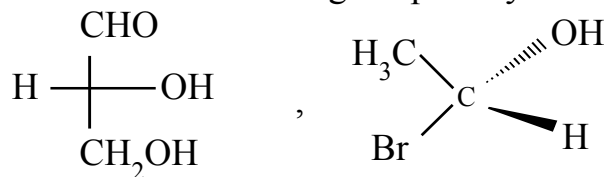


(6)

10. (a) Assign the R/S descriptor for the following molecules mentioning the priority order 2



- (b) How do you carry out the following transformation.

(i) Benzene \longrightarrow 2,4,6-Tribromophenol

(ii) Nitrobenzene \longrightarrow benzoic acid. 2x2=4

- (c) Discuss the mechanism of nitration of nitrobenzene with mixed acid. Predict the product and justify your answer. 4

— X —

Ex./PE/CHEM/T/111/2019(OLD)

BACHELOR OF POWER ENGINEERING EXAMINATION, 2019
(1st Year, 1st Semester, Old Syllabus)

Chemical Sciences

Time : Three hour

Full Marks : 100

Use a 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. (a) Justify Boyle's law from the PV equation derived from the postulates of kinetic theory of gases.
(b) "van der Waal's gas constants "a" and "b" are system specific" – Justify or criticize. 4+5
3. Name a relative method of determination of the coefficient of viscosity and an absolute method for the determination of surface tension of a liquid. Describe how we can determine the coefficient of viscosity of a liquid by any one method of your choice. 2+6

(Turn over)

(2)

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. (a) During conductometric titration concentration of the solution added from the burette is kept much higher than the concentration of the solution taken in the beaker – why?
- (b) Draw and explain the curve for conductometric titration of NaOH solution with acetic acid solution, the latter being added from the burette.
- (c) Describe how transport numbers of ions on HCl solution are determined using moving boundary method. 3+5+5

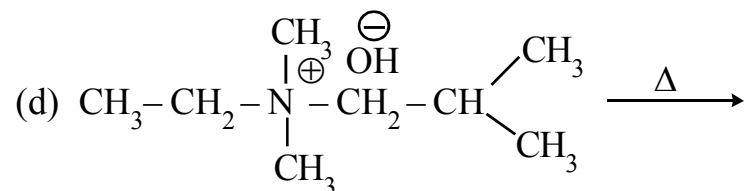
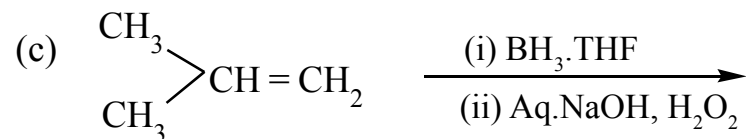
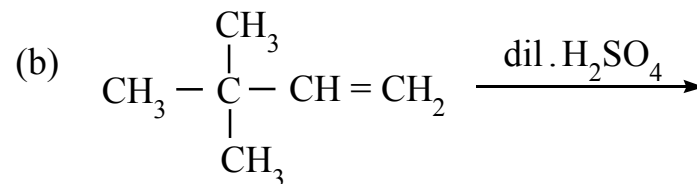
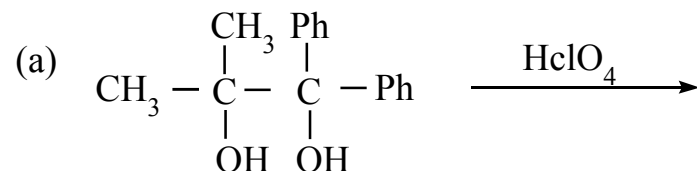
PART - II (50 marks)

Answer *all* questions.

6. (a) Draw the orbital picture of the following molecules indicating the state of hybridisation of each carbon atom.
- (i) $\text{CH}_3 - \text{CH} = \text{C} = \text{CH}_2$
- (ii) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH} = \text{O}$ 2x2=4

(5)

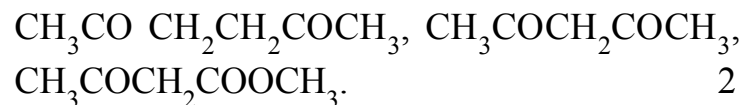
9. Predict the product(s) of the following reactions and explain with mechanism. 4x2¹/₂=10



(Turn over)

(4)

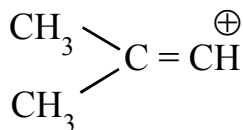
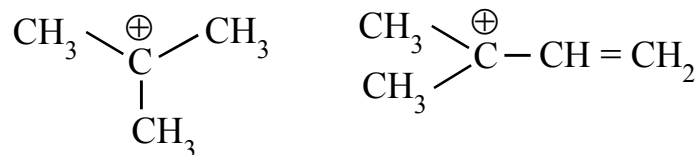
- (d) Arrange the following compounds in order of increasing enol content. Justify your answer.



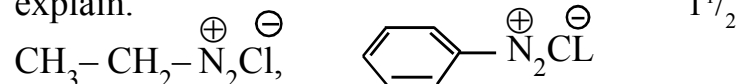
8. (a) Draw the Fischer projection of the *meso* isomer of $\text{CH}_3\text{CH}(\text{Br})\text{CH}(\text{Br})\text{CH}_3$. Convert this to the corresponding Newman and Sawhorse projection formula.

- (b) What is "steric inhibition of resonance" – explain with proper example.

- (c) Arrange the following carbocations in order of stability and explain.



- (d) Compare the stabilities of the following species – explain.



(3)

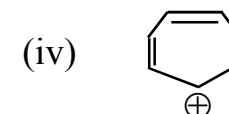
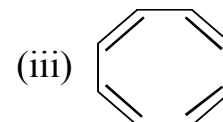
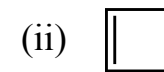
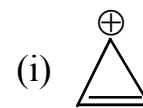
- (b) Arrange the following molecules in order of increasing acidity and explain.



- (c) Which of the following compounds have higher dipole moment and explain



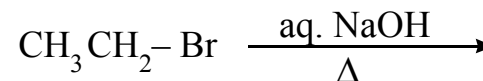
- (d) Classify the following compounds as aromatic, anti aromatic and non-aromatic and justify your answer.



7. (a) Draw the conformational energy diagram of n-butane along C_2-C_3 bond. Show all the conformations and comment on the stability.

- (b) O-Nitrophenol is steam volatile but the P-isomer is not – explain.

- (c) Discuss the mechanism of the following reaction and draw the energy profile diagram



(Turn over)