

## THE OPEN UNIVERSITY OF SRI LANKA

## B.Sc. Degree Programme / Stand alone courses in Chemistry

## Level 3 – FINAL EXAMINATION – 2017/18

## CYU3302– Basic Practical Chemistry



Duration: Two hours

Reg. No.....

Date: 28.03.2019

Time: 9.30 a.m. – 11.30 a.m.

| Question number | marks |
|-----------------|-------|
| 1               |       |
| 2               |       |
| 3               |       |
| 4               |       |
| Total           |       |
| %               |       |

**Answer all the questions. Write the answers in the spaces provided.**

සියළුම ප්‍රශ්න සඳහා පිළිතුරු සපයන්න.

දී ඇති ඉඩ ප්‍රමාණයෙහි පිළිතුරු ලියන්න.

1. A primary standard solution of the weak acid HA was prepared by dissolving an accurate weight of the acid in hundred milli liters of distilled water.

දුර්වල අම්ලයක් වන HA හි නිවැරදි බර ප්‍රමාණයක් ආසන්න ජලය මිලි ලීටර් සියයක දියකර ප්‍රාථමික සම්මත ද්‍රාවණයක් පිළියෙල කරන ලදී.

- (a) State two properties of HA that should be fulfilled to call it as a primary standard.

ප්‍රාථමික සම්මතයක් ලෙස හැඳින්වීම සඳහා HA හි තිබිය යුතු ගුණාංග දෙකක් (02) ලියන්න.

(06 marks)

- (b) The calculated concentration of the above prepared solution was highly accurate. Write down the essential steps with the appropriate glassware and apparatus that could have been used to prepare the solution. Marks will be deducted for wrong glassware and apparatus.

ඉහත ද්‍රාවණයෙහි ගණනය කරන ලද සාන්ද්‍රණය ඉතා නිවැරදි විය. මෙම ද්‍රාවණය පිළියෙල කිරීම සඳහා අනුගමනය කළ යුතු අත්‍යවශ්‍ය පියවර ඊට අදාළ උපකරණ සහ වීදුරු භාජන ද ඇතුළුව සඳහන් කරන්න. වැරදි උපකරණ සහ වීදුරු භාජන සඳහා ලකුණු අඩු කරනු ලැබේ.

(20 marks)

(c) If the weight of HA was 7.2066 g, calculate the concentration of HA. ( $\text{HA} = 60.00 \text{ g mol}^{-1}$ ). HA හි බර 7.2066 g නම් HA හි සාන්ද්‍රණය ගණනය කරන්න. (06 marks)

(d) The above solution was used to titrate 25.0 mL of  $\text{M}(\text{OH})_2$  using a suitable indicator. The titration curve had only one equivalence point. Sketch and label the expected titration curve.

$\text{M}(\text{OH})_2$  ද්‍රාවණයේ 25.0 mL අනුමාපනය කිරීම සඳහා සුදුසු දර්ශකයක් සමඟ ඉහත ද්‍රාවණය යොදා ගැනිණි. මෙම අනුමාපනයේ එක් සමක ලක්ෂ්‍යයක් පමණක් තිබුණි. බලාපොරොත්තු විය හැකි අනුමාපන වක්‍රයේ දළ සටහනක් ඇඳ නම් කරන්න. (12 marks)

(e) What is the principle of selecting a suitable indicator for this titration?

මෙම අනුමාපනය සඳහා දර්ශකයක් තෝරා ගැනීමේ දී සැලකිය යුතු මූලික කාරණය කුමක් ද?

(10 marks)

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.....

(f) The end point readings (in mL) obtained were in the following order. Before obtaining each end point the burette was filled up to zero mark. Tabulate only the results that will be considered for calculation.

Eighteen, eighteen point five, nineteen, nineteen point three, eighteen point nine

ලබාගත් අන්ත ලක්ෂ්‍යයන් (මි.ලීටර් වලින්) අනුපිළිවෙලින් පහත ඇත. සෑම අන්ත ලක්ෂ්‍යයක්ම ලබා ගැනීමට පෙර බියුරෙට්ටුව බිංදුවේ පාඨාංකය දක්වා පුරවන ලදී. ගණනය කිරීම් සඳහා තෝරා ගන්නා ලද පාඨාංක පමණක් වගුගත කරන්න.

දහ අටයි, දහ අටයි දශම පහයි, දහ නවයයි, දහ නවයයි දශම තුනයි, දහ අටයි දශම නවයයි.

(10 marks)

(g) Give two reasons for getting different end point readings.

වෙනස් අන්ත ලක්ෂ්‍යයන් ලැබීමට හේතු දෙකක් ලියන්න.

(04 marks)

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(h) The pipette used for the above titration had 24 °C and 25.0 ±0.03 mL on it. What do they mean?

ඉහත අනුමාපනය සඳහා භාවිත කරන ලද පිපෙට්ටුවේ 24° C සහ 25.0 ±0.03 mL ලෙස සඳහන් විය. මේවායින් අදහස් කරන්නේ කුමක් ද?

(10 marks)

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(i) Calculate the concentration of M(OH)<sub>2</sub>.

M(OH)<sub>2</sub> හි සාන්ද්‍රය ගණනය කරන්න.

(10 marks)

(j) Comment on the following statement.

පහත දී ඇති වාක්‍යය සඳහා අදහස් දක්වන්න.

“The principle behind the colour change of the redox indicators is different from that of acid-base indicators”

“ඔක්සිහරණ - ඔක්සිකරණ දර්ශක වල වර්ණ වෙනස්වීමට හේතුවන මූලික කාරණය අම්ල - භෂ්ම දර්ශක සඳහා හේතුවන මූලික කාරණයට වඩා වෙනස් වේ.”

(12 marks)

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.....  
.....

02. Answer both Parts A and B. A සහ B කොටස් දෙකටම පිළිතුරු සපයන්න.

**Part A**

a) Indicate the safety measures that must be taken when carrying out each of the following actions?

පහත ක්‍රියාවන් සිදු කිරීමේ දී ඔබ විසින් ගනු ලබන ආරක්ෂාකාරී ක්‍රියාමාර්ග මොනවාදැයි සඳහන් කරන්න.

i. Heating a reaction mixture that contains a flammable liquid.

ගිනිගන්නා සුළු ද්‍රවයක් සහිත ප්‍රතික්‍රියා මිශ්‍රණයක් රත් කිරීම.

.....  
.....

ii. Diluting a sample of concentrated H<sub>2</sub>SO<sub>4</sub> with water.

සාන්ද්‍ර H<sub>2</sub>SO<sub>4</sub> ද්‍රාවණ සාම්පලයක් ජලය යොදා තනුක කිරීම.

.....

iii. Inserting a glass tube in a rubber stopper.

රබර් ඇබයක් තුළින් වීදුරු කුරක් යැවීම.

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b) i. What is 'fire diamond'? / 'fire diamond' යනු කුමක් ද?

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.....

ii. Indicate what is represented by each colour in it.

එහි ඇති පැහැයන් එකිනෙකින් නිරූපණය වන්නේ කුමක් ද?

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(50 marks)

## Part B / B කොටස

A student is given an unknown organic compound for identification of functional groups. He dissolved a small amount of the compound in methanol. Given below are some of the tests done on small portions of this solution.

ක්‍රියාකාරී කාණ්ඩ මොනවාදැයි හඳුනා ගැනීම පිණිස, නොදන්නා කාබනික සංයෝගයක් ශීඝ්‍රයෙන් යෙකුට ලබා දී ඇත. ඔහු එය මෙතනෝල් ස්වල්පයක දිය කරන ලදී. පහත දී ඇත්තේ එම ද්‍රාවණ කොටස් සඳහා කල පරීක්ෂණ කිහිපයකි.

