මහ/මහාමායා බාලිකා විද්‍යාලය
Mahamaya Girls' College , Kandy

| 02 | E | I |
|---|---|---|

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, පළමු වාර පරීක්ෂණය - 2025 අප්‍රේල්
General Certificate of Education (Adv. Level) Examination, First Term Test – April 2025

| Chemistry I<br>රසායන විද්‍යාව I | Grade 12<br>12 ශ්‍රේණිය | One hour<br>පැය එකයි |
|---|---|---|

**Instructions :**

- *Periodic table is provided.*
- *This paper consists of 04 pages.*
- ***Answer all the questions.***
- ***Use of calculators is not allowed.***
- *Write your index number in the space provided in the answer sheet.*
- *Follow the instructions given on the given on the back of the answer sheet carefully.*
- ***In each of the question 1** to 25 pick one of the alternatives from (1), (2), (3), (4), (5) which is correct or most appropriate and mark your response on the answer sheet with a cross(x).*

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

1. The respective order of scientists who involved in giving the name electron to the fundamental particle of electricity, the charge of an electron and the e/m ratio of cathode rays.
   (1) Thompson, Millikan, Rutherford
   (2) Rutherford, Chadwick, Rutherford
   (3) Stony, Millikan, Thompson
   (4) Thompson, Chadwick, Thompson
   (5) Stony, Chadwick, Thompson

2. The molecule without having ionic bonds,
   (1) $Na_2O$ (2) $F_2O$ (3) LiH (4) KF (5) $AlF_3$

3. The value expressed in the given statement exactly tally with the mathematical expression that can be used to calculate it,
   (1) The wave particle nature of matter $V = \frac{h}{m\lambda}$
   (2) The energy value of an quanta $E = \frac{h\lambda}{c}$
   (3) The emission of energy during an electron transition in the hydrogen emission spectrum $-\Delta E = -(E_f - E_i)$
   (4) The relative atomic mass of an element = mass of an atom × fractional isotopic mass
   (5) The atomic mass unit $1U = \frac{1g}{6.022\times10^{23}} \times \frac{1}{12}$

4. An ionic compound with the highest covalent character is formed from the combination of a cation with the highest polarizing power and an anion with highest polarizability,
   (1) KBr (2) $MgCl_2$ (3) $AlF_3$ (4) MgO (5) LiCl

5. The mass of 2.65g of pure anhydrous $Na_2CO_3$ is completely dissolved in water and diluted up to 250 $cm^3$ in a volumetric flask. The $Na_2CO_3$ concentration of the solution in mol $dm^{-3}$ is (Na = 23, C = 12, O = 16),
   (1) 0.20 (2) 0.10 (3) 0.15 (4) 0.05 (5) 0.025

6. The electron pair geometry around the central atom is different among other chemical species is,
   (1) $SO_4^{2-}$ (2) $PO_4^{3-}$ (3) $SO_3^{2-}$ (4) $ClO_4^-$ (5) $NO_3^-$

$C_2H_5OH$

7. The mass of a molecule of the ethanol is, (C = 12, H = 1, O = 16),

(1) $46 \times 6.022 \times 10^{23}$ (2) $\frac{46}{6.022 \times 10^{23}}$ (3) $6.022 \times 10^{23}$

(4) 46 (5) $\frac{46 \times 10^{23}}{6.022}$

8. A compound that is well soluble in water by forming hydrogen bonds with water,

(1) $CO_{2(g)}$ (2) $CH_{4(g)}$ (3) $CH_3OH_{(l)}$ (4) $NaCl_{(s)}$ (5) $I_{2(s)}$

9. The maximum number of electrons that can exist with the quantum numbers n = 2, $l = 1$ is,

(1) 1 (2) 3 (3) 4 (4) 6 (5) 8

10. An aqueous solution contains 40g of NaOH and 90g of $H_2O$. The mole fraction of $H_2O$ in the aqueous solution is,

(1) $\frac{2}{6}$ (2) $\frac{3}{6}$ (3) $\frac{1}{6}$ (4) $\frac{4}{6}$ (5) $\frac{5}{6}$

