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**A Reg. No. :**

**Question Paper Code: 51004**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

First Semester

Mechanical Engineering

15UCY104 - ENGINEERING CHEMISTRY

(Common to Chemical Engineering)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 1. | According to Fajan's rule, the increasing order of covalent character for Licl,Nacl,Kcl, and Cscl is | | | | | | | | | | | | | CO1- R | |
|  | (a) Licl > Nacl > Kcl >Cscl | | | | | | | | | (b) Licl > Kcl > Cscl > Kcl | | | | | |
|  | (c) Cscl > Nacl > Kcl >Licl | | | | | | | | | (d) Nacl > Kcl > Licl >Cscl | | | | | |
| 2. | The bond energy is expressed in | | | | | | | | | | | | | CO1- R | |
|  | (a) k cal.mol | | | | | (b) k cal.mol-1 | | | | (c) J.mol | | | | (d) kcal kg-1 | |
| 3. | Driving force is infinitesimally greater than opposing force in | | | | | | | | | | | | | CO2- R | |
|  | (a) Reversible cell | | | | | | | | | (b) Irreversible cell | | | | | |
|  | (c) Solar cell | | | | | | | | | (d) Anodic cell | | | | | |
| 4. | Pitting corrosion is an example for | | | | | | | | | | | | CO2- R | | |
|  | (a) Dry corrosion | | | | | | | | | (b) Corrosion by H2 | | | | | |
|  | (c) Differential aeration corrosion | | | | | | | | | (d) Corrosion by CO2 | | | | | |
| 5. | All spontaneous process are accompanied by \_\_\_\_\_\_\_\_in entropy. | | | | | | | | | | | CO3- R | | | |
|  | (a) Decrease | | | (b) Increase | | | | (c) Same | | | (d) No change | | | | |
| 6. | Entropy change in reversible process ΔS total | | | | | | | | | | CO3- R | | | | |
|  | (a) 0 | | | (b) 1 | | | | (c) P | | | (d) PV | | | | |
| 7. | Producer gas is a mixture of | | | | | | | | | | CO4- R | | | | |
|  | (a) CO& N2 | | | (b) CO2 & O2 | | | | | (c) CO2 & H2 | | (d) CO2 & H2 | | | | |
| 8. | The catalyst employed in Bergius process is | | | | | | | | | | CO4- R | | | | |
|  | (a) Zinc oleate | | | (b) Tin oleate | | | | | (c) Lead oleate | | (d) Magnesia | | | | |
| 9. | Brass alloy containing mainly | | | | | | | | | | CO5-App | | | | |
|  | (a) Cu and Zn | | | | (b) Cu and Sn | | | | (c) Zn and Pb | | (d) Cu and Fe | | | | |
| 10. | Metal matrix composite consist of a matrix phase of metal and \_\_\_\_\_\_\_\_in composites. | | | | | | | | | | CO5- R | | | | |
|  | (a) Ceramic | | (b) Glass | | | | (c) Plastic | | | | (d) Rubber | | | | |
|  | PART – B (5 x 2= 10 Marks) | | | | | | | | | | | | | | |
| 11. | what is meant by bond order? CO1-App | | | | | | | | | | | | | | |
| 12. | Tell the functions of pigment in paint. CO2 -R | | | | | | | | | | | | | | |
| 13. | State reduced phase rule. CO3 -U | | | | | | | | | | | | | | |
| 14. | What is calorific value of a fuel? CO4 -U | | | | | | | | | | | | | | |
| 15. | What is Nichrome? Write the composition of Nichrome. CO5 -U | | | | | | | | | | | | | | |
|  | PART – C (5 x 16= 80 Marks) | | | | | | | | | | | | | | |
| 16. | (a) | (i) What is Aufbau principle? Explain the order of filling of  orbitals with a neat diagram. | | | | | | | | | | | | CO1-U | (8) |
|  |  | (ii) Explain the determination of lattice energy with the help of  Bor-Haber cycle. | | | | | | | | | | | | CO1-U | (8) |
|  |  | Or | | | | | | | | | | | |  |  |
|  | (b) | (i) Examine the shape of any one diatomic molecule based on  M.O theory. | | | | | | | | | | | | CO1 -App | (10) |
|  |  | (ii) Show what do you understand by hybridization. Demonstrate  the hybridized structure of methane molecule. | | | | | | | | | | | | CO1 -App | (6) |
|  |  |  | | | | | | | | | | | |  |  |
| 17. | (a) | (i) Derive the Nernst equation for electrode potential. | | | | | | | | | | | | CO2 -App | (8) |
|  |  | (ii) What are the main objective of electroplating. Give an  account of the method used in electroplating of gold. | | | | | | | | | | | | CO2-U | (8) |
|  |  | Or | | | | | | | | | | | |  |  |
|  | (b) | (i) What is paint? What are the consistents and functions of  paints. | | | | | | | | | | | | CO2-App | (10) |
|  |  | (ii) Describe the mechanism of differential aeration corrosion  with neat diagram. | | | | | | | | | | | | CO2-U | (6) |
|  |  |  | | | | | | | | | | | |  |  |
| 18. | (a) | (i) Derive any two Maxwell's relations. | | | | | | | | | | | | CO3 -Ana | (8) |
|  |  | (ii) Explain the phase diagram for one component water system. | | | | | | | | | | | | CO3 -Ana | (8) |
|  |  | Or | | | | | | | | | | | |  |  |
|  | (b) | (i) Derive Gibbs-Helmholtz equation and discuss its  applications. | | | | | | | | | | | | CO3- Ana | (10) |
|  |  | (ii) Explain the entropy change in a irreversible process. | | | | | | | | | | | | CO3- Ana | (6) |
|  |  |  | | | | | | | | | | | |  |  |
| 19. | (a) | (i) How is synthetic petrol obtained by Fischer Tropsch  process.? | | | | | | | | | | | | CO4- U | (8) |
|  |  | (ii) Explain flue gas analysis by orsat's apparatus. | | | | | | | | | | | | CO4- U | (8) |
|  |  | Or | | | | | | | | | | | |  |  |
|  | (b) | (i) Predict the Otto-Hoffmann’s method of manufacturing coke  from coal. | | | | | | | | | | | | CO4- Ana | (10) |
|  |  | (ii) Demonstrate the various steps involved in production of  producer gas along with its uses. | | | | | | | | | | | | CO4- App | (6) |
|  |  |  | | | | | | | | | | | |  |  |
| 20. | (a) | (i) What are composites? Explain the various constituents of it? | | | | | | | | | | | | CO5- U | (8) |
|  |  | (ii) Write the composition and uses of Brass and Bronze alloys. | | | | | | | | | | | | CO5- U | (8) |
|  |  | Or | | | | | | | | | | | |  |  |
|  | (b) | (i) What is the objective of heat treatment of alloys? Explain  their types. | | | | | | | | | | | | CO5- U | (8) |
|  |  | (ii) Write short notes on  a) Metal matrix composites and  b) Ceramic matrix composites | | | | | | | | | | | | CO5- U | (8) |