WOLKITE UNIVERSITY

College of Natural and Computational Sciences

Department of Chemistry

Chemistry Final Exam for Natural Science Remedial Students

Academic Year: 2023

Time allowed 2:30

Total Mark: 50%

Instructions

- Check out that the exam booklet contains a total of 8 pages including the cover page.
- Cheating is strictly forbidden.
- Your hand writing should be understandable and legible.
- Try to use your time properly.
- Write your name and ID. No. on each page.
- Switch off your cell phone.
- Don't detach any paper

Useful constants
F = 96,500 C

Element	C	H	O	S	CU	Zn
Atomic mass(g/mol)	12	1	16	32	63.5	65

Name: _____ Id.No _____ Section: _____

Choose and write the letter of the correct answer from the given alternatives on the space provided (1pt each)

1. Solution is formed when the strong force of attraction occurs between:

A. Solvent – solvent particles

B. Solute – solvent particles

C. Solute- solute particles

D. All of the above

2. Which of the following is used to express a very small concentration of solution?

A. Molarity C. ppb

B. Molality D. Normality

3. Which of the following is true about metallic and electrolytic conduction?

A. Metallic conduction is due to flow of electrons.

B. Electrolytic conduction result in chemical changes

C. Electrolytic conduction is due to flow of ions.

D. All

4. Which one of the following is not concept of collision theory?

A. The particles of the reactants must collide.

B. The particles of the reactants must have proper orientation.

C. Collision between reactants results a short- lived high energy state species.

D. The particles of the reacting species must collide with energy greater than or equal to the activation energy

5. Among the following reactions, which one is not affected by the change in pressure?

A. $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ C. $N_2O_4(g) \rightleftharpoons 2NO_2(g)$

B. $I_2(g) + H_2(g) \rightleftharpoons 2HI(g)$ D. $O_2(g) + 2H_2(g) \rightleftharpoons 2H_2O(g)$

6. Nitrogen has the same oxidation number in all of the following except:

A. NO_3^- B. N_2O_5 C. NH_4Cl D. $Ca(NO_3)_2$

7. Among the following which group conserved in a balanced chemical equation?

A. mass & mole C. mass & molecule

B. atom & mole D. mass & atom

8. What is the possible physical state of solvent in liquid solution?

A. Solid B. Liquid C. Gas D. All

9. Which of the following is not factor to affect solubility?

A. The nature of solute C. Surface area of solid solute

B. Temperature D. Pressure for solid

10. Given a general reaction at equilibrium:

$$\mathbf{aA + bB \rightleftharpoons cC + dD}$$

The equilibrium constant (K_c) expression is

A) $K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$

B) $K_c = [A]^a[B]^b - [C]^c[D]^d$

C) $K_c = [C]^c[D]^d - [A]^a[B]^b$

D) $K_c = \frac{[A]^a[B]^b}{[C]^c[D]^d}$

11. Consider the following reversible reaction: $2S(s) + 3O_2(g) \leftrightarrow 2SO_3(g) + heat$
The equilibrium position of this reaction could not be affected by:

A. Decreasing temperature. C. Increasing the concentration of S(s)

B. Adding a catalyst. D. Increasing the concentration of $SO_3(g)$.

12. An 8.00 g sample of solution has 5.8×10^{-5} g of calcium ions. The ppm concentration is

A. 8ppm B. 7.5 ppm C. 7.25 ppm D. 5.8ppm

13. The proposed reaction mechanism between nitrogen monoxide and bromine is given.

$$\mathbf{NO + Br_2 \rightleftharpoons NOBr_2 \ (fast)}$$

$$\mathbf{NOBr_2 + NO \rightarrow 2NOBr \ (slow)}$$

Which of the following rate equations is consistent with the proposed mechanism?

A. Rate = $k[NO]^2$ C. Rate = $k[NO]^2\ [Br_2]$

B. Rate = $k[NO]\ [Br_2]^2$ D. Rate = $k[NO]\ [Br_2]$

14. Which one of the following reactions is a non–redox?

A. $HCl + KOH \rightarrow KCl + H_2O$ C. $3NO_2 + H_2O \rightarrow 2HNO_3 + NO$

B. $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ D. $CuO + H_2 \rightarrow Cu + H_2O$

15. The rate of a chemical reaction tells us about:

A. The reactants taking part in the reaction

B. The products taking part in the reaction

C. How slow or fast the reaction taking place

D. None

16. In which of the following reactions the magnitudes of Kc and Kp are equal?

A. $2CO_2(g) \rightleftharpoons 2CO_2(g) + O_2(g)$ C. $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

B. $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ D. $CO(g) + Cl_2(g) \rightleftharpoons COCl_2(g)$

17. The reaction $2NO(g) + Cl_2(g) \rightarrow 2NOCl(g)$ was studied at 263k and the following data obtained.

Experiment	$[NO]_0$(M)	$[Cl_2]_0$(M)	$(Rate)_0$(m/min)
1	0.10	0.10	0.18
2	0.10	0.20	0.36
3	0.20	0.20	0.36

What is **the rate equation** for the above experiments at 263K?

