Technical University of Mombasa

Faculty of Applied and Health Sciences

DEPARTMENT OF **MEDICAL SCIENCES**

DIPLOMA IN PHARMACEUTICAL TECHNOLOGY
(DPT 12M)

ACH 2204 : INORGANIC CHEMISTRY

SPECIAL/SUPPLEMENTARY: EXAMINATIONS

SERIES: February 2013

TIME: 2 HOURS

INSTRUCTIONS:

You should have the following for this examination
- *Answer booklet*

This paper consists of **THREE sections A, B and C.**
Answer all questions in section **A** and **B** and choose **THREE** out of **FIVE** questions in section **C.**

*This paper consists of **8** **PRINTED** pages*

SECTION A (40MARKS)

1. When potassium chlorate is thermally decomposed the gas produced is
   a) Chlorine
   b) Hydrogen
   c) Oxygen
   d) chloroform

2. If the amount of solute present in a solution at a given temperature exists in equilibrium with the solvent, the solution is defined as.
   a) Unsaturated
   b) Super saturated
   c) Concentrated
   d) Saturated

3. The term catenation means……
   a) Joining of carbon atoms to form a chain
   b) Mixing of orbital in bonding state
   c) Mixing of molecules
   d) S and P orbitals

4. Give an equailibrium expression for the decomposition of ammonium carbonate,

   $(NH_2), CO_3(s) \rightleftharpoons 2NH_3(s) + CO_2(g) + H_2O(l)$

   a) Kc = $[NH_3][CO_2][H_2O]$
   b) Kc = $[NH_3]^2[CO_2][H_2O]$
   c) Kc = $[NH_3][CO_2][H_2O]/[NH_4]_2[CO_3]$
   d) Kc = $[NH_4{}_2][CO_3]/ [NH_3]^2[CO_2][H_2O]$

5. Which factor will not affect both the value of the equilibrium constant and the composition of equilibrium?
   a) Increasing the volume of the container
   b) Adding inert reactants
   c) Increasing pressure
   d) Raising the temperature

6. As a solid melts, the atoms become …… and they have …. Attraction for one another
   a) Closer together, more
   b) Larger, greater
   c) More separated, more
   d) More separated less

7. Which element would have higher electron affinity

a) Chlorine
b) Bromine
c) Fluorine
d) Iodine

8. When a mixture of NO and NO_2 is dissolved in NaOH, the product is
   a) $NaNO_3$
   b) $NaNO_2$
   c) $NaHNO_3$
   d) Nitroglycerol

9. When nitrate salts of alkaline metals are heated the gas evolved is
   a) NO
   b) NO_2
   c) N_2O
   d) O_2

10. The most stable oxide of nitrogen is
    a) NO
    b) No_2
    c) N_2O
    d) N_2O_5

11. Determine oxidation state of SO2
    a) +4
    b) +2
    c) +1
    d) +1 and +2

Use the information below to answer question 12-15

(a) CS_2O
(b) $FeTiO_3$
(c) Na_2O
(d) H_2O_2

12. Identify:-
13. Suboxide
14. Normal oxide
15. Peroxide

16. Which of the following is a gased
    a) SF_4
    b) N_2O_3
    c) N_2O_5
    d) CCl_4

17. Give the correct formula of Zinc blende is
    a) $ZnCO_3$
    b) ZnS
    c) $ZnSO_4$
    d) ZNd_2

18. Choose the correct statement among the following
    a) Flanine occurs as a volatile liquid
    b) Chlorine cannot expand its octet
    c) Bromine is a volatile liquid at room temperature
    d) Iodine occurs naturally as radioactive solid

19. Which among the following causes permanent hardness in water?
    a) Calcium hydrogen carbonate
    b) Magnesium hydrogen carbonate
    c) Calcium hydrogen carbonate
    d) Magnesium sulphate

20. Electrical conductivity is increased by addition of potassium during electrolysis of
    a) HG
    b) NaF
    c) CaF_2
    d) $NaCl_2$

21. Sulphur is in group
    a) 5
    b) 6
    c) 7
    d) 8

22. The only element in group 6 which cannot expand its octet is
    a) Oxygen
    b) Sulphur
    c) Selenium
    d) Tellurium

23. Which is the most electronegative element in periodic table
    a) Oxygen
    b) Flourine
    c) Sulphur
    d) Nitrogen

24. Which is most abundant gas on earth crust is
    a) Oxygen
    b) Hydrogen
    c) Nitrogen

d) Carbon(iv) oxide

25. For an isotope of argon (Z = 18), the mass number is 40. The number of neutrons in the isotope is:
a) 18
b) 40
c) 22
d) The same as in any other isotope of argon

