THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
(A Centre of Excellence)

Faculty of Applied & Health Sciences

DEPARTMENT OF MEDICAL SCIENCES

DIPLOMA IN PHARMACEUTICAL TECHNOLOLOGY
(DPT 12M)

ACH 2114: PHYSICAL CHEMISTRY

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2012
TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination
-   *Answer Booklet*
Attempt **ALL** questions in section **A** by choosing the correct answer
Attempt **ALL** question on section **B** and any **TWO** question on section **C**
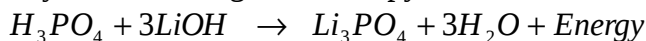This paper consists of **EIGHT** printed pages

SECTION A (COMPULSORY)

1. Which of the following statement is not consistent:
    b) Gas molecules are a apart
    c) Gas molecules have K.E
    d) Total translation energies is independent of collision
    e) Diffusion is movement of gas molecules

2. Identify nature and sign of Enthalpy for reaction
    $$H_3PO_4 + 3LiOH \rightarrow Li_3PO_4 + 3H_2O + Energy$$

    a) Endothermic, Negative
    b) Endothermic, Positive
    c) Exothermic, Negative
    d) Exothermic, Positive

3. Calculate quantity of heat required to flow into 1.5g of water to change temperature of water by $53^{\circ}C$
    (Specific heat of water = $4.184Ug.^{\circ}C$)
    a) 326
    b) 327
    c) 326.8
    d) 330

4. One mole of CH_3COONa dissolves to release -17.3kg of heat. Calculate $\overset{\Delta}{} H_s$ for 3 moles.
    a) 17.3
    b) -34.6k
    c) -51.9
    d) None of above

5. Give an equilibrium constant expression for $A_{(s)} \rightleftharpoons 2C_{(g)} + B_{(g)} + D_{(g)}$
    a) $K_C = [D] [C] [B]$
    b) $K_C = [C] [B] [D]/[A]$
    c) $K_C = [C]^2 [B] [D]$
    d) $K_C = [C]^2 [B] [D]/[A]$

Use the following value of Equilibrium constant to answer question 6, 7, 8 and 9

    a) $K_C = 1 \times 10^2$
    b) $K_C = 1 \times 10^{-8}$
    c) $K_C = 1 \times 10^8$
    d) $K_C = 1$

6. Which value of KC indicates that reaction is towards completion?

7. Which value of KC indicates that reaction is at Equilibrium balance?

8. Which value of KC indicates that reaction is far from completion?

9. Which value of KC indicates that reaction proceeds to a small extent?

10. For reaction $2NH_3 \rightleftharpoons 3H_{2(g)} + N_{2(g)}$ AH = -90kj the number of moles of H_2 can be decreased by:

   a) Increasing container size
   b) Adding NH_3
   c) Increasing Temperature
   d) Removing N_2

11. Which factor will not affect the value of equilibrium constant K_C?
   a) Volume
   b) Pressure
   c) Catalyst
   d) Temperature

12. Which pair of variables are inversely proportional to each other?
   a) P, T
   b) P, V
   c) V, T
   d) P, n

13. If solute present is less than maximum amount, solution is said to be:
   a) Saturated
   b) Supersaturated
   c) Unsaturated
   d) Concentrated

14. In a solution equilibrium.
   a) No dissolution occurs
   b) Rate of dissolution is less than rate of crystallization
   c) Rate of dissolution greater than rate of crystallization
   d) None of the above

15. The solubility of solute depends on:
   a) Nature of solute only
   b) Temperature of solvent
   c) Nature of solute and temperature
   d) Nature of solvent and temperature

16. Viscosity is proportional to:
   a) Temperature
   b) Molecular weight
   c) Pressure
   d) Nature of molecules

17. Which of the following is not an empherical gas law?

a) Charles
b) Boyles
c) Dalton
d) Avogadro's

18. What is the sign of Enthalpy of formation?

a) $DH^{+\!\!+}$

b) DH^{0}_{f}

c) DF

d) ΔH_f

19. Which unit of composition varies with temperature?
a) Molality
b) Molarity
c) Mole fraction
d) Mass percent

20. Calculate molarity of a solution that contains 0.20 mol of KCI in 7.98L solution
a) 0.0132
b) 0.0253
c) 0.459
d) 1.363

21. Colligative properties depends on:
a) Identify of solute molecules
b) Concentration of solute
c) Nature of solute
d) Physical properties

22. Which of the following is NOT a colligative properties.
a) Elevation of Boiling Point
b) Depression of Boiling Point
c) Depression of Freezing Point
d) Osmotic Pressure

23. Gases have:
a) Maximum intermolecular space
b) Maximum intermolecular attraction
c) High compressibility factor
d) Maximum Repulsion

24. Choose basic salt from the following:
a) NaCl

b) Na_2Co_3
c) $NaHSO_4$
d) $NaNO_3$

25. Which of the following is a double salt?
   a) $K\ CaPO_4$
   b) $NaCl$
   c) $NaSO_4$

26. Non-colligative properties depends on:
   a) Nature of solute
   b) Amount of solute
   c) Nature of solvent
   d) Amount of solvent

27. Which of the following in NOT a theory of osmosis
   a) Sieve theory
   b) Solution
   c) Elevation of vapour pressure
   d) Vapour pressure theory

28. Which law relates pressure and volume
   a) Charles
   b) Boyles
   c) Dalton
   d) Avogadro's

29. Which pair of variable are directly proportional to one another in ideal gas equation
   a) P,T
   b) P,V
   c) n,T
   d) R,n

