருக.

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Give relevant chemical equations for the observation of experiment stated in (ii) for solution (γ).

(ii) இல் தரப்பட்ட அவதானங்களுக்கு அமைய (γ) கரைசலுக்குப் பொருத்தமான இரசாயனத் தாக்கங்களைத் தருக.

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(20 marks)

(E) (i) Write down the expression for solubility product of a sparingly soluble salt of the form A_xB_y with the aid of a balanced chemical equation.

A_xB_y எனும் அமைப்பிலுள்ள அரிதிற் கரையும் உப்பின் கரைதிறன் பெருக்கத்திற்கான வெளிப்பாட்டினை சமப்படுத்திய இரசாயன சமன்பாட்டின் துணையுடன் தருக.

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(ii) A student added dimethyl glyoxime (HDMG) to a solution of Ni^{2+} ions expecting he formation of a bright pink precipitate Ni $(DMG)_2$ based on the equilibrium reaction shown below. However, a precipitate was **NOT** observed. Explain.

ஒரு மாணவன் , கீழே தரப்பட்ட சமநிலைத் தாக்கத்தின் அடிப்படையில் Ni^{2+} அயன் கரைசலிற்கு ஈர்மெதயில் கிளைஒட்சிம் (HDMG) இனைச் சேர்த்தான். அவன் Ni $(DMG)_2$ இன் ஒரு பிரகாசமான இளம்சிவப்பு வீழ்படிவினை எதிர்பார்த்தான். எனினும், வீழ்படிவு அவதானிக்கப்பட**வில்லை**. விளக்குக.

$Ni^{2+}(aq) + 2HDMG\ (aq) \rightleftharpoons Ni\ (DMG)_2\ (s) + 2H^+\ (aq)$

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(32 marks)

2. Nimal an undergraduate student, wanted to determine the concentration of a HCl solution by carrying out an acid-base titration.

ஒரு பட்டதாரி கற்கை மாணவன் நிமல் ஒரு அமில-மூல நியமிப்பின் மூலம் HCl கரைசலின் செறிவைத் தீர்மானிக்க விரும்பினான்.

(A) The only bases found in the laboratory were NaOH and Na_2CO_3. He selected Na_2CO_3 to prepare the basic solution for the titration. Do you agree with his choice? Give reasons for your answer.

ஆய்வுகூடத்தில் NaOH மற்றும் Na_2CO_3 மூலங்கள் மட்டும் காணப்படுகின்றன. அவன் Na_2CO_3 கரைசலை மூலக் கரைசல் தயாரிக்க தெரிவு செய்தான். நீர் அவனின் தெரிவுடன் இணங்குகிறீரா? உமது விடைக்கான காரணங்களைத் தருக.

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(10 marks)

(B) Calculate the weight of Na_2CO_3 required to prepare 250.0 mL of 0.1000 M Na_2CO_3 solution. (Na = 23.00, C = 12.00, O = 16.00)

250.0 mL; 0.1000 M Na_2CO_3 கரைசலைத் தயாரிக்கத் தேவையான Na_2CO_3 இன் திணிவைக் கணிக்குக.

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(10 marks)

(C) Write down all the necessary steps that he followed in weighing the above calculated amount, if you are provided with pure Na_2CO_3.

உமக்கு தூய Na_2CO_3 தரப்பட்டிருப்பின் மேற்படி கணிக்கப்பட்ட அளவை நிறுப்பதனைத் தொடர்ந்து நீர் எடுக்கவேண்டிய முக்கிய படிகளை எழுதுக.

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(12 marks)

(D) He decided to fill the burette with the acid solution of which the concentration should be determined but not with the base. Do you agree with his decision? Give reasons for your answer.

செறிவு தீர்மானிக்க வேண்டிய அமிலக் கரைசலைக் கொண்டு அளவியை நிரப்ப அவன் தீர்மானித்தான். ஆனால் மூலத்துடன் அல்ல. நீர் அவரின் தீர்மானத்துடன் இணங்குகிறீரா? உமது விடைக்கான காரணங்களைத் தருக.

