



Date: 9 / 9 /2023

Name :.....

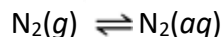
Instructor Name: Khadeeja Al Abrouni

Student No.:

1 H Hydrogen 1.01																		2 He Helium 4.00																			
3 Li Lithium 6.94		4 Be Beryllium 9.01																		5 B Boron 10.81		6 C Carbon 12.01		7 N Nitrogen 14.01		8 O Oxygen 16.00		9 F Fluorine 19.00		10 Ne Neon 20.18							
11 Na Sodium 22.99		12 Mg Magnesium 24.31																		13 Al Aluminum 26.98		14 Si Silicon 28.09		15 P Phosphorus 30.97		16 S Sulfur 32.07		17 Cl Chlorine 35.45		18 Ar Argon 39.95							
19 K Potassium 39.10		20 Ca Calcium 40.08		21 Sc Scandium 44.96		22 Ti Titanium 47.87		23 V Vanadium 50.94		24 Cr Chromium 52.00		25 Mn Manganese 54.94		26 Fe Iron 55.85		27 Co Cobalt 58.93		28 Ni Nickel 58.69		29 Cu Copper 63.55		30 Zn Zinc 65.39		31 Ga Gallium 69.72		32 Ge Germanium 72.61		33 As Arsenic 74.92		34 Se Selenium 78.96		35 Br Bromine 79.90		36 Kr Krypton 83.80			
37 Rb Rubidium 85.47		38 Sr Strontium 87.62		39 Y Yttrium 88.91		40 Zr Zirconium 91.22		41 Nb Niobium 92.91		42 Mo Molybdenum 95.94		43 Tc Technetium (98)		44 Ru Ruthenium 101.07		45 Rh Rhodium 102.91		46 Pd Palladium 106.42		47 Ag Silver 107.87		48 Cd Cadmium 112.41		49 In Indium 114.82		50 Sn Tin 118.71		51 Sb Antimony 121.76		52 Te Tellurium 127.60		53 I Iodine 126.90		54 Xe Xenon 131.29			
55 Cs Cesium 132.91		56 Ba Barium 137.33		57 La Lanthanum 138.91		72 Hf Hafnium 178.49		73 Ta Tantalum 180.95		74 W Tungsten 183.84		75 Re Rhenium 186.21		76 Os Osmium 190.23		77 Ir Iridium 192.22		78 Pt Platinum 195.08		79 Au Gold 196.97		80 Hg Mercury 200.59		81 Tl Thallium 204.38		82 Pb Lead 207.2		83 Bi Bismuth 208.98		84 Po Polonium (209)		85 At Astatine (210)		86 Rn Radon (222)			
87 Fr Francium (223)		88 Ra Radium (226)		89 Ac Actinium (227)		104 Rf Rutherfordium (261)		105 Db Dubnium (262)		106 Sg Seaborgium (266)		107 Bh Bohrium (264)		108 Hs Hassium (269)		109 Mt Meitnerium (268)																					

Question 1: Circle the correct answer:

1- Consider the following gas-liquid equilibrium for an aqueous system at a constant partial pressure of N_2 .



What is the effect on the equilibrium composition of the liquid when the temperature is increased?

- a. The amount of N_2 dissolved in the liquid increases.
- b. The amount of N_2 dissolved in the liquid decreases.
- c. The amount of N_2 dissolved in the liquid does not change.
- d. Not enough information is provided to answer the question.

2-At a particular temperature, the solubility of O_2 in water is 0.590 g/L at an oxygen pressure of around 15.2 atm. What is Henry's law constant for O_2 (in units of L · atm/mol)?

- a. 3.88×10^{-2}
- b. 8.26×10^2
- c. 2.80×10^{-1}
- d. 1.21×10^{-3}

3- Which compound has the lowest standard enthalpy of vaporization at 25°C?

- a. C_6H_{14}
- b. C_8H_{16}
- c. C_5H_{12}
- d. C_8H_{18}

4-If two fluids do not mix but, rather, form two layers, they are said to be ____.

- a. immiscible
- b. miscible
- c. homogeneous
- d. identical

5-The molarity of a solution is defined as the

- a. moles of solute per liter of solvent.
- b. grams of solute per kilogram of solvent.
- c. grams of solute per liter of solution.
- d. moles of solute per liter of solution.

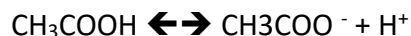
6- Given the value of K_a for the following acids

HF	7.2×10^{-4}
HOC	3.5×10^{-8}
HCN	4.0×10^{-10}

Which of these has the strongest conjugate base?

- a. F-
- b. OC-
- c. CN-
- d. non

7- A solution of acetic acid CH_3COOH was prepared. What would happen to the pH of this solution if sodium acetate CH_3COONa were added to the solution?



- a. pH would go up
- b. pH would go down
- c. would not affect the pH
- d. Does this solution have pH?

8- The gas phase reaction $\text{A} + \text{B} \longrightarrow \text{C}$ has a reaction rate which is experimentally observed to follow the relationship $\text{Rate} = k[\text{A}]^2$
Which of the following statements is correct?