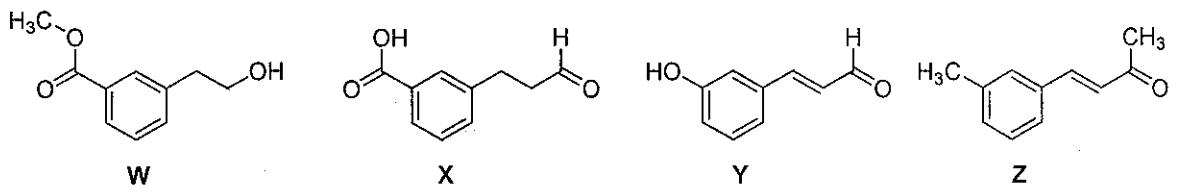
- i. Write down the inference for each observation. දී ඇති නිරීක්ෂණ සඳහා නිගමනයන් ලියන්න.

| No. | Test<br>පරීක්ෂණය   | Observation<br>නිරීක්ෂණය   | Inference<br>නිගමනය |
|-----|--|--|---------------------|
| 1.  | Br <sub>2</sub> in CH <sub>2</sub> Cl <sub>2</sub> was added.<br><br>CH <sub>2</sub> Cl <sub>2</sub> හි දිය කල Br <sub>2</sub> දියරය එකතු කරන ලදී. | Brown color of Br <sub>2</sub> solution was decolorized.<br><br>Br <sub>2</sub> ද්‍රාවණයේ දුඹුරු පැහැය අවර්ණ විය | .....<br>.....      |
| 2.  | Brady's reagent was added.<br><br>බ්‍රේඩ් ප්‍රතිකාරකය එකතු කරන ලදී.  | An orange colored precipitate was formed.<br><br>කැබ්ලි පාට අවක්ෂේපයක් සෑදුණි.                                   | .....<br>.....      |
| 3.  | Fehling's reagent was added and warmed.<br><br>ෆේලිං ද්‍රාවණය එකතු කර උණුසුම් කරන ලදී.   | A red-brown precipitate was not formed.<br><br>රතු - දුඹුරු අවක්ෂේපයක් නොලැබුණි.                                 | .....<br>.....      |

ii. What is/are the functional group(s) present in the compound according to the above observations? ඉහත නිරීක්ෂණයන්ට අනුව සංයෝගයෙහි තිබිය හැකි ක්‍රියාකාරී කාණ්ඩ/කාණ්ඩය කුමක් වේ ද?

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 .....

iii. Unknown compound could be one of the following. නොදන්නා සංයෝගය පහත ඒවායින් එකක් විය හැකිය.



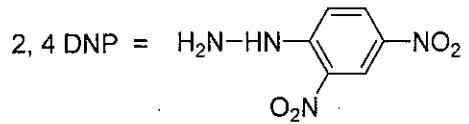
Identify the correct compound. නිවැරදි සංයෝගය හඳුනා ගන්න.

.....

iv. What will happen if you add too much of Br<sub>2</sub> in CH<sub>2</sub>Cl<sub>2</sub> to the sample in Test No. 1? පරීක්ෂණ අංක 1 හිදී, සාම්පලයට වැඩිපුර Br<sub>2</sub> / CH<sub>2</sub>Cl<sub>2</sub> එකතු කළේ නම් කුමක් සිදු වේ ද?

.....  
 .....

v. Write the reaction taking place in Test No. 2, giving the structure of the product. The structure of Brady's reagent is: එලයෙහි ව්‍යුහය දක්වමින්, පරීක්ෂ අංක 2 හි දී සිදුවන ප්‍රතික්‍රියාව ලියා දක්වන්න. බ්‍රේඩ් ප්‍රතිකාරකයේ ව්‍යුහය:



vi. Name an alternative test for Test No. 3.

පරීක්ෂණ අංක 3 සඳහා විකල්ප පරීක්ෂණයක් නම් කරන්න.

.....  
 .....

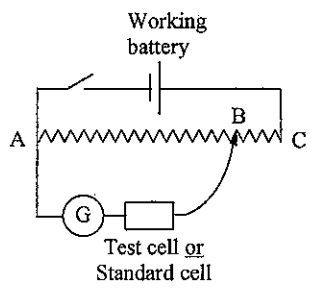
vii. Name another test to identify the functional group present in the compound you have selected in (iii).

ඔබ ඉහත (iii) හි තේරූ සංයෝගයේ ඇති ක්‍රියාකාරී කාණ්ඩය හඳුනා ගැනීමට කළ හැකි වෙනත් පරීක්ෂාවක් (අසංතෘප්තතාවය සඳහා පරීක්ෂණ හැර) නම් කරන්න.

.....  
 .....

(50 marks)

3. (a) At 50°C, a student prepared a Galvanic cell by placing a wire of metal X in solution of its ions, X<sup>2+</sup>(aq), placing a wire of metal Y in solution of its ions, Y<sup>3+</sup>(aq), and then bringing the electrical contact between the two solutions using a salt bridge. He measured its emf using a potentiometer as shown in the diagram. The length AB when there was no current through the Galvanometer, G, was (81.0 ± 0.1) cm. He observed that the metal wire Y is connected to the Galvanometer (and X to the variable resistor). He could not find voltmeter to measure the potential difference across AC (i.e. across the terminals of the working battery) during the experiment. However, he found a standard cell in the laboratory and repeated the potentiometer experiment by replacing the test cell with it. With the standard cell in place, he determined the length AB to be (53.6 ± 0.1) cm when there was no current through the Galvanometer. On the standard cell, the emf of it was written as (1.2 ± 0.1) V



You are given that for  $y = \frac{a}{b}x$ ,  $\left(\frac{\delta y}{y}\right)^2 = \left(\frac{\delta a}{a}\right)^2 + \left(\frac{\delta b}{b}\right)^2 + \left(\frac{\delta x}{x}\right)^2$

[Assume that the current through the variable resistor remained constant throughout the experiment.]

උෂ්ණත්වය 50C<sup>0</sup> දී සිසුවෙකු විසින් X<sup>2+</sup>(aq) අයන ද්‍රාවණයක ගිල්වූ X ලෝහ කුරක් (ඉලෙක්ට්‍රෝඩයක්) හා Y<sup>3+</sup>(aq) අයන ද්‍රාවණයක ගිල්වූ Y ලෝහ කුරක් එකිනෙක සම්බන්ධ කර ගැල්වානී කෝෂයක් සාදා ගත් අතර, එම ද්‍රාවණ දෙක අතර විද්‍යුත් සම්බන්ධතාව ලවණ



සේතුවක් ඇසුරින් ගොඩ නගා ගත්තේය. ඔහු ඉහත රූපයේ දක්වා ඇති පරිදි විභවමානයක් ආධාරයෙන් කෝෂයේ වි.ගා.බ. මැන ගන්නා ලදී. ගැල්වනෝමීටරය G හරහා ධාරාවක් නොගලන අවස්ථාවේ AB අතර දුර  $(81.0 \pm 0.1)$  cm විය. එම අවස්ථාවේ Y ලෝහ කුර ගැල්වනෝමීටරයට සම්බන්ධව ඇති බව (සහ X ලෝහ කුර විචලය ප්‍රතිරෝධකයට සම්බන්ධව ඇති) බව දක්නට ලදී. පරීක්ෂණය අතරතුර AC අතර විභව අන්තරය මැන ගැනීම සඳහා (එනම් ක්‍රියාකාරී බැටරියේ අග්‍ර අතර විභව අන්තරය මැනීමට) ඔහුට වෝල්ටීමීටරයක් සොයා ගත නොහැකි විය. කෙසේ වෙතත් ඔහුට පරීක්ෂණාගාරයේ තිබූ සම්මත කෝෂයක් හමු වී ඇති අතර, පරීක්ෂණ කෝෂය වෙනුවට සම්මත කෝෂය යොදා ගනිමින් එම විභවමාන පරීක්ෂණය නැවත වරක් සිදු කළේය.