11. Which is true regarding with lattice structures?

| | Type of lattice | Building units | Force of attraction | Example |
|---|---|---|---|---|
| (1) | Atomic | Atoms | LDF | Diamond |
| (2) | Metallic | + and − ions | Electrostatic attractions | $Cu_{(s)}$ |
| (3) | Molecular | Molecules | Hydrogen bonds | Ice |
| (4) | Atomic | Molecules | LDF | $I_{2(s)}$ |
| (5) | Ionic | + ions and electrons | Ionic bond | $MgO_{(s)}$ |

12. The mole fraction of glucose ($C_6H_{12}O_6$) in an aqueous glucose is 0.1. The mass percentage of glucose in the solution is (C = 12, H = 1, O = 16),

(1) $\frac{18 \times 1}{(180 \times 9)+(18 \times 1)} \times 100$ (2) $\frac{180 \times 1}{(180 \times 1)+(18 \times 9)} \times 100$ (3) $\frac{180 \times 0.1}{(180 \times 0.1)+(18 \times 0.9)} \times 100$

(4) $\frac{18 \times 0.1}{(180 \times 0.9)+(18 \times 1)} \times 100$ (5) $\frac{(180 \times 1)+(18 \times 9)}{180 \times 1} \times 100$

13. The energy of a certain radiation is $9.8 \times 10^2$ kJ $mol^{-1}$. The wavelength of this radiation in nm and it belongs to the region of the electromagnetic spectrum are respectively,

(1) 122 nm (Visible) (2) 122 nm (Ultra violet) (3) 400 nm (Visible)

(4) 820 nm (Infrared) (5) 91 nm (Ultra violet)

14. The correct statement is about atomic models,

(1) The positive charges of the atom are concentrated according to Rutherford model.
(2) The positive charges of an atom are randomly distributed within a negatively charged sphere according to Thompson model.
(3) The electrons move around the nucleus at constant velocities as their distance from the nucleus varies according to the Rutherford - Bohr model.
(4) Bohr model, Rutherford model, Plum pudding model are all nuclear models.
(5) The Bohr model accepts that the hydrogen atom is spherical.

15. The correct Lewis structure for the anion $S_2^{2-}$ in the molecule $FeS_2$ is,

(1) $[\ddot{S}=\ddot{S}]^{2-}$ (2) $^{-}\ddot{S}-\ddot{S}^{-}$ (3) $[\ddot{S}\equiv\ddot{S}]^{2-}$ (4) $^{3-}\ddot{S}\equiv S^{+}$ (5) $^{2-}\ddot{S}\equiv S$

16. The nitrate which formed from an element A, has one atom of A and six atoms of O. The valance of A is,
(1) 1 (2) 2 (3) 3 (4) 4 (5) 5

17. Consider the following reaction.
$aZnS + bO_2 \longrightarrow cZnO + dSO_2$
The suitable values for a, b, c and d are respectively.
(1) 3, 2, 2, 2 (2) 2, 3, 2, 2 (3) 2, 2, 2, 3 (4) 2, 2, 3, 2 (5) 2, 2, 2, 2

18. Which of the following molecule/ ion does not stabilize by resonance?
(1) $NO_3^-$ (2) $HC_2O_4^-$ (3) $SF_4$ (4) $N_2O$ (5) $HSO_3^-$

19. The reaction of synthesize of propane ($C_3H_8$) from propene ($C_3H_6$) is as follows.
$CH_3CH = CH_2 + H_2 \longrightarrow CH_3CH_2CH_3$
In this case which of the following does not happen?
(1) The carbon undergoes reduction.
(2) The cumulative oxidation states of the three carbon atoms vary from $-6$ to $-8$.
(3) There is an overall gain of two electrons from the reactant $C_3H_6$ to form the product $C_3H_8$.
(4) The two electrons are removed from $H_2$.
(5) The $H_2$ undergoes reduction while the carbon undergoes oxidation.

