FEDERAL UNIVERSITY OF AGRICULTURE ABEOKUTA

INTRODUCTORY PHYSICAL CHEMISTRY 1 PAST QUESTION (CHM 101)

UNIVERSITY OF AGRICULTURE, ABEOKUTA
COLLEGE OF NATURAL SCIENCES
CHEMISTRY DEPARTMENT
B.Sc Chemistry First Semester Continuous Assessment Test

CHM 101: Introductory Physical Chemistry I **Time: 30 minutes**

Instruction: Answer all the Questions.

Useful constants: Planck constant, $h = 6.626 \times 10^{-34}$Js, 1 atm = 1.013×10^{5}Nm^2, mass of particles (m) = 9.11×10^{31}, 1Å = 10^{-8}cm = 10^{-10}m, mass of electron (m_e) = 1.602×10^{-19} speed of light = 3.0×10^{8}m Bohr radius $a_o = 8.854 \times 10^{-11}$, Relative Permitivity = $\varepsilon_0 = 8.845 \times 10^{-12}$ $c^2N^{-1}m^2$. R_H = 109629cm^{-1} R = 8.314Jmol^{-1}K^{-1}. Mg = 24.31, Hg = 200.59g, Cu = 63.55g, C = 12.00g, O = 16.00g, N = 14.01, Ca = 40.00 Al = 27

1. 10g of a solid is in equilibrium with its own vapour when 1g of a small amount of solid is added. The vapour pressure (A) remain the same (B) drops (C) increases by 99% (D) increases by 1%
2. All redox reactions involve (A) the gain of electrons only (B) both the gain and loss of electrons only (C) the loss of electrons only (D) neither the gain nor loss of electrons only
3. Alpha particle has properties similar to that of (A) He (B) Be (C) Li (D) Ne
4. Balancing of chemical equation is based on the law of: (A) Definite proportion (B) multiple proportion (C) conservation of matter (D) conservation of energy
5. $CH_3COOH_{(aq)} \rightleftharpoons CH_3COO^-_{(aq)} + H^+_{(aq)}$, [Given that K = 1.8×10^{-5}]: Calculate $[H^+]$ when 0.1mol acetic acid was treated with 0.2 mol acetate ion. (A) 1.8×10^{-5} (B) 9.0×10^{-6} (C) 55555.6 (D) 3.6×10^{-5}.

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6. Consider this reaction: $xP + yP \rightleftharpoons mR + nS$, the expression for the equilibrium constant for the reaction above is (A) $K[P]^x[Q]^y$ (B) $\frac{[P]^x[Q]^y}{[R]^m[S]^n}$ (C) $\frac{[R]^m[S]^n}{[P]^x[Q]^y}$ (D) $\frac{m[R]n[S]}{x[P]y[Q]}$
7. If an element X forms the oxides XO and X_2O_3 the oxidation numbers of X are (A) +1, +2 (B) +1,+3 (C) +2,+4 (D) +2,+3
8. [illegible] compound does Cl have the highest oxidation numbers (A) $KClO_4$ (B) $KClO_3$ (D) KClO
9. [illegible] 40% dissociated at 25^{0}C and 1 atm, the K_p is (A) 0.76 atm (B) 0.57 atm (C) 0.27

...22.4dm³ (c) 224.055dm³ (d) 24.055dm³

...e substance that sticks is called _____
... it sticks to is called _____
...sorbent (b) Adsorb, Adsorber (c) Adsorbate, Adsorber, Absorbent

...$2NO_{(g)} \rightleftharpoons N_{2(g)} + O_{2(g)}$ is considered to be at ... when (a) the concentration of N_2 and O_2 are equal (b) concentration of NO is twice that of either N_2 or O_2 (c) concentration of NO is equal to the combined ...ration of N_2 and O_2 (d) the rate of decomposition of ...qual to its rate of formation.