A. Rate = $K[Cl_2]$ C. Rate = $K[NO]^2[Cl_2]$

B. Rate = $K[NO][Cl_2]$ D. Rate = $K[NO][Cl_2]^2$

18. Which of the following is not factor to affect solubility?

A. The nature of solute C. Surface area of solid solute

B. Temperature D. Pressure for solid

19. What is the coefficient of H_2O_2 in the following reaction, after balancing

$$H_2O_2 \rightarrow H_2O + O_2$$

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

20. How many litres of 2.5M of HBr are required to make 1.5 L of 1M HBr?

A. 0.3 B. 4 C. O.6 D. 2

21. Ethene, C_2H_4 can be produced in the following industrial system:

$$C_2H_{6\,(g)} + \text{energy} \rightleftharpoons C_2H_{4\,(g)} + H_{2\,(g)}$$

The conditions that are necessary to maximize the equilibrium yield of C_2H_4 are:

A. Low temperature and low pressure

B. High temperature and low pressure

C. Low temperature and high pressure

D. High temperature and high pressure

22. Which one of the following reactions is double displacement reaction?

A. $2CO + O_2 \longrightarrow 2CO_2$

B. $2NaHCO_3 \xrightarrow{\text{heat}} Na_2CO_3 + CO_2 + H_2O$

C. $NaOH + HCl \longrightarrow NaCl + H_2O$

D. $Zn + HBr \longrightarrow ZnBr_2 + H_2$

23. What is the normality of 0.6M of H_2SO_4 solution

A. 0.3 B. 1.2 C. 0.2 D. 2

24. What is the mole fraction of ethylene glycol($C_2H_6O_2$) in a solution containing 20% of $C_2H_6O_2$ by mass (assuming that the solvent is water)

A. 0.067 B. 0.5 C. 0.71 D. 0.932

25. Which one of the following **is not** true about battery (cell)?

A. Primary cell is rechargeable

B. Secondary cell is rechargeable

C. Daniel cell is used in the form of solution

D. Zinc – carbon (leclanche) cell is used in the form of paste

26. Which one of the following is true about oxidation-reduction reactions?

A. Oxidation without reduction is possible.

B. The reduced species lose electrons(s)

C. The oxidation numbers of reducing agents increase.

D. Oxidizing agents cause reduction.

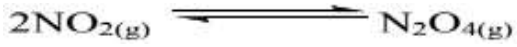
27. Which of the following is true about the reaction below?

$$Cu + HNO_3 \longrightarrow Cu(NO_3)_2 + NO + H_2O$$

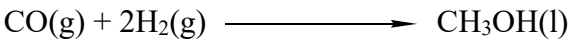
A. Cu is Oxidized C. HNO_3 is reducing agent

B. N is Oxidized D. H_2 is reduced

28. Which of the following characteristics is the description for homogeneous mixture?
A. Has one or more visible boundaries between the components.
B. Its composition is not uniform.
C. It is a combination of two or more substances that has the same composition throughout.
D. Each component's particles can be detected by the naked eye or with a magnifying glass.
29. Consider the following equilibrium:



When the volume of the container is increased, the equilibrium position shifts to the
A. left and equilibrium constant decreases
B. left and equilibrium constant remains constant
C. right and equilibrium constant increases
D. right and equilibrium constant remains constant
30. The rate constant of zero order reactions has the unit
A. s^{-1} B. mol $L^{-1}s^{-1}$ C. $L^2mol^{-2}s^{-1}$ D. $L^2mol^{-1}s^{-1}$
31. What is the product formed at the cathode in the electrolysis of molten NaCl?
A. Chlorine gas C. Hydrogen gas
B. Sodium metal D. Oxygen gas
32. In which type of solution does an equilibrium always exist?
A. Supersaturated C. Unsaturated
B. Saturated D. Diluted
33. Calculate gram of H_2SO_4 needed to make 200ml of 0.2M H_2SO_4
A. 1.92 B. 2.92 C. 3.92 D. 4.92
34. If we double the concentration of reactant, the rate increased by eight times, the reaction is:
A. First order B. Zero order C. Third order D. Second order
35. A solution of $CuSO_4$ is electrolyzed for 10 minutes with a current of 1.5 amperes. What is the mass of copper deposited at the cathode? (Molar mass of Cu = 63.5 g/mol)
A. 0.492 g B. 0.325 g C. 0.873 g D. 0.296 g
36. Which one of the following is true during electrorefining?
A. Mass of anode increases C. Anode is pure metal
B. Mass of cathode increases D. Cathode is impure metal
37. How many liters of carbon monoxide at STP are required to react with 11.2L of hydrogen gas according to the equation,



A. 11.2L B. 5.6L C. 44.8L D. 22.4L

38. A human blood has a pH of 7.4. Its pOH will be:
A. 6.6 B. 3.98 x10 -8 C. 62.51 x10-7 D. 7.4

39. It is possible that different mass of oxygen with the ratio 1:2 combine with constant mass of tin to form SnO & SnO2 respectively. Which law governs these two possible chemical combinations between atoms of tin & oxygen.