- For each questions 20 to 22, one or more responses out of four responses (a), (b), (c) and (d) given is/ are correct. Select the correct response/ responses. In the accordance with the instructions given on your answer sheet, mark.
  (1) If only (a) and (b) are correct.
  (2) If only (b) and (c) are correct.
  (3) If only (c) and (d) are correct.
  (4) If only (d) and (a) are correct.
  (5) If any other number or combination of response is correct.

**Summary of above instructions**

| (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|
| If only (a) and (b) are correct. | If only (b) and (c) are correct. | If only (c) and (d) are correct. | If only (d) and (a) are correct. | If any other number or combination of response is correct. |

20. Which of the electronic configuration/s is/ are contradicted to the principles of Pauli exclusion principle, Hund rule and Aufbau principle?
a) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$
b) $1s^2\ 2s^2\ 2p^4\ 3s^2$
c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3\ 3d^5$
d) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^2$

21. Which of the following/s is/ are true regarding with an electron?
a) The mass is $\frac{1}{1837}$ of mass of lightest hydrogen atom.
b) The relative charge is $-1$.
c) The ratio $\frac{e}{m}$ of an electron $1.66 \times 10^8\ Cg^{-1}$ is important for calculating mass.
d) The charge is $1.662 \times 10^{-19}$ C.

22. Which of the following set of quantum numbers is/ are possible for electron in an atom?

| | | | |
|---|---|---|---|
| a) n = 3 | $l = 2$ | $m_l = 0$ | $m_s = +\frac{1}{2}$ |
| b) n = 2 | $l = 3$ | $m_l = +1$ | $m_s = -\frac{1}{2}$ |
| c) n = 3 | $l = 1$ | $m_l = +2$ | $m_s = +\frac{1}{2}$ |
| d) n = 2 | $l = 1$ | $m_l = +1$ | $m_s = -\frac{1}{2}$ |

- In question numbers **23** to **25** two statements are given in respect of each question. From the table given below, select the response (1), (2), (3), (4) and (5) that the **best** fits the two statements and mark appropriately on your answer sheet.

| Response | First Statement | Second Statement |
|---|---|---|
| (1) | True | True and correctly explains the first statement. |
| (2) | True | True, but does not explain the first statement correctly. |
| (3) | True | False |
| (4) | False | True |
| (5) | False | False |

| First Statement | Second Statement |
|---|---|
| 23. The boiling point of hydrogen fluoride is higher than that of water. | The electronegativity of fluorine is higher than that of oxygen. |
| 24. The compound FeS is named as ferrous sulfide while $Fe_2S_3$ as ferric sulfide. | If element shows variable oxidation states, the lower oxidation state is denoted by the suffix "ous" and the higher oxidation number denoted by the suffix "ic". |
| 25. Carborundum has a very high melting point. SiC | Carborundum has a gaint molecular lattice structure. |

**Periodic Table**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 H | | | | | | | | | | | | | | | | 2 He |
| 2 | 3 Li | 4 Be | | | | | | | | | | | 5 B | 6 C | 7 N | 8 O | 9 F | 10 Ne |
| 3 | 11 Na | 12 Mg | | | | | | | | | | | 13 Al | 14 Si | 15 P | 16 S | 17 Cl | 18 Ar |
| 4 | 19 K | 20 Ca | 21 Sc | 22 Ti | 23 V | 24 Cr | 25 Mn | 26 Fe | 27 Co | 28 Ni | 29 Cu | 30 Zn | 31 Ga | 32 Ge | 33 As | 34 Se | 35 Br | 36 Kr |
| 5 | 37 Rb | 38 Sr | 39 Y | 40 Zr | 41 Nb | 42 Mo | 43 Tc | 44 Ru | 45 Rh | 46 Pd | 47 Ag | 48 Cd | 49 In | 50 Sn | 51 Sb | 52 Te | 53 I | 54 Xe |
| 6 | 55 Cs | 56 Ba | | 72 Hf | 73 Ta | 74 W | 75 Re | 76 Os | 77 Ir | 78 Pt | 79 Au | 80 Hg | 81 Tl | 82 Pb | 83 Bi | 84 Po | 85 At | 86 Rn |
| 7 | 87 Fr | 88 Ra | | 104 Rf | 105 Db | 106 Sg | 107 Bh | 108 Hs | 109 Mt | 110 Ds | 111 Rg | 112 Cn | 113 Uut | 114 Uuq | 115 Uup | 116 Uuh | 117 Uus | 118 Uuo |

