



FWC

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with Provincial Department of Education

Northern Province

Term Examination, November - 2019

Grade - 13 (2020)

Chemistry - II

Time :- 3 hours 10 minutes

Part II A

structure Questions

Answer all four question on this paper itself.

Each questions carries 100 marks

1) (A) The following questions are related to the elements of the third row in the periodic table. Write the symbol of the element in the space provide in answering parts (i) to (vi)

(i) Identify the element that has highest electro negativity

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(ii) Identify the element that has more allotropes.

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(iii) Identify the element that forms the monatomic ion smallest in size

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(iv) Identify the element that forms dimer molecule only in gaseous state.

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(v) Identify the element that does not form compound with other elements.

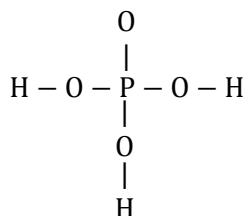
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(vi) Identify the element which form dimaraization of chloride in gaseous stage.

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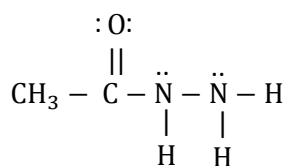
(B)

(i) Draw the most acceptable Lewis dot - dash structure for the molecule  $\text{PO}_4\text{H}_3$ . It Skelton is given below.



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- (ii) The most stable Lewis dot – dash structure for the molecule  $C_2H_6N_2O$  is shown below. Draw two more Lewis dot – dash structure. (resonance structure) for this molecule write unstable under the more unstable drawn by you.



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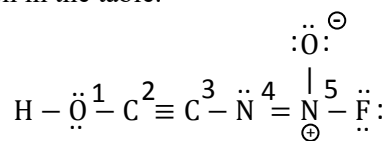
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- (iii) Based on the Lewis dot – dash structure given below, state the following regarding the C, N and O atoms given in the table.



		O <sup>1</sup>	C <sup>3</sup>	N <sup>4</sup>	N <sup>5</sup>
(a) <sup>(iv)</sup>	VSEPR Pair				
(b) <sup>(iv)</sup>	Electron pair geometry				
(c)	hybridization				
(d)	Shape				

- (iv) Identify the atomic / hybrid orbitals involved in the formation of the following  $\sigma$  bonds.

The Lewis dot – dash structure given in part (iii) above. [ Numbering of atoms is as in part (iii)]

- (i) H – O<sup>1</sup>    H    .....
- (ii) O<sup>1</sup> – C<sup>2</sup>    O<sup>1</sup>    .....
- (iii) C<sup>3</sup> – N<sup>4</sup>    C<sup>3</sup>    .....
- (iv) N<sup>4</sup> – N<sup>5</sup>    N<sup>4</sup>    .....
- (v) N<sup>5</sup> – F    N<sup>5</sup>    .....

- (v) Identify the atomic orbitals involved in the formation of the following  $\pi$  bonds in the Lewis dot – dash structure give in part (iii) above

- I. C<sup>2</sup> – C<sup>3</sup>    C<sup>2</sup>    \_\_\_\_\_    C<sup>3</sup>    \_\_\_\_\_
- II. N<sup>4</sup> – N<sup>5</sup>    N<sup>4</sup>    \_\_\_\_\_    N<sup>5</sup>    \_\_\_\_\_

(C) An atomic orbital is described by the quantum numbers  $n, \ell, m_\ell$

	$n$	$\ell$	$m_\ell$	Atomic orbital
(i)	.....	.....	<u>-2</u>	3d
(ii)	3	.....	+1	.....
	3	.....	0	.....
	3	.....	-1	.....
(iii)	3	.....	.....	3s
(iv)	2	.....	+1	.....
(v)	2	.....	.....	2s

(D) Arrange the following in the increasing order of the property indicated in parenthesis (Reasons are not required)

(i)  $BeSO_4, MgSO_4, CaSO_4$  (Thermal stability)

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(ii)  $NO_4^{3-}, NO_2^+, NO_2^-, NO_3^-$  (Bond angle)

.....

(iii)  $KF, NaF, LiF$  (ionic property)

.....

2) (A) X is an S block element in the periodic table. Different between first and second ionization energy value of X is very high. X vigorously react with normal water and also easily flammable in water. X reacts with water liberating  $H_2$  gas and forming its hydroxide of strong base. X contributes the manufacturing of Baby soap

(i) Identify X X .....

(ii) Write the ground state electronic configuration ?

.....

(iii) Give the chemical formulae of oxides of X, when X burns in air?

