

" pH I love you"

Name _____

Consider the reaction $2 \text{CO}(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2 \text{CO}_2(\text{g})$ (questions 1 to 3)

- _____ 1. Based on information on table I, this reaction is
A) endothermic, and releases heat B) endothermic, and absorbs heat
C) exothermic, and releases heat D) exothermic, and absorbs heat
- _____ 2. How much heat would be involved (either produced or absorbed) in the formation of 44.0 grams of CO_2 ? A) 283 kJ B) 566 kJ C) 1132 kJ
4) 393.5 kJ
- _____ 3. When this reaction is at equilibrium, which **MUST** be true?
A) the moles of CO and the moles of CO_2 are equal
B) there are twice as many moles of CO as there are of O_2
C) the concentration of CO is constant
D) the rate of the forward reaction is zero

Consider the reaction $2 \text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2 \text{SO}_3(\text{g}) + 197 \text{ kJ}$

- _____ 4. Once the system has reached equilibrium, the addition of more oxygen gas would cause the amount of SO_2 gas to A) decrease B) increase C) remain the same
- _____ 5. If the temperature is increased, the amount of SO_2 at equilibrium would
A) decrease, and the amount of SO_3 would decrease
B) decrease, and the amount of SO_3 would increase
C) increase, and the amount of SO_3 would decrease
D) increase, and the amount of SO_3 would increase
- _____ 6. If the volume of the system is decreased, the amount of SO_2 at equilibrium would A) decrease B) increase C) remain the same
- _____ 7. If the volume of the system is decreased, the **rate** of the reaction would
A) decrease B) increase C) remain the same.
- _____ 8. An acid is defined as a substance which, when added to water, produces
A) OH^- ions B) H_3O^+ ions C) Cl^- ions D) a pH greater than 7
- _____ 9. A 0.10 molar solution of HCl contains about 100 times the molarity of H^+ ions as a 0.10 molar solution of $\text{HC}_2\text{H}_3\text{O}_2$. If the pH of the acetic acid solution is 3, then the pH of the HCl solution is A) 0.03 B) 1 C) 4 D) 5

- _____10. What do solutions of acids and solutions of salts have in common?
A) they always have pH less than 7 B) they are always electrolytes
C) they always contain more H^+ ions than OH^- ions
D) they always contain one metal and one nonmetal
- _____11. In a solution that has a pH of 5.0, A) methyl orange is yellow, and bromthymol blue is blue B) methyl orange is red, and bromthymol blue is yellow
C) methyl orange is yellow, and bromthymol blue is yellow
D) methyl orange is red, and bromthymol blue is blue
- _____12. A student has a solution that he thinks might be a strong acid. One acceptable way to test the solution for acidity would be A) see whether it tastes sour. B) see whether it feels soapy to the touch C) add zinc metal, and see whether hydrogen gas is produced D) test whether the solution conducts electricity
- _____13. If 20.0 mL of 0.200 molar HCl exactly neutralizes 40.0 mL of a solution of KOH, the molarity of the KOH is A) 0.100 M B) 0.200 M C) 0.400 M D) 40.0 M
- _____14. When nitric acid reacts with calcium hydroxide, the formula for the salt that forms is A) CaN B) CaNO_2 C) CaNO_3 D) $\text{Ca}(\text{NO}_3)_2$
- _____15. According to the Bronsted-Lowry theory, HNO_3 is an acid in water because it
A) lowers the pH of the water B) donates an H^+ ion to the water
C) receives an H^+ ion from the water D) raises the pH of the water
- _____16. The pH of pure water is A) 0 B) 5 C) 7 D) 14
- _____17. A reaction is considered spontaneous at all temperatures, if the reaction causes A) an increase in potential energy, and a decrease in entropy
B) a decrease in potential energy and an increase in entropy
C) an increase in potential energy and a increase in entropy
D) a decrease in potential energy and an decrease in entropy.
- _____18. For the physical change $\text{ice} \rightarrow \text{water}$, the signs of ΔH and ΔS are
A) + and + B) - and - C) ΔH is + while ΔS is - D) ΔH is - while ΔS is +
- _____19. The reaction $\text{N}_2(\text{g}) + 2 \text{O}_2(\text{g}) \rightarrow 2 \text{NO}_2(\text{g})$ (see table I) is
A) endothermic, with an increase in entropy B) endothermic with a decrease in entropy
C) exothermic with an increase in entropy D) exothermic with a decrease in entropy
- _____20 . Which change would cause an increase in entropy?
A) $\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$ B) $\text{CO}_2(\text{s}) \rightarrow \text{CO}_2(\text{g})$
C) $\text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \rightarrow 2 \text{NH}_3(\text{g})$ D) $2 \text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2 \text{H}_2\text{O}(\text{l})$

21. A student performed a titration using two burettes, and obtained the data provided. Complete the table, by calculating the volumes of acid and base, and the molarity of the base. Show work in the space under the table.

	HCl	KOH
initial reading (mL)	12.50	14.50
Final reading (mL)	42.50	34.50
mL added		
Molarity	0.40 molar	

22. Explain the following observations: If 25 mL of 1.00 molar HCl is mixed with 50.0 mL of 1.00 molar NaOH, the resulting solution is basic, but if 25 mL of H₂SO₄ is mixed with the same 50.0 mL of 1.00 molar NaOH, the resulting solution is exactly neutral.
23. Explain the following observations: When carbon dioxide is bubbled into water, the resulting solution turns bromthymol blue yellow and also turns methyl orange yellow.