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

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Mahamaya Girls' College , Kandy

| 02 | E | II |
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අධ්‍යයන පොදු සහතික පත්‍ර (උසස්පෙළ) විභාගය, පළමු වාර පරීක්ෂණය - 2025 අප්‍රේල්
General Certificate of Education (Adv. Level) Examination, First Term Test – April 2025

| රසායන විද්‍යාව II<br>Chemistry II | 12 ශ්‍රේණිය<br>Grade 12 | පැය එක හමාරයි.<br>Half & Hour |
|---|---|---|

| Index Number | | | | | | |
|---|---|---|---|---|---|---|

- ***Use of calculators is not allowed.***
  - *Universal gas constant, $R = 8.314\ JK^{-1}mol^{-1}$*
  - *Avogadro constant, $N_A = 6.022 \times 10^{23}\ mol^{-1}$*
    - *Part A – Structured Essay (pages 2-7)*
- ***Answer all the questions on the question paper itself.***
- *Write your answer in the space provided for each question. Please note that the space provided is sufficient for the answer and that extensive answers are not expected.*
    - *Part B – Essay (pages 8-10)*
- *Answer all the questions.*
- *At the end of the time allotted to this paper, tie the answers to the two parts A and B together so that part A is on the top and hand them over.*
- *You are permitted to remove only part B of the question paper.*

**For Examiner's Use Only.**

| Part | Question No. | Marks |
|---|---|---|
| A | 01 | |
| | 02 | |
| B | 03 | |
| | 04 | |
| Total | | |
| Percentage | | |

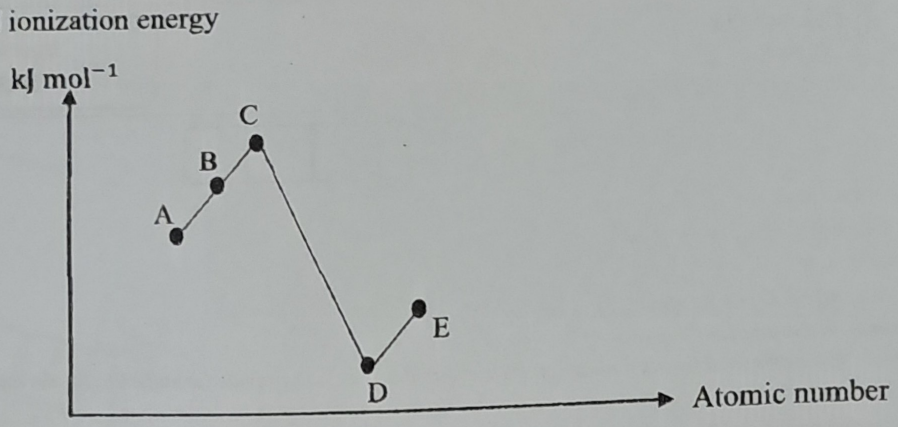
| Final Marks | |
|---|---|
| In Numbers | |
| In Letters | |
| Signature | |

## Part A – Structured Essay

(Answer all questions on this paper itself. The allocated marks for each question is 10.)

