



## ABUNE GORGORIOS SCHOOL

### 2012E.C SECOND SEMESTER CHEMISTRY MODEL EXAM FOR GRADE 12

Time Allowed: 2:30hrs

**DIRECTIONS :** EACH OF THE FOLLOWING QUESTIONS IS FOLLOWED BY FOUR POSSIBLE ALTERNATIVES. CHOOSE THE BEST ANSWER AND BLAKEN THE LETTER OF YOUR CHICE ON THE SEPARATE ANSWER SHEET PROVIDED.

You may refer to the information given below when you work on some of the questions.

#### SI units and conversion factors

- A) 1 ton= 907.185kg
- B) 1 metric ton =1000kg
- C)  $1 \text{ A}^0 = 10^{-10}\text{m}$
- D) 1 L.atm=101.3J
- E) Coulombs = amperes  $\times$  seconds

#### Physical constants

1. Avogadro's No. =  $6.02 \times 10^{23} \text{ mol}^{-1}$
2. Plank's constant,  $h = 6.626 \times 10^{-34} \text{ J.S}$
3. Rydberg's constant,  $R_H = 109,678 \text{ cm}^{-1}$
4. Velocity of light,  $c = 3 \times 10^8 \text{ ms}^{-1}$
5. Mass of electron =  $9.11 \times 10^{-31} \text{ kg}$
6. Faraday's constant(F) = 96,500 coulomb's/mol
7. Universal gas constant,  $R = 8.31 \text{ J/mol.K}$
8. 1cal=4.184 J

#### Atomic Numbers (Z) and Atomic Weights (A)

Element	H	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl
Z	1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	1.0	6.9	9.0	10.8	12.0	14.0	16.0	19.0	20.18	22.98	24.3	27	28.1	31.0	32.1	35.5

Element	Ar	K	Ca	Cr	Mn	Fe	Ni	Cu	Zn	As	Kr	I	Xe	Se
Z	18	19	20	24	25	26	28	29	30	33	36	53	54	34

A	39.9 5	39. 1	40.0 8	5 2	54. 9	55. 9	58.7 1	63. 5	65. 4	75. 0	83. 8	126. 9		
---	-----------	----------	-----------	--------	----------	----------	-----------	----------	----------	----------	----------	-----------	--	--

- A measuring cylinder has a precision  $\pm 0.01\text{ml}$ . a liquid sample that has a volume of  $10\text{ml}$  is measured by the measuring cylinder. How many significant figures should be reported for this measurement?  
A. 1      B. 2      C. 3      D. 4
- Which one of the following electromagnetic radiation has the longest wavelength?  
A. Gamma rays      C. radio waves  
B. Microwaves      D. x- rays
- Which one of the following is not a basic SI unit?  
A. Candela      B. Gram      C. Mole      D. Second
- Which of the following properties of a substance does not represent an intensive physical property?  
A. Boiling point      C. Density  
B. Color      D. Volume
- What is the mass of one molecule of water?  
A.  $3.0 \times 10^{-23}\text{g}$       C.  $0.0003\text{g}$   
B.  $1.8 \times 10^{-23}\text{g}$       D.  $18.0\text{g}$
- What is the number of significant figures in  $0.0030050$ ?  
A. 4      B. 5      C. 7      D. 8
- What is the number of chloride ions ( $\text{Cl}^-$ ) present in  $1.0 \times 10^{-5}\text{ mol}$  of  $\text{AlCl}_3$ ?  
A.  $1.80 \times 10^{19}$       C.  $6.02 \times 10^{23}$   
B.  $6.02 \times 10^{18}$       D.  $6.02 \times 10^{28}$
- What is the wavelength associated with an electron of mass,  $m = 9.11 \times 10^{-28}\text{g}$ , travelling at 40% of the velocity of light?  
A.  $6.06 \times 10^{-15}\text{m}$       C.  $6.06 \times 10^{-12}\text{m}$   
B.  $2.42 \times 10^{-15}\text{m}$       D.  $2.42 \times 10^{-11}\text{m}$
- Which of the following hybrid orbitals is favoring the formation of trigonal bipyramidal?  
A.  $\text{sp}^3\text{d}$       B.  $\text{sp}^3$       C.  $\text{sp}^3\text{d}^2$       D.  $\text{sp}^3\text{d}^3$
- The Hydrogen line spectrum provides evidence for the  
A. Heisenberg uncertainty principle      C. Wave like properties of light  
B. Diatomic nature of  $\text{H}_2$       D. Quantized nature of atomic energy states
- What is the complete chemical symbol for the ion contains 19 protons, 18 electrons, 20 neutrons?  
A.  $^{38}_{19}\text{K}^+$       B.  $^{40}_{20}\text{K}^+$       C.  $^{39}_{19}\text{K}^+$       D.  $^{29}_{20}\text{K}^+$
- Which of the following radiations has the highest photon energy?

