G.C.E. A/L Examination March - 2017

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Northern Provincial Department of Education

FWC

Grade :- 12 (2018)	CHEMISTRY	Time :- 3 hours.

PART - II A

Answer all four questions on this paper.

01. (a) You are provided with the following list of some elements in the periodic table.

Li	Be	B	C	N	O	F
Na	Mg	Al	Si	P	S	Cl

From the list

(i) Identify the element that has the highest ionization energy ----------

(ii) Identify the element that exhibits highest oridation state ----------

(iii) Identify the nonmetallic element that forms a homoatomic covalent Lattice of high hardness ----------

(iv) Identify the element which forms the largest anion ----------

(v) Identify the element that a P - black metal ----------

(vi) Identify the element that has the highest melting point ----------

(b) The following parts (i) to (vi) are based on the molecule HNCO (isocyanic acid)

It has the following skeleton.

$H - N - C - O$

(i) Draw the most acceptable Lewis structure for this ion

(ii) Draw resonance structures for this molecule and comment on their relative stabilities.

(iii) State the following given in the table below (around the atoms N and C)

		N atom	C atom
I	Electron pair geometry		
II	Shape		
III	hybriclization		

(iv) Is this molecule polar or nonpolar ?----------

(v) Identify the atomic / hybrid orbitals involved in the formation of the following bonds in the Lewis structure drawn in part (i) above.

I) H and N ----------

II) N and C ----------

III) C and O ----------

(vi) Sketch the shape of the Lewis structure drawn in part (i) above indicating approximate values of the bond angles.

---------- (100 marks)

02. (a) On treatment with cold water an element (A) reacted quietly, Liberating a colourless, odourless gas (B), a solution (C). Element (A) reacted with (B) yielding a solid product (D) which reacted with water to give basic solution (C). When carbondioxide was bubbled through solution (C) initially a white precipitate (E) is formed, but this redissolved forming solution (F) when more CO_2 was added. Precipitale (E) effervesced when moistened with concentrated hydrochloric acid and gave a brick red colouration to the burner flame. When (E) was heated at 1000°C a white compound (G) was formed. which when heated carbon at 2000°C gave a solid (H) of some commercial importance.

(i) Identify A, B, C, D, E, F, G and H

(A) ---------- (B) ---------- (C) ----------
(D) ---------- (E) ---------- (F) ----------
(G) ---------- (H) ----------

(ii) Give balanced chemical equations for the reaction described above.

(b) (i) Describe a test which would distingues sodium chloride from potassium chloride.

(ii) Write balanced equation for the following thermal decomposition reactions.

(I) $NaNO_3 \longrightarrow$
(II) $Mg(NO_3)_2 \longrightarrow$
(III) $BaCO_3 \longrightarrow$
(IV) $LiOH \longrightarrow$
(V) $NaHCO_3 \longrightarrow$

(iii) Write balanced equations for the following reactions.

(I) $Sr_{(s)} + O_{2(g)} \longrightarrow$
(II) $Mg_{(s)} + H_2O_{(g)} \longrightarrow$
(III) $Li_{(s)} + N_{2(g)} \longrightarrow$

03. (a) (i) State Dalton's Law of partialpressure.

(ii) At 300K and at $4.0\times 10^5\ Nm^{-2}$ He gas exists in a vessel with a volume $3.0m^3$. At 300K and at $8.0\times 10^5 Nm^{-2}$ Ne gas exsits in a vessel with a volume $7.0m^3$. The vessels are connected allowing the two gases to mix completely. Assuming the ideal gas behaviour calculate the following.

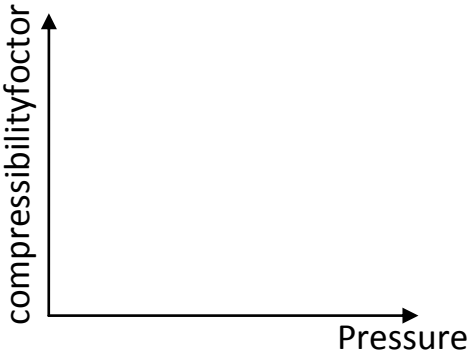
(I) The total pressure in the connected vessels.

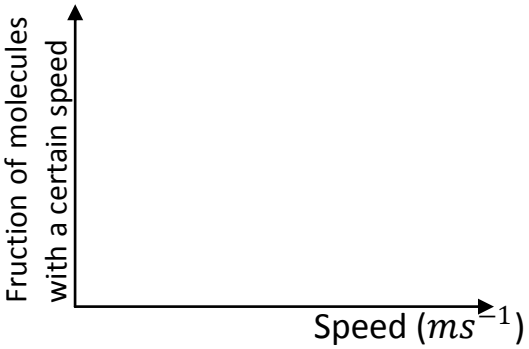
(II) The molefraction of the gas He in the mixture.

(III) The partial pressure of the gas in the connected vessels when the temperature of the gas mixture is increased to 400K maintaining the total volume of the two vessels the same.

(b) (i) Sketch below the variation of the compressibility factor with pressure for an ideal gas and for a real gas. State for the reasons for the difference in the sketches you drew for the two types of gases.

(ii) Sketch below Maxwell- Boltzmann curves for a gas at two different temperatures T_1K, T_2K ($T_1 < T_2$) state the reason for the difference in the sketch.





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04. Consider the chemical reaction.

$CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$

and the thermochemical data given below (at 25°C)

Chemical species	$\Delta Hf^{\theta}(KTmol^{-1})$	$S^{\theta}JK^{-1}\,mol^{-1})$
$CaCO_{3(s)}$	- 1206	93
$CaO_{(s)}$	- 635	40
$CO_{2(g)}$	- 394	210

(i) Calculte ΔH^{θ} for the above reaction at 25°C

(ii) Calcute ΔS^{θ} for the above reaction at 25°C

(iii) Write an expression to relate ΔG of a chemical reaction to its ΔH and ΔS.

(iv) Calculate ΔG for the above reaction at 500°C and state whether the reaction is spontaneous or non- spontaneous.

(b) (i) What does the term entropy mean?

(ii) State whether the entropy change decrease or increase of the following changes.

I $H_2O_{(s)} \rightarrow H_2O_{(l)}$ ----------

II $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$ ----------

III $Li_3N_{(s)} + 3H_2O_{(l)} \rightarrow 3LiOH_{(aq)} + NH_{3(g)}$ ----------

IV $NH_4Cl_{(s)} \rightarrow NH_{3(g)} + HCl_{(g)}$ ----------

V $CO_{2(g)} + C_{(s)} \rightarrow 2CO_{(g)}$ ----------

(c) Write down balanced chemid equation for the processes from (i) to (iv) statements .

(i) Standard enthalpy of second lonisation of calcium

(ii) standard enthalpy of formation of $MgBr_{2(s)}$

(iii) standard First electron gain enthalpy of orygen.

(iv) standard bond dissouiation enthalpy of bromine.