01)

a) A, B, C, D and E are five consecutive elements in periodic table. The variation of second ionization energies of these elements is shown in the graph given below.




(i) Which of the above elements shows $ns^2\ np^0$ electronic configuration?

.....

(ii) State whether the first ionization energy of D is greater than that of E or not giving reasons.

.....

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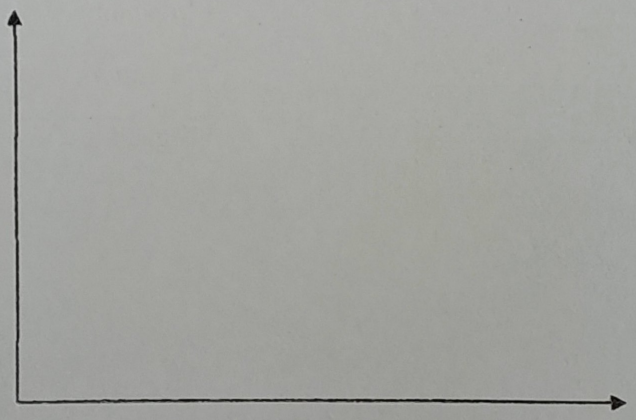
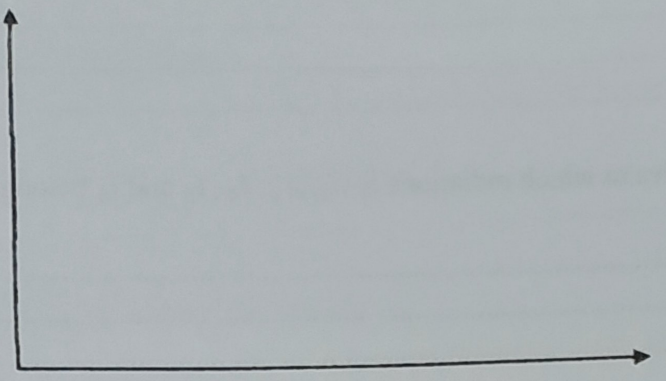
(iii) Draw a graph of the variation of the first ionization energies of A, B, C, D and E.



(iv) State how the atomic radius of the above elements vary.

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

(v) Plot the variation of ionization energy of the first five electron of the element D.



(vi) What is the formula of a compound which formed from the elements A and C.

.....

(vii) Fill in the blanks with the use of above elements.

I. The element with highest atomic radius. .....

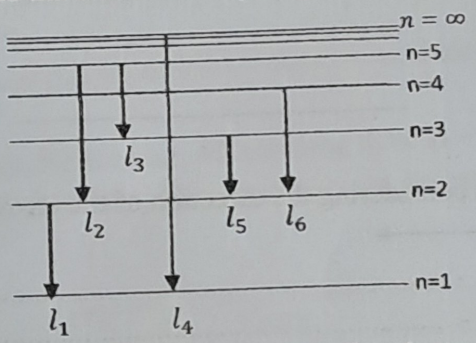
II. The element with highest electronegativity. .....

III. The element with lowest reactivity. .....

IV. The pair of elements which form ionic compound with highest ionic character.

..... , .....

b) The six possible electronic transitions of a hydrogen atom are $l_1$ , $l_2$ , $l_3$ and $l_4$ , $l_5$ , $l_6$ shown in the diagram given below.




The wavelength of an emitted radiation related to the electron transition in the atomic spectrum of hydrogen is given by $\frac{1}{\lambda} = R_H\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$ equation. $R_H = 1.1 \times 10^7\ m^{-1}$ constant value. $n_1$ and $n_2$ are energy levels while $n_2 > n_1$. ($N_A = 6.022 \times 10^{23}\ mol^{-1}$ , $h = 6.63 \times 10^{-34}$ Js , $C = 3 \times 10^8\ ms^{-1}$)

(i) The wavelength of radiation associated with $l_2$ and $l_3$ electronic transition are 652 nm and 488 nm respectively. Calculate the following with respect to the radiation released during the electronic transition from $n = 4$ to $n = 3$.