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(10 marks)

(E) Write down all the necessary steps that he followed in measuring 10.0mL of 0.1000 M Na_2CO_3 solution into the titration flask.

10.0mL, 0.1000 M Na_2CO_3 கரைசலை அளந்து நியமிப்புக் குடுவையில் இடுவதனைத் தொடர்ந்து மேற்கொள்ளவேண்டிய அவசியமான படிகளை எழுதுக.

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(15 marks)

(F) The burette was filled with the acid and the titration flask had 10.0 mL of 0.1000 M Na_2CO_3 solution with two drops of phenolphthalein indicator. State three important things that you should check just before starting to titrate.

அளவியானது அமிலத்தால் நிரப்பப்பட்டதுடன் நியமிப்புக்குடுவையில் 10.0 mL, 0.1000 M Na_2CO_3 கரைசலானது பினோப்தலின் காட்டியின் இரு துள்ளியுடன் உள்ளது. நியமிப்பை ஆரம்பிக்க முன்னர் நீர் கட்டாயமாக சோதிக்க வேண்டிய மூன்று முக்கிய விடயங்களைக் கூறுக.

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(12 marks)

(G) The end point readings (mL) he got for the above titration is listed in the order he got.

மேற்படி நியமிப்பில் முடிவுப்புள்ளியில் அவர் பெற்ற வாசிப்புகள் (mL) அவர் பெற்ற ஒழுங்கில் கீழே அட்டவணைப்படுத்தப்பட்டுள்ளது.

31.80, 32.05, 31.50, 31.95, 32.50

(i) What are the readings that you would select to calculate the average end point reading?

முடிவுப் புள்ளியில் சராசரிப் பெறுமானத்தைக் கணிப்பதற்கு நீர் எவ் வாசிப்புகளைத் தெரிவு செய்யவேண்டும்?

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(05 marks)

(ii) Calculate the concentration of the acid solution showing all the necessary steps.

அவசியமான எல்லாப் படிமுறைகளையும் காட்டி அமிலத்தின் செறிவினைக் கணிக்குக.

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(16 marks)

(iii)State the difference between the equivalence point and the end point.

சமநிலைப்புள்ளிக்கும் முடிவுப்புள்ளிக்கும் இடையிலுள்ள வேறுபாட்டைக் கூறுக.

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(10 marks)

3. Answer **both** parts **A** and **B**

A, B ஆகிய இரு பகுதிகட்கும் விடை தருக.

A. A student was asked to purify an organic solid with small amount of impurities (labelled as **A**) by recrystallization. He was given the following instructions. Give reasons briefly why he has to follow each of them.

சிறிதளவு மாசுக்களைக் கொண்ட (**A** எனப் பெயரிட்ட) ஒரு சேதனத் திண்மத்தை மீள்பளிங்காக்கல் மூலம் தூய்மையாக்குமாறு ஒரு மாணவன் கேட்கப்பட்டுள்ளார். அவருக்குப் பின்வரும் அறிவுறுத்தல்கள் தரப்பட்டுள்ளன. அவை ஒவ்வொன்றையும் அவர் ஏன் பயன்படுத்த வேண்டும் என்ற காரணத்தையும் சுருக்கமாகத் தருக.

i. Solid **A** should not be soluble in the solvent at room temperature.

அறைவெப்பநிலையில் கரைப்பானில் திண்மம் **A** யானது கரைக்கப்படலாகாது.

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ii. Amount of the solvent used to dissolve the solid should be a minimum.

திண்மத்தைக் கரைப்பதற்குப் பயன்படுத்தப்படும் கரையத்தின் அளவு இழிவாக்கப்பட வேண்டும.

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iii. Hot filtration of the solution should not be done under suction.

