ONDO STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY, OKITIPUPA
FACULTY OF SCIENCE
DEPARTMENT OF CHEMICAL SCIENCES
SECOND SEMESTER EXAMINATIONS 2015/2016 SESSION
CHM 104: INTRODUCTORY PHYSICAL CHEMISTRY
INSTRUCTION: ANSWER ALL QUESTIONS

Time allowed: 35 MINUTES

1 Aluminium materials should not be exposed to Alkalis because aluminium is
a) basic b) an oxidizing agent c) amphoteric d) reducing agent
2. Calculate the pH of a 0.0001 M acid solution
a) 5 b) 3 c) 4 d) 2
3. Acids are substances that dissociate in water to produce H^+ ions and bases are substances that dissociate i
water to produce OH^- ions. The definitions were proposed by
a) Arrhenius b) Newton c) Kelvin d) Brønsted Lowry
4. $HCl\ (aq) + H_2O\ (l) \rightarrow Cl^-\ (aq) + H_3O^+\ (aq)$
In the above equation, what is the Brønsted base?
a) HCl b) Cl c) H_2O d) H_3O^+
5. $H_2O\ (l) + H_2O\ (l) \rightleftarrows H_3O^+\ (aq) + OH^-\ (aq)$
In the above equation, what is the Conjugate base?
a) HCl b) H_2O c) H_3O^+ d) OH^-
6. ..... is defined as the amount of heat absorbed when 1 mole of H^+ from an acid reacts with 1 mole of ^-OH
from an alkali react to form 1mole of water.
A. Standard enthalpy of formation B. Standard enthalpy of solution C. Standard enthalpy of combustion D
Standard enthalpy of neutralization
7. A system is the part of the Universe
A. not under study B. under study C. already studied D. about to be studied
8. The unit of specific heat capacity is
A. $JK^{-1}mol^{-1}$ B. $JK^{-1}mol^{-1}g^{-1}$ C. $JK^{-1}g^{-1}$ D. $JK^{-1}g^{-1}mol^{-1}$
9. A change that occur within a system when there is no heat flow between the system and the surroundings
is.....A. Adiabatic change B. Acrobatic change C. Isothermal change D. Isobaric change
10. A 25.0g piece of iron at 85°C was place into 75.0g of water at 20°C. Given that the specific heat capacity of Fe
is 0.450J/g°C and that of water is 4.18 J/g°C. Calculate the final temperature.
A. 0.229°C B. 2.29°C C. 22.9°C D. 229°C
11. Which law states that the total enthalpy change of a chemical system is constant regardless of the route
provided the condition at the beginning is equal to the condition at the end of the reaction.
A. Hess's law B. Gay Lussac's law C. Avogadro's law D. Equilibrium's law
12. The sequence of steps in which a chemical process is broken down into is known as
A. Elementary steps B. Molecular step C. Reaction steps D. Kinetis steps
13. An expression of this kind "$v = k[A]^a[B]^b[C]^c...$" in chemical kinetics is called
a. Rate constant b. Reaction order c. Arrhenius model d. Rate law
14. Elementary reactions involves all of the following steps except
a. Unimolecular step b. Bimolecular step c. Termolecular step d. Polymolecular step
15. Identify the correct unit of rate constant for a typical third order reaction
a. $mol^{-2}\ dm^2\ s^{-1}$ b. $mol\ dm^{-3}\ s^{-1}$ c. $(mol\ dm^{-3})^{1/2}$ d. $L\ mol^{-1}\ s^{-1}$
16. The number of moles of each reactant and product appearing in a reaction equation is referred to as
a. Reaction coefficient b. Molarity c. Stoichometric coefficient d. Normality
17. The rate law whose integrated form is given below corresponds to

$$\ln[A] = -kt + \ln[A]_0$$

a. Zero order b. First order c. Second order d. Third order
18. A reaction whose successive half life are in the following order "400min, 200min, 100min, 50min, and 25min" corresponds to : a. Third order b. First order c. Zero order d. Second order
19. Consider the reaction

$N_{2(g)} + O_{2\ (g)} \rightleftarrows 2NO_{\ (g)}$ Kc = 0.10 at 2000 °C stanting with initial concentrations of 0.040 mol/L at $N_{2\ (g)}$ and 0.040 mol/L of O_2. Calculate the equilibrium concentration of No in mol/L

a. 0.0055 mol/L b. 0.0096 mol/L c. 0.011 mol/L d. 0.080 mol/L

20. Kc = 0.040 for the system below at 450 °C if a reaction is initiated with 0.04 mole of U_2 and 0.40 mole PU_3 in a 2.0 litre container. What is the equilibrium concentrationsof U_2 in the same system?

