



# G.C.E. A/L Examination November - 2017

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Provincial Department of Education Northern Province.

Chemistry - II

Grade :- 12 (2019)

## Part- II

### Structured essay - A

❖ Answer all questions on This paper itself.

01. a)

*Li F Cl C Si K N*

1) The element with lowest first ionization enthalpy.

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2) The element with high melting point

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3) The two elements which combine to form the compound with high Ionic character.

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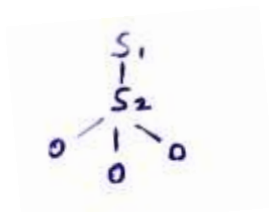
4) High electropositive element

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5) Element which can form basic gas.

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b) Thiosulphate  $S_2O_3^{2-}$  is the conjugated base of Thiosulphuric acid. The skeletal structure of Thiosulphate ion is given below.



i. Draw the most suitable Lewis structure for this molecule.

ii. Draw the resonance structures & comment about its relative stability.

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iii. Obtain the arrangement of bonds and electron pair geometry around sulphur atom  $S_2$  and its hybridization. Using VSEPR theory.

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iv. Identify the atomic orbitals / hybridized orbitals involved in the formation  $S_1 - S_2$   $\sigma$  bond?

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v. Give the approximate value of bond angle  $S_1 - \hat{S}_2 O$ ?

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c)

i. State the covalent character of compounds  $BCl_3$ ,  $BeCl_2$ ,  $LiCl$  in the ascending order giving the reasons.

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ii. State the strength of single bonds  $N - N$ ,  $O - O$ ,  $C - C$  in the ascending order giving reasons.

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02. a)  $A, D, E$  and  $M$  are elements with atomic Number less than 20. In the periodic table Atomic numbers of  $A, D, E$  and  $M$  are  $(Z - 1)$ ,  $Z$ ,  $(Z + 1)$  and  $(Z + 2)$  respectively. First ionization energy of  $E$  is low when compared to this value  $D$ .  $M$  is a gas,  $A$  is solid at room temperature.

1) State real elements relevant to  $A, D, E$  and  $M$

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2) Which element has the lowest second ionization energy among elements  $A, D, E$  and  $M$ .

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3) State the melting points of elements  $A, D, E$  and  $M$  in ascending order.

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4)  $D, E$  and  $M$  Elements form  $XO_m^{n-}$  type of anions and all having  $109.5^\circ$  bond angles. Write the real elemental formulae of three anions, substituting suitable values for  $m$  and  $n$ .

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5) E forms an anion the type  $E_2O_3^{2-}$  State the structure of  $E_2O_3^{2-}$  and state clearly valiancys and oxidation numbers of E atoms of the structure.

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b) Identify the sub shells (atomic orbital's) along with their azimuthal quantum number ( $l$ ) and magnetic quantum numbers for the last energy level electrons of  $Zn^{2+}$  ion. And mention the the maximum numbers ( $M_l$ ) of electrons present in each sub shell Write your answers in the table given below.

Sub shell	Azimuthal quantum number ( $l$ )	Magnetic quantum numbers ( $m_l$ )	Maximum number of electrons in each sub shell.

c) The following questions are based on the compounds

$NH_3(aq)$ ,  $KHF_2(s)$ ,  $(NH_4)_2CO_3(s)$ ,  $NaCl(aq)$ ,  $NH_4NO_2(s)$ ,  $KI_3(s)$ ,  $AlF_3(s)$ ,  $HCl(g)$ ,  $AlCl_3(s)$  and  $HF(g)$