I. The energy of the radiation.

.....

.....

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.....

II. The frequency of the radiation.

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(ii) Name the series to which radiations $l_1$ , $l_2$ , $l_3$ , $l_4$ , $l_5$ and $l_6$ belong in the atomic spectrum of hydrogen.

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(iii) Name the regions of the electromagnetic spectrum to which the line series mentioned in (ii) above belong.

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(iv) I. Draw the spectral lines related to the above $l_5$ , $l_6$ , $l_2$ electronic transitions in the sketch given below.

_____

_____

II. fill in the blanks considering the direction of the arrow. (Increases or decreases)

⟶

Wavelength - .....

Frequency - .....

(v) Answer the following questions considering above electronic transitions.

I. At which transition the intensity of the line spectrum is highest?

.....

II. What is the transition related to the colour red?

.....

III. Which transition emits an energy equal to the ionization energy?

.....

IV. A difference between which electronic transitions equals the energy released during the $l_1$ transition.

.....

c) Arrange the following chemical species in ascending order of the property mentioned in parenthesis.

(i) S, Al, Na, P (First ionization energy)

.....

(ii) $CN_2^{2-}$ , $CH_3^+$ , $CH_3^-$ (s character of carbon)

.....

(iii) $Mg^{2+}$ , $Li^+$ , $Al^{3+}$ , $K^+$ (Ionic radius)

.....

(iv) $NO_2^-$ , $NO_3^-$ , $NCl_3$ , $NF_3$ (Electronegativity of N)

.....

02)

a) (i) State the followoing statement is true or false considering the elements in 1, 2, 3 periods in periodic table other than the inert elements.

I. The fluorine is the element that releases the most energy when it gains an electron in the gaseous state. (.....)

II. The carbon has the highest hardness. (.....)

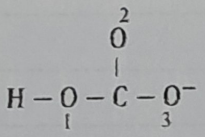
III. Only Be and B can be taken as elements forming electron-deficient compounds. (.....)

IV. The element that never shows positive oxidation state is fluorine. (.....)

(ii) A molecule with the formula AB contains three A – B sigma (σ) bonds. A and B are the symbols for all elements. The molecule can be polar or nonpolar. Complete the table accordingly.

| | Shape | Example |
|---|---|---|
| I. Polar | | |
| II. Nonpolar | | |

b) (i) Draw the more suitable Lewis-dot dash structure for the ion $HCO_3^-$. Skeleton structure is given below.



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(ii) Draw two more resonance structures for $HCO_3^-$ ion except above. Write their stabilities under the two structures as stable/ less stable/ unstable. Write reasons for your answers.

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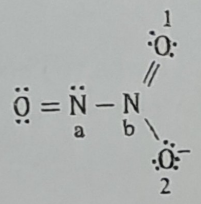
(iii) Consider the more stable structure you drew above and complete the table using the terms given below.

(σ, π, 2p atomic orbitals, 1s atomic orbitals, sp hybrid orbital, linear overlapping, lateral overlapping, $sp^2$ hybrid orbital, $sp^3$ hybrid orbital)

| Bond | Type of bond | Overlapping orbitals | Overlap |
|---|---|---|---|
| $H - O^1$ | | | |
| $O^1 - C$ | | | |
| $C - O^2$ | | | |
| $C - O^3$ | | | |

c) (i) Consider the Lewis structure given below and complete the table.




| On/ around the respective atom | $N_a$ | $N_b$ |
|---|---|---|
| I. No. of VSEPR units | | |
| II. Electron pair geometry | | |
| III. Hybridization | | |
| IV. Shape | | |
| V. Bond angle | | |

(ii) Write the oxidation numbers of atoms $N_a$, $N_b$, $O^1$, $O^2$.

.....