සම්මත කෝෂය සම්බන්ධ කල අවස්ථාවේ, ගැල්වනෝමීටරය හරහා ධාරාවක් නොගලන අවස්ථාවේ AB අතර දුර  $(53.6 \pm 0.1)$  cm ලෙස ඔහු මැන ගන්නා ලදී. සම්මත කෝෂයේ වි.ගා.බ  $(1.2 \pm 0.1)$  V ලෙස සටහන් කර ඇත.

$$y = \frac{a}{b}x \quad \text{විට දී} \quad \left(\frac{\delta y}{y}\right)^2 = \left(\frac{\delta a}{a}\right)^2 + \left(\frac{\delta b}{b}\right)^2 + \left(\frac{\delta x}{x}\right)^2 \quad \text{ලෙස දී තිබේ.}$$

(පරීක්ෂණය අතරතුර විචලය ප්‍රතිරෝධකය හරහා ධාරාව නියතව පවතින බව උපකල්පනය කරන්න.)

(i) Giving reasons, identify the negative terminal (metal X or Y?) of the cell prepared by the student. සිසුවා විසින් සාදන ලද කෝෂයේ සෘණ අග්‍රය (X හෝ Y ලෝහ කුර) හේතු දක්වමින් හඳුනා ගන්න.

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(ii) Write down the spontaneous cell reaction.  
ස්වයංසිද්ධ කෝෂ ප්‍රතික්‍රියාව ලියා දක්වන්න.

.....

(iii) Denote the potential difference across AC by P, the length of AC by L and the emf of the cell prepared by the student by E.

Write down the relationship among E, P and L.

AC අතර විභව අන්තරය P ලෙස ද, AC අතර දුර L ලෙස ද, සිසුවා විසින් නිර්මාණය කරන ලද වි.ගා.බ. E ලෙස ද යොදා ගනිමින්, E, P සහ L අතර සම්බන්ධතාවය ලියා දක්වන්න.

.....

(iv) Write down the relationship among the emf of the standard cell, P and L.

සම්මත කෝෂයේ වි.ගා.බ, P සහ L අතර සම්බන්ධතාවය ලියා දක්වන්න.

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(v) Calculate E. E ගණනය කරන්න.

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(vi) Estimate the error in E. E සඳහා දෝෂය ගණනය කරන්න.

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(vii) State E up to the correct significant figures indicating the uncertainty (in standard form). E නිවැරදි සාර්ථක ගණනකට දක්වමින් අවිනිශ්චිතභාවය (සම්මත ආකාරයෙන්) දක්වන්න.

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(50 marks)

(b) A student reports two of the values obtained in a kinetics experiment that he carried out to test the relationship between rate constant and temperature in accordance with the logarithmic form of the Arrhenius equation given below.

වාලක රසායනයට අදාළ පරීක්ෂණයකින් ශීඝ්‍රයෙක් ලබාගත් අගයන් දෙකකින් උෂ්ණත්වය හා සීඝ්‍රතා නියතය අතර සම්බන්ධතාවය වූ ආභිනියස් නියමයේ ලඝු ගණනක ආකාරය පහත දී ඇත.

$$\ln k = -\frac{E_a}{RT} + \ln A \text{ -----(1) [the symbols used have the usual meanings]}$$

(සංකේත භාවිතා කර ඇත්තේ සම්මත අදහසට අනුවය.)

0039

[assume that both  $E_a$  and  $A$  are constants in the above temperature range;  
 දී ඇති උෂ්ණත්ව පරාසයක් තුළදී  $E_a$  හා  $A$  නියත යැයි උපකල්පනය කරන්න.  
 $R$  හි අගය  $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$ ].

|                                 |     |      |
|---------------------------------|-----|------|
| Temp. /°C                       | 27  | 37   |
| $k \times 10^3/\text{min}^{-1}$ | 7.5 | 15.0 |
|                                 |     |      |

(i) Given that the temperature in the laboratory is  $30^\circ \text{C}$ , briefly outline the experimental procedure carried out in the laboratory that would enable you to maintain the temperature at  $27^\circ \text{C}$  and  $37^\circ \text{C}$ . Why is it important to do so?  
 විද්‍යාගාරයේ උෂ්ණත්වය  $30^\circ \text{C}$  වන්නේ නම් එහි උෂ්ණත්වය  $27^\circ \text{C} - 37^\circ \text{C}$  අතර පවත්වා ගැනීමට යොදා ගත හැකි පර්යේෂණාත්මක පිළිවෙත සැකෙවින් විස්තර කරන්න.) එය එසේ පවත්වා ගැනීම වැදගත් වන්නේ මන් ද?

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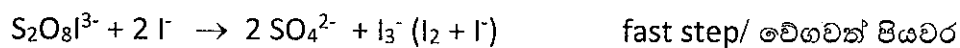
.....

- .....
- .....
- .....
- .....
- (ii) Calculate the activation energy ( $E_a$ ) assuming that the above data fits equation(1)  
 ඉහත දත්ත, අංක (1) සමීකරණය හා ගැලපේ යයි උපකල්පනය කරමින් සක්‍රියන ශක්තිය ( $E_a$ ) ගණනය කරන්න.

(28 marks)

- (b) The reaction between  $S_2O_8^{2-}$  and  $I^-$  is said to take place according to the following mechanism.

$S_2O_8^{2-}$  සහ  $I^-$  අතර ප්‍රතික්‍රියාව පහත දී ඇති යාන්ත්‍රණයට අනුව සිදුවේ.



The iodine formed in the above reaction reacts immediately with a fixed amount of thiosulphate. The moment all the thiosulphate is used up, further iodine produced by this reaction imparts a blue color with starch.

ඉහත ප්‍රතික්‍රියාවේ සෑදෙන අයඩින්, තයෝසල්ෆේට් නියත ප්‍රමාණයක් සමග ක්ෂණිකව ප්‍රතික්‍රියා කරයි. මුළු තයෝසල්ෆේට් ප්‍රමාණයම ප්‍රතික්‍රියාකර, නිම වූ මොහොතට පසුව මෙම ප්‍රතික්‍රියාවෙන් තවදුරටත් ලැබෙන අයඩින් පිෂ්ඨය සමග නිල්පාට ලබා දෙයි.

(i) This reaction may be considered as a **pseudo first order** reaction with respect to the persulphate ion. Explain how you would achieve this experimentally.  
මෙම ප්‍රතික්‍රියාව සල්ෆේට් අයනයට සාපේක්ෂව ව්‍යාජ ( **pseudo**) පලමු පෙළ ලෙස සැලකිය හැක. පරීක්ෂණාත්මකව මෙය ලබා ගන්නේ කෙසේ දැයි විස්තර කරන්න.  
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(ii) If 0.0005 mole of Iodine is produced due to oxidation of Iodide ions by the action of persulphate ions, calculate the volume of thiosulphate (0.04 M) added.  
අයඩයිඩ් අයන, පර්සල්ෆේට් අයන මගින් ඔක්සිකරණය වීමෙන් අයඩින් මොල 0.0005 ක් ලබා දෙයි නම්, ඒ සඳහා එකතු කරන ලද (0.04 M) තයෝ සල්ෆේට් පරිමාව ගණනය කරන්න.

(iii) Write down the balanced equation for the reaction between  $S_2O_3^{2-}$  and  $I_2$ .  
 $S_2O_3^{2-}$  සහ  $I_2$  අතර ප්‍රතික්‍රියාව සඳහා තුලිත සමීකරණය ලියන්න. (22 marks)

4. (a) One of the tests for **sulphite** is to add dil **hydrochloric acid** to an aqueous solution of sulphite and pass the evolved gas through **lime water**. The evolved gas also was tested with filter paper which was dipped in acidified **potassium dichromate**.

සල්ෆයිට් අයනය සඳහා එක් පරීක්ෂාවක් නම් තනුක හයිඩ්‍රොක්ලෝරික් අම්ලය ජලීය සල්ෆයිට් ද්‍රාවණයට එකතු කර පිටවන වායුව හුණු දියර තුලින් යැවීමයි. පියවන වායුව ආම්ලික පොටෑසියම් ඩයික්‍රොමේට් ද්‍රාවණයෙන් පොහවන ලද පෙරහන් කඩදාසියක් මඟින් ද පරීක්ෂා කරන ලදී.