...olubility of CuBr at 25°C is found to be 2.0×10^{-4} mol²L⁻². ...alue is (a) 4.0×10^{-8} mol²L⁻² (b) 2.0×10^{-8} mol²L⁻² (c) 6.0×10^{-8} mol²L⁻² (d) 8.0×10^{-8} mol²L⁻².

...The relationship between the K_c and K_p is (a) $K_c = K_p(RT)^{\Delta n}$ (b) $= K_p(RT)$ (c) $K_c = K_p$ (d) $K_c = K_p/(RT)^{\Delta n}$

...given that P = $2.5 \times 10^5 Nm^{-2}$ and the % dissociation of NOBr ...ven, the value of K_p for the reaction: $2NOBr_{(g)} \rightleftharpoons 2NO_{(g)} + Br_{2(g)}$ at ...K is (a) 938.5Nm^{-2} (b) 745Nm^{-2} (c) 1013Nm^{-2} (d) 1128Nm^{-2}

...During the reaction $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ 0.5 mole each of H_2 and ... were placed in a 1L vessel at 425°C until the equilibrium was ...ained. The vessel was found to contain 0.44 mole of HI and 0.059 mole each of H_2 and I_2. the value of K_c is (a) 54.9 (b) 72.0 (c) 110.6 (d) 87.2

...The K_p for the reaction $CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$ is

(a) $K_p = \frac{[CaO][CO_2]}{[CaCO_3]}$ (b) $K_p = P_{CO_2}$

(c) $K_p = \frac{[CaCO_3]}{[CaO][CO_2]}$ (d) $K_p = [CO_2]$

...The value of K_p at 500°C for the reaction $3H_{2(g)} + N_{2(g)} \rightleftharpoons 2NH_{3(g)}$ is 1.50×10^{-5}, the value of K_c is (a) 6.02×10^{-2} (b) 4.8×10^{-3} (c) 8.01×10^{-4} (d) 2.1×10^{-2}.

...Which of the following is false (a) the atom of an element all have the same mass number (b) The atoms of an element are identical, but different from atoms of other elements (c) mass number = atomic number + number of neutrons (d) 1amu = ...twelfth of the mass of one atom of $^{12}_{6}C$

...he electronic configuration of Cl and Cl^- respectively are (a) $3s^23p^5$ and $1s^22s^22p^63s^23p^6$ (b) $1s^22s^22p^63s^23p^6$ and $3s^23p^5$ (c) $1s^22s^22p^23s^23p^4$ and $1s^22s^22p^63s^23p^6$ (d) $3s^23p^4$ and $1s^22s^22p^63p^6$

...of silver has atomic weight of 106.911 and ...relative atomic mass of silver is 107 the % ...isotopes respectively are (a) 6.45 and 93.55 (b) ...(c) 6.45 and 93.55 (d) 95.55 and 4.45

region of space is (...) unknow...
(d) orbital.

30. Light scattering experiment ... Schrödinger (b) Louis de-Brog... Ernest Rutherford

Name_____

Dept._____

	a	b	c
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13	a		
14			
15	b		
16			
17			
18			
19			
20			
21	d		
22			
23			
24			
25			
26			
27			
28			
29	c		
30	d		

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NAAS EXCOS'15/16

UNIVERSITY OF AGRICULTURE, ABEOKUTA
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CHEMISTRY DEPARTMENT
B.Sc Chemistry First Semester Continuous Assessment Test

CHM 101: Introductory Physical Chemistry I **Time: 30 minutes**

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7. If an element X forms the oxides XO and X_2O_3 the oxidation numbers of X are (A) +1, +2 (B) +1,+3 (C) +2,+4 (D) +2,+3
8. In which compound does Cl have the highest oxidation numbers (A) $KClO_4$ (B) $KClO_3$ (C) $KClO_2$ (D) KClO
9. N_2O_4 is 40% dissociated at 25°C and 1 atm, the K_p is (A) 0.76 atm (B) 0.57 atm (C) 0.27 atm (D) 1.4 atm

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11. In the compound SH_4, the central atom S, has bonding electrons in four pairs. The molecule as predicted by VSEPR is:
(a) Linear (b) Trigonal planar (c) Tetrahedral (d)

12. Which of the following compounds does not obey octet rule?
(a) CH_4 (b) NH_3 (c) SO_3 (d) BF_3

13. The following arise as a result of permanent dipole in a molecule except.
(a) Interatomic forces (b) Dipole-Dipole interactions
(c) Ion-dipole interaction (d) Hydrogen Bonding.