A. Law of conservation of mass C. Law of definite proportion

B. Law of conservation of atoms D. Law of multiple proportion

40. You have 200ml 0f 0.5M HCl solution, & you want to dilute in to exactly 0.1M. How match water should be added?

A. 1000ml B. 1200 ml C. 800 ml D. 400ml

41. In which of the following is the reaction will proceed in the forward direction at equilibrium?

A. Qc < Kc B. Qc > Kc C. Qc = Kc D. None

42. The equilibrium constant for reaction (a) is K. what is the equilibrium constant for the reaction (b)

$$SO_2(g) + 1/2\ O_2(g) \leftrightarrow SO_3(g) \text{ ----- a}$$

$$2SO_3(g) \leftrightarrow 2SO_2(g) + O_2(g) \text{ --- b}$$

A. K^2 B. $1/K^2$ C. 2K D. 1/2K

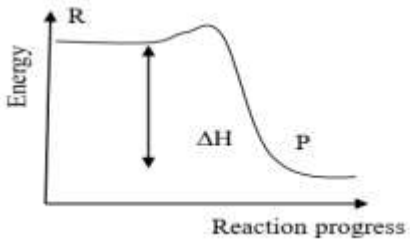
43. Which of the following pairs of liquids are miscible?

A. benzene, C_6H_6, and hexane, C_6H_{12} C. hexane and methanol, CH_3OH

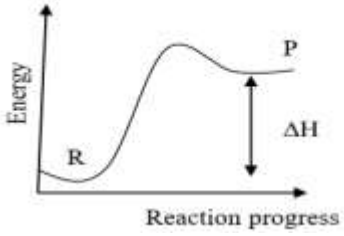
B. water and hexane, C_6H_{12} D. water and benzene, C_6H_6

44. Which one of the following is energy diagram of endothermic reaction? (Hint: p = product r = reactant)

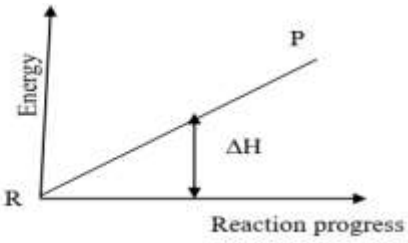
A.



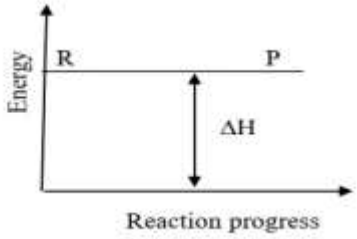
B.



C.



D.



45. When 20 grams of sulphur dioxide, SO_2, reacts with oxygen, 23 grams of sulphur trioxide is formed. What is the percentage yield? (Atomic masses: S =32, O = 16)

$$2SO_2 + O_2 \rightarrow 2SO_3$$

A. 46% B. 23% C. 92% D. 54.35%

46. If 65 grams of zinc, Zn, reacts with 5 grams of HCl according to the following reaction. How many grams of hydrogen would be produced? Atomic masses: Zn = 65, H = 1, Cl = 35.5)

$$Zn + 2HCl \rightarrow ZnCl_2 + H_2$$

A. 2g B. 0.14g C. 0.28g D. 1g

47. Which of the following is not true about the reaction below?

$$3H_2(g) + N_2(g) \leftrightarrow 2NH_3(g)$$

A. Removing ammonia, NH_3, will shift the reaction to the forward direction.

B. Increasing concentration of H_2 will shift the reaction to the reverse direction.

C. Catalyst helps the equilibrium to be attained soon.

D. Equilibrium cannot be attained in the open system.

48. Which of the following **is not** true about a reversible reaction at equilibrium?

A. The concentration of reactants and products is the same.

B. The rate of the forward and reverse reaction is equal.

C. Concentrations of products and reactants are constant.

D. Chemical equilibrium is dynamic in nature.

49. The equilibrium constant, Kc, expression for the reaction below is:

$$CaCO_3(s) \leftrightarrow CaO(s) + CO_2(g)$$

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

50. Which of the following is not true about electrolytic cell and galvanic cell?

A. In an electrolytic cell electrical reaction is non-spontaneous.

B. In galvanic cell reaction is non spontaneous and generates electrical energy.

C. In both galvanic cell and electrolytic cell electrons flow from the Cathode to the anode.

D. In both galvanic cell and electrolytic cell oxidation takes place at the anode.