

Time: 2 hours

Maximum marks: 60

NB:

- 1) Question No.1 is Compulsory
- 2) Attempt any Three questions from the remaining Five questions
- 3) Figures to the right indicate full marks
- 4) Atomic weight: Ca = 40, Mg = 24, S = 32, Cl = 35.5, C = 12, H = 1, O = 16, Na = 23.

Q.1 Attempt any **five** of the following: (15)

- a) Compare temporary and permanent hardness (any 3 points).
- b) At room temperature,  $H_2O$  is liquid and  $H_2S$  is a gas. Justify.
- c) Comment on glass transition temperature ( $T_g$ ).
- d) Give difference between bonding and antibonding orbitals.
- e) Identify how many phase/s are present in each of the following systems;
  - 1) Mixture of  $N_2$ ,  $H_2$  and  $O_2$
  - 2) Mixture of rhombic and monoclinic Sulphur
  - 3) Ethanol and water
- f) Explain drawbacks of Kekule's Benzene structure.
- g) Calculate COD of 25 ml of waste water sample in ppm which was refluxed with 10 ml of  $K_2Cr_2O_7$  and after refluxing the excess unreacted dichromate required 6.5 ml of 0.1N FAS solution. A blank of 25 ml of distilled water on refluxing with 10 ml of  $K_2Cr_2O_7$  solution required 27 ml of 0.1N FAS solution.

Q.2) a) Apply Gibb's phase rule to one-component (Water) system. (6)  
b) Explain reverse osmosis with the help of principle, process, and diagram. Also give its advantages. (5)  
c) Discuss the roles of plasticizer and lubricant in compounding of plastics. (4)

Q.3) a) Draw the Molecular Orbital diagram of CO molecule. Give its electronic configuration. Calculate its bond order and identify its magnetic behaviour. (6)  
b) What is hydrogen bonding? Explain its types with examples. (5)  
c) Calculate number average molecular weight of polymer which has 5 molecules of molecular weight of 10000, 3 molecules of molecular weight 30000 and 2 molecules of molecular weight 60000. (4)