14. In which of the following repulsion is greatest.
(a) Lone pair, bond pair (b) Lone pair, lone pair
(c) Bond pair, bond pair (d) None.

Use this equation to answer questions 15 and 16.
$3KMnO_4 + 5Fe + 24HCl \rightarrow 5FeCl_3 + MnCl_2 + 3KCl + 12H_2O$ if 156g of Fe were consumed
(Fe = 56, Mn = 55, K = 39, O = 16).

15. What mass of $KmnO_4$ is consumed? (a) 170g (b) 264g (c) 180g

16. How many grams of $MnCl_2$ are produced? (a) 60.4g (b) 56.6g (c) 70.2g

Use this to answer questions 17 and 18. Gold is attacked by very few chemicals. A mixture of HNO_3 and HCl, called aqua regia, however dissolves gold by the following equation.
$Au(s) + 3HNO_3(aq) + 4HCl(aq) \rightarrow HAuCl_4(aq) + 3NO_2(g) + 3H_2O$. If 28.4g of Au were used in this reaction, (Au = 197).

17. What is the minimum volume, in ml, of 12.0MHCl needed?
(a) 48.0 (b) 60.2 (c) 42.8 (d) 30.6.

18. If 16.0MHNO$_3$ were used, what is the minimum volume in ml, required?
(a) 28.5 (b) 27.0 (c) 30.2 (d) 48.0.

19. The total volume, in ml, of aqua regia needed for the reaction is:
(a) 75.0 (b) 87.2 (c) 73.0 (d) 78.6.

A solution contains 5.0×10^{-3} moles of H_2SO_4 dissolved in 250ml of solution.

20. What is the molarity of the solution.
(a) 0.04M (b) 0.02M (c) 0.03M (d) 0.025M

21. The molarity of H^+ ions in the solution is:
(a) 0.04M (b) 0.02M (c) 0.03M (d) 0.025M.

22. The half-life period for the decomposition of radium is 1,590 years. Calculate the rate constant in Sec^{-1}?

(a) 5.83×10^{-12} Sec^{-1}
(b) 2.58×10^{-11} Sec^{-1}
(c) 1.382×10^{-11} sec^{-1}
(d) 5.83×10^{-11} Sec^{-1}

Use this information for question 23 - 25.
For the chemical reaction
$5Br^- + BrO_3^- + 6H^+ \rightarrow 3Br_2 + 3H_2O$
the rate expression is given as
Rate = $K[Br^-][BrO_3^-][H^+]^2$
What is the molecularity and the order of each reactant?

23. Reactant Br^-:
(a) 5 and 1 (b) 2 and 5 (c) 3 and 1 (d) 1 and 4.

24. Reactant BrO_3^-:
(a) 2 and 1 (b) 1 and 3, (c) 3 and 2, (d) 1 and 1.

25. Reactant H^+:
(a) 6 and 1, (b) 6 and 2, (c) 6 and 3, (d) 4 and 2.

26. A first order reaction has an initial volume of 1.71ml after 9 minutes the volume became. Calculate the rate constant if the infinity reading is 15.58ml.

(a) 1.41×10^{-2} min^{-1}
(b) 2.41×10^{-2} min^{-1}
(c) 3.41×10^{-2} min^{-1}
(d) 2.54×10^{-2} min^{-1}.

27. A first order reaction is 40% percent complete at the end of 50 mins.
What is the value of the rate constant in Sec^{-1}.
(a) 1.82×10^{-4} Sec^{-1}
(b) 1.90×10^{-4} Sec^{-1}
(c) 1.70×10^{-4} Sec^{-1}
(d) 1.63×10^{-4} Sec^{-1}.

