# Kombolcha General and Preparatory Secondary School Grade 12th Chemistry Work sheet. May 2014

**TIME ALLOWED 2:30**

PHYSICAL CONSTANTS

- Avogadro's No = 6.02 $x10^{23}$ mole
- Mass of electron = $9.11x10^{-31}$kg
- Gas constant (R) = 8.314 J/mol K = 0.082 L.atm/mol. K
- Planks constant (h) = $6.626x10^{-34}$ JS/photons
- Faraday's constant (F) = 96500C/mol
- Ryberg's constant ($R_H$) = $2.18x10^{-18}$J
- Velocity of light (C) = $3x10^{8}$ m/s

Atomic number (Z) and mass number (A)

| Element | H | He | Li | Be | B | C | N | O | F | Ne | Na | Mg | Al | P | K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 1 | 4 | 7 | 8 | 11 | 12 | 14 | 16 | 19 | 20 | 23 | 24 | 31 | 32 | 39 |
| Z | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 15 | 19 |

| Element | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ag | Au | Hg | Ti | Kr | Sc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 51 | 52 | 55 | 56 | 59 | 58.7 | 64 | 65 | 108 | 197 | 201 | 48 | 84 | 45 |
| Z | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 47 | 79 | 80 | 22 | 36 | 21 |

***TOTAL 10 PAGES***

***General Directions***

**This Examination contains 80 multiple choice questions. From the given alternatives choose the correct answer and write your answer in capital letter in your separate answer sheet**

1. Which one of the following measurement contains four significant figures?

   A. 0.06 B. 5.004 C. 0.0009 D. 0.0027

2. Which of the following is correct?

   A.1L=1$dm^3$ B.1L =10$dm^3$ C. 10L = 1$cm^3$ D.1L =0.1$dm^3$

3. The general statement that summarizes facts that come from many experiment is

   A. Observation B. hypothesis C. theory D. law

4. Which one of the following is NOT true about random errors?

   A. They affect the precision of the result

   B. They vary in magnitude and direction

   C. They cause the data to be scattered more or less symmetrically around the main value

   D. They lie only in one direction for a set of measurements

5. The conjugate acid and conjugate base pair of $HSO_4^-$ , respectively:

   A. $HSO_4^-$ and $H_2SO_4$ B. $SO_4^{2-}$ and $H_2SO_4$

   C. $HSO_4^-$ and $SO_4^{-2}$ D. $H_2SO_4$ and $SO_4^{2-}$

6. Which one of the following substance could be Amphiprotic?

   I. $H_2S$ II.$HS^-$ III.$NH_3$IV.$HCO_3^-$

   A.I, II and III B.I and II C.II and IV D. II , III and IV

7. Given the acid-dissociation constant

| Acid | Dissociation constant ,Ka |
|---|---|
| $CH_3COOH$ | $1.8x10^{-5}$ |
| HCOOH | $1.7x10^{-4}$ |
| HOCl | $3x10^{-8}$ |
| HOBr | $2.5x10^{-9}$ |

When the conjugate bases are arranged in order of increasing base strength, which order is correct?

A. HCOOH, $CH_3COOH$, HOCl , HOBr

B. HOBr, HOCl, $CH_3COOH$, HCOOH

C. HOCl,HOBr , HCOOH ,$CH_3COOH$

D.$CH_3COOH$, HCOOH, HOBr ,HOCl

8. Identify the hybridization of carbon atoms in this molecule $CH_3$-CH=CH-COOH respectively
   A. $Sp^3$, $sp^2$, $sp^2$,$sp^2$ B. $sp^2$,$sp^2$, $sp^2$, sp
   C. $sp^3$, sp, $sp^2$,sp D. sp,$sp^2$,sp,$sp^2$
9. According to molecular orbital theory which one of the following species is paramagnetic?
   A. $N_2$ B. $O_2$ C. $CN^-$ D. $0_2^{2-}$¿¿
10. Which of the following crystals posses high thermal and electrical conductivity?
    A. metallic crystal B. molecular crystal
    C. Ionic crystal D. covalent net work crystal
11. 0.1M of Nitrous Acid ($HNO_2$) is 7.1% ionized at equilibrium. What is dissociation constant of $HNO_2$?

    A. $5x10^{-7}$ B. $5.04x10^{-4}$ C. $1x10^{-14}$ D. $3x10^{12}$

12. Consider the reaction,

    $CH_3COOH + H_2O \leftrightarrow H_3O^+ + CH_3COO^-$

What will happen if $CH_3COONa$ is added to the above reaction at equilibrium?