- A. UV      B. IR      C. Microwaves      D. Visible
13. In which case are the metals arranged in order of increasing metallic character?
- A. Mg, Ca, K, Cs      C. Mg, Ca, Cs, K  
B. Ca, Mg, K, Cs      D. K, Mg, Ca, Cs
14. What did Rutherford conclude from the experiments he carried out in which a beam of alpha particles was directed at a thin piece of metal foil?
- A. The positive charged parts of atoms are moving about with a velocity approaching the speed of light  
B. The positively charged parts of atoms are extremely small and extremely heavy particles  
C. The diameter of an electron is approximately equal to that of the nucleus  
D. Electrons travel in circular orbits around the nucleus
15. Which one of the following sets of quantum numbers could be those of the last electron of Mo?
- A.  $n=4, L=0, m_s=+1/2$       C.  $n=4, L=2, m_L=-1, m_s=+1/2$   
B.  $n=5, L=0, m_L=9, m_s=-1/2$       D.  $n=3, L=2, m_L=0, m_s=+1/2$
16. Which of the electromagnetic spectrum is capable of inducing electron transition with the greatest energy?
- A. Infrared      B. Microwave      C. Ultraviolet      D. Visible
17. As atomic number increases within a group, what happens to the electronegativity of the elements?
- A. The electronegativity decreases, because the atomic number increases  
B. The electronegativity decreases, because the atomic size increases  
C. The electronegativity increases, because the number of energy levels increases  
D. The electronegativity increases, because the atomic number increases
18. Which atom in the ground state has three half-filled orbitals?
- A. P      C. Al  
B. Si      D. Li

19. Which conclusion is based on the Rutherford's gold foil experiment and the resulting model of the atom?
- A. An atom is mainly empty space, and the nucleus has a positive charge
  - B. An atom is mainly empty space, and the nucleus has a negative charge
  - C. An atom has hardly an empty space, and the nucleus has a positive charge
  - D. An atom has hardly an empty space, and the nucleus has a negative charge
20. Which element of group 4A forms the most acidic oxide?
- A. Carbon
  - B. Silicon
  - C. Germanium
  - D. Tin
21. An element with a partially filled d sublevels in the ground state is classified as
- A. A halogen
  - B. A transition metal
  - C. An alkali metal
  - D. An alkaline earth metal
22. Which one of the following statements is correct about Millikan Oil Drop Experiment?
- A. It demonstrates that most of the mass and positive charge of the atom is located in small region called the nucleus
  - B. It measures the mass to charge ratio of the proton
  - C. It determines the magnitude of the electron charge
  - D. It measures the mass of the neutron
23. Which one of the following statements is NOT correct about quantum mechanical model of the atom?
- A. The energy and position of an electron cannot be determined simultaneously
  - B. Lower energy orbitals are filled with electron before higher energy orbitals
  - C. When filling orbitals of equal energy, two electrons will occupy the same orbitals before filling a new orbitals
  - D. No two electrons can have the same four quantum numbers
24. How many spectral lines are emitted from a hydrogen atom excited to the state designated by the principal quantum number,  $n=3$ ?
- A. 1
  - B. 2
  - C. 3
  - D. 4
25. Which element corresponds to the electron configuration  $[\text{Ne}]3s^23p^1$ ?
- A. Mg
  - B. Al
  - C. Si
  - D. Ga