.....

(iv) One of the oxide mention above dissolve in water and give alkaline solution, viscous liquid and dimermolecule as products.

1) Identify that oxide

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2) Write the chemical reaction for the above reaction

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3) Write the chemical reaction when the above mention oxide dissolve in hot water.

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(v) Special attention should be paid when identifying the salt of X by flame test mention it?

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.....

(vi) An element Y belonging to the same group of X differs from the rest of the elements in that group Mention the element 'Y'

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(vii) How is the similarities of shown by element 'Y' with adjacent group elements called

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(viii) State any two of the above mention properties?

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(B)

I. Complete the following reactions by selecting the suitable solution from the list given below and writing them appropriately in the relevant boxes.

NaOH<sub>(aq)</sub>, Na<sub>2</sub>S<sub>2</sub>O<sub>3(aq)</sub>, HNO<sub>3(aq)</sub>, NaBr<sub>(aq)</sub>, HCl<sub>(aq)</sub>

(i)  $(NH_4)_2SO_{4(aq)} + \boxed{\phantom{NaOH}}$   $\longrightarrow$  A (a basic gas with an irritating smell )

(ii)  $Pb(NO_3)_{2(aq)} + \boxed{\phantom{NaOH}}$   $\longrightarrow$  B (White precipitate which dissolves on heating )

(iii)  $\boxed{\phantom{NaOH}} + AgNO_{3(aq)}$   $\longrightarrow$  C (a pale yellow precipitate which dissolves in conc. NH<sub>3</sub>)

(iv)  $BaCO_3 + \boxed{\phantom{NaOH}}$   $\longrightarrow$  D (a gas which turns lime water milky)

(v)  $Pb(NO_3)_2 + \boxed{\phantom{NaOH}}$   $\longrightarrow$  E (a white precipitate which turns black when heated )

II. Write the chemical formulae of the species A to E.

A - ..... B - .....

C - ..... D - .....

E - .....

III. Write the reactions for the dissolving of the precipitates B and C ?

.....  
.....

IV. Write the reaction responsible for the formation of the black precipitate on heating E

.....

3) (A) The following questions related to the experimental determination of relative molar mass of Mg in laboratory. When this experiment 25 cm<sup>3</sup> water was taken into the burette, then dilute HCl was added until the burette filled with aqueous solution. 0.04 g Mg ribbon wrapped roundly with cotton wool which was placed into the top of the burette. Invert this burette quickly and place vertically under water in a beaker and initial reading was measured. Final reading was measured after the complete reaction of Mg with air bubble liberation. Saturated vapour pressure of water at 30°C was 31.8 mm Hg. Final and initial readings of burette are 46.00, 2.20 cm<sup>3</sup> (R = 8.314Jmol<sup>-1</sup>K<sup>-1</sup> and atmospheric pressure was 760 mm Hg)

i. I. Why Mg ribbon was captured by the cotton wool?

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 .....

II. What is the disadvantage if fail to capture the Mg ribbon with cotton wool

.....  
 .....

ii. Can you complete above experiment using concentrated HCl instead of dilute HCl? Why Explain.

.....  
 .....

iii. Write the balanced chemical equation to the above experiment

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iv. Calculate the volume of the liberated gas in cm<sup>3</sup>.

.....

v. Calculate the pressure of the liberated gas in Nm<sup>-2</sup>

.....  
 .....

vi. Write the equation to complete this calculation and mention the terms used this equation

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 .....  
 .....  
 .....

vii. Calculate the mole of liberated gas?

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 .....  
 .....  
 .....

viii. If you used any assumption to this experiment, mention it?

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ix. Calculate the molar mass of Mg and the give relative molar mass of Mg?

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4) (A) Four organic compounds A, B, C and D have the molecules formula  $C_7H_{16}O$ . The above mentioned four organic compounds react with Na and liberate  $H_2$  gas. A, B and C immediately give turbidity with anhydrous  $ZnCl_2/Con\ HCl$ . But D gives the turbidity after a long time.

1) Identify A, B, C and draw the structures of this organic compounds in the given boxes.

A



B



C

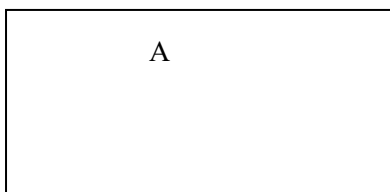


2) Only one of the structures mentioned above in part (1) does not show optical isomerism.

