**MET-304-METALLURGICAL THERMODYNAMICS (C-14)**

**D.MET.E-III SEMESTER**

**BIFURCATION FOR UNIT TESTS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.No.** | **MAJOR TOPICS** | **WEIGHTAGE OF MARKS** | **SHORT TYPE** | **ESSAY TYPE** |
| **UNIT TEST-I** | | | | |
| 1. | Introduction and application of thermodynamics | 13 | 1 |  |
| 2. | First law of thermodynamics | 18 | 1 | 1 |
| 3. | Thermo-chemistry | 16 |  | 1 |
| 4. | Second law of thermodynamics | 18 | 1 | 1 |
| **UNIT TEST-I** | | | | |
| 5. | Ellingham diagrams | 06 | 1 |  |
| 6. | Phase Equilibria | 13 | 1 | 1 |
| 7. | Fugacity,Activity,Equilibrium constant, | 13 | 1 | 1 |
| 8. | Solutions | 13 |  | 1 |

**D.MET.E-III SEMESTER**

**MET-304-METALLURGICAL THERMODYNAMICS (C-14)**

**UNIT TEST-I**

**MODEL PAPER-I**

**PART-A 3X2=6 MARKS**

***Note : Answer all questions and each question carries 2 marks***

1. Define system and surroundings
2. State first law of thermodynamics
3. Define entropy change and phase change

**PART-B 2X7=14 MARKS**

***Note : Answer any two of the following questions and each question carries 7 marks***

1. Derive the relation between Cp and Cv
2. Explain variation of heat of reaction with temperature and derive the Kirchoff’s equation..
3. Derive equation for variation of entropy with temperature

**D.MET.E-III SEMESTER**

**MET-304-METALLURGICAL THERMODYNAMICS (C-14)**

**UNIT TEST-I**

**MODEL PAPER-II**

**PART-A 3\*2=6**

***Note : Answer all questions and each question carries 2 marks***

1. Differentiate between homogeneous system and hetrogeneous system
2. Define heat capacity
3. State the Second law of thermodynamics

**PART-B 2\*7=14**

***Note : Answer any two of the following questions and each question carries 7 marks***

1. Calculate the pressure – volume work done when a system containing a gas expands from 1 lit to 2 lit against a constant external pressure of 12 atm. Express the answer in cal and joules
2. State the thermo-chemical laws

(a) Laplace Law.

(b) Hess law of constant heat summation.

1. Derive the Gibbs – Helmholtz Equation

**D.MET.E-III SEMESTER**

**MET-304-METALLURGICAL THERMODYNAMICS (C-14)**

**UNIT TEST-II**

**MODEL PAPER-I**

**PART-A 3\*2=6**

***Note : Answer all questions and each question carries 2 marks***

1. State the applications of ΔGo – T diagram
2. State the CLAPEYRON equation for solid-liquid equilibrium
3. Define fugacity and activity

**PART-B 2\*7=14**

***Note : Answer any two of the following questions and each question carries 7 marks***

1. Derive the CLASIUS CLAPEYRON equation
2. Explain the factors effecting the position of equilibrium
3. (a) Classify Solutions

(b) State the factors causing deviation from ideal behavior

**D.MET.E-III SEMESTER**

**MET-304-METALLURGICAL THERMODYNAMICS (C-14)**

**UNIT TEST-II**

**MODEL PAPER-II**

**PART-A 3\*2=6**

***Note : Answer all questions and each question carries 2 marks***

1. State the limitations of ΔGo – T diagrams.
2. State Trouton’s rule.
3. Define equilibrium constant and give its mathematical formula

**PART-B 2\*7=14**

***Note : Answer any two of the following questions and each question carries 7 marks***

1. Derive the CLAPEYRON equation
2. Derive the VANTHOFF’s equation for isothermal process
3. (a) Define Solution, Mole Fraction