26. What is the correct order of the atomic radius in the elements below?
- A.  $\text{Mg} < \text{Al} < \text{Cl}$                       C.  $\text{Mg} > \text{Al} > \text{Cl}$   
B.  $\text{Al} < \text{Mg} < \text{Cl}$                       D.  $\text{Cl} > \text{Al} > \text{Mg}$
27. The outermost electron(s) of which of the following experiences the greatest effective nuclear charge?
- A. K      B. Ca      C. Br      D. P
28. Within a specified period, an increase in atomic number is usually accompanied?
- A. An increase in atomic radius and an increase in electronegativity  
B. A decrease in atomic radius and an increase in electronegativity  
C. An increase in atomic radius and a decrease in electronegativity  
D. A decrease in atomic radius and a decrease in electronegativity
29. Which of the following sets of quantum numbers is not allowed in the hydrogen atom?
- A.  $n=2, l=1, m_l=-1$   
B.  $n=1, l=0, m_l=0$   
C.  $n=8, l=7, m_l=-6$   
D.  $n=2, l=0, m_l=2$
30. Which metal atoms can form ionic bonds by losing electrons from both the outermost and next to outermost principal energy levels?
- A. Fe              B. Mg              C. Pb              D. Ca
31. What is the difference between chlorine -35 and chlorine -37?
- A. Chlorine -37 has two more protons than chlorine -35  
B. Chlorine -37 has two more neutrons than chlorine -35  
C. Chlorine -37 has two more electrons than chlorine -35  
D. Chlorine -37 has one more proton and one more neutron than chlorine -35
32. Which of the following is the right order of the steps of a scientific method?
- A. Performing experiments – formulating hypothesis – making observations  
B. Forming hypothesis – making observations – performing experiments  
C. Making observations – formulating hypothesis – performing experiments  
D. Making observations – performing experiments – formulating hypothesis
33. Which of the following quantum number(s) determine the energy of an element in a hydrogen atom?
- A.  $n$               B.  $n$  and  $l$               C.  $n, l$  and  $m$               D.  $n, l, m$  and  $s$
34. What did Rutherford's alpha particle experiment show?

- A. Electrons have a negative charge
  - B. A proton is a hydrogen atom without electron
  - C. Electrons circle the nucleus of an atom in orbits
  - D. Most of the mass and all of the positive charge of an atom is found in nucleus
35. For which of the following element is Hund's rule used in writing the electron configuration?
- A. C      B. B      C. Be      D. Li
36. Which of the following statement is true?
- A. Ultraviolet light has longer wavelength than visible light
  - B. The energy of radiation decrease as the wavelength decreases
  - C. The frequency of radiation increases as the wavelength as the wavelength decreases
  - D. Wave number of an electromagnetic radiation increases as wavelength increase
37. What sizes of the particles and velocities can consider quantum effect?
- A. Particles with very large mass and large velocities
  - B. Particles with large mass and small velocities
  - C. Particles with very small mass and large velocities
  - D. Particles with small mass and velocities
38. Which one of the following molecules is a non-polar?
- A. CS<sub>2</sub>      B. SO<sub>2</sub>      C. CHCl<sub>3</sub>      D. SF<sub>4</sub>
39. Which of the following molecules is not paramagnetic?
- A. O<sub>2</sub><sup>+</sup>      B. O<sub>2</sub>      C. O<sub>2</sub><sup>-</sup>      D. O<sub>2</sub><sup>2-</sup>
40. Which of the following molecules has the shortest bond length?
- A. O<sub>2</sub>      B. Cl<sub>2</sub>      C. N<sub>2</sub>      D. Br<sub>2</sub>
41. Which molecule has the largest bond angle?
- A. CF<sub>4</sub>      B. NF<sub>3</sub>      C. BF<sub>3</sub>      D. OF<sub>2</sub>
42. Which of these statements explains what makes graphite useful as an electrode material?
- A. The carbon sheet in graphite are close enough for electrons to freely jump from one sheet to another
  - B. The three – dimensioned network of carbon in graphite allows electrons to move freely in all directions
  - C. The electrons in the Pi bond in graphite are free to move within the structure
  - D. The London dispersion forces allow electrons to freely move through graphite
43. Which of the following statements about intermolecular interactions is incorrect?