(iii) Arrange the atoms $N_a$, $N_b$, $O^1$, $O^2$ with respect to their ascending order of electronegativity.

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

d) A 100 g sample of a pure compound X contains 34.10 g of Na, $9.033 \times 10^{23}$ atoms of C and 2.99 mol of O. The relative molecular mass of the compound X is 134. (Na = 23 , C = 12 , O = 16).

(i) Calculate the empirical formula of the compound.

.....

.....

.....

.....

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.....

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.....

(ii) Write the expression that shows the relationship between empirical formula mass and molecular formula mass.

.....

.....

(iii) Determine the molecular formula of the compound.

.....

.....

.....

(iv) The label of a commercially available $HNO_3$ acid bottle contains following information.

Mass percentage of $HNO_3$ $W/W = 70\%$

Density $= 1.35\ g\ cm^{-3}$

Molar mass $= 63\ g\ mol^{-1}$

I. Calculate the concentration of the solution.

II. Calculate the volume of commercial $HNO_3$ solution to be measured to prepare $250\ cm^3$ of $HNO_3$ solution with a concentration of $1.0\ mol\ dm^{-3}$.

(v) The concentration of $SO_4^{2-}$ ions in the aqueous solution with 1: 2 mole ratio of $K_2SO_4$ and $Cr_2(SO_4)_3$ is $1.344\ g\ dm^{-3}$. Calculate the total ion concentration of the solution in $mol\ dm^{-3}$. $(K = 39,\ S = 32,\ O = 16,\ Cr = 52)$

04)

a) The water soluble $Pb^{2+}$ has been identified as a heavy metal that impairs kidney and hemoglobin production. The data from a test on $Pb^{2+}$ in effluent water discharged from a paint factory is given below.

Density of the effluent water solution $1\ g\ cm^{-3}$. It is found that $500\ cm^3$ of effluent water contains $16.56\ mg$ of $Pb^{2+}$ ions. $(Pb = 207)$

(i) Calculate the concentration of $Pb^{2+}$ ions in the effluent water.
(ii) Calculate the composition of $Pb^{2+}$ ions in the effluent water in ppm.
(iii) If the factory releases $8\ m^3$ of water per day, find the mass of Pb released in a day.

b) The balanced equation for a method of producing a sample of $O_2$ in the laboratory is given below.

$$2KClO_{3(s)} \longrightarrow 2KCl_{(s)} + 3O_{2(g)}$$

It is planned to produce $O_2$ using 4.9 g of pure $KClO_3$. If the mass of $O_2$ obtained after sometime is 0.96 g, $(K = 39, O = 16,\ Cl = 35.5)$

(i) Calculate the obtained number of moles of $O_2$.
(ii) Calculate the number of moles of $KClO_3$ decomposed.
(iii) Calculate the decomposition percentage of $KClO_3$.
(iv) Find the maximum mass of $O_2$ that could be produced if the initial $KClO_3$ sample were completely decomposed.

c) The $25.0\ cm^3$ of $0.1\ mol\ dm^{-3}$ oxalic acid $(H_2C_2O_4)$ solution is mixed with $15.0\ cm^3$ of dilute sulfuric $(H_2SO_4)$ acid. The mixture was heated to about 60°C and titrated with a potassium permanganate $(KMnO_4)$ solution from the burette. The burette reading was $18.0\ cm^3$.

The unbalanced half reactions is given below.

$$MnO_4^- \longrightarrow Mn^{2+}$$

මහ/මහාමායා බාලිකා විද්‍යාලය
Mahamaya Girls' College , Kandy

02 | E | II

අධ්‍යයන පොදු සහතික පත්‍ර (උසස්පෙළ) විභාගය, පළමු වාර පරීක්ෂණය - 2025 අප්‍රේල්
General Certificate of Education (Adv. Level) Examination, First Term Test – April 2025

රසායන විද්‍යාව II
Chemistry II

12 ශ්‍රේණිය
Grade 12

* Universal gas constant, $R = 8.314\ JK^{-1}mol^{-1}$
* Avogadro constant, $N_A = 6.022 \times 10^{23}\ mol^{-1}$

**Part B - Essay**

Answer all the questions. The allocated marks for each question is 15.

