G.C.E. A/L Examination July - 2015

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Zonal Department of Education Jaffna.

FWC

Grade :- 12 (2016) **CHEMISTRY**

Part - II (A)

Structured Essay

❖ **Answer all Questions.**

(01) a) Complete the following statements

i) Among Na, K *and* Rb the element which has the lowest density is ……..……...…

ii) Among NO, NO_2 *and* CO_2, the one which is insoluble in water is ……..……..……

iii) Of the chlorides NCl_3, PCl_3 *and* BCl_3 the one which gives an acidic compound and a basic compound on hydrolysis is ……

iv) Among Li_2O, K_2O_2 *and* MgO the one which reacts with O_2 is ……..……

v) The species which has the greatest $N - O$ bond length among NO_3^-, NO_2 *and* NO_2^+

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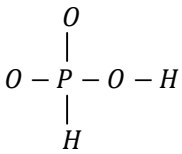
b) The skeletal structure of $H_2PO_3^-$ ion is given below.



i) Draw the most acceptable Lewis structure for the above ion..

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ii) Draw the resonance structures of it and comment on their relative stabilities.

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iii) Write the shape and the electron pair geometry around the following atoms in the above ion.

	Atom	Shape around the atom	Electron pair geometry
i)	P		
ii)	O attached to H		

c) X, $and\ Y$ are two consecutive elements belonging to the same period in the periodic table. The first ionization energy of Y is greater than that X. The salts of Y do not impart any characteristic colour in the flame test. X reacts rapidly with cold water to give a solution P and gas Q while Y reacts with steam to give the compound R and the gas Q

i) Identify the elements X and Y

X - ……

Y - ……

ii) Identify the solution P and the compound R

P - ……

R - ……

iii) What could be gas Q?

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iv) What are the compounds that may be formed when Y is ignited in air?

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v) Write balanced chemical equations for the reactions that the element X undergoes when O_2 gas is in excess.

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vi) One of the compounds of Y mentioned in part (iv) above reacts with water and forms a gas. Write the balanced chemical equational for the reaction of that gas with excess of $Cl_{2(g)}$ and mention a test for identifying the above stated gas

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(02) (a) A white substance A reacts with dil. H_2SO_4 to produce a colouress gas B and a colourlees solution C. The reaction between B and $K_2Cr_2O_7$ solution produces a green solution and a slightly coloured precipitate D. The substance D burns in air to produce a gas and a colourless liquid. Anhydrous $CuSO_4$ is turned blue on addition of this colourless liquid. Addition of aqueous NH_3 or $NaOH$ to C produces first a precipitate which dissolves in the excess of the respective reagent to produce a clear solution in each case.

i) Identify the species from A to E

A - ……
B - ……
C - ……
D - ……
E - ……

ii) Write balanced equations for the reactions involved.

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(b) i) Write the chemical formulae of the stable oxides formed by the elements in the 2nd period in their highest oxidation states.
Mention clearly and separately the acidic / basic / amphoteric / neutral nature of each of the above oxides.

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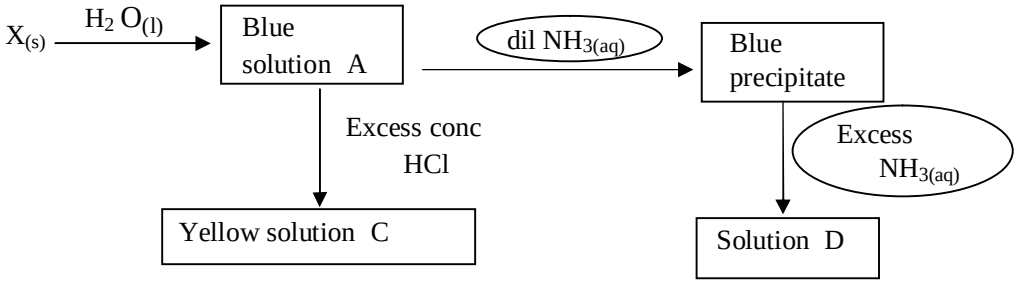
ii) Mention the variation trend observed in each of the following properties of the element in the second period across the period from left to right

i) Electronegativity ……
ii) 2nd ionization energy ……

c) The element M belongs to 3d – series M reacts with dry $Cl_{2(g)}$ to form a yellow colured solid X



i) Identify the element M

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ii) Write the electron configuration of M in the usual manner as $1s^2\ 2s^2$

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iii) Write the formulae and the IUPAC names responsible for the colours of each of the $A, B, C \text{ and } D$

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iv) What is the colour of the solution D

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v) What could be observed if SO_2 gas is passed through the solution C

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(03) a) i) What is meant by the "compressibility factor (Z)" of a gas

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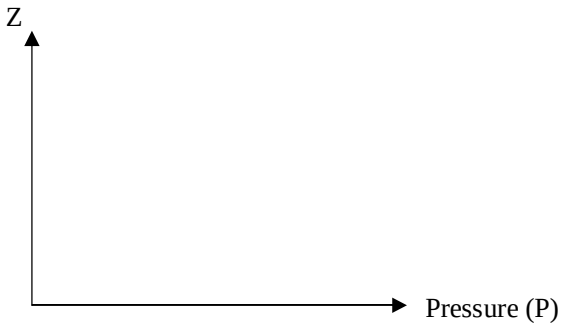
ii) Draw in the diagram given below the plot showing the variation of the compressibility factor against pressure for each of the gases NH_3» He and an ideal gas. Label each of them.



iii) Using the ideal gas equation and the equation for kinetic molecular theory, show that $\overline{C^2} = \frac{3RT}{M}$ where M is the molar mass of the gas.