- A. Dispersion interaction are greater for Xe than for He
  - B. Dipole – dipole interactions are greater for  $\text{CF}_4$  than for  $\text{H}_2\text{O}$
  - C. Individual hydrogen bonds are stronger for HF than for HCl
  - D.  $\text{H}_2\text{O}$  boils at a higher temperature than  $\text{H}_2\text{S}$  because of hydrogen bonding
44. Which type of intermolecular forces exist between nonpolar covalent bonds
- A. Dipole – dipole forces
  - B. Dispersion forces
  - C. Ion – dipole forces
  - D. hydrogen bonding
45. A substance that does NOT conduct electricity as a solid but does conduct electricity when melted is most likely classified as?
- A. An ionic compound
  - B. A molecular compound
  - C. a metal
  - D. a non-metal
46. Which of the following ionic compounds has the smallest lattice energy?
- A. LiF
  - B. CsI
  - C. NaF
  - D. LiI
47. Silicon dioxide ( $\text{SiO}_2$ ) and diamonds are best described as?
- A. Molecular substances with coordinate covalent bonding
  - B. Molecular substances with ionic bonding
  - C. Network solids with covalent bonding
  - D. Network solids with ionic bonding
48. Which compound contains both ionic and covalent bonds?
- A.  $\text{CaCO}_3$
  - B.  $\text{PCl}_3$
  - C.  $\text{MgF}_2$
  - D.  $\text{CH}_2\text{O}$
49. What does the correct Lewis structure for the  $\text{CCl}_4$  molecule show?
- A. 5 bonds
  - B. 24 unshared electrons
  - C. No unshared electrons
  - D. 10 shared electrons
50. Which of the following statement is not true about ionic compounds?
- A. They have high boiling and melting points
  - B. They conduct heat and electricity
  - C. Their unit particles are ions
  - D. They are ductile
51. Which one of the following is the geometry of  $\text{ICl}_4$ ?
- A. Octahedral
  - B. Square planar
  - C. Tetrahedral
  - D. trigonal planar
52. A covalent bond is unlikely to exist in which of the following substance?

A.  $\text{H}_2$       B.  $\text{SeH}_2$       C.  $\text{SiF}_4$       D.  $\text{CaO}$

53. Which one of the following is NOT true of metallic bonding?

- A. It gives rise to excellent electrical conductivity
- B. Electrons are free to move throughout the structure
- C. The strength of metallic bonds increases down a group
- D. The strength of metallic bonding affects the boiling points of metals

54. All of these are characteristics of most ionic compounds in the solid phase EXCEPT

- A. High melting point
- B. Solubility in water
- C. High electrical conductivity
- D. Insolubility in organic solvents

55. Which set contains only covalently bonded molecules?

- A.  $\text{BCl}_3$ ,  $\text{SiCl}_4$ ,  $\text{PCl}_3$       C.  $\text{I}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{NaI}$
- B.  $\text{NH}_4\text{Br}$ ,  $\text{N}_2\text{H}_4$ ,  $\text{HBr}$       D.  $\text{Al}$ ,  $\text{O}_3$ ,  $\text{As}_4$

56. Which of the following compounds would be expected to have the highest melting point?

- A.  $\text{BaF}_2$       C.  $\text{BaBr}_2$
- B.  $\text{BaCl}_2$       D.  $\text{BaI}_2$

