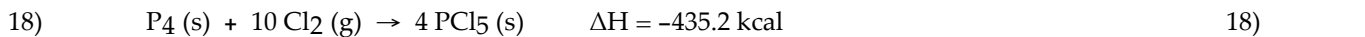


**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 1) A sample of gas has a volume of 135 mL at 0.600 atm. What would be the volume if the pressure is decreased to 0.200 atm while temperature is held constant? 1) \_\_\_\_\_  
A) 101 mL      B) 135 mL      C) 45.0 mL      D) 180 mL      E) 405 mL
- 2) A sample of helium has a volume of 480 mL at 47.0°C and 740 mm Hg. The temperature is lowered to 22.0°C and the pressure to 625 mm Hg. What is the new volume? 2) \_\_\_\_\_  
A) 1214 mL      B) 373 mL      C) 266 mL      D) 616 mL      E) 524 mL
- 3) How many moles of gas are present in a 10.0 liter sample at STP? 3) \_\_\_\_\_  
A) 0.446 moles  
B) 22.4 moles  
C) 224 moles  
D) 10.0 moles  
E) 2.24 moles
- 4) For the following reaction, if 11.2 L of nitrogen are reacted to form NH<sub>3</sub> at STP, How many liters of hydrogen will be required to completely consume all of the nitrogen? 4) \_\_\_\_\_  
$$\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$$
  
A) 33.6 L      B) 11.2 L      C) 16.8 L      D) 7.4 L      E) 6.1 L
- 5) How many grams of O<sub>2</sub> are contained in a 25.0 L sample at 5.20 atm and 28.0°C? 5) \_\_\_\_\_  
A) 5.26 g      B) 168 g      C) 1810 g      D) 0.164 g      E) 84.2 g
- 6) Calculate the volume of a 3.50 mol sample of carbon dioxide at 30.0°C and 0.900 atm. 6) \_\_\_\_\_  
A)  $8.54 \times 10^{-4}$  L  
B) 2.20 L  
C) 96.7 L  
D) 421 L  
E) 9.58 L
- 7) A mixture of the gases N<sub>2</sub>, O<sub>2</sub>, and He has a total pressure of 760 mm Hg. If the partial pressure of N<sub>2</sub> is 90 mm Hg and of O<sub>2</sub> is 270 mm Hg, What is the partial pressure of He? 7) \_\_\_\_\_  
A) 400 mm Hg  
B) 120 mm Hg  
C) 1120 mm Hg  
D) 760 mm Hg  
E) 360 mm Hg

- 8) Which homogeneous mixture is opaque **and** has particles large enough to be filtered? 8) \_\_\_\_\_  
 A) solution  
 B) colloid  
 C) suspension  
 D) both colloids and suspensions  
 E) none of the above
- 9) Consider the following four liquids: 9) \_\_\_\_\_  
 1. **water**: highly polar; H-bonding  
 2. **hexanol**: slightly polar; some H-bonding  
 3. **chloroform**: slightly polar; no H-bonding  
 4. **octane**: non-polar; no H-bonding  
 Which pair of liquids is **immiscible**?  
 A) water and hexanol  
 B) chloroform and octane  
 C) hexanol and chloroform  
 D) water and octane  
 E) none of the above
- 10) In general, the solubility of \_\_\_\_\_ in water decreases as temperature increases. 10) \_\_\_\_\_  
 A) liquids  
 B) solids  
 C) gases  
 D) none of these  
 E) all of these
- 11) How much NaCl is needed to make 75 mL of a 12% (w/v) solution? 11) \_\_\_\_\_  
 A) 7.5 g                      B) 12 g                      C) 30 g                      D) 9.0 g                      E) 6.0 g
- 12) What is the molarity of a solution prepared by dissolving 0.750 mol CaCl<sub>2</sub> in enough water to make 0.500 L of solution? 12) \_\_\_\_\_  
 A) 0.375 M                      B) 1.50 M                      C) 166.5 M                      D) 83.2 M                      E) 0.667 M
- 13) How many g of Fe(NO<sub>3</sub>)<sub>3</sub> are present in a 20.0 mL sample of a 0.500 M solution? 13) \_\_\_\_\_  
 A) 4.84 g                      B) 2.14 g                      C) 1.21 g                      D) 9.68 g                      E) 2.42 g
- 14) A 50.0 mL sample of a 6.0 M solution of HCl is diluted to 200. mL. What is the new concentration? 14) \_\_\_\_\_  
 A) 24.0 M                      B) 2.00 M                      C) 1.50 M                      D) 6.0 M                      E) 2.10 M
- 15) Considering 0.10 M solutions of each substance, which contains the smallest concentration of ions? 15) \_\_\_\_\_  
 A) (NH<sub>4</sub>)<sub>3</sub>PO<sub>4</sub>  
 B) Ca(NO<sub>3</sub>)<sub>2</sub>  
 C) FeSO<sub>4</sub>  
 D) Na<sub>2</sub>SO<sub>4</sub>  
 E) K<sub>2</sub>CO<sub>3</sub>
- 16) After swimming in the ocean for several hours, the swimmers noticed that their fingers appeared to be very wrinkled or shriveled up. This is an indication that seawater is \_\_\_\_\_ relative to the fluid in cells. 16) \_\_\_\_\_  
 A) hypotonic                      B) hypertonic                      C) isotonic                      D) none of these