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iv) The element X exists as a triatomic gas at room temperature. If its root mean square speed at 227^0C is $500ms^{-1}$,
What is the relative atomic mass of X

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b) i) A gaseous mixture which contains the two gases C_2H_6 and C_3H_8 occupies a volume of 11.2 dm^3 under STP conditions when the mixture was subjected to complete combustion, 950 kJ heat was evolved Enthalpies of combustion of C_2 $H_{o(g)}$ and $C_3H_{8(g)}$ are - 1560 $kJmol^{-1}$ and $-2240kJ\ mol^{-1}$ respectively. Find the mass% of C_2H_6 in the mixtu $(C = 12, H = 1)$

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ii) When 2g of a gas A was introduced into an evacuated vessel at 25^0C, the pressure inside the vessel was $1 \times 10^5\ Nm^{-2}$ when 3g of another gas B was further introduced into the vessel, the pressure inside it was found to increase to $1.5 \times 10^5\ Nm^{-2}$ Assuming ideal behavior calculate the ratio of the molar masses $M_A : M_B$

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(04) A) The non – cyclic hydrocarbon P with the molecular formula C_6H_{12} exhibit enantiomer isomerism,

i) Draw the possible structure for P in the box below.

P

ii) Does P exhibit geometrical isomerism?

……

iii) Draw the structure of the product obtained when P is heated with Ni/H_2

Q

iii) Draw the structure of the product R formed when P is treated with $Br_2/CC\ell_4$

R

iv) How many asymmetric carbon atoms are there in a molecule of compound R?

……

b) Consider the following reaction scheme

$$C_3H_4 \xrightarrow{NaNH_2} B \xrightarrow{P} C \xrightarrow{Q} CH_3-\overset{\overset{O}{\|}}{C}-CH_2CH_3$$

(A)

i) Write below the structures of the compounds appropriate for A, B and C

A = ……

B = ……

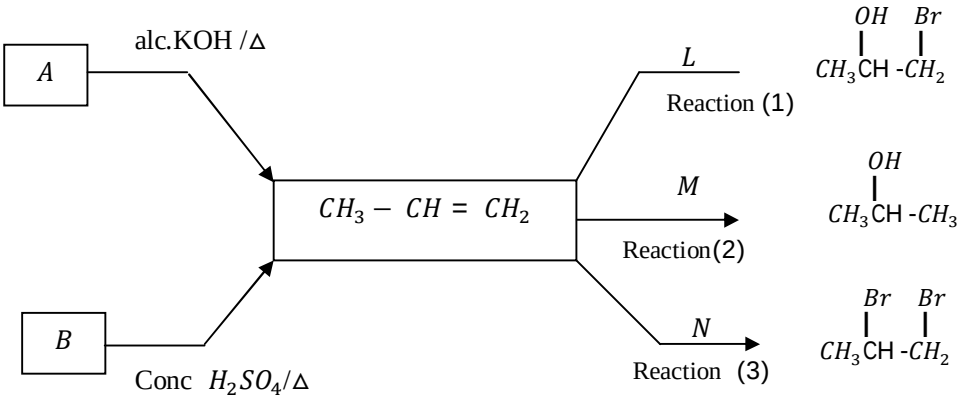
C = ……

ii) Give the reagents suitable for P and Q

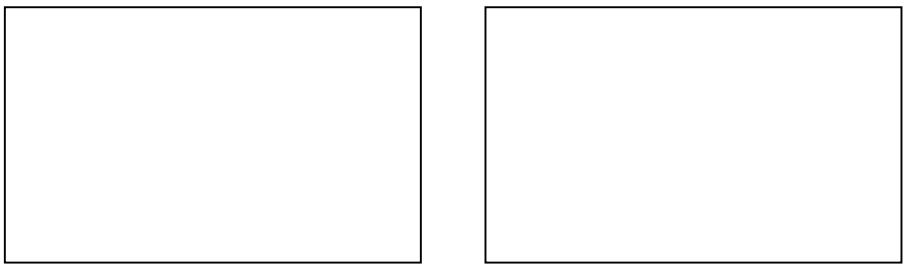
P = ……

Q = ……

c) Some information regarding the preparation and some reactions of propene are given below.



i) Write in the boxes given below the structure of a compound suitable for each of $A, and\ B$



A B

ii) Write the reagents $L, M\ and\ N$

L - .....

M - .....

N - .....

iii) Write the structure of the intermediate formed in reaction (3) above

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d) Complete the following table by writing the type of mechanism and the major product in each of the reactions.

Symbols for mechanism types:

Electrophilic addition (A_E)

Electrophilic substitution (S_E)

Nucleophilic addition (A_N)

Nucleophilic substitution (S_N)

Eliminination (E)

Free radical substitution (F_R)

	Reactant	**Reagent**	**Mechanism type**	**Major product**
1)	$CH_3CH = CH_2$	HBr		
2)	$CH_3\underset{\underset{OH}{\vert}}{C}H - CH_2CH_3$	Al_2O_3 / Δ		
3)	$CH_3CH_2CHBrCH_3$	$Ethanol\ /\ KOH$		
4)	$CH_3CH_2 - CH_3$	Equimole of Cl_2 / Diffused light		

5)	$CH_3CH = CHCH_3$	Conc H_2SO_4		