57. Which is likely to have the largest intermolecular dispersion forces?

- A.  $\text{Br}_2$       C.  $\text{HCl}$
- B.  $\text{Ne}$       D.  $\text{N}_2$

58. According to the molecular orbital theory, which one of the following is paramagnetic?

- A.  $\text{F}_2$       B.  $\text{H}_2$       C.  $\text{NO}^+$       D.  $\text{NO}$

59. Which term describes the units that make up compounds with covalent bonds?

- A. Ions      B. Acids      C. Salts      D. Molecules

60. There is a strong covalent bond between the N atoms in nitrogen gas,  $\text{N}_2$ . Why does nitrogen have such a low boiling point of  $-196^\circ\text{C}$ ?

- A. The bond between the N-atoms is triple
- B. N is very electronegative, only next to F and O
- C. The strong bond, at intramolecular one, determines the boiling point of the substance
- D. Boiling point is determined by intermolecular force, which in this case is weak as this molecule is non-polar

61. Which of the following below best explains why atoms react chemically with each other?

- A. When atoms react, they gain protons and are more stable



- B. When atoms react, they lose all their electrons and become more stable
- C. When atoms react, they lose, they gain, or share electrons and are then less stable
- D. When atoms react, they lose, gain, or share electrons to attain in full outer energy level and are then more stable
62. Which one of the following ionic compounds is formed from the reaction between magnesium and nitrogen
- A.  $\text{MgN}_2$     B.  $\text{Mg}_2\text{N}_2$     C.  $\text{Mg}_3\text{N}_2$     D.  $\text{Mg}_2\text{N}_3$
63. How many types of cubic cells are known?
- A. 2    B. 3    C. 4    D. 5
64. Which of the following crystals possess high electrical and thermal conductivities?
- A. Ionic crystals    C. Molecular crystals
- B. Metallic crystals    D. Covalent network crystals
65. Which of the following molecules has a trigonal pyramidal structure?
- A.  $\text{SF}_4$     B.  $\text{IF}_5$     C.  $\text{ICl}_4^-$     D.  $\text{BrF}_5$
66. Which of the following is the most important type of solute – solvent interaction in a solution of n – butanol in water?
- A. Dispersion    C. Dipole-dipole
- B. Ion- dipole    D. Hydrogen bonding
67. Which one of the following molecules/molecular ions is paramagnetic according to the molecular orbital theory?
- A.  $\text{O}_2^{2-}$     B.  $\text{O}_2$     C.  $\text{F}_2$     D.  $\text{O}_2^{2+}$
68. Which of the following molecules has dipole moment?
- A.  $\text{XeF}_4$     B.  $\text{H}_2\text{S}$     C.  $\text{SO}_3$     D.  $\text{CH}_4$
69. Two reactant particles collide with proper orientation. The collision will be effective if the particles have
- A. High activation energy    C. High ionization energy
- B. Sufficient kinetic energy    D. Sufficient potential energy
70. Which of the following statement is FALSE?
- A. The reaction vessel cools when an endothermic reaction occurs
- B. An exothermic reaction is characterized by a negative value of  $\Delta H$
- C. An endothermic reaction causes the surrounding to absorb heat

D. Heat is evolved when an exothermic reaction occurs

71. Based on the energy values given for the forward reaction, which of the following reaction would be fastest in the reverse direction?

- A.  $E_a = 30 \text{ kJ/mol}$ ;  $\Delta E = -10 \text{ kJ/mol}$       C.  $E_a = 45 \text{ kJ/mol}$ ;  $\Delta E = +15 \text{ kJ/mol}$   
B.  $E_a = 60 \text{ kJ/mol}$ ;  $\Delta E = +10 \text{ kJ/mol}$       D.  $E_a = 20 \text{ kJ/mol}$ ;  $\Delta E = -20 \text{ kJ/mol}$

72. Which of the following increases when the concentration of reactant molecules increases?

- A. The frequency of molecular collisions      C. The rate constant  
B. The average kinetic energy      D. The activation energy

