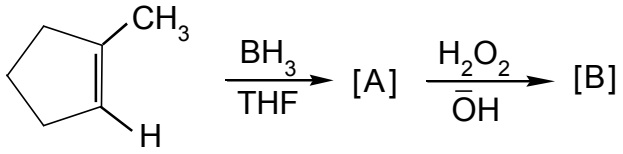
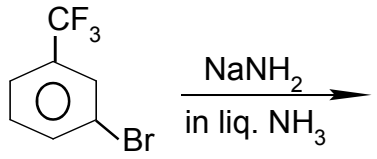
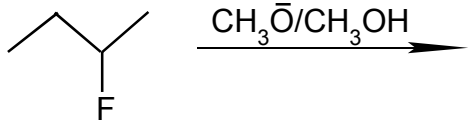
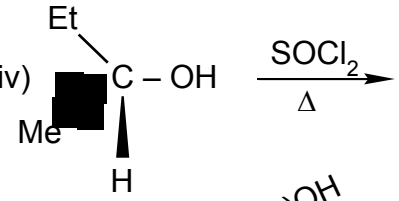
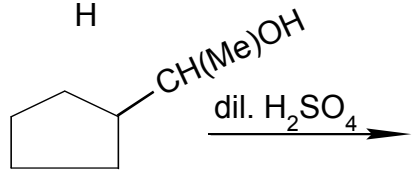
11. (a) Predict the product with plausible explanations (any ***four***) 2x4

(i) 

(ii) 

(iii) 

(iv) 

(v) 

(b) Draw the Sawhorse and Newman projection formula of threo 3-bromo-2-butanol. 4

—— X ——

Ex./PE/CHEM/T/111/2017(S)

BACHELOR OF POWER ENGINEERING EXAMINATION, 2017

(1st Year, 1st Semester, Supplementary)

Chemical Science

Time : Three hours Full Marks : 100

Use separate Answer Script for each part.

PART - I (50 marks)

Answer ***all*** questions.

1. State the fundamental postulates of kinetic theory of gas. Which of them do you think incorrect and why ? 4+3

2. Name two methods, one relative and one absolute method, for the determination of coefficient of viscosity of a liquid. Describe how we can determine the coefficient of viscosity of a liquid by any one of them. 2+6

3. Explain why does water rise in a capillary tube. Arrive at a mathematical relation for the determination of surface tension from this point of view. 3+4

4. Define equivalent conductance of a solution. On what factors does it depend ? How and why do the equivalent conductances of a strong and a weak electrolyte vary with concentration ? 2+3+8

5. During the conductometric titration, conductance of the solution is plotted against the volume of the liquid that is being added.–Why do we not plot resistance of the solution vs. the volume of the added liquid ? Predict and draw the conductometric titration curve during the titration of KCl (taken in the beaker) against $AgNO_3$. 3+4

6. Explain the electrolytic conduction of a solution in the light of Arhenius's theory. What do you mean by strong and weak electrolytes ? 5+3

PART - B (50 marks)

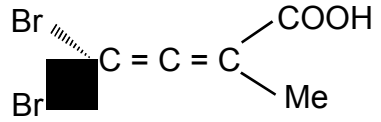
Answer ***all*** questions.

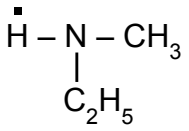
7. (a) Draw the orbital picture of the following compound $CH_3 - C \equiv N$ or $CH_2 = C = O$. 2

   (b) Which one is more stable in each of the following pairs, explain.

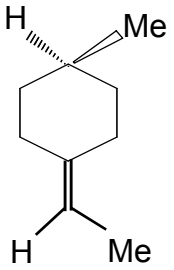
   (i)  and $MeCH = CH - \overset{\oplus}{C}H_2$

   (e) Which of the following compound is expected to be chiral and why ? 2





and



10. (a) What do you mean by the term 'conformation' ? Draw the conformational energy profile diagram of *n*-propane arising from the rotation of $C_2 - C_3$ bond and label the conformer/s. 1+2+1

    (b) What is Saytzeff's rule. Explain with a suitable example. 2

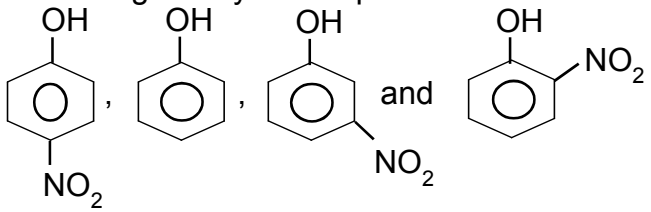
    (c) Differentiate the following pairs (any ***two***) 2x2

    (i) Enantiomer and diastereomer.

    (ii) Plane of symmetry and centre of symmetry.

    (iii) Tautomer and metamer.

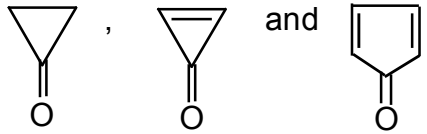
9. (a) Arrange the following compounds in order of their increasing acidity with explanation. 2



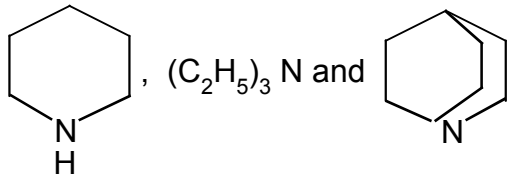
(b) Arrange the following in increasing order of nucleophilicity with explanation. 2

$\overset{\ominus}{O}AC$, $\overset{\ominus}{O}Me$, $\overset{\ominus}{O}H$, $\overset{\ominus}{O}Ph$

(c) Arrange the following in increasing order of dipolemoment. 2



(d) Arrange the following in increasing order of basicity and explain. 2



(ii) $MeCH_2 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}} = CH - CH_3$ and $\begin{matrix} Me \\ \diagup \\ \diagdown \\ Me \end{matrix} C = CH - CH_3$

(iii) $F_3\overset{\ominus}{C}$ and $H_3\overset{\ominus}{C}$ 2x3

8. (a) Explain the following observations (any ***two***) 2x2

(i) Bond energy of C = C is less than twice that of C – C bond, whereas the bond energy of C = O is greater than twice that of C – O bond.

(ii) Chlorobenzene does not give a precipitate with aqueous alcoholic silver nitrate but albye chloride does.

(iii) The boiling point of *n*-pentane is greater than that of neo-pentane.

(b) Draw the energy diagram and write the rate expression, order and molecularity of the following reaction.

$$CH_3CH_2CH_2Br + NaCN \xrightarrow{DMF} CH_3CH_2CH_2CN + NaBr.$$ 4

(c) Write the major differences between SN1 and SN2 pathways. 2