கரைசலின் சூடான நிலையிலான வடிகட்டல் உறிஞ்சல் முறையின் கீழ்செய்யப்படக்கூடாது.

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iv. Hot filtrate should not be cooled rapidly.

சூடான நிலை வடிகட்டல் துரிதமாக குளிர்த்தப்படக்கூடாது.

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v. Pure crystals of **A** should not be dried in the oven at 120°C.

A யின் தூய பளிங்குகள் கனலடுப்பில் 120°C யில் உலர்த்தப்படக்கூடாது.

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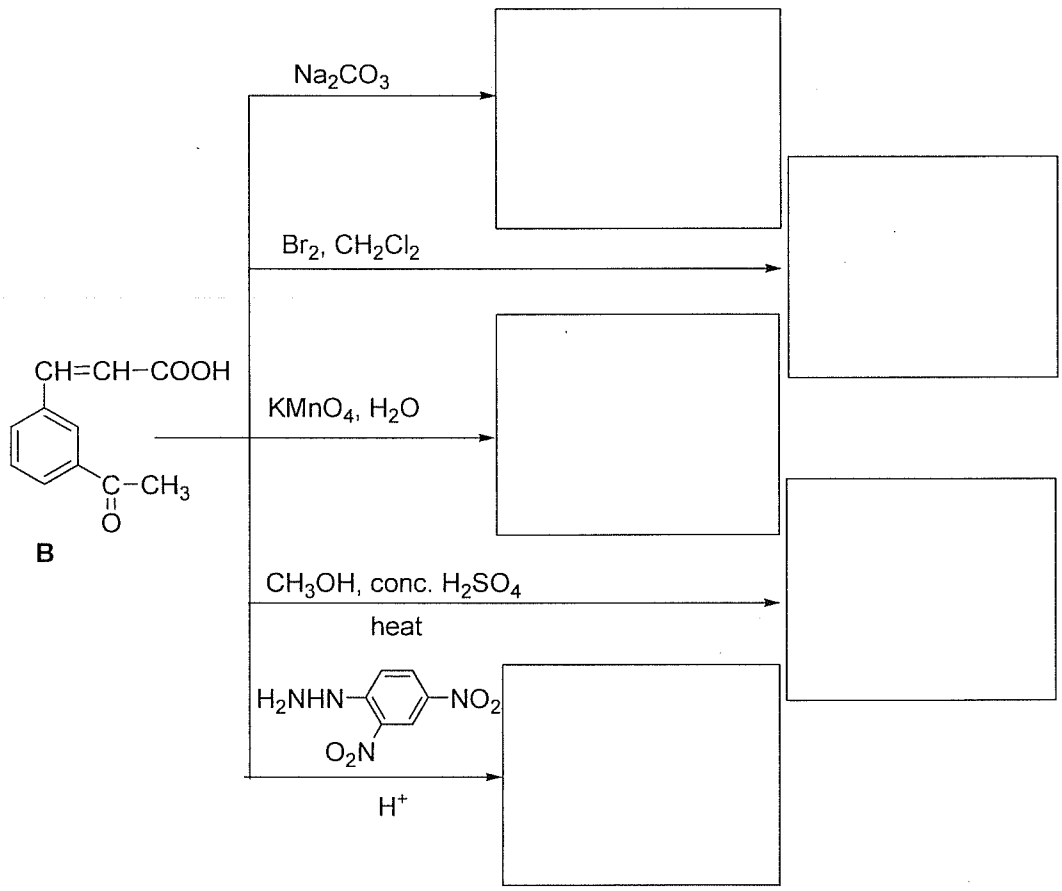
(50 marks)

B. Several chemical tests were done on a known organic compound (**B**) to confirm the presence of its functional groups.

அறியப்பட்ட ஒரு சேதனச் சேர்வை (**B**) யிலுள்ள தொழிற்பாட்டுக் கூட்டங்களை உறுதிப்படுத்த பல்வேறு சோதனைகள் செய்யப்பட்டன.

i. Give the expected product in each of the reaction of **B** given below.