73. How does a catalyst increase the rate of a chemical reaction?

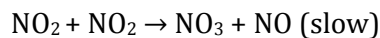
- A. By shifting the equilibrium to the right  
B. By shifting the equilibrium to the left  
C. By lowering the activation energy  
D. By increasing the activation energy

74. For the reaction  $2A + B \rightarrow 2C$ , the following data were obtained:

Experiment	Initial conc. of A mol/l	Initial conc. of B mol/l	Initial rate (mol/l sec)
1.	0.5	0.5	10
2.	0.5	1.0	20
3.	0.5	1.5	30
4.	1.0	0.5	40

- A.  $r = k[A]^2$       B.  $r = k[A]^2[B]$       C.  $r = k[A][B]$       D.  $r = k[A]^2[B][C]$

75. The reaction of  $\text{NO}_2$  with  $\text{CO}$  is believed to occur according to the following mechanism. What would be the rate expression if the mechanism is correct?



- A.  $\text{Rate} = k[\text{NO}_2]^2$       B.  $\text{Rate} = k[\text{NO}_2][\text{CO}]$       C.  $\text{Rate} = k[\text{NO}_2]^2[\text{CO}]$       D.  $\text{Rate} = k[\text{NO}_2]$

76. Which of the following rate law is third order overall?

- A.  $\text{Rate} = k[A]^1[B]^3$       B.  $\text{Rate} = k[A][B]^2$       C.  $\text{Rate} = k[A]^3[B]^3$       D.  $\text{Rate} = k[A]^5[B]^2$

77. For the decomposition of acetaldehyde the rate expression is:  $\text{Rate} = k[\text{Acetaldehyde}]^{1.5}$ .

If the concentration of acetaldehyde is doubled, then the rate would increase by a factor of:

- A. 5.50      B. 2.83      C. 3.0      D. 4.83

78. A possible mechanism for the reaction,  $2A + B \rightarrow C + D$ , is

1.  $A + A \rightarrow A_2$  fast equilibrium
2.  $A_2 + A \rightarrow A_3$  slow
3.  $A_3 + B \rightarrow A + C + D$  fast

According to the mechanism, the rate law will be:

- A. Rate =  $K[A]$                       C. Rate =  $K[A]^3$   
 B. Rate =  $K[A]^2$                       D. Rate =  $K[A]^2[B]$

79. A particular reaction was found to depend on the concentration of the hydrogen ion,  $[H^+]$ .

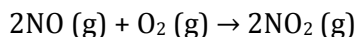
The initial rate changed as a function of  $[H^+]$  as follows:

$[H^+](M)$	0.005	0.001	0.02
Initial rate(M/s)	$3.4 \times 10^{-7}$	$1.7 \times 10^{-7}$	$0.85 \times 10^{-7}$

What is the order of the reaction in  $[H^+]$ ?

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

80. For the reaction,



The following data were obtained:

$[NO]_0(M)$ :	0.10	0.10	0.40
$[O_2]_0(M)$ :	0.10	0.20	0.20
Rate(M/s):	$2.5 \times 10^{-4}$	$5.0 \times 10^{-4}$	$8.0 \times 10^{-3}$

What is the rate for the reaction?

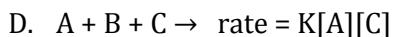
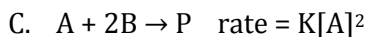
- A. Rate =  $K[NO][O_2]$                       C. Rate =  $K[NO]^2[O_2]$   
 B. Rate =  $K[NO][O_2]$                       D. Rate =  $K[NO]^2[O_2]$

81. Which of the following does NOT affect the rate of a chemical reaction?

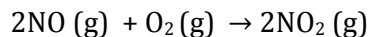
- A. Enthalpy of the reaction                      C. Surface area  
 B. Concentration of reactants                      D. Temperature

82. Each of the choices below gives a reaction and the corresponding rate law, of these choices, which one could be an elementary process or individual step in a chemical reaction?

