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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) |