(i) Write down the chemical formulae for all the bold/underlined species.

යටින් ඉරි අදින ලද/ තද කළ පාවිත් ලියන ලද ද්‍රව්‍ය සඳහා රසායනික සූත්‍ර ලියන්න.

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(ii) What is the expected observation for both tests? Explain your observation by giving relevant equations.

පරීක්ෂණ දෙකම සඳහා බලාපොරොත්තු විය හැකි නිරීක්ෂණය කුමක් ද? එම නිරීක්ෂණ සුදුසු සමීකරණ දක්වමින් පැහැදිලි කරන්න.

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(iii) A student performed the qualitative cation group analysis and obtained positive results for  $\text{NH}_4^+$ . But the salt is not containing  $\text{NH}_4^+$ . State the reason how the student got the positive result even in the absence of  $\text{NH}_4^+$ .

ශිෂ්‍යයකු විසින් කැටායන සඳහා කාණ්ඩ විශ්ලේෂණය කරන ලද අතර,  $\text{NH}_4^+$  සඳහා ධනාත්මක ප්‍රතිඵලයක් ලැබුණ නමුත් එම ලවණයේ  $\text{NH}_4^+$  අඩංගු නැත.  $\text{NH}_4^+$  නැති විටදී වුවද ධනාත්මක ප්‍රතිඵල ලැබීමට හේතුව සඳහන් කරන්න.

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(iv) Which ion turns the ferrous sulphate solution brown? Why freshly prepared  $\text{FeSO}_4$  had to be used?    ෆෙරස් සල්ෆේට් ද්‍රාවණය දුඹුරු පැහැයට හරවන අයනය කුමක් ද? මේ සඳහා අලුතින් පිළියෙල කරන ලද  $\text{FeSO}_4$  ද්‍රාවණයක් යොදා ගත යුත්තේ ඇයි?

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(30 Marks)

(b) You are provided with an inorganic salt (Y) which is drawn from an unlabelled bottle. It is suspected to be either  $\text{BaCl}_2$  or  $\text{BaCO}_3$ .

නම සඳහන් නොකරන ලද බෝතලයකින් ගන්නා ලද අකාබනික ලවණයක් (Y) ඔබට සපයා දී ඇත. එය  $\text{BaCl}_2$  හෝ  $\text{BaCO}_3$  විය හැකි බවට අනුමාන කරන ලදී.

- (i) Write down one relevant test for each suspected compound and the expected observations.

ඉහත (Y) ලෙස අනුමාන කරන එක් එක් ලවණය සඳහා එක් පරීක්ෂණයක් සහ බලාපොරොත්තු වන නිරීක්ෂණ ලියන්න.

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- (ii) Cations of Group II and IV metals are precipitated as their sulphides in qualitative cation group analysis by the addition of HCl and H<sub>2</sub>S for Group II and NH<sub>4</sub>OH, NH<sub>4</sub>Cl and H<sub>2</sub>S for group IV. With the aid of necessary chemical equations compare the precipitation of group II and IV cations as sulphides.

කාණ්ඩ විශ්ලේෂණයේ දී II වන කාණ්ඩයේ කැටායන සඳහා HCl සහ H<sub>2</sub>S එකතු කිරීමෙන් ද IV වන කාණ්ඩයේ කැටායන සඳහා NH<sub>4</sub>OH, NH<sub>4</sub>Cl සහ H<sub>2</sub>S එකතු කිරීමෙන් ද සල්ෆයිඩ් ලෙස එම කැටායන අවක්ෂේප වේ. අවශ්‍ය වන පරිදි රසායනික සමීකරණ භාවිත කරමින් II සහ IV කාණ්ඩවල කැටායන සල්ෆයිඩ් ලෙස අවක්ෂේප වීම සංසන්දනය කරන්න.

(20 Marks)



(c) (i) Fill in the blanks in each of the rows and complete the table below.

එක් එක් පේලියේ ඇති හිස්තැන් පුරවා පහත වගුව සම්පූර්ණ කරන්න.

The following tests were carried out with the salt KBr.

පහත පරීක්ෂණ KBr ලවණය සඳහා සිදු කරන ලදී.

| Test  | Observation    |
|---|----------------|
| 1. Salt was added to distilled water.<br>ලවණයට ආසුනු ජලය එකතු කරන ලදී.  | .....          |
| 2. Added dil. $\text{HNO}_3$ to a small portion of the above solution (1), boiled and added an <b>equal amount</b> of $\text{AgNO}_3$<br>ඉහත (1) ද්‍රාවණයේ ස්වල්ප ප්‍රමාණයකට තනුක $\text{HNO}_3$ අම්ලය එකතු කර, නටවා ඊට සමාන ප්‍රමාණයක් එකතු කරන ලදී. | .....<br>..... |
| 3. Dil. $\text{NH}_3$ solution was added to resultant solution (2).<br>ඉහත (2) ද්‍රාවණයට තනුක $\text{NH}_3$ ද්‍රාවණය එකතු කරන ලදී.  | .....<br>..... |
| 4. Added $\text{CHCl}_3$ and $\text{Cl}_2$ water to the resultant solution (1).<br>ඉහත (1) ද්‍රාවණයට $\text{CHCl}_3$ සහ $\text{Cl}_2$ දියර එකතු කරන ලදී.  | .....<br>..... |
| 5. Added cold dil. $\text{HCl}$ to the resultant solution (1).<br>ඉහත (1) ද්‍රාවණයට තනුක $\text{HCl}$ එකතු කරන ලදී.   | .....<br>..... |
| 6. Add $\text{NH}_4\text{OH}$ and $\text{NH}_4\text{Cl}$ to the resultant solution (5).<br>ඉහත (5) ද්‍රාවණයට $\text{NH}_4\text{OH}$ සහ $\text{NH}_4\text{Cl}$ එකතු කරන ලදී.   | .....<br>..... |
| 7. Add $\text{NH}_4\text{OH}$ , $\text{NH}_4\text{Cl}$ and $(\text{NH}_4)_2\text{CO}_3$ to resultant solution (6).<br>ඉහත (6) ද්‍රාවණයට $\text{NH}_4\text{OH}$ , $\text{NH}_4\text{Cl}$ සහ $(\text{NH}_4)_2\text{CO}_3$ එකතු කරන ලදී.                 | .....<br>..... |
| 8. Flame test was done.<br>පහන්සිළු පරීක්ෂාව සිදු කරන ලදී.  | .....          |

- (ii) Give relevant equations for the observations of test stated in (2) and (4).  
 ඉහත (2) සහ (4) හි සඳහන් පරීක්ෂණවල නිරීක්ෂණ සඳහා අදාළ සමීකරණ ලියන්න.

- (iii) Briefly outline how would you carry out the flame test on this sample.  
 මෙම ලවණය සඳහා පහත් සිළු පරීක්ෂාව සිදුකරන අයුරු කෙටියෙන් සඳහන් කරන්න.

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- (iv) Suggest one reason, why the platinum wire is used.  
 ප්ලැටිනම් වයරය භාවිත කිරීමට එක් හේතුවක් යෝජනා කරන්න.

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- (v) If the platinum wire is not available in your lab, suggest another suitable substance to do the flame test.

ප්ලැටිනම් වයරයක් ඔබේ පරීක්ෂණාගාරයේ නොමැති නම් පහත් සිළු පරීක්ෂාව කිරීම සඳහා සුදුසු තවත් ද්‍රව්‍යයක් යෝජනා කරන්න.

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- (vi) While we are doing the flame test, why do we use double cobalt glass?

පහත් සිළු පරීක්ෂාවේදී කොබෝල්ට් වීදුරු ද්විත්වයක් භාවිතා කරන්නේ ඇයි?

