10. State Raoult's law for a solution of volatile liquids.

11. What is deliquescence ? Give example.

12. Thermogravimetry is often used in conjunction with DTA. Why ?

(5×1=5 Weightage)

SECTION – C

Answer **any four** questions. **Each** carries a Weightage of **2**.

13. Explain the Amagat's method for determining critical volume of a gas.

14. The EMF of the cell formed by coupling a saturated calomel electrode ($E°red = .24V$) with a hydrogen electrode is found to be 0.45 V. Calculate the pH of the solution in the hydrogen electrode.

15. Explain electrophoretic effect.

16. Complete separation of ethanol and water by distillation of a solution of the two is not possible. Explain.

17. Sketch the labelled phase diagram of water system.

18. Discuss the basic instrumentation in uv - vis spectrophotometry.

(4×2=8 Weightage)

SECTION – D

Answer **any two** questions. **Each** carries a Weightage of **4**.

19. i) Derive the Bragg's equation.   3
    ii) State the law of constancy of interfacial angles.   1

20. i) Write the principle of potentiometric titration and mention any two advantages of the method
    ii) Derive an equation for the hydrolysis constant of a salt of strong acid and weak base.

21. What are amperometric titrations ? Mention the important applications, advantages and limitations of the method.

(2×4=8 Weightage)

IV Semester B.Sc. Degree (CCSS – Reg./Supple./Imp.)
Examination, May 2015
Complementary Course in Chemistry
4C06CHE : CHEMISTRY FOR PHYSICAL SCIENCES

Time : 3 Hours   Max. Weightage : 25

SECTION – A

Answer **all** questions. **Each** bunch of **four** questions carries a Weightage of **1**. Choose the correct option.

1. i) The van der Waals' equation for 'n' moles of a gas is

   a) $\left(p + \dfrac{an^2}{V^2}\right)(V - nb) = RT$ b) $\left(p + \dfrac{an^2}{V^2}\right)(V - nb) = nRT$

   c) $\left(p + \dfrac{an}{V^2}\right)(V - nb) = nRT$ d) $\left(p + \dfrac{an^2}{V^2}\right)(V - b) = nRT$

   ii) Which among the following gas will have the same value of most probable velocity as that of $N_{2(g)}$, at the same temperature ?

   a) CO   b) O_2

   c) NO_2 d) CH_4

   iii) Critical pressure of a gas is related to van der Waal's constants 'a' and 'b' as

   a) $Pc = {8a}/{27bR}$ b) $Pc = {a}/{27bR}$

   c) $Pc = \dfrac{a}{27b^2}$ d) $Pc = {27b^2}/{a}$

iv) A real gas behaves ideally, when
   a) the pressure is low and temp. is high
   b) the P and T are very high
   c) the P and T are low
   d) the P is high and T is low

2. i) The fourteen different ways in which similar points can be arranged in three dimensional space is called
   a) Crystal systems
   b) Miller indices
   c) Bravais lattices
   d) Space lattice

ii) The Weiss indices of plane with intercepts 2a, 4b and 3c are
   a) $\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{3}$
   b) 2, 4, 3
   c) (634)
   d) 4, 3, 6

iii) For a body centred cube, the interplanar distance ratio d100 : d110 : d111 is given by
   a) 1 : 1.414 : 0.577
   b) 1 : 0.707 : 1.154
   c) 1 : 0.707 : 0.577
   d) 1 : 0.577 : 1.414

iv) Which is not a characteristic of crystalline solids ?
   a) Sharp M.P.
   b) Even cleavage
   c) Long range order
   d) Isotropic

3. i) The electrode potential of a SHE is taken as
   a) Zero
   b) One
   c) Positive always
   d) ± 1

ii) The cell reaction taking place in the electrochemical cell Cu|Cu^{2+}||Ag$^+$|Ag is
   a) $Cu + Ag^+ \rightleftharpoons Cu^+ + Ag$
   b) $Cu + 2Ag^+ \rightleftharpoons Cu^{2+} + 2Ag$
   c) $2Ag + Cu^{2+} \rightleftharpoons 2Ag^+ \ Cu$
   d) $Cu + Ag^+ \rightleftharpoons Cu^{2+} + Ag$

iii) Which is not a characteristic of an ideal solution ?
   a) $\Delta Vmix = 0$
   b) $\Delta Hmix = 0$
   c) Forms azeotrope
   d) Obeys Raoult's law

iv) A partially miscible liquid pair among the following is
   a) CCl_4 and water
   b) Benzene and Toluene
   c) Ethanol and water
   d) Phenol and water

4. i) In solid $\rightleftharpoons$ liquid equilibria, where no gas phase is present, the phase rule can be written as
   a) $F' = C - P + 1$
   b) $F' = C - P + 2$
   c) $F' = C - P + 3$
   d) $F' = C - P$

ii) The number of components in the system

$CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$, is
   a) 3
   b) 2
   c) 1
   d) 4

iii) Which among the following is an efflorescent substance ?
   a) $CaCl_2.6H_2O$
   b) NaOH
   c) $Na_2CO_3.10H_2O$
   d) $CaCO_3$

iv) Pb – Ag system is an example of
   a) Two component system
   b) Condensed system
   c) Simple eutectic system
   d) All these

   (4×1=4 Weightage)

SECTION – B

Answer **any five** questions. **Each** carries a Weightage of **1**.

5. Calculate the temperature at which RMS velocity of $H_{2(g)}$ becomes four times that of $O_{2(g)}$ at 300 K.

6. Write any four characteristics of liquid crystalline state.

7. What are concentration cells ? Give example.

8. The dissociation constant values of equimolar solutions of Benzoic acid and Acetic acid are 6.4×10^{-5} and 1.8×10^{-5} respectively at 25°C. Compare the strength of Benzoic acid with Acetic acid.

9. Give an example each for maximum boiling azeotrope and minimum boiling azeotrope.