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28. What is the general form of a rate law?
(a) Rate = $K[A]^m[B]^n$
(b) Rate = KAnilm
(c) Rate = $[K]^m_A[K]^n_B$
(d) Rate = $R[A\ B]^{mn}$

29. What is the relationship between specific rate constant and half life.
(a) $t_{\frac{1}{2}} = \frac{8.314}{K}$ (b) $t_{\frac{1}{2}} = \frac{95.00}{K}$ (c) $t_{\frac{1}{2}} = \frac{0.693}{K}$ (d) $K = \frac{2.303}{t_{\frac{1}{2}}}$

Use this information to answer questions 30 – 32.

The decomposition of acetaldehyde and aceline-dicarboxylic acid yielded results when against 1/T gave straight lines with slopes. (a) = -9920 and (b) -5070 respectively.

30. Calculate the activation energy of the first.
(a) 54,394 Kcal mol^{-1} (b) 43,394 Kcal mol^{-1} (c) 54,382 Kcal mol^{-1} (d) 63,290 K cal

31. What is the activation energy of the second?
(a) 15,000 Cal mol^{-1} (b) 17,000 cal mol^{-1} (c) 19,000 Cal mol^{-1} (d) 20,000 Cal

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10. One mole of a chemical substance contains: (A) Faraday numbers of particles (B) Quantum number of particles (C) atomic number of particles (D) Avogadro's number of particles
11. Statements of Dalton atomic theory include the following except; (A) atom of each element are identical (B) atom of different elements are similar (C) chemical combination of atoms are in simple whole number (D) atom is the discrete particles of an element.
12. The degeneracy of the d – orbital is (A) 2 (B) 4 (C) 5 (D) 7
13. The mass of substance passed through 15A of electricity for 45mins is 38.25g . What is the electrochemical equivalent of the reaction. (A) 21.58g (B) 18.25g (C) 0.001g (D) 0.0009g
14. the number of mole of sodium carbonate in 8.5g of the salt is: (A) 0.28 (B) 0.08 (C) 2 (D) 18
15. The oxidation number of Cr in $Cr_2O_7^{2-}$ is (A) +2 (B) +7 (C) +6 (D) +5
16. The percentage composition of Sulphur (S) in $FeSO_4.10H_2O$ is (A) 6.9% (B) 5.6% (C) 9.6% (D) 5.8%

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17. The region outside the nucleus, where there is highest probability of finding electrons is known as (A) path length (B) wavelength (C) orbits (D) orbital
18. The slowest step in an elementary reaction is (A) molecularity of a reaction (B) order of a reaction (C) rate-determining step (D) elementary step
19. Which of the following series of spectra line is in the UV region (A) Balmer (B) Paschen (C) Lyman (D) Pfund
20. Which of these is a reference electrode (A) Daniel cell (B)Leclanche cell (C)Standard hydrogen electrodel cell (D)Lead acid accumulator

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UNIVERSITY OF AGRICULTURE, ABEOKUTA
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CHEMISTRY DEPARTMENT
2001/2002 FIRST SEMESTER EXAMINATION
CHM 101: INTRO. PHYSICAL CHEMISTRY 1

TIME: 1 Hour

INSTRUCTIONS: Answer ALL Questions.

Useful Constants.
R = 0.0821L-atm/mol-K
H_2 = 2.01588 g/mole
O_2 = 31.9988g/mole
He = 4.003g/mol.

1. Calculate the total pressure of a gas mixture that contain 2.5g of O_2, 4.5g of H_2 and 5.0g of He in a 25.00L gas cylinder at 25°C.
(a) 3.00 atm (b) 4.00 atm (c) 4.48 atm (d) 3.48 atm.