- A.  $2A \rightarrow P$                       rate =  $K[A]$



83. Consider the reaction in which nitric oxide is oxidized to nitrogen dioxide:



For which the rate law is  $\text{rate} = K[\text{NO}]^2[\text{O}_2]$ . If this reaction takes place in a sealed vessel and the partial pressure of nitric oxide is doubled, what effect would this have on the rate of reaction?

A. The reaction rate would increase by a factor of four

B. The reaction rate would increase by a factor of three

C. The reaction rate would increase by a factor of eight

D. The reaction rate would increase by a factor of two

84. Which of the following is NOT probable shape of a molecule?

A. A tetrahedral,  $\text{GeCl}_4$

B. A bent,  $\text{HCN}$

C. A triangular bipyramidal,  $\text{PCl}_5$

D. A T-shaped,  $\text{BrF}_3$

85. Which of the following factors does NOT affect the rate of a chemical reaction that is of zero order?

A. Concentration of reactants

B. Surface area of reactants

C. Temperature

D. Presence of a catalyst

86. What is the Half-life,  $t_{1/2}$ , for zero order reaction  $A \rightarrow B$ , (k is rate constant)

A.  $\ln 2k$     B.  $[A]_0/2k$     C.  $\ln k/[A]_0$     D.  $\ln 2/[A]_0K$

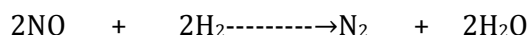
87. The reaction between NO and  $\text{I}_2$  is second-order in NO and first-order in  $\text{I}_2$ . What change occurs in the rate of the reaction if the concentration of NO is doubled and  $\text{I}_2$  is left unchanged?

A. Doubled    B. Quadruple    C. Eight times    D. Three times

88. Consider the following reaction:  $2\text{S}_2\text{O}_3^{2-}(\text{aq}) + \text{I}_2(\text{aq}) \rightarrow \text{S}_4\text{O}_6^{2-}(\text{aq}) + 2\text{I}^-(\text{aq})$ , if in an experiment  $0.05\text{mol S}_2\text{O}_3^{2-}$  is consumed in  $1.0\text{L}$  of solution each second, at what rates  $\text{S}_4\text{O}_6^{2-}$  and  $\text{I}^-$  Produced in this solution ?

- A.  $\text{S}_4\text{O}_6^{2-} = 0.025$  ;  $\text{I}^- = 0.025$
- B.  $\text{S}_4\text{O}_6^{2-} = 0.025$  ;  $\text{I}^- = 0.05$
- C.  $\text{S}_4\text{O}_6^{2-} = 0.05$  ;  $\text{I}^- = 0.05$
- D.  $\text{S}_4\text{O}_6^{2-} = 0.05$  ;  $\text{I}^- = 0.025$

89. What is a valid expression for the following reaction ?



- A.  $\frac{1}{2} \Delta[\text{H}_2]/\Delta t$
- B.  $-\frac{1}{2} \Delta[\text{H}_2\text{O}]/\Delta t$
- C.  $\frac{1}{2} \Delta[\text{NO}]/\Delta t$
- D.  $-\Delta[\text{N}_2]/\Delta t$

89. Increase in temperature of rate of a given reaction is due to the increase in the :

- A. Extent of molecular dissociation
- B. Activation energy of the reaction
- C. Frequency of collision of the reaction species
- D. Numerical value of the rate constant of the reaction

90. For the reaction :



The following experimental results were obtained:

Experiment	[A]	[B]	Rate ( $\text{mol L}^{-1}\text{S}^{-1}$ )
1	0.50	0.50	0.300
2	0.50	0.25	0.075
3	0.25	0.25	0.075

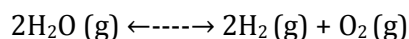
What is the value of the rate constant?

- A.  $0.6 \text{ mol L}^{-1}\text{S}^{-1}$
- B.  $0.6 \text{ mol}^{-1}\text{S}^{-1}$
- C.  $1.2 \text{ L mol}^{-1}\text{S}^{-1}$
- D.  $2.4 \text{ mol L}^{-1}\text{S}^{-1}$

91. Consider the following equilibrium:  $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$ . what happens if the total pressure is increased by adding Nitrogen gas?