கீழே தரப்பட்ட (**B**) யின் ஒவ்வொரு தாக்கத்திலும் எதிர்பார்க்கப்படும் விளைவுகளைத் தருக.



ii. **B** answers for the iodoform test.

B யானது அயடோபோம் சோதனைக்கு விடையளிக்கிறது.

What is the expected observation for this test?

இத் தாக்கத்தில் எதிர்பார்க்கப்படும் அவதானம் யாது?

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Give the formula of the product which is responsible for this observation?
மேற்படி அவதானத்திற்குப் பொறுப்பான விளைவின் சூத்திரத்தைத் தருக.

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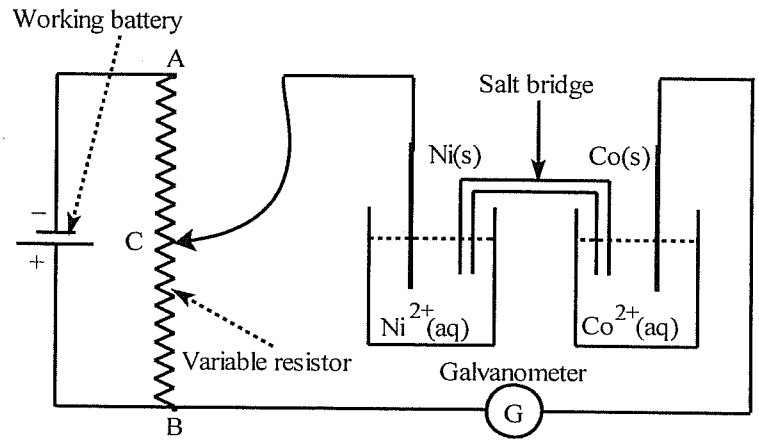
(50 marks)

4. Answer **all** parts: எல்லா பகுதிகட்கும் விடை தருக.

A. At $25^{\circ}C$ a student prepared a galvanic cell by placing a cobalt wire in a $Co^{2+}(aq)$ solution and a nickel wire in a $Ni^{2+}(aq)$ solution, and bringing the electrical contact between the two solutions using a salt bridge. He measured the emf of the cell to be $0.10\ V$ using a potentiometer with the electrical connections as shown in the figure. During the experiment, the potential difference across the terminals of the working battery was found to be $1.00\ V$. [At $25^{\circ}C$ the standard electrode potentials of $Ni(s)|Ni^{2+}(aq)$ and $Co(s)|Co^{2+}(aq)$ electrodes are $-0.23\ V$ and $-0.28\ V$, respectively.]

$25^{\circ}C$ யில் ஒரு மாணவனினால் கோபாற்றுக் கம்பியை $Co^{2+}(aq)$ கரைசலினுள்ளும் நிக்கல் கம்பியை $Ni^{2+}(aq)$ கரைசலினுள்ளும் வைத்து ஒரு கல்வனிக் கலம் தயாரிக்கப்பட்டது. அத்துடன் இரு கரைசல்களுக்கிடையில் மின் தொகுப்பைப் பெறுவதற்கு ஓர் உப்புப் பாலம் பயன்படுத்தப்படுகின்றது. ஒரு அழுத்தமானியைப் பயன்படுத்தி இக்கலத்தின் மின்னியக்கவிசை (emf) $0.10\ V$ என அவரால் அளக்கப்பட்டது. இப்பரிசோதனையிலிருந்து, தொழிற்படுநிலையில் கலத்தின் முடிவிடங்களிடையேயான அழுத்தவேறுபாடு $1.00\ V$ எனக் காணப்பட்டது. [$25^{\circ}C$ யில் $Ni(s)|Ni^{2+}(aq)$, $Co(s)|Co^{2+}(aq)$ ஆகிய மின்வாய்களின் நியம மின்வாய் அழுத்தங்கள் முறையே $-0.23\ V$ உம் $-0.28\ V$ உம் ஆகும்.]