2. On decomposing a 25.0m^3 NH_3 gas according to the equation below in a cylinder with piston.
$NH_3(g) \rightarrow N_2(g) + H_2(g)$
It was found that the volume of the cylinder and piston increased to 100.0m^3 at 50N/m^2. what is the work done by the system?
(a) 3750N-m (b) -3057N-m (c) -3750N-m (d) 3057Nm.

3. Calculate the enthalpy of reaction for the reaction below $2B_5H_9 + 12O_2 \rightarrow 5B_2O_3 + 9H_2O$ given that $\Delta H°_f$ B_5H_9 = 75.0; B_2O_3 = -1300; O_2 = 0; H_2O = -250KJ/mol.
(a) -8686KJ (b) 8686KJ (c) 8900KJ (d) -8900KJ.

4. For the shell n = 4, the possible values of l are:
(a) 1,2,3,4. (b) 2,3,4,5. (c) 0,1,2,3 (d) 4,3,2,1.

5. What are the possible values of m for a subshell with l = 1.
(a) 0,1,2 (b) -1,0,1 (c) 1,2,3 (d) -1,2,1.

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6. A possible value of spin quantum no is: (a) ½ (b) 1 (c) 0 (d) 2

7. How many orbitals are found in a d-subshell? (a) 3 (b) 4 (c) 5 (d) 6.

8. Which of the following is a possible set of quantum numbers for a 2p electron?
(a) 1, 0, 0, -½. (b) 2, 0, 0, +½ (c) 2, 0, 1, -½. (d) 2 1, 0, -½.

9. Which of the following gives a 3-dimensional model of the atomic structure.
(a) Bohr (b) Rutherford (c) Schrodinger (d) Mendeleev.

10. The type of intermolecular interaction involving KCl is:
(a) Dipole – Dipole (b) Hydrogen bonding (c) Interatomic forces (d) Ion-dipole.

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(30) First order rate law is expressed as follows.

(a) $K = \frac{2.303}{t} \log \frac{a-x}{a}$ (b) $K = \frac{2.303}{t} \log \frac{a}{a-x}$

(c) $K = \frac{2.303}{t} \log \frac{a}{x}$

(d) $K = \frac{2.303}{t} \log \frac{x}{a}$

(31) Arrhenius equation is $\frac{d\ln k}{dT} = \frac{Ea}{RT^2}$ and this equation is valid and can be tested by plotting log K vs 1/T which will give straight line and the slope therefore will be

(a) slope = $1/T + C$ (b) $\frac{-Ea}{2.303R}$

(c) $\frac{-Ea}{2.303RT}$ (d) $\frac{-Ea}{T} + C$

(e) $\frac{-Ea}{2.303} R$

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(32) An aldehyde and a carboxylic acid decomposed and yielded results whose logK plot against 1/T gave straight lines with slope = 5070.
Calculate the activation energy.
(a) 1.987 (b) 2.303 (c) 23,200 (d) 22.320 (e) 198,700 all in cal mol-1.

Use this for questions 33 and 34
Find the masses of products formed when a dilute sulphuric acid solution is electrolyzed with a current of 0.6A for 90 minutes. R.a.m: H= 1.0 O= 16.0, S = 32.0)

(33). Cathode: (a) 0.022g (b) 0.033g (c) 0.044g (d) 0.055g (e) 0.011g

(34) At the Anode. (a) 0.208g (b) 0.168g (c) 0.368g (d) 0.408g (e) 0.008g

(35) What is the unit of rate constant k for a second order reaction.
(a) $mol\,dm^{-3}s^{-1}$ (b) s^{-1} (c) $mol^{-1}dm^3s^{-1}$ (d) $mol^{-2}dm^6s^{-1}$ (e) none of the above.

(36) The half-life of a radioactive isotope A is 1997 years. How long does it take for a sample of A to decay to 20% of its original radioactivity.
(a) 2038years (b) 3638years (c) 4038years (d) 1638years (e) 5000 years.

Question 37 & 38.

