

d) Write electronic configuration of the following elements.

i) Ti ii) Z_x^{2+} iii) Co iv) Cu^+ 2

e) Calculate the second Ionization Potential of Helium (Given I.P.

for hydrogen = 13.6 eV). $2\frac{1}{2}$

FIRST B. SC. EXAMINATION, 2018

(1st Semester, Old Syllabus)

CHEMISTRY (SUBSIDIARY)

PAPER - IS

Time : Two hours

Full Marks : 50

Use a separate answerscript for each group.

GROUP - A

1. a) Indicate the Kinetic theory postulates that must be modified to explain the behavior of real gas. 2
- b) What do you mean by the distribution of molecular speed? Write down without derivation, Maxwell's expression for this. Draw schematically the one dimensional speed distribution plot for an ideal gas at two different temperatures. What specific type of distribution is it? 1+1+1+1
- c) What are critical constants (P_c , V_c , T_c) of a gas ? How are they related with the constants 'a' and 'b' of a Van der Waal's gas ? 3+3

[Turn over

[2]

- d) Explain continuity of states with the help of isotherm of a real gas. 2
- e) Define Boyle temperature (T_B) for a real gas. Calculate the value of T_B (in Kelvin) for hydrogen gas

[Given $a = 0.245 \text{ atm L}^2\text{mol}^{-2}$, $b = 26.7 \times 10^{-3} \text{ L Mol}^{-1}$]. 1+2

[5]

GROUP - C

3. a) Write a short note on anomalous Zeeman effect. 4
- b) Find the ground state term symbols for ${}_5B$ or ${}_{15}P$. 2
- c) Find all the possible Terms for p^2 system. 4
- d) Calculate the wave length of the 5th line in the Paschen series of Li^{2+} spectrum. 2
- e) Calculate the exchange energy for d^4 and d^5 configuration and hence comment on their stability. 2
- f) Calculate the radius of O^{7+} ion using Bohr's theory. 2

OR

- a) Determine the ground state term for a d^8 configuration. $2\frac{1}{2}$
- b) Write down Schrödinger's wave equation. How we can arrive Schrödinger's wave equation from the fundamental equation representing a standing wave. What is the physical significance of ψ ? 1+4+1
- c) Calculate the velocity of the Hydrogen electron in the 1st and 2nd Bohr orbit. 3

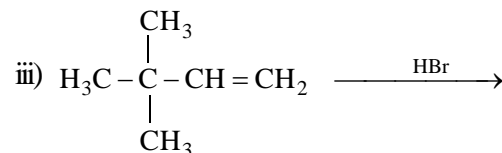
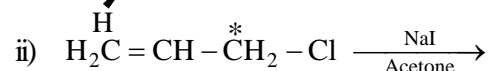
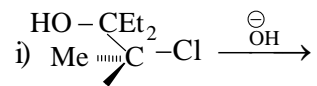
[Turn over

[4]

- c) Compare the rate of S_N2 reaction of the following alkyl bromides with EtO^- at a particular temperature.



- d) Predict the product(s) of the following reactions with plausible mechanism. Attempt **any two** of the following questions. 2×2



[3]

GROUP - B

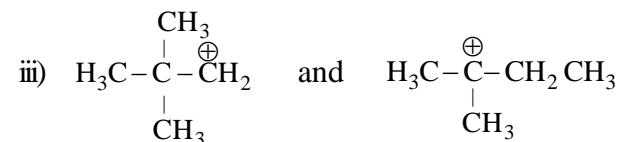
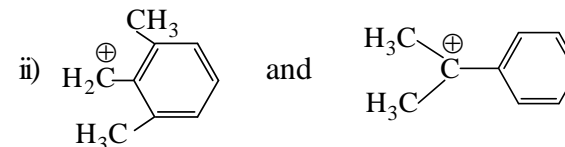
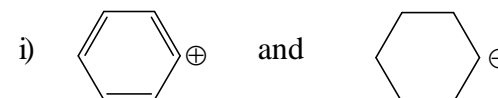
2. a) Answer **any two** of the following questions : $2 \frac{1}{2} \times 2$

i) CH_3Cl has larger dipole moment than CH_3F although F is more electronegative than Cl – Explain with proper reasons.

ii) Compare the acidic character of o, m - and p - nitrophenol with proper justification.

iii) Cis-butenedioic (maleic) acid is a much stronger acid than its trans isomer (fumaric acid) in first dissociation – Explain with proper reasons.

- b) Comment on the relative stabilities of the following pairs of carbocations (answer **any two**) $2 \frac{1}{2} \times 2$



[Turn over