- A.  $K_c$  increases
- B. The equilibrium shifts to the left
- C. The equilibrium shifts to the right
- D. The position of equilibrium is not affected

92. Consider the gas-phase equilibrium system represented by the equation:



Given the forward reaction is endothermic, which one of the following changes will decrease the amount of  $\text{H}_2\text{O}$ ?

- A. Adding more oxygen
- B. Adding a solid phase catalyst
- C. Increasing the temperature at constant pressure
- D. Adding He gas

93. Consider the equilibrium system:  $\text{CaCO}_3\text{(s)} + \text{SO}_2\text{(g)} \rightleftharpoons \text{CaSO}_4\text{(s)} + \text{CO}_2$ . Which of the following changes will shift the equilibrium to the right?

- A. Removing the  $\text{CaSO}_3$  as it is formed
- B. Adding more  $\text{CaCO}_3$
- C. Decreasing the volume of the container
- D. Removing the  $\text{CO}_2$  as it is formed

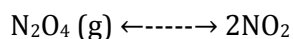
94. For specific reaction, which of the following statements is true about K, the equilibrium constant?

- A. It may be changed by the addition of a catalyst
- B. It increases if the concentration of one of the reaction is increased
- C. It changes with changes in the temperature
- D. It increases if the one concentration of one product is increased

95. Which one of the following statements describes a system that is at equilibrium?

- A. The rate constants for the forward and reverse reactions are equal
- B. The concentration of reactants and products are equal
- C. The reaction ceases
- D. The forward and reverse rates are equal

96. In what direction will the equilibrium between  $\text{N}_2\text{O}_4$  and  $\text{NO}_2$  shift, if the total pressure is increased by adding  $\text{N}_2\text{(g)}$ ?



- A. The equilibrium will shift to the right
- B. The equilibrium will shift to the left
- C. There will be no shift in the position of the equilibrium
- D. The equilibrium will first shift to the right and after a while to the left

97. For the sublimation of iodine crystals,  $\text{I}_2\text{(s)} \rightleftharpoons \text{I}_2\text{(g)}$  at  $25^\circ\text{C}$  and the atmospheric pressure, the enthalpy change,  $\Delta H = 39.37\text{ kJ/mol}$  and the entropy change,  $\Delta S = 86.2\text{ J/K-mol}$ . At what temperature will solid iodine be in equilibrium with gaseous iodine?

- A. 298K
- B. 460K
- C. 520K
- D. 575K

98. A reaction reaches a state of equilibrium only when

- A. The reactants and the products are reacting
  - B. The concentration of the reactants and products become equal
  - C. The products react together at the same rate at which they are formed
  - D. All the reactants and the products are in the same state of matter
99. Which one of the following is correct about a dynamic equilibrium?
- A. Is a form of static equilibrium
  - B. Occurs when the rate constant of the forward process is equal to the rate constant of the reverse process
  - C. Only occurs in chemical equilibrium
  - D. Exists when the rate of the forward reaction is equal to the rate of the reverse reaction
100. Which one of the following indicates the correct expression for the equilibrium constant (K) for the process given below?
- $$\text{PCl}_5 (\text{s}) \rightleftharpoons \text{PCl}_3 (\text{l}) + \text{Cl}_2 (\text{g})$$
- A.  $K = [\text{PCl}_3][\text{Cl}_2]/[\text{PCl}_5]$
  - B.  $K = [\text{Cl}_2]$
  - C.  $K = [\text{PCl}_3][\text{Cl}_2]$
  - D.  $K = [\text{PCl}_5]/[\text{PCl}_3][\text{Cl}_2]$

*"I ADVISE YOU TO KEEP YOUR SELF, YOUR FAMILY AND YOUR COUNTRY FROM THE REACH OF CORONA VIRUS."*

---

*SET BY: Mr. DANIEL FENTA*