(b) State Sieverts law and its applications

**MODEL PAPER – I** C-14-MET-304

**BOARD DIPLOMA EXAMINATIONS**

**D.MET.E-III SEMESTER EXAMINATIONS**

**METALLURGICAL THERMODYNAMICS**

Time : 3 Hours Total Marks :80

**PART – A** 10 × 3 = 30

***Instructions***  : (1) Answer any ***five*** questions and each question carries

***twelve*** marks

(2) The answer should be brief and straight to the point

and shall not exceed ***five*** simple sentences∆∆

1. Define system, surrounding & boundary

2. State first law of thermodynamics

3. Define heat of reaction and heat formation

4. State laplace law

5. What are the conditions for equilibrium in terms of change in free energy?

6.What are the applications of ∆G0- T diagram-

7. Draw the Ellingham Diagram for CO and CO2 Formation

8. State Troutans rule

9. Define Fugacity,Activity and Equilibirium constant

10.State Roults law for ideal solutions

**PART – B** 5 × 10 = 50

***Instructions***  : (1) Answer ***all*** questions and each question carries

***three*** marks

(2) The answers should be comprehensive and the

criteria for valuation is the content but not the

length of the answer

11. Explain the terms of heat and work with its units and give its sign conversations

12. Derive the temperature and volume relationship for reversible adiabatic process

13. Calculate the standard heat of formation of B2O3 in terms of per mole of B2O3 and per g of B2O3. Atomic weights of B and O are 10.82 and 16.0 respectively

The enthalpy changes for the following reactions are as follows :

2B+3H2+3O2 2H3BO ΔH0298= -512.8K.cal

B2O3+3H2O 2H3BO3 ΔH0298= -4.12K.cal

H2+1/2 O2 H2O ΔH0298= -68.73K.cal

14. Derive the Gibbs – Helmholtz Equation.

15. (a) Explain energy content and energy changes

(b) State the entropy changes in reversible and irreversible processes

16. Melting point of cadmium at a pressure of 101,325 N/m2  3210C and its heat of fusion is 57.15 X 103 J/kg. The volume change in the melting of cadmium is +0.0064 x10-3 m3/kg. Calculate the melting point of cadmium at 202650 N/m2

17. Derive the VANTHOFF’s equation for isothermal process

18. (a) Classify the solutions

(b) What are the factors causes for deviation from ideal behavior of solutions

**MODEL PAPER – II**  C-14-MET-304

**BOARD DIPLOMA EXAMINATIONS**

**D.MET.E-III SEMESTER EXAMINATIONS**

**METALLURGICAL THERMODYNAMICS**

Time : 3 Hours Total Marks :80

**PART – A** 10 × 3 = 30

***Instructions***  : (1) Answer any ***five*** questions and each question carries

***twelve*** marks

(2) The answer should be brief and straight to the point

and shall not exceed ***five*** simple sentences

1. Distinguish homogeneous system and heterogeneous system

2. Define heat capacity at constant volume and constant pressure

3. Define exothermic reaction and endothermic reaction

4. State Hess law of constant heat summation

5. State second law of thermodynamics

6. What are the limitations of ∆G0- T diagram-

7. Draw the Ellingham diagram in Terms of Formation of Al2O3, ZnO

8. State the equation for solid-liquid equilibrium

9. Give the mathematical formula for equilibrium constant

10.State Henrys law

**PART – B** 5 × 10 = 50

***Instructions***  : (1) Answer ***all*** questions and each question carries

***three*** marks

(2) The answers should be comprehensive and the

criteria for valuation is the content but not the

length of the answer

11. Explain about pressure – volume work expansion and derive the equation for it.

12. Derive the relation between Cp and Cv

13. Derive the Kirchoff’s equation..

14. Derive the equation for entropy change with teparature

15. (a) Define Enthalpy and derive an expression for it.

(b) The standard free energy change for the reaction Cu2O + ½ O2 = 2CuO is given as

∆G0 = - 34950 – 6.1 T log T + 44.3T

Calculate the enthalpy change at 9000C

16. Derive the CLASIUS CLAPEYRON equation and explain its applications.

17. Calculate the equilibrium constant for the following reaction at 12000C :

ZrO2 = Zr + O2 ; ΔG0=259940+4.33TlogT-59.12T

Also state the possibility of decomposing a pure zirconia crucible under a vaccum of 10-5mm of Hg at that temperature

18. (a) State Sieverts law and its applications.