$$PU_{5\,(g)} \rightleftharpoons PU_{3\,(g)} + U_{2\,(g)}$$

a. 0.07M b. 0.16M c. 0.11M d. 0.04M

21. At equilibrium, a 1.0 litre container was found to contain 0.20 moles of A, 0.20moles of B, 0.40moles of C and 0.40moles of O. If 0.10 moles of A and 0.10moles of B are added to this system. What will be the new equilibrium concentration of A?.

$$A_{(g)} + B_{(g)} \rightleftharpoons C_{(g)} + D_{(g)}$$

a. 0.37 mol/L b. 0.47 mol/L c. 0.87 mol/L d. 0.23 mol/L

22. Consider the following system in a 1.00L container.

$$A_{(g)} + B_{(g)} \rightleftharpoons 2Cl$$

The equilibrium concentration at 200 °C were determined to be (A) = 0.200M, (B) = 3.00M. how many moles of A must be added to increase the concentration of C to 0.700M at 200 °C?

a. 0.225 mol b. 0.305 mol c.0.417 mol d.0.610 mol

23. Consider the reversible reaction at equilibrium at 392 °C

$$2A_{(g)} + B_{(g)} \rightleftharpoons C_{(g)}$$

The partial pressure are found to be evaluate K_p for this reaction a. 7.94 x 10-3 b. 0.146 c. 0.0532 d. 54.5

24. Conditions for equilibrium of concentration of reactant and products will be same if.

a. Temperature is constant b. Pressure or volume is constant c. Concentration of products and reactants are same. D. All of the above

25. Equilibrium constant can be used to

a. Predict direction of chemical reaction b. Predict extent of chemical reaction c.Determine the equilibrium concentration of mixture d. All of the above

26 Calculate the mass of Cu required to react with 5.00×10^{20} molecules of S_8 to form Cu_2S [Cu=63.5, S=32] a. 1.844gCu b. 0.844gCu c. 0.928gCu d. 0.105gCu

27. When gases react they do so in volume which bear simple ratio to one another and to the volume of the product if gaseous provide the temperature and the pressure remain constant. The law stated above is A. Charles' law B. Avogadro's law C. Gay-Lussac's law D. Boyle's law

28. Convert 74.7 cmHg to a pressure in atmospheric pressure. A. 0.943 B. 200 C. 100 D. 0.0983 E. 0.712

29. How many carbon atoms are in 0.0022g of CO_2? A. 0.00005 B. 0.0005 C. 0.0004 D. 0.0004

30. Determine the final pressure when 30.0cm^3 of O_2 at 600 torr is compressed to 5.0 cm^3. Assume constant temperature.

a. 3.6×10^3 torr b. 3.4×10^3 torr c. 3.6×10^2 torr d. 2.6×10^3 torr

31. What pressure is required to compress 5 litres of gas at 1 atm. Pressure to 1 litre at a constant temperature?

a. 1 atm b. 4 atm c. 5 atm d. 8 atm

32. The molar mass of ethylbutanoate, is 116$gmol^{-1}$. Its empirical formula determined from its mass percentage composition $C_3H_6O_2$. What is its molecular formula? a. $C_6H_{12}O_2$ b. $C_6H_{12}O_2$ c. C_3H_6O d. None of the above

33. The acid pair in the above equation is:

(A) CH_3COO^- and CH_3COOH (B) H_2O and CH_3COOH (C) H_3O^+ and CH_3COOH (D) H_2O and OH^-

34. The base pair in the above equation is:

(A) CH_3COO^- and OH^- (B) H_2O and CH_3COO^- (C) H_2O and OH^- (D) OH^- and CH_3COOH

35. Convert 0.1M HCl into its pH value.

(A) 1 (B) 2 (C) 3 (D) -2

36. The pH of a NaOH solution was measured to be 11, calculate its concentration (mol/dm^3).

(A) 0.01 (B) 1 (C) 0.001 (D) 0.004

37. The pH of 0.01 Monoprotic acid ($K_a = 7.5 \times 10^{-5}$ mol dm^{-3}) is

(A) 2.12 (B) 3.13 (C) 4.13 (D) 4.65

38. One of these is not an indicator

(A) Dull Orange (B) Methylene Blue (C) Phenolphthalein (D) Indigo red

39. Calculate the pH of 0.005 M Sodium hydroxide.

(A) 11.67 (B) 11.68 (C) 11.69 (D) 11.55

40. One of these is correct about K_w at 25°C.

(A) Not dependent on temperature (B) Equilibrium dependent (C) Equals 10^{-14} (D) Greater than 10^{-14}