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(50 Marks)

இலங்கைத் திறந்த பல்கலைக்கழகம்

விஞ்ஞான இளமாணிப்பட்ட நிகழ்ச்சித் திட்டம் / இரசாயனவியலில் தனித்து நிற்கும் கற்கைநெளி

மட்டம் 3 - இறுதிப் பரீட்சை - 2017/18



CYU3302- Basic Practical Chemistry

காலம்: இரண்டு (02) மணித்தியாலங்கள்

சுட்டிலக்கம் : .....

திகதி: 28.03.2019

நேரம்: மு.ப. 9.30 - மு.ப .11.30

| வினா இலக்கம் | புள்ளிகள் |
|--------------|-----------|
| 1            |           |
| 2            |           |
| 3            |           |
| 4            |           |
| மொத்தம்      |           |
| %            |           |

**Answer all the questions. Write the answers in the spaces provided.**

அனைத்து வினாக்களுக்கும் உரிய விடைகளை தரப்பட்ட இடைவெளியில் எழுதுக.

1. A primary standard solution of the weak acid HA was prepared by dissolving an accurate weight of the acid in hundred milli liters of distilled water.

நூறு மில்லிலீற்றர் காய்ச்சி வடித்த நீரில் HA எனும் மென்னமிலத்தின் திருத்தமான நிறையைக் கரைத்து HA இனது முதல் நியமக் கரைசல் தயாரிக்கப்பட்டது.

- (a) State two properties of HA that should be fulfilled to call it as a primary standard.

(06 marks)

முதல் நியமம் எனக் கருதப்படுவதற்கு HA பூர்த்தி செய்ய வேண்டிய இரண்டு (02) இயல்புகளைக் குறிப்பிடுக?

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- (b) The calculated concentration of the above prepared solution was highly accurate. Write down the essential steps with the appropriate glassware and apparatus that could have been used to prepare the solution. Marks will be deducted for wrong glassware and apparatus.

(20 Marks)

மேலே தயாரிக்கப்பட்ட கரைசலின் கணிக்கப்பட்ட செறிவு மிகவும் திருத்தமானது. இக்கரைசலைத் தயாரிக்கப் பயன்படுத்திய முறையின் முக்கிய படிகளை

பயன்படுத்தப்பட்ட கண்ணாடி உபகரணங்கள் மற்றும் ஏனைய உபகரணங்களுடன் எழுதுக. தவறான கண்ணாடி, உபகரணங்களுக்கு புள்ளிகள் குறைக்கப்படும்.

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- (c) If the weight of HA was 7.2066 g, calculate the concentration of HA. ( $HA = 60.00 \text{ g mol}^{-1}$ )  
 HA இனது நிறை 7.2066g எனில், HA இனது செறிவினைக் கணிக்கുക? ( $HA = 66.00 \text{ g mol}^{-1}$ )  
 (06 Marks)

- (d) The above solution was used to titrate 25.0 mL of  $M(OH)_2$  using a suitable indicator. The titration curve had only one equivalence point. Sketch and label the expected titration curve.  
 (12 Marks)

பொருத்தமான காட்டியைப் பயன்படுத்தி 25.0 mL  $M(OH)_2$  இனை நியமிப்பதற்கு மேலே தயாரிக்கப்பட்ட கரைசல் பயன்படுத்தப்பட்டது. நியமிப்பு வளையி ஒரு சமநிலைப்புள்ளியை மாத்திரம் கொண்டிருந்தது. இந்த நியமிப்புக்கு எதிர்பார்க்கப்படும் நியமிப்பு வளையியை வரைந்து அதனைக் குறிக்கുക?

(e) What is the principle of selecting a suitable indicator for this titration? (10 Marks)

எக்கொள்கையின் அடிப்படையில் இந்நியமிப்பிற்கான பொருத்தமான காட்டி தெரிவுசெய்யப்படுகின்றது?

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(f) The end point readings (in mL) obtained were in the following order. Before obtaining each end point the burette was filled up to zero mark. Tabulate only the results that will be considered for calculation.

Eighteen, Eighteen point five, nineteen, nineteen point three, eight teen point nine

(10 Marks)

நியமிப்பில் பெறப்பட்ட முடிவுப் புள்ளிகளின் வாசிப்புக்கள் (ml இல்) பின்வரும் வரிசையில் தரப்பட்டுள்ளன. ஒவ்வொரு முடிவுப்புள்ளியும் பெறப்படுவதற்கு முன்பும் குழாயியானது பூச்சியக்குறி வரை நிரப்பப்பட்டது. இம்முடிவுப் புள்ளிகளில் கணித்தலுக்கு கருத்தில் கொள்ள வேண்டிய முடிவுப்புள்ளிகளை மாத்திரம் அட்டவணைப்படுத்துக.

பதினெட்டு, பதினெட்டு தசம் ஐந்து, பத்தொன்பது, பத்தொன்பது தசம் மூன்று, பதினெட்டுத் தசம் ஒன்பது

- (g) Give two reasons for getting different end point readings. (04 Marks)

வேறுபட்ட முடிவுப்புள்ளி வாசிப்புக்களைப் பெறுவதற்கான இரண்டு (02) காரணங்களைத் தருக?

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- (h) The pipette used for the above titration had  $24^{\circ}\text{C}$  and  $25.0 \pm 0.03 \text{ mL}$  on it. What do they mean? (10 Marks)

இந்நியமிப்பில் பயன்படுத்திய குழாயியின் மீது  $24^{\circ}\text{C}$  ,  $25.0 \pm 0.03 \text{ mL}$  எனக் குறிப்பிடப்பட்டுள்ளது. இவற்றின் கருத்து யாது?

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(i) Calculate the concentration of  $M(OH)_2$ . (10 Marks)

$M(OH)_2$  இனது செறிவினைக் கணிக்கുക.

(j) Comment on the following statement.

பின்வரும் கூற்றினைச் சர்ச்சிக்க.

“The principle behind the colour change of the redox indicators is different from that of acid-base indicators” (12 Marks)

“தாழ்த்தேற்றுக் காட்டிகளின் நிறமாற்றத்திற்கான அடிப்படைக் கொள்கையானது அமில-கார காட்டிகளின் நிற மாற்றத்திற்கான அடிப்படைக் கொள்கையிலிருந்து வேறுபடுகின்றது”

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02. Answer both Parts A and B. பகுதி A , B இரண்டிற்கும் விடையளிக்குக.

பகுதி A

a) Indicate the safety measures that must be taken when carrying out each of the following actions?

பின்வரும் செயற்பாடு ஒவ்வொன்றினையும் நடாத்தும் போது எடுக்கப்பட வேண்டிய பாதுகாப்பு முறைகளைக் குறிப்பிடுக.

i. Heating a reaction mixture that contains a flammable liquid.

எரிபற்றக்கூடிய திரவமொன்றைக் கொண்ட தாக்கக் கலவையை வெப்பமேற்றும் போது

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ii. Diluting a sample of concentrated  $H_2SO_4$  with water.

செறிந்த  $H_2SO_4$  மாதிரியினை நீரினால் ஐதாக்கும் போது

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iii. Inserting a glass tube in a rubber stopper.

இறப்பரினாலான மூடியில் கண்ணாடிக் குழாயினை செலுத்தும் போது

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b) i. What is 'fire diamond'? / "நெருப்பு வைரம்" என்றால் என்ன?

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ii. Indicate what is represented by each colour in it.

இதில் காணப்படும் ஒவ்வொரு நிறத்தினாலும் யாது பிரதிபலிக்கப்படுகின்றது எனக்காட்டுக.

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(50 marks)

### Part B / பகுதி B

A student is given an unknown organic compound for identification of functional groups. He dissolved a small amount of the compound in methanol. Given below are some of the tests done on small portions of this solution.