A. The concentration of $CH_3COOH$ would decrease and $H_3O^+$ would be increase

B. The concentration of $CH_3COOH$ would be increase and the concentration of $H_3O^+$ decrease

C. The concentration of both $CH_3COOH$ and $H_3O^+$ would increases.

D. The concentration of both $CH_3COOH$ and $H_3O^+$ decreases

13. .which one of the following salts gives, PH >7when dissolved in water?

A.$NH_4NO_3$ B. NaCl C.$MgCl_2$ D. NaF

14. Which compound has Trigonal planar arrangement?

A. $CS_2$ B. BF C. $NH_4^+$ D. $SO_4^{2-}$

15. Atoms take part bond formation to:

A. Attain a stable electron configuration. C. Neutralize their charge

B. Increase their energy. D. Increase their charge density.

16. Which one of the following pairs gives a buffer system?

A. $H_2SO_4$ / $SO_4^{-2}$ B. $NH_3$ / $NH_4Cl$ C. HCl / NaCl D. $HNO_3$ / $KNO_3$

17. A buffer solution is prepared by taking 0.250 moles of acetic acid (ka=$1.8x10^{-5}$) and 0.40 mole of sodium acetate in sufficient water to make 1.80L of solution, the $P^H$ of abuffer solution is:

A. 4.95 B. 4.66 C. 4.86 D. 4.56

18. If the molecular form of the indicator HIn is yellow and In is green. what is the color of the solution contain this indicator when $P^H$= 7 (Kin=$1x10^{-5}$)

A. Yellow B. Green C. Yellowish green D. Green or Yellow

19. Which one has the highest bond order?

A. $N_2$ B. $F_2$ C. $O_2$ D. $Be_2$

20. Which one of the following compounds contains both ionic and covalent bonds?

A. $AlCl_3$ B. $Mg_3N_2$ C. NaCN D. NaCl

21. Which of the following best describes the formation of pi bonds

A. They are formed by sideways over lap of parallel orbitals

B. They are formed by the axial overlap of orbitals

C. They are formed by sideways over lap of s and p orbital

D. They are formed by the axial overlap of either s or p orbitals

22. Which of the following is addition polymer?

A. Nylon B. protein C. Polyester D. Polystyrene

23. The process by which natural rubber can be hardened by adding sulphur is

A. Eutrification C. Polymerization

A. Vulcanization D. Condensation

24. Which one of the following polysaccharides cannot be digested by human beings?

A. Fructose B. Sucrose C. Cellulose D. Starch

25. The most abundant polysaccharide is

A. Amylase B. Cellulose C. Starch D. SugarF

26. Which one of the following polymer –monomer pair is not correctly matched?

A. Teflon –propylene B. PVC-chloroethene

C. Plexiglass--Methylmethacryate D. Bakelite-- phenol and formaldehyde

27. Consider the following reaction,

$S_2O_8^{2-} + 3I^- \rightarrow 2SO_4^{2-} + I_3$

The following experimental results were obtained, what will be the rate law for the given reaction?

| Experiment # | $[S_2O_8^{2-}]$ | $[I^{-1}]$ | Rate (mol/l.S) |
|---|---|---|---|
| 1 | 0..036 | 0.060 | 1.5x10-5 |
| 2 | 0.072 | 0.060 | 2.9x10-5 |
| 3 | 0.036 | 0.120 | 2.9x10-5 |

A. Rate=$K[S_2O_8^{2-}]^2[I^{-1}]$ B. Rate =$K[S_2O_8^{2-}]^2[I^{-1}]^2$

C. Rate=$K\ [S_2O_8^{2-}]^3[I^{-1}]^2$ D. Rate =$K[S_2O_8^{-2}][I^{-1}]$

28. .The mechanism of the reaction is shown below,

1. $HBr(g) + O_2(g) \rightarrow HOOBr(g)$ (slow)

2. $HOOBr(g) + HBr(g) \rightarrow 2HOBr(g)$ (Fast)

3. $HOBr(g) + HBr(g) \rightarrow H_2O(g) + Br_2(g)$ (fast)

4. $HoBr(g) + HBr(g) \rightarrow 2\ H_2O(g) + Br_2(g)$ (fast)

What is the rate law and all intermediate based on above mechanism?