- a. The reaction is second order of A and zero order of B
- b. The reaction is an overall third-order
- c. The reaction is first order of A and first order of B
- d. The reaction rate dependent on the concentration of A and B

9- A chemical reaction that absorbs heat from the surroundings is said to be _____ and has a _____ ΔH at constant pressure.

- a. endothermic, positive
- b. endothermic, negative
- c. exothermic, negative
- d. exothermic, positive

10- Which one of the following reactions has a **POSITIVE** entropy change ΔS ?

- a. $\text{BF}_3(\text{g}) + \text{NH}_3(\text{g}) \longrightarrow \text{F}_3\text{BNH}_3(\text{s})$
- b. $2 \text{NH}_4\text{NO}_3(\text{s}) \longrightarrow 2 \text{N}_2(\text{g}) + 4 \text{H}_2\text{O}(\text{g}) + \text{O}_2(\text{g})$
- c. $\text{H}_2\text{O}(\text{g}) \longrightarrow \text{H}_2\text{O}(\text{l})$
- d. $2 \text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2 \text{SO}_3(\text{g})$

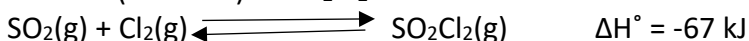
11- The energy needed for a reaction to convert reactants to products is called

- a. collision energy.
- b. potential energy.
- c. kinetic energy.
- d. activation energy.

12- What is the K_b of the NO_2^- species (K_a of $\text{HNO}_2 = 4.5 \times 10^{-4}$)

- a. 2.2×10^{-11}
- b. 1×10^{-14}
- c. 4.5×10^{-4}
- d. 1×10^{-7}

13- Given the following reaction at equilibrium, which of the following will increase the amount (in moles) of SO_2Cl_2 :



- a. adding heat to the system
- b. adding Cl_2 to the system.
- c. removing Cl_2 from the system.
- d. increasing the volume of the reaction vessel.

14- Which of the following is not a colligative property?

- a- freezing point depression
- b- boiling point elevation
- c- solubility
- d- vapor pressure lowering

15-A catalyst:

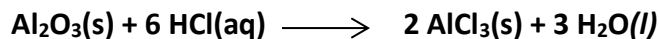
- a. always participates in the reaction.
- b. always decrease the activation energy for a reaction.
- c. always decreases the rate of a reaction.
- d. always increases the activation energy for a reaction.

16- For the reaction, $A + B \rightarrow C$, $\Delta H^\circ = +30 \text{ kJ}$; $\Delta S^\circ = +50 \text{ J/K}$.

Therefore, the reaction is:

- a. spontaneous at all temperatures.
- b. nonspontaneous at all temperatures.
- c. spontaneous at temperatures less than 600 K.
- d. spontaneous at temperatures greater than 600 K.

Question 2: Use the data in the table to calculate ΔH_f for reaction at 298 K:

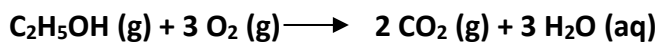


SPECIES	ΔH_f° at 298 K (kJ/mol)
$\text{Al}_2\text{O}_3(\text{s})$	-1675.7
$\text{HCl}(\text{aq})$	-167.16
$\text{AlCl}_3(\text{s})$	-704.2
$\text{H}_2\text{O}(\text{l})$	-285.8

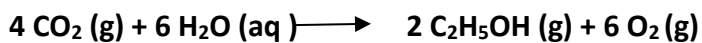
Question 3: Calculate the boiling point elevation of a solution containing 478 g of ethylene glycol in 3202 g of water. Molar mass = 62.07g/mol, $K_b = 0.52\text{ }^{\circ}\text{C}/m$, $T^{\circ} = 100\text{ }^{\circ}\text{C}$

Question 4: The PH of a sample of human blood was measured to be 7.41 at 25°C. Calculate POH, $[\text{H}^+]$, and $[\text{OH}^-]$ for the sample.

Question 5: The standard molar enthalpy of combustion for ethanol, C₂H₅OH, is -1409 kJ.



What is the standard enthalpy change for the following process?

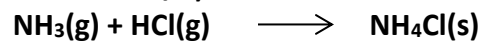


Question 6: Given: N₂(g) + H₂(g) ⇌ NH₃(g)

At equilibrium at a specific temperature, the concentration of NH₃(g) is 0.980 M, 1.53 M H₂(g) and 0.510 M N₂(g). Calculate the value of K_c for this reaction.

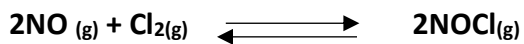
Question 7: Calculate the temperature for the following equilibrium reaction.

(Given: $\Delta H = -176 \text{ kJ}$ and $\Delta S = -284.5 \text{ J/K}$)



Question 8: The following reaction was studied at 25°C . The pressure at equilibrium was found to be $P_{\text{NOCl}} = 1.2 \text{ atm}$, $P_{\text{NO}} = 5.0 \times 10^{-2}$, $P_{\text{Cl}_2} = 3.0 \times 10^{-1}$

Calculate the value of K_c for the reaction at 25°C



Extra paper:

Good Luck