மாணவன் ஒருவருக்கு தொழிற்பாட்டுக் கூட்டங்களை அடையாளம் காண்பதற்காக ஓர் அறியப்படாத சேதனச் சேர்வை தரப்பட்டுள்ளது. அவர் அதனது சிறிய கலவையை மெதனோலில் கரைத்தார். இக் கரைசலின் சிறிய பகுதிகளுக்கு மேற்கொள்ளப்பட்ட சில சோதனைகள் கீழே தரப்பட்டுள்ளன.



- i. Write down the inference for each observation. ஒவ்வொரு அவதானத்திற்கும் முடிவை எழுதுக.

| எண் | சோதனை   | அவதானம்  | முடிவு         |
|-----|---|--|----------------|
| 1.  | Br <sub>2</sub> in CH <sub>2</sub> Cl <sub>2</sub> was added.<br><br>Br <sub>2</sub> / CH <sub>2</sub> Cl <sub>2</sub> சேர்க்கப்பட்டது. | Brown color of Br <sub>2</sub> solution was decolorized.<br><br>Br <sub>2</sub> இனது கபில நிறம் நீக்கப்பட்டது. | .....<br>..... |
| 2.  | Brady's reagent was added.<br><br>பிரேடியின் சோதனைப் பொருள் சேர்க்கப்பட்டது.  | An orange colored precipitate was formed.<br><br>செந்நிற வீழ்படிவு தோன்றியது.                                  | .....<br>..... |
| 3.  | Fehling's reagent was added and warmed.<br><br>பீலிங்கின் சோதனைப் பொருள் சேர்த்து சூடாக்கப்பட்டது.                                      | A red-brown precipitate was not formed.<br><br>சிவப்பு- கபில நிற வீழ்படிவு தோன்றவில்லை.                        | .....<br>..... |

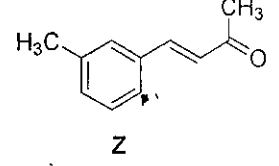
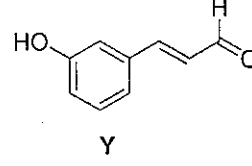
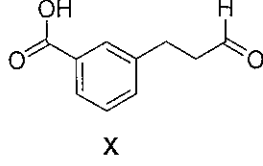
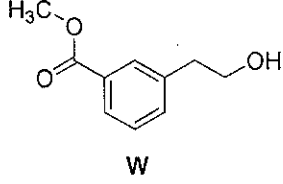
- i. What is/are the functional group(s) present in the compound according to the above observations?

மேற்கூறப்பட்ட அவதானங்களின்படி சேதனச் சேர்வையில் காணப்படுகின்ற தொழிற்பாட்டுக் கூட்டம்/ கூட்டங்கள் யாவை?

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ii. Unknown compound could be one of the following.

அறியப்படாத சேர்வை பின்வருவற்றில் ஒன்றாகக் காணப்படலாம்.



Identify the correct compound. திருத்தமான சேர்வையை இனங்காண்க.

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iv. What will happen if you add too much of  $\text{Br}_2$  in  $\text{CH}_2\text{Cl}_2$  to the sample in Test No. 1?

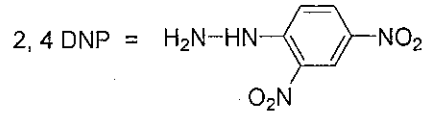
சோதனை எண் 1 இல் அதிகளவிலான  $\text{Br}_2 / \text{CH}_2\text{Cl}_2$  இனை நீங்கள் சேர்ப்பீர்களாயின் யாது நிகழும்?

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v. Write the reaction taking place in Test No. 2, giving the structure of the product.

The structure of Brady's reagent is:



சோதனை எண் 2 இல் நடைபெறும் தாக்கத்தை விளைவினது கட்டமைப்பைத் தந்து எழுதுக? பிரேடியின் சோதனைப் பொருளின் கட்டமைப்பு மேலே தரப்பட்டுள்ளது.

vi. Name an alternative test for Test No. 3.

சோதனை எண் 3 இற்கு மாற்றீடான சோதனையொன்றின் பெயர் தருக?

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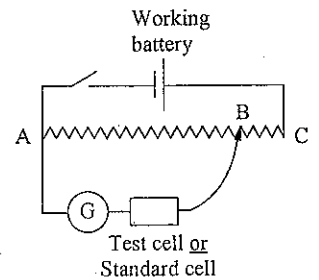
vii. Name another test to identify the functional group present in the compound you have selected in (iii). (50 Marks)

வினா (iii) இல் நீங்கள் தெரிவு செய்த சேர்வையில் உள்ள தொழிற்பாட்டுக் கூட்டத்தை ஏனைய சேர்வைகளில் இருந்து அடையாளம் காண்பதற்கு மற்றுமொரு சோதனையின் பெயர் தருக?

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3. (a) At 50°C, a student prepared a Galvanic cell by placing a wire of metal X in solution of its ions,  $X^{2+}(aq)$ , placing a wire of metal Y in solution of its ions,  $Y^{3+}(aq)$ , and then bringing the electrical contact between the two solutions using a salt bridge. He measured its emf using a potentiometer as shown in the diagram. The length AB when there was no current through the Galvanometer, G, was

$(81.0 \pm 0.1)$  cm. He observed that the metal wire Y is connected to the Galvanometer (and X to the variable resistor). He could not find voltmeter to measure the potential difference across AC (i.e. across the terminals of the working battery) during the experiment. However, he found a standard cell in the laboratory and repeated the potentiometer experiment by replacing the test cell with it. With the standard cell in place, he determined the length AB to be  $(53.6 \pm 0.1)$  cm when there was no current through the Galvanometer. On the standard cell, the emf of it was written as  $(1.2 \pm 0.1)$  V



You are given that for  $y = \frac{a}{b}x$ ,  $\left(\frac{\delta y}{y}\right)^2 = \left(\frac{\delta a}{a}\right)^2 + \left(\frac{\delta b}{b}\right)^2 + \left(\frac{\delta x}{x}\right)^2$

[Assume that the current through the variable resistor remained constant throughout the experiment.]

50°C யில் உலோக x இனை அதன்  $X^{2+}(aq)$ , கரைசலினுள் அமிழ்த்தியும் உலோகம் y இனை அதன்  $Y^{3+}(aq)$  கரைசலினுள் அமிழ்த்தியும், அத்துடன் இரண்டு கரைசலுக்குமிடையிலான மின்னிணைப்பை உப்புப் பாலத்தின் மூலம் ஏற்படுத்தியும் ஒரு கல்வாணிக் கலத்தை மாணவன் ஒருவர் உருவாக்கினார். வரைபடத்தில் காட்டியுள்ளவாறு இக்கலத்தின் மி.இ. விசையை மாணவன் அளவிட்டார். கல்வனொமணியினூடாக (G) மின்னோட்டம் பூச்சியமாக இருக்கையில் AB யின் நீளம்  $(81.0 \pm 0.1)$  cm ஆகக் காணப்பட்டது. உலோகக் கம்பி y கல்வனொமணியினுள் (உலோகக் கம்பி x மாறும் தடையினுள் இணைக்கப்பட்டிருப்பதை அம்மாணவன் அவதானித்தான். AC இற்கடையிலான அழுத்த வேறுபாட்டினை (தொழிற்பாட்டுக் கலத்தின் முடிவுகளுக்கிடையே) அளப்பதற்கு மாணவனுக்கு வோல்ட்மாணி கிடைக்கவில்லை. ஆயினும் ஆய்வுகூடத்தில் காணப்பட்ட நியமக் கலமொன்றினை சோதனைக் கலத்திற்குப் பதிலாகப் பயன்படுத்தி அழுத்தமாணிப் பரிசோதனையை மீள் நிகழ்த்தினார். நியமக் கலம் பயன்படுத்திய போது கல்வனொமணியினூடாக மின்னோட்டம் பூச்சியமாக இருக்கையில் AB யின் நீளம்  $(53.6 \pm 0.1)$  cm ஆகக் காணப்பட்டது. நியமக் கலத்தின் மி.இ.விசை  $(1.2 \pm 0.1)$  V எனக்குறிப்பிடப்பட்டிருந்தது.

$$y = \frac{a}{b}x, \quad \left(\frac{\delta y}{y}\right)^2 = \left(\frac{\delta a}{a}\right)^2 + \left(\frac{\delta b}{b}\right)^2 + \left(\frac{\delta x}{x}\right)^2$$

எனத் தரப்பட்டுள்ளது.