A. Rate =K[HOBr][HBr] and HBr and $O_2$

B. Rate =K[HOOBr][HBr] and HBr and $H_2O$

C. Rate =K[HOOBr][$O_2$] and HOBr and $Br_2$

D. Rate =K[HBr] [$O_2$] and HOOBr and HOBr

29. The reaction A + 2B → C+D is second order with respect to reactant A and third order with respect to reactant B. If the concentration of A is quadrupled and concentration of B is halfed , the rate of the reaction would _____by a factor of_____

A. Increase, 2 B. Decrease, 2
C. Increase, 8 D. Decreases, 8

30 .For the reaction, $N_2(g) + 3H_2(g) \leftrightarrow 2NH_3(g)$ , the rate of appearance of $NH_3$ is 0.007mol/min , the rate of disappearance of $H_2$ would be
A. 0.00l mol/l.min B. 0.02mol/l.min
C. 0.01mol/l.min D.0.07mol/l.min

31. Which one of the following has highest hydration energy?
A. $Mg(OH)_2$ B. $Ca(OH)_2$ C. $Ba(OH)_2$ D. $Sr(OH)_2$

32. Which one of the following is **NOT true** about strong acid-strong base titration?
A. The PH is low at the beginning of titration
B. PH=7 at equivalent point
C. Just before the equivalent point the PH rises slowly
D. Indicators whose color changes from 4 to 10 PH ranges used

33. What is the most important type of solute-solvent interaction in a solution made by mixing ammonia and water?
A. London force B. ion-dipole C. induced dipole D. hydrogen bonding

34. When a solution is heated, which one of the following ways of expressing its concentration remains unchanged?
A. Molality B. molarity C. normality D. % (m/v)

35. The Henry's law constant ($K_H$) for oxygen in water at $20^0$C is $1.28 \times 10^{-3}$ mol/L.atm. How many grams of oxygen will dissolve in 2L water that is in contact with air, in which the partial pressure of oxygen is 0.209 atm?
A. $3.6 \times 10^{-4}$ B. $2.4 \times 10^{-3}$ C. $1.7 \times 10^{-2}$ D. $2.8 \times 10^{-1}$

36. Which set of quantum numbers ($n.l.m_l.m_s$) is permissible for an electron?
A. $n=0$ , $l = 1$ , $m_l = 0$ $m_s = +1/2$
B. $n = 2$ , $l = 3$ , $m_l = 0$ , $m_s = -1/2$
C. $n=3$ , $l = 2$ , $m_l = 3$ , $m_s = +1/2$
D. $n=3$ , $l = 2$ , $m_l = 2$ , $m_s = -1/2$

37. What is the energy associated with one photon of a microwave radiation having a frequency of $1.45 \times 10^8$ $s^{-1}$?

A. $9.6 \times 10^{-26}$ J B. $9.6 \times 10^{42}$ J C. $19.6 \times 10^{-26}$ J D.$196 \times 10^{42}$ J

38. What is the ratio of the energy of a photon of 600nm wave length radiation to that of 800nm radiation?
A. 3:4 B. 1:1 C. 4:3 D. 2:1

39. The Equilibrium Concentration for the reaction b/n carbonmonoxide,CO, and molecular chlorine ,$Cl_2$ to form $COCl_2(g)$ at 74°C.are [CO]=0.012M, $[Cl_2]$=0.054M and$[COCl_2]$ =0.14M. Calculate the Kp value for the reaction ?

A. 220 B.7.7 C. 440 D. 0.082

40. In the equilibrium $N_{2(g)} + 3H_{2(g)} \leftrightarrow 2NH_{3(g)} + 92KJ/mol$, the maximum yield of ammonia will be obtained with the process having:

A. low pressure and high temperature
B. low pressure and low temperature
C. high temperature and high pressure
D. high pressure and low temperature

41. How many phase are present in ice floating on water?

A. 0 B. 3 C. 1 D. 2

42. The equilibrium constant expression for the reaction, $CaO(s)+CO_2(g) \leftrightarrow CaCO_3(s)$ is

A. $[CO_2]$ B. $[CaCO_3]/[CaO][CO_2]$ C. $1/[CO_2]$ D. $[CO_2]/[CaCO_3]$

43. For the reaction, A + B → AB, $\Delta H$ = +30KJ, $\Delta S$ = + 50 J/K. what can we say about the reaction? The reaction is:

A. Spontaneous at all temperature
B. Spontaneous at temperature greater than 600k
C. non- spontaneous at temperature greater than 600k
D. non- spontaneous at all temperature

44. The heat involved at constant volume is

A. $\Delta H$ B. $\Delta E$ C. $\Delta G$ D. $\Delta S$

45. . Which one is not state function?