(37) Find the masses of products formed when dilute sulphuric acid solution is electrolysed with a current of 0.6A for 90 minutes.
(a) mass of H_2 formed is 0.033g
(b) mass of Cu formed is 0.033g
(c) mass of S formed is 0.033g
(d) mass of Fe formed is 0.033g
(e) mass of Zn formed is 0.033g

(38) (a) mass of Ar formed is 0.268g
(b) mass of H_2O formed is 0.268g
(c) mass of O_2 formed is 0.268g
(d) mass of Cl_2 formed is 0.268g
(e) mass of Br_2 formed is 0.268g

(39) 26cm^3 of a solution containing 10.5g of impure hydrochloric acid solution in 250cm^3 is titrated against 25cm^3 of 0.1M sodium trioxocarbonate (iv) solution.
Calculate the concentration of the pure acid in mole/dm^3.
(a) 0.2913M (b) 0.5923M (c) 0.1538M (d) 0.1813M (e) 0.1923M

(40) What is the mass of copper formed at the cathode when a current of 0.25A is passed through a copper (II) sulphate solution for 1 hour. (R.a.m: Cu = 63.5).
(a) 0.296g (b) 0.358gs (c) 0.581g (d) 0.159g (e) 0.578g

(41) What is the maximum number of electrons in the orbital that has the following quantum numbers, n=3, l= 0, m =0?
(a) 0 (b) 2 (c) 10 (d) 14

(42) For the shell n = 3, the possible values are
(a) 1,2,3 (b) 2, 1, 1 (c) 0, 1, 2
(d) 3, 2, 1.

(43) Which of the following is a possible set of quantum numbers for a 3p electron?
(a) 3,0, 0, -½ (b) 3, 0, 1, + ½ (c) 3,0 (d) 2, 1, 0, -½

(44) Which of the following is not an allowed combinations of n, l and m quantum numbers when n = 3?
(a) 3,1, -1 (b) 3,1,0 (c) 3, 1, +1 (d)

(45) Which of the following is an allowed combinations of the n, l, and m quantum numbers when n = 2?

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solution of NH_4Cl. (Given ΔT = 1.5°C, s.h.c. of the H_2O is 4.200kJkg^{-1}K^{-1}, neglect s.h.c. of the polystyrene).
(a) 1,000kJ/mol (b) 2.8kJ/mol (c) 0.284kJ/mol (d) 14.2kJ/mol (e) none

(17) Which of the following is false on melting a solid.
(a) solids will only melt when the forces of vibration overcomes the binding forces.
(b) the presence of impurity in solids will raise the melting point of such solids.
(c) The presence of impurity may cause a solid to have a melting point range than a sharp melting point.
(d). The presence of impurity in solids will lower the melting point of such solids.
(e) None

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(18) The cohesive forces holding particles in matter together is smallest in
(a) Gases (b) Solids (c) Liquids (d) Vapour. (e) all

(19) A certain mass of a gas at 12°C and 419mmHg pressure occupies a cylinder of 480cm^3. What volume will it occupy at 24°C and 838mmHg.
(a) 200.71cm^3 (b) 480cm^3 (c) 250.11cm^3 (d) 472.21cm^3

(20) Use the ideal gas equation to work out the volume that 1mol of an ideal gas should have at 20°C and pressure of 1.013×10^5Nm^{-2}.
(a) 100dm^3 (b) 22.41dm^3 (c) 0.00024dm^3 (d) 725.50dm^3

(21).Given that the solubility product constant of silver chloride at 298K is 1.8×10^{-10}mol/dm^3. Calculate the solubility of silver chloride solution in 0.02M sodium Chloride solution at 298K.
(a) 0.5×10^{-5}M (b) 0.6×10^{-6}M (c) 0.7×10^{-8}M (d) 0.8×10^{-10}M (e) 0.9×10^{-5}M.

(22) In the redox reaction, $CuO_{(s)} + CO_{(g)} \rightarrow Cu_{(s)} + CO_{2(g)}$
which of the specie is an oxidizing agent?
(a) CuO (b) CO (c) Cu (d) CO_2 (e) none.