30. If solute is present in small size less than one nanometer the mixture will be called.
   a) Solution
   b) Suspension
   c) Emulsion
   d) Mixture

31. Which is not a characteristic of chemical equilibrium:
   a) Rate of forward equal rate of reverse
   b) Concentration of Reactant and products are constant with time
   c) Pressure of both reactant and products are equal
   d) Reaction moves to forward and reserve at the same rate

32. Consider reaction $3A_{(s)}\ +\ B_{(s)}\ \rightleftharpoons\ 2C$ if 2 mol of A, 3.0 mols of B and 2.0 moles of C were present in 1 L vesses. Calculate the value of KC.

a) 8.0
b) 1.0
c) 2.0
d) 0.50

33. For chemical reactions $PCl_{3(g)} + Cl_{2(g)} \rightleftharpoons PCl_{5(g)}$ AH = - 92.6kg which conditions favours maximum conversion to products.
    a) High pressure and high temperature
    b) High pressure and low temperature
    c) Low pressure and low temperature
    d) Low pressure and low temperature
    e) Low pressure and high pressure

34. 25 grams of Napthelene was mixed with 75 grams of Benzane. Calculate mass percent of Benzane.
    a) 35
    b) 36
    c) 25
    d) 75

35. Calculate molality of a solution that contains 6.1 mols of KNO3 and 745grams of water.
    a) 0.315
    b) 1.02
    c) 0.779
    d) 1.14

36. The pressures of gas will _____ when volume is decreased.
    a) Increases
    b) Decreases
    c) Do not change
    d) Non of above

37. If both volume and pressure are double what would happen to temperature.
    a) Double
    b) Reduce by half
    c) Decreases
    d) Increases

38. If a solute exist in equilibrium with the solvent, the solution is defined as:
    a) Saturated
    b) Unsaturated
    c) Dilute
    d) Concentrated

39. The weakest antiparticle attraction exist between particles of

a) Liquid
b) Gas-liquid
c) Gas-gas
d) Solid-solid

40. Boyles Law requires that:
     I. $P1\ V1 = P_2P_2$
    II. PV = Constant
   III. $P1/P1 = V_2/V_1$

a) I only
b) II and I
c) III only
d) II and III

SECTION B (ATTEMPT ALL QUESTIONS – 40 MARKS)

41. 10g of Nitrogen gas and 10g of Neon were mixed in 15L contained at $25^{\circ}C$. Calculate total pressure of mixture and partial pressure of Nitrogen gas. **(4 marks)**

42. With the aid of equations state:
    a) Charles Law
    b) Boyles Law   **(4 marks)**

43. Define:
    a) Partial pressure of a gas
    b) Vapour pressure of a liquid   **(4 marks)**

44. A solution was prepared by dissolving 35.0gramms of Haemoglobin (Hb) in water and making solution up to one litre. If osmotic pressure of solution at $25^{\circ}C$ was 10mmHg, calculate molar mass of Haemoglobin LR = 0.0821 L.atm/Kelvin mol   **(4 marks)**

45. 0.55grams of Nitrobenzene in 22grams of ethanoic acid depressed the freezing point of the latter by $078^{\circ}C$. Calculate R.M.M of Nitrobenzene given cryoscopic constant as $3.90^{\circ}Cm^{-1}$ **(4 marks)**

46. Differentiate between:
    a) Isotonic and hypotonic solution
    b) Reverse osmosis and osmosis   **(4 marks)**

47. State the postulates made in kinetic theory of gases.   **(4 marks)**

48. Calculate molar gas constant R at S.T.P for one mole of a gas given pressure as 760mmHg.
                                                 (4 marks)

49. Calculate heat of combustion of liquid Benzene per mole given enthalpy of formation of CO_2, H_2O and C_6H_6 as -393.55, - 285.85 and -49.04 Kibjoules respectively.　　　　**(4 marks)**

50. (a) State equilibrium Law　　　　**(2 marks)**
    (b) Explain why gases deviate at high pressure.　　　　**(2 marks)**

SECTION C (ATTEMPT ANY TWO QUESTIONS)

51. (a) 0.6 grams of Vinyl Methyl ether C_3H_6O was dissolved in 460 grams of water and volume of solution was made to 120ML. Calculate:
    i)   Molarity of solution
    ii) Molality of solution
    iii) Mole fraction of Methyl ether
    iv) Boiling point of solution given ebuliscopic constant of water as $0.52°C$ kg/m
    v)   Vapour pressure of solution given vapour pressure of water as 23.48mmHg
    　　　　(10 marks)

    (b) Define the following terms:
    i)   Boiling point
    ii) Osmotic pressure
    iii) Enthalpy of combustion
    iv) Hydration energy　　　　**(8 marks)**

    (c) State Lechateliers Principle.　　　　**(2 marks)**

52. (a) With help of a diagram, explain the working of Berkely Hertley Apparatus.　　**(6 marks)**

    (b) State (i) Characteristic of Reversible Reaction
    　　　　(ii) Characteristic of Dynamic Equilibrium　　　　**(5 marks)**

    (c) Explain briefly theories of semi-permeable membrane.　　　　**(9 marks)**

53. (a) Define the following terms:
    i)   Order of reaction
    ii) Molecularity
    iii) Rate Constant　　　　**(6 marks)**

    (b) State:
    i)   Rate Law
    ii) Ohmic Law
    iii) Characteristic of First Order Reaction.　　　　**(6 marks)**

    (c) Derive first order rate equation and use it to calculate concentration of a reaction after 30 minutes if the initial concentration was 0.02m with rate constant of 1.8×10^2 min^{-1}　　**(8 marks)**