A. Internal energy B.Temperature C.work D.pressure

46. IUPAC name for $C_6H_5COOCH_2CH_2\ CH_3$

A. Propyl benzoate C. Phenayl ethanoate
B. Phenayl propnoate D. ethyl benzoate

47. Which of the following is more soluble in water?

A. $HOOC\ CH_2CH_2OH$ C. $CH_3COOCH_3$
B. $CH_3\ CH_2CH_2COOH$ D. $CH_3\ CH_2CH_2OH$

48. Oxidation of primary alcohol or aldehydes produce?

A. Ether B. Carboxylic acid C. Ester D. Alcohol

49. Chemically fats and oils are? A. Ester B. Acid C. Alkenes D. Alcohol

50. What product/s is/are formed during the electrolysis of concentrated NaCl solution (brine)?

A. $Cl_2(g)$ B. $Cl_2(g)$ and $H_2(g)$
C. $Cl_2(g)$ ,$H_2(g)$ and NaOH(aq) D. NaOH(aq) and $Cl_2(g)$

51. What is the coefficient of permanganate ion when the following equation is balanced? $Mno_4^- + Br^- \rightarrow Mn^{2+} + Br_2$ (in acidic medium)

A. 1 B. 2 C. 3 D. 5

52. Which of the following reaction will occur spontaneous as written $Sn^{4+}/Sn^{2+}$ E red=0.15 $Fe^{3+}/Fe^{2+}$ E red=0.77 $Cr^{3+}/Cr$ E red=0.44

A. $3\ Sn^{4+}(aq) + Fe^{2+}(aq) \rightarrow Sn^{2+}(aq) + Fe^{3+}(aq)$

B. $3\ Sn^{4+}(aq) + 2Cr(s) \rightarrow 2Cr^{3+}_{(aq)} + 3Sn^{2+}(aq)$

C. $Sn^{2+}(aq) + Fe^{3+}(aq) \rightarrow Sn^{4+}(aq) + Fe^{2+}(aq)$

53. In which order/s the half-life ($t_{1/2}$) is independent of the initial concentration of the reactant?

A. Zero order B. 1st order C. 2nd order D. zero and 1st order

54. In a 1st order decomposition reaction 50% of a compound decomposes in 10.5minutes. How long does it take for 75% of a compound to decompose?

A. 21min B. 32min C. 6.67min D. 15.5min

55. Consider the following reaction $5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq¿ \rightarrow 3Br_2(l) + 3H_2O(l)$ the rate expression for the reaction is found to be

A. The overall order is 12

B. Doubling the concentration of all the reactant at the same time would increase the rate of the reaction by a factor of 16

C. The unit of rate constant K, $mol\ dm^{-3}s^{-1}$

D. A change in concentration of $Br^-$ or $BrO_3^-$ does not affect the rate of the reaction

56. The reaction $2NO_2(g) \rightarrow 2NO(g) + O_2(g)$ is suspected to second order in $NO_2$ .Which of the following kinetics plots would be the most useful to confirm whether or not the reaction is second order

A. A plot of $[NO_2]^{-1}$ Vs t C. A plot of ln $[NO_2]$ Vs t

B. A plot of $[NO_2]$ Vs t D. A plot of $[NO_2]^2$ Vs t

57. Calculate the mole fraction of ethanol in a mixture of equal masses of water and ethanol?

A. 0.47 B. 0.28 C. 0.62 D. 0.72

58. What is the freezing point of a 0.1m solution of NaCl (Kf = 1.86 $^0$C/m and the freezing point of the pure water is 0 $^0$C)?

A. -1.86 $^0$C B. -0.372 $^0$C C. -0.093 $^0$C D. -0.186 $^0$C

59. A solution of aqueous $H_2SO_4$ has a density of 1.84 g/ml and contains 98.08%(m/m) $H_2SO_4$. The molarity of this solution is

A. 11.4 M B. 8.41 M C. 18.4 M D. 14.8 M

60. How much water must be added to 100 ml of 0.5M of HCl solution to produce 0.1M HCl solution? A. 500 ml B. 400 ml C. 300 ml D. 100 ml

61. Which of the following mixture exhibits positive deviation from Raout's law?

A. $H_2O$ and $C_2H_5OH$ C. $H_2O$ and HCl

B. $C_6H_6$ and $C_6H_5CH_3$ D. $CCl_4$ and $CH_3OH$

62. Calculate the normality of a solution that contains 20g of the salt $Fe_2(SO_4)_3$ in 200ml of solution? A. 3.5 N B. 0.5 N C. 2.5 N D. 1.5 N