(i) Giving reasons identify the positive terminal of the cell.

காரணங்கள் தந்து கலத்தின் நேர்முடிவிடத்தை அடையாளங் காண்க.

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(ii) Write down the **spontaneous** cell reaction (in the cell prepared by the student).

கலத்தின் சுயாதீன தாக்கத்தை எழுதுக. (மாணவனால் தயாரிக்கப்பட்ட கலத்தில்)

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(iii) What is the emf assigned to the cell reaction you have written in part (ii) above (under the conditions the student carried out the experiment).

மேலே பகுதி (ii) இல் உம்மால் எழுதப்பட்ட கலத்தாக்கத்திற்கு வழங்கப்பட்ட emf யாது? (மாணவனால் பரிசோதனை நிகழ்த்தப்பட்ட நிபந்தனைகளின் கீழ்)

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(iv) Giving reasons state which length (on the potentiometer wire) out of AC and BC is larger. Here C is the point where the jokey touches the potentiometer wire when there is no current in the galvanometer.

காரணங்கள் தந்து. (அழுத்தமானிக் கம்பியில்) AC மற்றும் BC என்பவற்றுள் எதன் நீளம் கூடியது எனக் கூறுக. இங்கு புள்ளி C என்பது.

கல்வனோமானியில் மின்னோட்டம் இல்லாத நிலையில் அழுத்தமானிக் கம்பியில் தொடுசாவி தொடும் புள்ளியாகும்.

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(50 marks)

B. (i) List **four (04)** essential 'safety equipment' that you should look in a Chemistry laboratory before commencing any experiment

ஒரு இரசாயன ஆய்வுகூடத்தில் எந்த ஒரு பரிசோதனையையும் ஆரம்பிக்க முன்னர் நீர் பார்க்க வேண்டிய அத்தியாவசியமான **நான்கு (04)** `பாதுகாப்பு உபகரணங்களை` பட்டயற்படுத்துக.

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(08 marks)

(ii) State **four (04)** 'personal protective' measures that you should use when working in a chemistry laboratory

ஒரு இரசாயன ஆய்வுகூடத்தில் வேலை செய்யும்போது நீர் பயன்படுத்த வேண்டிய **நான்கு (04)** `தனிப்பட்ட பாதுகாப்பு` நடவடிக்கைகளை பட்டயற்படுத்துக.

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(08 marks)

(iii)What does the label 'corrosive' on a label in a bottle containing chemical indicate.

ஒரு இரசாயனப் போத்தலில் `அரிப்பு` என்பதால் குறிக்கப்படுவது யாது

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(04 marks)

(iv)Give **two (02)** examples of corrosive chemicals

அரிக்கும் இரசாயனங்களிற்கு **இரண்டு (02)** உதாரணங்கள் தருக

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(04 marks)

C. Write short answers for the following.

பின்வருவனவற்றிற்கு சுருக்கமான விடைகள் தருக.

(i) Substances that give off vapours that readily ignite under usual working conditions are classified as,

வழமையான செயற்பாட்டு நிபந்தனைகளின் கீழ் உடனடியாகத் தீப்பற்றி ஆவிகளைத் தருகின்ற பதார்த்தங்கள் வகைப்படுத்தப்படுவது

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(ii) When someone has been exposed to chemical in the eyes, hands or arms he/she must first

ஒருவரது கண்கள். கைகள் அல்லது கரங்கள் இரசாயனங்களிற்கு வெளிக்காட்டப்படின் அவன் /அவள் முதலில் செய்யவேண்டியது

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(iii)MSDS stand for: MSDS குறிப்பது

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(12 marks)

(iv)Explain how you would set up a water bath with a temperature of 20^0C.

20^0C வெப்பநிலையில் ஒரு நீர்த்தொட்டியை எவ்வாறு அமைப்பீர் என விளக்குக.

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(14 marks)