(பரிசோதனை முழுவதிலும் மாறும் தடையினுடாக மின்னோட்டம் மாறிலியாகக் காணப்பட்டது எனக் கருதுக.)

- (i) Giving reasons, identify the negative terminal (metal X or Y?) of the cell prepared by the student.

மாணவனால் உருவாக்கப்பட்ட கலத்தின் எதிர்முனைவினை (x அல்லது y என) காரணங்கள் தந்து அடையாளங்காண்க?

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- (ii) Write down the spontaneous cell reaction. சுயமான கலத்தாக்கத்தை எழுதுக.

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- (iii) Denote the potential difference across AC by P, the length of AC by L and the emf of the cell prepared by the student by E.

Write down the relationship among E, P and L.

AC இற்கிடையிலான அழுத்த வேறுபாடு P எனவும் , AC யினது நீளம் L எனவும் அத்துடன் மாணவனால் உருவாக்கப்பட்ட கலத்தின் மி.இ.விசை E எனவும் குறிப்பிடுக.

E,P,L என்பவற்றிற்கிடையிலான தொடர்பை எழுதுக.

(iv) Write down the relationship among the emf of the standard cell, P and L.

நியமக்கலத்தின் மி.இ.விசை , P அத்துடன் L என்பவற்றிற்கு இடையிலான தொடர்பை எழுதுக.

(v) Calculate E. E யினைக் கணிக்கുക.

(vi) Estimate the error in E. E யின் வலுவை மதிப்பிடுக?

(vii) State E up to the correct significant figures indicating the uncertainty (in standard form). (50 Marks)

நிச்சயமில்லாததன்மையைக் (நியம வடிவில்) குறிப்பிட்டு E யினை திருத்தமான பொருளுடைய இலக்கம் வரைக் கூறுக.

- (b) A student reports two of the values obtained in a kinetics experiment that he carried out to test the relationship between rate constant and temperature in accordance with the logarithmic form of the Arrhenius equation given below.

கீழே தரப்பட்டுள்ள ஆனியசின் மடக்கை வடிவத்தின்படி வீத மாறிலியிற்கும் , வெப்பநிலைக்கும் இடையிலான தொடர்பை பரிசோதிக்க நடாத்தப்பட்ட இயக்கவியல் பரிசோதனையில் பெறப்பட்ட இரண்டு பெறுமானங்களை மாணவனொருவன் அறிவித்துள்ளார்.

$$\ln k = -\frac{E_a}{RT} + \ln A \text{ -----(1) [the symbols used have the usual meanings]}$$

(குறியீடுகள் அவற்றின் வழமையான கருத்தையே கொண்டுள்ளன.)

[assume that both  $E_a$  and  $A$  are constants in the above temperature range; [  $E_a, A$  என்பன பரிசோதனை மேற்கொள்ளப்பட்ட வெப்பநிலை வீச்சத்தில் மாறிலி எனக் கருதுக  $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$ ].

|                                   |     |      |
|-----------------------------------|-----|------|
| Temp. /°C                         | 27  | 37   |
| $k \times 10^3 / \text{min}^{-1}$ | 7.5 | 15.0 |
|                                   |     |      |

- (i) Given that the temperature in the laboratory is 30°C, briefly outline the experimental procedure carried out in the laboratory that would enable you to maintain the temperature at 27 °C and 37° C. Why is it important to do so?

ஆய்வுகூடத்தில் வெப்பநிலை 30 °C எனத் தரப்பட்டுள்ளது. ஆய்வுகூடத்தில் 27 °C இலும் 37 °C இலும் வெப்பநிலையைப் பராமரிப்பதற்கு ஏதுவான பரிசோதனைச் செயன்முறையைச் சுருக்கமாக கூறுக. இவ்வாறு வெப்பநிலையைப் பராமரிப்பது ஏன் முக்கியமானது?

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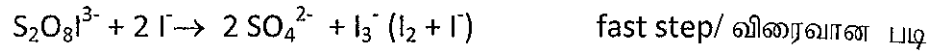
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- (ii) Calculate the activation energy ( $E_a$ ) assuming that the above data fits equation(1) (28 Marks)

மேற்காட்டப்பட்ட தரவுகள் சமன்பாடு (1)இல் பொருந்தும் எனக்கருதி, ஏவற்சக்தியை ( $E_a$ ) கணிக்குக?

- (b) The reaction between  $S_2O_8^{2-}$  and  $I^-$  is said to take place according to the following mechanism.

$S_2O_8^{2-}$  யிற்கும்  $I^-$  இற்கும் இடையிலான தாக்கம் பின்வரும் பொறிமுறையின்படி நடைபெறுகின்றது எனக் கூறப்படுகின்றது.



The iodine formed in the above reaction reacts immediately with a fixed amount of thiosulphate. The moment all the thiosulphate is used up, further iodine produced by this reaction imparts a blue color with starch.

மேற்காட்டப்பட்ட தாக்கத்தில் உருவாகும் அயடனானது நிச்சயிக்கப்பட்ட அளவு தயோசல்பேற்றுடன் உடனடியாகத் தாக்கமுறுகின்றது. முழு தயோசல்பேற்றும் பயன்படுத்தப்பட்ட கணத்தில், தாக்கத்தில் மேலும் உருவாக்கப்படும் அயடன் மாப்பொருளுடன் நீல நிறத்தைத் தோற்றுவிக்கும்.

This reaction may be considered as a **pseudo first order** reaction with respect to the persulphate ion.

Explain how you would achieve this experimentally.

பேர்சல்பேற்றின் சார்பாக இத்தாக்கமானது போலி முதலாம் வரிசைத் தாக்கமாக கருதப்படுலாம். இதனை பரிசோதனை ரீதியாக எவ்வாறு அடையலாம் எனக் கருதுக?

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- (i) If 0.0005 mole of Iodine is produced due to oxidation of Iodide ions by the action of persulphate ions, calculate the volume of thiosulphate (0.04 M) added.

பேர்சல்பேற்று அயன்களின் தாக்கத்தினால் அயடைட்டு அயன்கள் ஒட்சியேற்றப்பட்டு 0.0005 மூல்கள் அயடின் உருவாக்கப்பட்டால், சேர்க்கப்பட்ட தயோசல்பேற்றின் (0.04M) கனவளவைக் கணிக்கുക.

- (ii) Write down the balanced equation for the reaction between  $S_2O_3^{2-}$  and  $I_2$ .

$S_2O_3^{2-}$ ,  $I_2$  இற்கு இடையிலான தாக்கத்திற்கான சமப்படுத்திய இரசாயனச் சமன்பாட்டை எழுதுக. (22 marks)

4. (a) One of the tests for sulphite is to add dil hydrochloric acid to an aqueous solution of sulphite and pass the evolved gas through lime water. The evolved gas also was tested with filter paper which was dipped in acidified potassium dichromate.

சல்பைற்று அயன்களுக்கான சோதனைகளுள் ஒன்று சல்பைற்றின் சேர்வைக்கு ஐதான ஐதரோக்குளோரிக் அமிலத்தைச் சேர்த்து வெளிவிடப்படும் வாயுவினைச் சுண்ணாம்பு நீரினாடாக செலுத்துவதாகும். வெளியேற்றப்படும் வாயுவானது அமிலமாக்கப்பட்ட பொற்றாசிய மிருகரோமேற்றுக் கரைசலில் தோய்த்த வடிதாளுடனும் பரிசோதிக்கப்பட்டது.

- (i) Write down the chemical formulae for all the bold/underlined species.