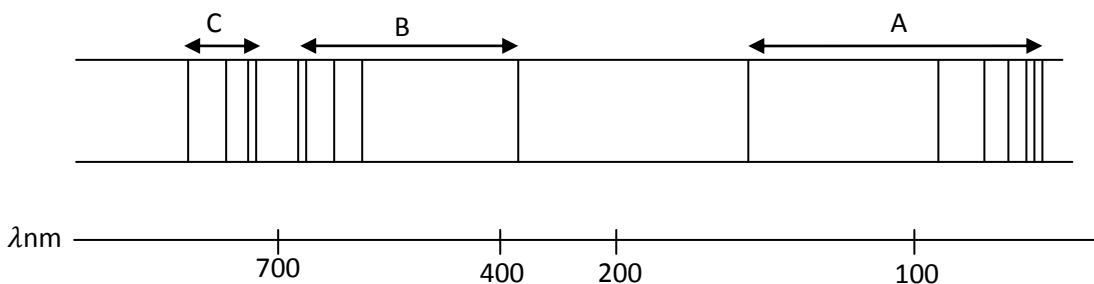
- i. Identify the compound / compounds that has hydrogen bonds.  
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- ii. Identify by the compound / compounds that has ion – dipole interactions.  
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- iii. Identify the compound / compounds that has ion – induced dipole interactions.  
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- iv. Identify the compound / compounds that forms dimers in gaseous phase.  
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- v. Consider the ions  $HF_2^-$ ,  $NO_2^-$ ,  $I_3^-$ . Write the variation of bond angles around the central atom of the ions in respective ascending order.  
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03. a)

- i. Explain the Neil bohr's model .

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ii. The sketch of emission lines in the atomic spectrum of hydrogen is drawn by a student as follows.



Giving reasons explain whether the above sketch is correct or wrong.

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iii. If the wave length of visible light is  $400\text{nm} - 700\text{nm}$  name, the series of *A, B, and C*.

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iv. Students idea was that the data which is essential to calculate the ionization energy of hydrogen can be obtained by the above spectrum.

a) Mention the above data.

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b) If the first ionization energy of hydrogen is  $1317\text{kJmol}^{-1}$ . Calculate the above mentioned data. [ $C = 3 \times 10^8\text{ms}^{-1}$ ,  $h = 6.626 \times 10^{-34}\text{Js}$ ,  $L = 6.022 \times 10^{23}\text{mol}^{-1}$ ].

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b)

i. State two main concepts that you have studied about the existence of sub atomic particles in atom.

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ii. State two assumptions for the currently accepted atomic structure.

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iii. The successive ionization energies of a certain element X is  $900\text{kJmol}^{-1}$ ,  $1800\text{kJmol}^{-1}$ ,  $14800\text{kJmol}^{-1}$  and  $21000\text{kJmol}^{-1}$  respectively. Draw the ionization energy plot against the number of electrons.

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iv. Explain the existence of electrons in the atom using above graph.

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v. Write the ion, Which derived from X with stating the charge.

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04.a) The addition of  $\text{ConKCl}$  to an aqueous solution of  $\text{Co}^{2+}$  gives a salt containing blue coloured complex. Its anhydrous salt contains 27.9% k, 21.2% Co, 50.9% Cl by mass Molar mass of compound X is given as  $279\text{gmol}^{-1}$  [Co = 59, K = 39, Cl = 35.5].

1) Deduce the empirical formula of X?

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2) Deduce the molecular formula of X ?

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b)

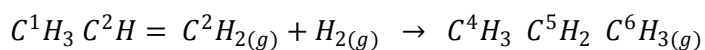
i. Fill the table given below.

Compound	Oxidation number of central atom
1. $H_3PO_4$	
2. $HPO_2^-$	
3. $CH_3Cl$	
4. $CH_2Cl_2$	
5. $CCl_4$	

ii. Write the IUPAC name of the following compounds.

- $SnCl_4$  .....
- $KMnO_4$  .....
- $HCN$  .....
- $NH_4ClO_4$  .....
- $H_2SO_3$  .....

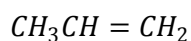
C) Consider the following reaction Carbon atoms are named from 1 to 6.

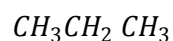


i) Find the Oxidation number of  $C_1$  to  $C_6$

	$C^1$	$C^2$	$C^3$	$C^4$	$C^5$	$C^6$
Oxidation Number						

ii) Find the total oxidation number of the following compounds.






iii) Hence calculate the change in the oxidation number of carbon?

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