B.Tech.
EVEN SEMESTER
Minor Test 2017-2018
Engineering Chemistry

Time: 2 hrs. **Max. Marks: 20**

Note: Attempt all questions.

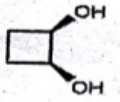
Q.1 Attempt any three of the following. Q. 1(a) is compulsory.

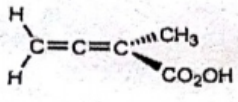
(a) With the help of molecular orbital diagram, calculate the bond order and explain the magnetic behavior of the following:
NO, CO, HF, He^{2+}, N_2, and N_2^-

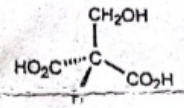
(b) Write short note on fullerenes, indicating the method of preparation, properties and their applications. (2)

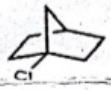
(c) i) What are inductive, mesomeric and hyperconjugative effects? Explain with examples. (2)
ii) Differentiate between SN^1 and SN^2 reactions.

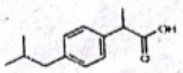
(d) i) Which of the following molecules is chiral? (2)

a) 

b) 

c) 

d) 

e) 

ii) Which of the following carbonium ion is most stable
$(CH_3)_3C^+$, $(CH_3)_2HC^+$ and $CH_3H_2C^+$
Justify your answer in terms of +I and hyperconjugative effect.

Q.2 Attempt any two of the following. Q. 2(a) is compulsory.

(a) i) State the phase rule and explain the terms involved in it. (4)

ii) Draw a neat labelled phase diagram of water system and explain areas, curves and triple point in it.

iii) Find the number of degrees of freedom in following systems. Name the variables that could correspond to these degrees of freedom.

a) Water (liquid) $\rightleftharpoons$ Water vapour
b) Water (liquid) $\rightleftharpoons$ Water vapour at 1 atmosphere pressure

(b) Derive Bragg's equation for diffraction of X-rays by crystal. In Bragg's reflection of X-ray, a reflection was found at 30° with lattice plane of spacing 1.87Å. If this is a second order reflection. Calculate the wavelength of X-rays. (2)

(c) i) Gold crystallizes into an FCC structure. The edge length of the FCC unit cell is 4.07 Calculate the density of gold if its atomic weight is 197 (2)
ii) Name different liquid crystalline phases. Which type of molecules give rise to cholesteric liquid phase?

Q. 3 Attempt any two of the following. Q. 3(a) is compulsory.

(a) Write the mechanism of any two of the following:
i) Beckmann rearrangement ii) Diels-Alder reaction iii) Cannizzaro reaction.

(b) What are different types of organic reactions? Explain them with one example each.

(c) i) Classify the following as electrophiles and nucleophiles
a) CN^- b) H_2O c) Br^+ d) NH_3 e) ROH f) RNH_2 g) S^+O_3H h) $AlCl_3$ i) BF_3
ii) Describe E and Z notations with example.