63. The maximum number of electrons in an atom posses a quantum number n=5, $l$=2, $m_l$= -1

A. 2 B. 4 C. 6 D. 10

64. Which one of the following EMR has the lowest wave length?

A. γ-ray B. radio wave C. micro wave D. X-ray

65. Which one of the following radioactive emission from the nucleus of an atom would change the mass of an atom?

A. γ- emission B. β- emission C. α- emission D. x- ray

66. If 500$cm^3$ of gas is compressed to 250$cm^3$ under constant external pressure of 2.96atm and also absorb 12.5kJ. What is change in internal energy, ΔE?

A.7.5KJ B.12.5KJ C.25.5KJ D.13.9KJ

67. The industrial process for making sulfuric acid has three steps as given below:

$S(g) + O_2(g) \rightarrow SO_2(g)$ $\Delta H_1$=-296.83KJ

$2SO_3(g) \rightarrow O_2(g) + 2SO_2(g)$ $\Delta H_2$=-195.2KJ

$SO_3(g) + H_2O(l) \rightarrow H_2SO_4$, $\Delta H_3$=-227.72KJ

Calculate $\Delta H^o$ at 25$^o$C for the reaction.

$2S(s) + 3O_2(g) + 2H_2O(l) \rightarrow 2H_2SO_4(l)$

A.-722.8KJ B.-853.9KJ C.-326.0KJ D.-1247.3KJ

68. Which of the following process most likely results in a decrease in entropy?

A. $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

B. $CS_2(l) \rightarrow CS_2(g)$

C. $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$

D. $2Na_2O_2(s) + 2H_2O(l) \rightarrow 4NaOH(aq) + O_2(g$

69. Calculate the energy of transition from energy level **3** to energy level **2** in hydrogen emission spectrum? ($R_H = 2.18x10^{-18}$ J)?

A. $5.45x10^{-19}$ J B. $-5.45x10^{-19}$ J C. $-2.42x10^{-19}$ J D. $-3.03x10^{-19}$ J

70. What is the kinetic energy of a photoelectron ejected from cesium by 500nm light? The critical wave length for the photoelectric effect in cesium is 660nm.

A. $6.6x10^{-34}$J B. $9.6x10^{-20}$J C. $1.5x10^{14}$J D. $6.6x10^{-20}$J

71. The wave length of an electron moving a velocity equal to one-tenth of the light is

A. 0.003nm B. $3x10^{8}$nm C. $2.42x10^{-2}$nm D. $5x10^{-3}$nm

72. Which of the following is not correctly matched?

A. Magnesium – Dow process C. gold – cyanidation

B. Nitric acid – contact process D. ammonia – Haber process

73. Which one of the following is the second most abundance metal in the earth crust?

A. Al B. Fe C. Si D. $O_2$

74. Which one of the following element can be prepared by self reduction?

A. Sn B. Pb C. Cr D. Ca

75. What is the point at which all the three physical states of water co-exist at equilibrium?

A. Critical temperature B. Critical point C. triple point D. Critical pressure

76. Which of the following is true about chemical equilibrium?

A. The reaction is stopped when it reaches to equilibrium

B. The concentration of reactants and products are exactly equal

C. The forward and reverse reactions proceed at equal rate

D. The reverse reaction is always endothermic

77. The equilibrium constant for the reaction $2X + Y \leftrightarrow X_2Y$ is K. What is the equilibrium constant for the reaction $3X_2Y \leftrightarrow 6X + 3Y$?

A. $K^3$ B. 3K C. $(1/K)^3$ D. $\sqrt{1/k}$

78. A laboratory technician wants to plate a spoon made from iron with silver. The technician cannot do one of the following activities. He:

A. Puts the spoon at anode

B. Uses silver nitrate solution as electrolyte

C. Uses pure silver metal at the anode

D. Puts the spoon at cathode

79. How many moles of a trivalent metal **M**, will be deposited at the cathode by the electrolysis of its molten salt in a cell operating at **20**A for **1** hour?

    A. 3.5 mols  B. 2.5 mols  C. 1.5 mols  D. 0.25 mols

80. In which one of the following galvanic cell is the redox reaction reversible?

    A. Zn – C dry cell  C. Alkaline cell

    B. NiCad cell  D. Mercury cell

GOOD LUCK!