தடித்த/கீழ்க்கோடிடப்பட்ட சகல கூறுகளினதும் இரசாயனச் சூத்திரத்தை எழுதுக.

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- (ii) What is the expected observation for both tests? Explain your observation by giving relevant equations.

இரண்டு சோதனைகளுக்கும் எதிர்பார்க்கப்படும் அவதானங்கள் யாவை? உமது அவதானங்களை பொருத்தமான இரசாயன சமன்பாடுகள் மூலம் விளக்குக?

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- (iii) A student performed the qualitative cation group analysis and obtained positive results for  $\text{NH}_4^+$  But the salt is not containing  $\text{NH}_4^+$  State the reason how the student got the positive result even in the absence of  $\text{NH}_4^+$ .

மாணவன் ஒருவன் உப்பு ஒன்றிற்கு கற்றயனிற்கான பண்பறி பகுப்பினை மேற்கொள்ள,  $\text{NH}_4^+$  இருப்பதற்கான முடிவு பெறப்பட்டது. ஆனால் அவ்வுப்பு  $\text{NH}_4^+$  அயனைக் கொண்டிருக்கவில்லை  $\text{NH}_4^+$  இல்லாத பட்சத்தில் மாணவன் எவ்வாறு அச்சோதனைக்குரிய நேர் விளைவினைப் பெற்றான் என்பதற்கான காரணத்தினைக் கூறுக?

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iv. Which ion turns the ferrous sulphate solution brown? Why freshly prepared  $\text{FeSO}_4$  had to be used? **(30 Marks)**

பெரகசல்பேற்றுக் கரைசலை எவ்வயன் கபில நிறமாக்குகின்றது. புதிதாகத் தயாரிக்கப்பட்ட  $\text{FeSO}_4$  ஏன் பயன்படுத்தப்பட வேண்டியுள்ளது?

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(b) You are provided with an inorganic salt (Y) which is drawn from an unlabelled bottle. It is suspected to be either  $\text{BaCl}_2$  or  $\text{BaCO}_3$ .

விபரம் குறிப்பிடப்படாத போத்தலிலிருந்து பெறப்பட்ட அசேதன சேர்வை (Y) ஒன்று உமக்குத் தரப்பட்டுள்ளது. இச் சேர்வை  $\text{BaCl}_2$  ஆக அல்லது  $\text{BaCO}_3$  ஆக இருக்கலாம் என சந்தேகிக்கப்படுகின்றது.

(i) Write down one relevant test for each suspected compound and the expected observations.

பொருத்தமான ஓர் சோதனையை சந்தேகிக்கப்படும் ஒவ்வொரு சேர்வைக்கும் அத்துடன் எதிர்பார்க்கப்படும் அவதானங்களையும் எழுதுக.

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- (ii) Cations of Group II and IV metals are precipitated as their sulphides in qualitative cation group analysis by the addition of HCl and H<sub>2</sub>S for Group II and NH<sub>4</sub>OH, NH<sub>4</sub>Cl and H<sub>2</sub>S for group IV. With the aid of necessary chemical equations compare the precipitation of group II and IV cations as sulphides.(20 Marks)

கற்றயனிற்கான கூட்டப் பண்பறி பகுப்பில் கூட்டம் II கூட்டம் IV உலோகங்கள் அவற்றின் சல்பைட்டுக்களாக கூட்டம் II இற்கு HCl மற்றும் H<sub>2</sub>S இனையும் அத்துடன் NH<sub>4</sub>Cl/NH<sub>4</sub>OH/H<sub>2</sub>S இனையும் சேர்ப்பதன் மூலம் விழ்படிவாக்கப்பட்டன. கூட்டம் II , IV என்பவற்றின் விழ்படிவாக்கத்தை அவசியமான இரசாயனச் சமன்பாடுகளின் உதவியுடன் ஒப்பிடுக.

- (c) (i) Fill in the blanks in each of the rows and complete the table below.

கீழே தரப்பட்டுள்ள அட்டவணையை ஒவ்வொரு நிரையினையும் நிரப்பி முற்றாக்குக.

The following tests were carried out with the salt KBr.

KBr. உப்பிற்கு பின்வரும் சோதனைகள் நடாத்தப்பட்டன.

| சோதனை   | அவதானம்        |
|---|----------------|
| 1. Salt was added to distilled water. காய்ச்சி வடிக்கப்பட்ட நீரினுள் உப்பு சேர்க்கப்பட்டது  | .....          |
| 2. Added dil. $\text{HNO}_3$ to a small portion of the above solution (1), boiled and added an equal amount of $\text{AgNO}_3$<br>கரைசல் (1) இன் சிறிய பகுதிக்கு ஐதான $\text{HNO}_3$ சேர்த்துக் கொதிக்க வைத்து சம கனவளவு $\text{AgNO}_3$ சேர்க்கப்பட்டது. | .....<br>..... |
| 3 Dil. $\text{NH}_3$ solution was added to resultant solution(2).<br>விளைவாகும் கரைசல் (2) இற்கு ஐதான $\text{NH}_3$ கரைசல் சேர்க்கப்பட்டது.   | .....<br>..... |
| 4. Added $\text{CHCl}_3$ and $\text{Cl}_2$ water to the resultant solution (1).<br>$\text{CHCl}_3$ , $\text{Cl}_2$ நீர் என்பன கரைசல் (1) இற்குச் சேர்க்கப்பட்டது  | .....<br>..... |
| 5. Added cold dil. $\text{HCl}$ to the resultant solution (1).<br>கரைசல் (1) இற்கு குளிர் , ஐதான $\text{HCl}$ சேர்க்கப்பட்டது   | .....<br>..... |
| 6. Add $\text{NH}_4\text{OH}$ and $\text{NH}_4\text{Cl}$ to the resultant solution (5).<br>விளைவாகும் கரைசல் (5) இற்கு $\text{NH}_4\text{Cl}$ / $\text{NH}_4\text{OH}$ சேர்க்கப்பட்டது  | .....<br>..... |
| 7. Add $\text{NH}_4\text{OH}$ , $\text{NH}_4\text{Cl}$ and $(\text{NH}_4)_2\text{CO}_3$ to resultant solution (6).<br>விளைவாகும் கரைசல் (6) இற்கு $\text{NH}_4\text{Cl}$ / $\text{NH}_4\text{OH}$ / $(\text{NH}_4)_2\text{CO}_3$ சேர்க்கப்பட்டது          | .....<br>..... |
| 1. Flame test was done.<br>சேர்வைக்குச் சுவாலைப் பரிசோதனை மேற்கொள்ளப்பட்டது.  | .....          |

(i) Give relevant equations for the observations of test stated in (2) and (4).

சோதனை (2), (4) இல் கூறப்பட்ட அவதானங்களுக்குப் பொருத்தமான இரசாயனச் சமன்பாடுகளைத் தருக?

(ii) Briefly outline how would you carry out the flame test on this sample.

இவ்வுப்பு மாதிரியிற்கு எவ்வாறு சுவாலைப் பரிசோதனையை மேற்கொள்ளுவீர் எனச் சுருக்கமாகக் கூறுக?

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(iii) Suggest one reason, why the platinum wire is used. பிளட்டினம் கம்பி ஏன் பயன்படுத்தப்படுகின்றது என்பதற்கான காரணம் ஒன்றைக் கூறுக?

.....

(iv) If the platinum wire is not available in your lab, suggest another suitable substance to do the flame test.

உமது ஆய்வு கூடத்தில் பிளட்டினம் கம்பி கிடைக்காவிடின் சுவாலைப் பரிசோதனைக்குப் பொருத்தமான வேறொரு பதார்த்தத்தைக் குறிப்பிடுக?

.....

(v) While we are doing the flame test, why do we use double cobalt glass?

சுவாலைப் பரிசோதனையை நடத்துகின்ற வேளையில் இரட்டை கோபோல்ட் கண்ணாடியை ஏன் பயன்படுத்துகின்றோம்?

**(50 Marks)**

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