***Phase Equilibrium***

1. The mathematical expression for Gibbs phase rule is

(i) F = C -P + 1 (ii) F = C -P + 2

(iii) F -P = C + 1 (iv) F = P -C + 1

2. The reduced phase rule, F = C -P + 1 is applicable to

(i) One component systems (ii) Two component systems

(iii) One and three component system (iv) All types of systems

3. The number of phases present in the system MgCO3(s) →MgO (s) + CO2(g), are

(i) 3 (ii) 2 (iii) 1 (iv) 4

4. At the equilibrium state: Ice(s) Water(l) Water (g), the number of phases present will be

(i) 1 (ii) 2 (iii) 3 (iv) 4

5. Super cooled water is an application of

(i) Melting point

(ii) Triple point

(iii) Metastable curve

(iv) Critical Temperature

6. The freezing mixture temperature in KI-H2O system is

(i) –3°C (ii) –13°C (iii) –23°C (iv) –33°C

7. Condensed Phase Rule is

(i) F=C-P+1 (ii) F=C+P-2 (iii) F=C-P+2 (iv) F=C+P-1

8. Metastable Equilibrium is applicable for water system at

(i) 20°C (ii) 100°C (iii) 0°C (iv) 373°C

9. Number of phases in emulsion of oil and water is

(i) 1 (ii) 2 (iii) 3 (iv) 4

10. Degree of freedom for triple point of water is

(i) 0 (ii) 1 (iii) 2 (iv) 3

11. Number of phases for a solution of NaCl completely dissolved in water is

(i) 1 (ii) 2 (iii) 3 (iv) 4

12. Highest melting point at which solid and liquid phases have same composition is

(i) Eutectic point (ii) Congruent point (iii) Triple point (iv) Eutectoid point

13. The maximum solubility of C in alpha ferrite at 723 is

(i) 0.08% (ii) 0.7% (iii) 1.2% (iv) 0.23%

14. The alpha iron transforms to gamma iron (austenite) at

(i) 723 (ii) 910 (iii) 1123 (iv) 1527

15. α-Iron (FERRITE) shows magnetic behavior below the temperature

(i) 768 (ii) 1123 (iii) 1050 (iv) 1130

16.Cementite is an intermetallic, hard compound which contains carbon % by weight is

(i) 0.08% (ii) 6.67% (iii) 1.2% (iv) 4.3%

17. In the Fe-C phase digram, the temperature at eutectic point remains

(i)723°C (ii) 910°C (iii) 1130°C (iv) 1403°C

18.The percentage of carbon in steels remains below

(i) 2.1% (ii) 3.7% (iii) 4.7 % (iv) 6.7%

19. Steel with layered mixture of ferrite and cementite with 0.83% C is called

(i) Pearlite (ii) ledeburite (iii) cementite (iv) austenite

20.The system which represents a 7 phase condensed system is

1. Ferric chloride water system
2. KI-Water system
3. Fe-C system
4. Carbon dioxide system

21.The phase digram of ferric chloride water system could be split into

1. Three typical eutectic points
2. Four special eutectic points
3. Five simple eutectic points
4. Cannot split in more than two points

22.At each eutectic point in ferric chlorie water system, the value of degree of freedom (F) remains

(i) 0 (ii) 1 (iii) 2 (iv) 3

23. Pattinson’s process is an application of

1. Pb-Ag System
2. Zn-Ag System
3. Cu-Ag System
4. KI-H2O System

24. The composition of KI and water at the eutectic point will be

1. 52 % KI and 48 % H2O
2. 48% H2O and 52% KI
3. 67% KI and 33% H2O
4. 50% KI a

25. The conditions of pressure and temperature at the triple point in CO2 system are

1. 5.2atm, -57 °C
2. 1 atm, -57 °C
3. 422 mm, 100 °C
4. 2 atm, 50 °C

26. At the critical point of water, the conditions of pressure and temp are

1. 218atm, 37.4 °C
2. 218atm, 374 °C
3. 4.58 mm, 374 °C
4. 72.8 atm, 31.1 °C

27. All the three phases can co-exist in water system provided the conditions of pressure and temperature

1. 4.58 atm, 0 °C
2. 4.58 mm, .0098 °C
3. 1 atm, -5 °C
4. 4.58mm, 0 °C

28. When NaCl is dissolved in water, the value of number of component for such a system would be

1. 2
2. 0
3. 1
4. 3

29. The degree of freedom in the area of a one component system when only liquid phase is present

1. 0
2. 1
3. 2
4. 3

30. Eutectic product in Fe-C system is called

(a) Pearlite (b) Bainite (c) Ledeburite (d) Spheroidite

31. Eutectoid product in Fe-C system is called

(a) Pearlite (b) Bainite (c) Ledeburite (d) Spheroidite

**2–Mark questions**

***Phase Equlibria***

1. In Pb-Ag system, the equilibrium cannot be explained by normal phase rule. Give reason.

2. What is the need to reduce Gibb’s Phase rule for two component systems?

3. Calculate the number of phases and Components for the decomposition of CaCO3.

4. Calculate the number of phases, Components and degree of freedom for the NaCl-KBr-H2O system.

5.Why the four phases cannot exist at any point simultaneously in the Sulphur system?

6.. If the temperature of water goes below 0oC then is it possible that the water remain in liquid state and how?

7. The solubility curve in case of KI-H2O system is incomplete. Give reason.

***5 Marks Questions***

***Phase Equilibria***

1. Compare carbon dioxide and water systems with the help of phase diagrams.
2. Explain sulphur system with the help of suitable phase diagram.
3. The two components of the system at certain stage enter into chemical combination with one another forming stable compounds. The compounds formed may have congruent melting point or incongruent melting point. How does system of ferric chloride and water behave when added to each other? Give the complete phase diagram of the system explaining all the curves and points.
4. Explain the following with respect to Lead-Silver system giving the complete labelled phase diagram:

a. Eutectic point

b. Eutectic composition

c. Freezing curves of Lead and Silver

d. Pattison’s process for desilverization lead.

5. Explain various alloy formation in Fe-C system with help of suitable phase diagram.

6. Freezing mixtures are used to store the eatables for a long time. Draw and explain the phase diagram for the formation of freezing mixture of KI-H2O system.