(23) Complex ionic equations in an alkaline (basic medium) are balanced as follows.
(a) To the oxidation half-cell equation add OH$^-$ (aq), $H_2O_{(l)}$ and $H_2O_{(l)}$ to reactants and products.
(b) To the reduction half-cell equation add H_2O and OH$^-_{(aq)}$, $H_2O_{(l)}$ to reactants and products.
(c) To the oxidation half-cell equation add H_2O and OH$^-$, H_2O to reactants and products.
(d) A & B only
(e). B and C only.

(24) Using the oxidation number method, the following reaction
$MnO^-_{4(aq)} + Br^-_{(aq)} \rightarrow Mn^{2+}_{(aq)} + Br_{2(g)}$ will have a Net Equation with---------- number of Bromide ion and ---------- molecules of water.
(a) 12 and 6 (b) 10 & 8 (c) 12 and 8 (d) 10 and 6 (e) none.

(25)100cm^3 of a gas A diffuses through a small hole in 20 seconds. The same volume of oxygen, under the same conditions, diffused in 80 seconds. Calculate the relative molecular mass of A.
(a) 4 (b) 3 (c) 2 (d) 1 (e) 5

(26) The ideal gas equation shows the relationship,
$PV = nRT$.
If $R = \frac{PV}{nT}$, the unit of R =
(a) Nm mol^{-1}K^{-1} (b) Kmol/NM (c) JK^{-1}mol^{-1} (d) A & B (e) a and C

(27) Which of this equation represents Avogadro's law.
(a) $V \propto n$, T, p constant
(b) $V \propto 1/n$, n, T constant
(c) $V \propto T$ n, p constant
(d) $V \propto 1/p$, Tn
(e) $V = R\ 1/pTn$

Use this information for questions 28 and 29.

At 25°C the half-life period for the decomposition of N_2O_5 is 5.7hrs and is independent of the initial pressure of N_2O_5.

(28). Calculate the specific rate constant?
(a) 0.015hr^{-1} (b) 0.15hr^{-1} (c) 0.013hr^{-1} (d) 0.12hr^{-1} (e) 0.14hr^{-1}

(29) Calculate the time required for the reaction to go 90% completion.
(a) 19.19 hrs (b) 19.18hrs (c) 19.17hrs (d) 19.20hrs.

$V_1M_1 = V_2M_2$

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UNIVERSITY OF AGRICULTURE, ABEOKUTA
DEPARTMENT OF CHEMISTRY
2005/2006 1ST SEMESTER EXAMINATION
CHM 101

INSTRUCTION: Shade the appropriate answer in the answer sheet provided.
TIME: 1½hrs

(1) For the reaction $FeO_{(s)} + CO_{(g)} \rightleftharpoons Fe_{(s)} + CO_{2(g)}$. If at 298K, the equilibrium amount present are 2.5 mol FeO, 0.2 mol Fe, 3.0 mol CO_2 and 4.0 mol CO. Calculate the equilibrium constant for the reaction.
(a) 0.06 (b) 0.6 (c) 6.0 (d) 2.1×10^{-2} (e) 0

(2) The rate law of a chemical reaction was found to be $R = k[A]^{2x-1}[B]^x$. What is the overall order of reaction if $x = 1$.
(a) 3/2 (b) 2 (c) 2x-1 + x (d) 3x-1 (e) 3

(3) In a first order chemical reaction, after 10s, 6 moles from the initial concentration of 16 moles from the initial concentration of 16 moles of the reactant disappeared calculate the rate constant.
(a) $2.303s^{-1}$ (b) $\log [16/10]s^{-1}$ (c) $0.0470s^{-1}$
(d) 20s (d) $14.74s^{-1}$

(4) Given $HCl_{(aq)} + NaOH_{(aq)} \rightarrow NaCl_{(s)} + H_2O_{(l)}$ $\Delta H = -57kJ$
Calculate the heat changes which would occur when $50cm^3$ of 0.01M NaOH solution and $100cm^3$ of 0.01M HCl.
(a) -57J (b) -114J (c) +57J (d) +114J (e) none