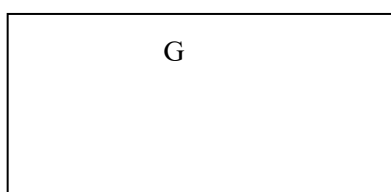


3) When one of the above compounds is heated with  $Al_2O_3$ , the alkene G is obtained. When G is reacted with concentrated  $H_2SO_4$  followed by hydrolysis, the product H is obtained as a minor product. H contains two asymmetric carbon atoms. Draw the structures of A, G and H.

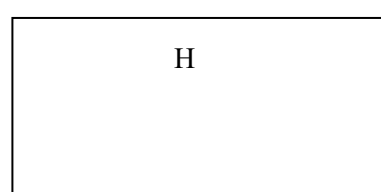
A



G



H



4) If D shows optical isomerism, draw three possible structures of D.



5) Mention a test to distinguish D from A, B and C which is not mentioned in the question

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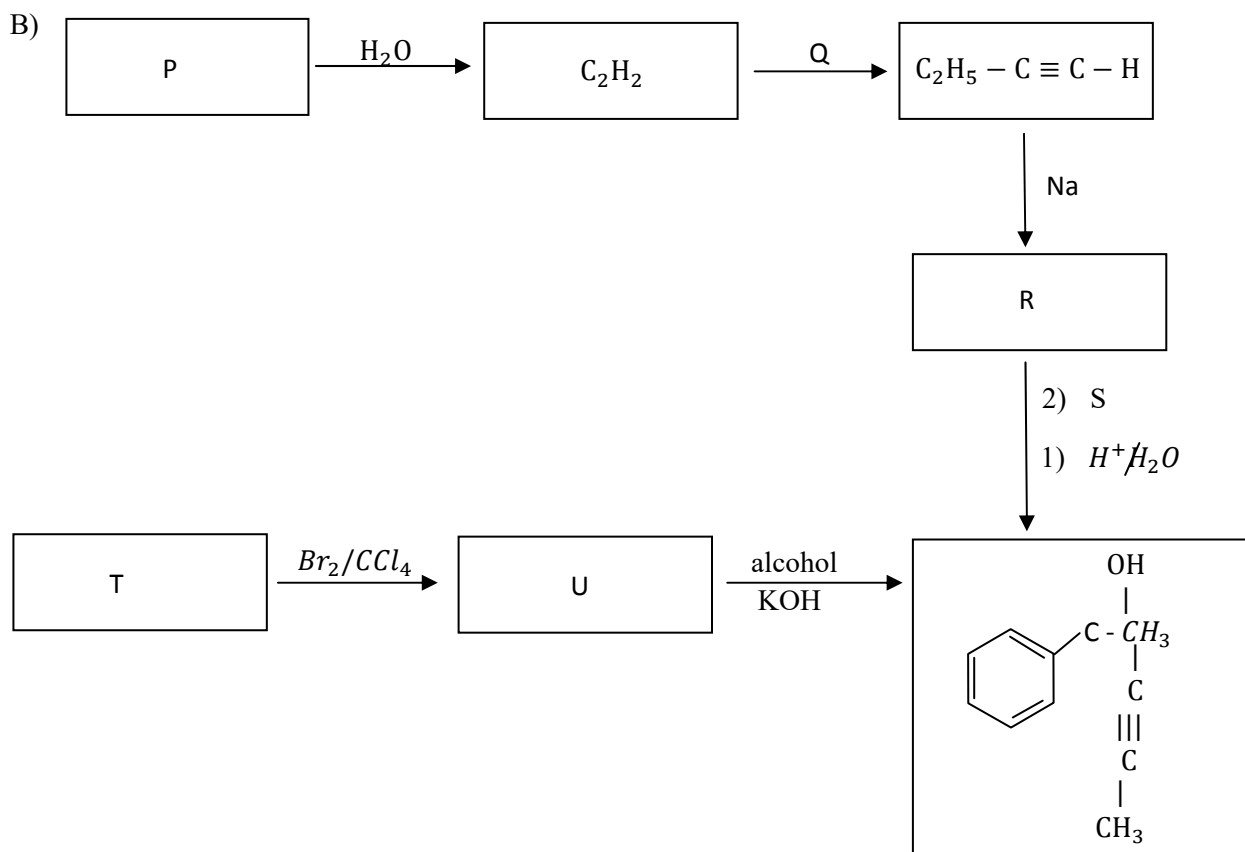
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I. In the above reaction scheme, identify the species P and Q

P - ..... Q - .....

II. Draw the structures of R, S, T and U in the relevant boxes.