03)

a) (i) State the type/ types of primary bond found in the following compounds.

I. $Cl_2$ II. $NH_3$ III. $NH_4NO_3$
IV. $KMnO_4$ V. $Na_2O$

(ii) Mention the types of forces of attraction seen in the following instances.

I. Carbonated water II. $I_{2(s)}$ dissolved in aqueous $KI_{(aq)}$
II. $HF_{(g)}$ sample IV. $HCl_{(aq)}$ aqueous solution

(iii) Write down the electronic configurations of the following species.

I. $_{12}Mg^{2+}$ II. ~~$_{24}Cu^{2+}$~~ $_{24}Cr^{2+}$ III. $_{16}S^{2-}$ IV. $_{15}P$

(iv) Derive the shape around the central atom of following species.

I. $PCl_4^+$ II. $IF_5$ III. $ClF_2^+$ IV. $SF_4$

(v) State the basic building units and type of lattice of the following lattice structures.

I. $CO_{2(s)}$ II. Diamond III. $SiO_{2(s)}$ IV. $NaCl_{(s)}$
V. $Cu_{(s)}$ VI. $H_2O_{(s)}$

b) (i) Write the correct chemical formulae with respect to the given IUPAC names.

I. dinitrogen tetroxide II. iron(III) sulfate
III. calcium oxalate

(ii) Write the correct IUPAC name for the given chemical formulae.

I. $NaClO_3$ II. HCN III. $NaHCO_3$

(iii) Calculate the number of electrons exchanged in the following reduction – oxidation reaction.

$$C_2H_5OH + O_2 \longrightarrow CO_2 + H_2O \text{ (Not balanced)}$$

$$C_2O_4^{2-} \longrightarrow CO_2$$

(i) Identify reductant (reducing agent) and oxidant (oxidizing agent).
(ii) Write the balanced half oxidation reaction.
(iii) Write the balanced half reduction reaction.
(iv) Write the balanced ionic redox reaction.
(v) Calculate the concentration of $KMnO_4$ from the data given above.

**Periodic Table**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 H | | | | | | | | | | | | | | | | 2 He |
| 2 | 3 Li | 4 Be | | | | | | | | | | | 5 B | 6 C | 7 N | 8 O | 9 F | 10 Ne |
| 3 | 11 Na | 12 Mg | | | | | | | | | | | 13 Al | 14 Si | 15 P | 16 S | 17 Cl | 18 Ar |
| 4 | 19 K | 20 Ca | 21 Sc | 22 Ti | 23 V | 24 Cr | 25 Mn | 26 Fe | 27 Co | 28 Ni | 29 Cu | 30 Zn | 31 Ga | 32 Ge | 33 As | 34 Se | 35 Br | 36 Kr |
| 5 | 37 Rb | 38 Sr | 39 Y | 40 Zr | 41 Nb | 42 Mo | 43 Tc | 44 Ru | 45 Rh | 46 Pd | 47 Ag | 48 Cd | 49 In | 50 Sn | 51 Sb | 52 Te | 53 I | 54 Xe |
| 6 | 55 Cs | 56 Ba | | 72 Hf | 73 Ta | 74 W | 75 Re | 76 Os | 77 Ir | 78 Pt | 79 Au | 80 Hg | 81 Tl | 82 Pb | 83 Bi | 84 Po | 85 At | 86 Rn |
| 7 | 87 Fr | 88 Ra | | 104 Rf | 105 Db | 106 Sg | 107 Bh | 108 Hs | 109 Mt | 110 Ds | 111 Rg | 112 Cn | 113 Uut | 114 Uuq | 115 Uup | 116 Uuh | 117 Uus | 118 Uuo |

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