26. Oxide ion N_3^-, is electronic with which of the following?
a) NO_2^-
b) NO_2
c) CO_2
d) SO_2
e) O_3

27. The reaction of nitrogen dioxide with water yields
a) NHO_3
b) HNO_2
c) HNO_2 & NO
d) HNO_3 & HNO_2

28. The solubility product expression, Ksp, for the slightly soluble salt $Pb(IO_3)_2$ is equal to
a) $[Pb^{2+}][IO^-_3]$
b) $[Pb^{2+}]2[IO^-_3]^2$
c) $[Pb^{2+}]\ [IO_3^-]^2$
d) $[pb^{2+}][2IO_3\text{-}]^2$

29. What is the odidation state of chromium in $(NH_4)_2Cr_2O_7$?
a) +7
b) +6
c) +5
d) +4
30. Which of the following compounds produces H2 gas when added to water
a) LiH
b) CH_4
c) NH_3
d) PH_3

31. Which of the following compounds forms the strongest hydrogen bonds with itself?
a) HF
b) HCl_3
c) PH_3
d) H_2S

32. Of the following, which is the strongest oxidizing agent?
a) O^{2+}
b) O_2

c) O^{2-}
d) O_2^{2-}

33. Which of the following is true for the element Xenon
    a) It does not form chemical compounds
    b) It exist as the diatomic molecule Xe_2
    c) It has a lower ionization energy than Na
    d) It forms compounds with some electronegative elements

34. According to molecular- orbital theory , which of the following species has the highest bond order
    a) NO_2^{2-}
    b) NO^-
    c) NO
    d) NO^+

Use the information below to answer question 35 – 38
a) A very important element in the vulcanization of rubber
b) It is used to manufacture drugs for anaemic patients
c) It is used in the treatment of diabetes
d) It is used as diuretic to alleviate the rate of urination

35. Mercury
36. Zinc
37. Iron
38. Sulphur

39. The gas that is released in small quantities from bad eggs is
    a) SO_2
    b) SO_3
    c) H_2S
    d) SCl

40. $AlCl_3$ has
    a) Ionic bond
    b) Electrovalent bond
    c) Giant molecular structure
    d) Covalent bond

SECTION B (Answer ALL questions)

41. Water is the most abundant liquid
    a) Name TWO compounds that causes temporary hardness in water. **(2marks)**
    b) Explain why water has high billing point compared to other hydrides of group 6. **(2marks)**
42. State FOUR different methods of preparing oxygen in the lab. **(4marks)**
43. Explain each of the following observations:

a) Phosphorous is stored under water
b) Mercury is stored in iron bottles
c) Sodium is stored under paraffin
d) Nitrous oxide rekindles a glowing splint

44. List FOUR physical properties of fluorine gas **(4marks)**
45. Although mercury vapour are extremely poisonous, but mercury is used in clinical thermometer. Give reasons **(4marks)**
46. Sulphur has two allotropes
    a) Name the two allotropes
    b) Sulphur has a valency of 2, 4, 6 while oxygen has a valency of 2 only . Explain **(4marks)**
47. a) List any TWO uses of sulphur dioxide
    b) Explain why is the manufacture of sulphur acid, SO_3 is dissolved in concentrated sulphuric acid forming ileum instead of being dissolved in water.

    (4marks)
48. State with reasons, the ion with the highest reducing power, chloride of bromide. **(4marks)**
49. Oxygen is a gas but sulphur is a solid at room temperature suggest reasons for this occurrence

    (4marks)
50. a) Define electron affinity
    b) With reasons explain the structure of
        (a) SO_3^{2-}
        (b) SO_4^{-2}

    (4marks)

SECTION C

51. a) The contact process for the manufacture of sulphuric acid involves the following reaction;

$$SO_2 + O_2 \longrightarrow SO_3OH - 196KJ/mole$$

i) Predict the conditions that will favour high yield of sulphur trioxide **(3marks)**
ii) Explain
    a) Why vanadium in the above reaction to platinum though the latter is more effective **(2marks)**
    b) Why Conc H_2SO_4 is viscous with high boiling point **(2marks)**
    c) In the preparation of sulphuric acid SO_3 is not dissolved in water **(2marks)**

b) i) Write an equation to represents the large scale production of sulphur dioxide from a source other than sulphur . **(2marks)**

52. (i) List FOUR ores from which sulphur is mined **(4marks)**

(ii) Explain the process of sulphur extraction from its ore. **(12marks)**

(iii) List FOUR uses of sulphur **(2marks)**

(iv) List TWO uses of SO_2 **(2marks)**

53. a) State the importance of nitrogen fixation **(2marks)**

b) Explain nitrogen cycle **(14marks)**

c) Give FOUR uses of nitrogen **(4marks)**