(5) Determine the ΔH for this reaction
$2NH_4NO_{3(s)} \rightarrow 2N_{2(g)} + 4H_2O_{(g)} + O_{2(g)}$
Given $\Delta H_f(NH_4NO_3) = -364.6kJmol^{-1}$,
$\Delta H_f(H_2O_{(g)}) = -286kJmol^{-1}$
(a) -41.4Kjmol^{-1} (b) +41.4kJmol^{-1} (c) -114.4kJmol^{-1} (d) +114.4kJmol^{-1} (e) none.

(6) Gas molecules are said to be perfectly elastic because:
(a) the volume occupied by them is negligible
(b) they collide without loss of energy
(c) they move about in straight lines
(d) the distance between them are negligible.

(7) For how long must a current of 0.2A need to pass through solution of $AgNO_3$ to deposit 0.5 mole of silver.[Ag = 108, F= 96,500C]
(a) 38,600s (b) 96500s (c) 96,500s
(d) 241,250s

(8) A gas occupies $172cm^3$ at 30°C. At what temperature would the volume of the gas be halved.
(a) 0.88K (b) 0.087K (c) 15K (d) 152K
(e) 15°C

(9) What are the relative rates of diffusion of hydrogen to nitrogen gases.
(a) 1:4 (b) 4:1 (c) 8:1 (d) 14:1 (e) 1:14

(10) What volume would a gas at s.t.p if at 15°C and 720mmHg it occupies $214cm^3$.
(a) $528cm^3$ (b) $378cm^3$ (c) $412cm^3$
(d) $252cm^3$ (e) none

(11) Which of the following contains coordinate covalent bond.
(a) NH_4^+ (b) Na^+Cl^- (c) CH_4 (d) HCl
(e) all

(12)---------- and ---------- are examples of ionic crystals and layer crystal respectively.
(a). Graphite and Diamond (b) HCl and Diamond (c) NaCl and Graphite
(d) NaCl and Diamond (e) all of the above

(13) The following are the properties of ionic compounds except.
(a) Good conductors of heat and electricity
(b) Mostly solids
(c) Low melting and boiling point
(d) Soluble in water.
(e) none

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(14)Nitrogen gas has ---------- ------ covalent bond
(a) triple bond (b) no bond (c) native
(d) Double bond (e) all of the above

(15)---------- has intermolecular forces called ----------
(a) KCl/ van der waal (b) CO_2/van der waal
(c) O_2/electrostatic force
(d) Cl_2/cohesive (e) none.

(16) 0.02mole of anhydrous NH_4Cl were added to 45g of H_2O in a polystyrene cup in order to determine the standard enthalpy change of

Question.

Isotopes	Z	[A−Z]	m
^{1}H	1	0	1·007825
^{2}H	1	1	2·014
^{3}H	1	2	3·01605
^{35}Cl	17	18	34·968852
^{37}Cl	17	20	36·965903

Use the data in table 2 to calculate the RAM value for naturally occuring chlorine ($75.77\%-Cl^{35}$) the percentage of occurence of chlorine in the atmosphere.

$^{35}_{17}Cl$ 75.77% $^{35}_{17}Cl$ 24.23%

$$\left[\frac{75.77 \times 35}{100}\right] + \left[\frac{24.23}{100} \times 37\right]$$

→ 26·5195 + 8·9651

→ 35·4846

∴ → 35·48

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Ram of $^{35}Cl = x$

% Abundance of $^{35}Cl = 75.77\%$

% Abundance of $^{37}Cl = 100.00\% - 75.77\%$

$= 24.33\%$

$^{35}_{17}Cl$ 75.77% $^{37}_{17}Cl$ 24.23%

$$\text{Ram} = \left(\frac{75.77}{100} \times 35\right) + \left(\frac{24.23}{100} \times 37\right)$$

$= 26.5195 + 8.9651$

$= 35.4846$

$\underline{\simeq} 35.48$

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