- 17) A process or reaction which releases heat to the surroundings is said to be \_\_\_\_\_  
A) endothermic.  
B) isothermal.  
C) exergonic.  
D) exothermic.  
E) conservative.

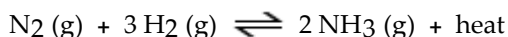


Based on the reaction shown, which statement is true?

- A) When 1 mol  $P_4(s)$  reacts, 435.2 kcal are released.  
B) When 30.97 g  $P_4(s)$  react, 435.2 kcal are released.  
C) When 123.88 g  $P_4(s)$  react, 435.2 kcal are consumed.  
D) When 1 mol  $PCl_5(s)$  is produced, 435.2 kcal are released.  
E) When 208.22 g  $PCl_5(s)$  are produced, 435.2 kcal are consumed.
- 19) A rapid reaction is distinguished by \_\_\_\_\_  
A) having a large value of activation energy.  
B) having a small value of activation energy.  
C) having a large heat of reaction.  
D) having a small heat of reaction.  
E) being unaffected by catalysts.

- 20) When a reaction system is at equilibrium \_\_\_\_\_  
A) the amounts of reactants and products are exactly equal.  
B) the rates of the reaction in the forward and reverse directions are exactly equal.  
C) there is no more chemistry happening.  
D) the reaction rate in the reverse direction is at a minimum.  
E) the reaction rate in the forward direction is at a maximum.

- 21) Which change to this reaction system would cause the equilibrium to shift to the right? \_\_\_\_\_



- A) addition of a catalyst  
B) lowering the temperature  
C) removal of  $H_2(g)$   
D) heating the system  
E) addition of  $NH_3(g)$



A conjugate acid-base pair in the reaction shown is \_\_\_\_\_ and \_\_\_\_\_.

- A)  $CH_3NH_3^+$  and  $Cl^-$   
B)  $HCl$  and  $H_3O^+$   
C)  $CH_3NH_2$  and  $HCl$   
D)  $CH_3NH_2$  and  $Cl^-$   
E)  $HCl$  and  $Cl^-$

- 23) Which net ionic equation correctly represents the neutralization of a solution of barium hydroxide by a solution of nitric acid? 23) \_\_\_\_\_
- A)  $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$   
 B)  $\text{H}^+ + \text{NO}_3^- \rightarrow \text{HNO}_3$   
 C)  $\text{Ba}(\text{NO}_3)_2 + \text{H}_2\text{O} \rightarrow \text{Ba}^{2+} + 2 \text{NO}_3^-$   
 D)  $\text{Ba}^{2+} + 2 \text{NO}_3^- \rightarrow \text{Ba}(\text{NO}_3)_2$   
 E)  $\text{Ba}^{2+} + 2 \text{OH}^- \rightarrow \text{Ba}(\text{OH})_2$
- 24) Acetic acid is a weak acid in water because it is 24) \_\_\_\_\_
- A) unable to hold onto its hydrogen ion.  
 B) dilute.  
 C) only slightly soluble.  
 D) only slightly dissociated into ions.  
 E) completely dissociated into hydronium ions and acetate ions.
- 25) Which one of the following is the strongest weak acid? 25) \_\_\_\_\_
- A)  $\text{HClO}$  ( $K_a = 3.0 \times 10^{-8}$ )                      B)  $\text{HF}$  ( $K_a = 6.8 \times 10^{-4}$ )  
 C)  $\text{HCN}$  ( $K_a = 4.9 \times 10^{-10}$ )                      D)  $\text{HNO}_2$  ( $K_a = 4.5 \times 10^{-4}$ )
- 26) Which solution is basic? 26) \_\_\_\_\_
- A)  $[\text{H}_3\text{O}^+] = 1.0 \times 10^{-7}$   
 B)  $[\text{H}_3\text{O}^+] = 1.0 \times 10^{-4}$   
 C)  $[\text{OH}^-] = 1.0 \times 10^{-10}$   
 D)  $[\text{OH}^-] = 1.0 \times 10^{-7}$   
 E)  $[\text{H}_3\text{O}^+] = 1.0 \times 10^{-10}$
- 27) If the concentration of  $\text{H}_3\text{O}^+$  in an aqueous solution is  $7.6 \times 10^{-9} \text{ M}$ , the concentration of  $\text{OH}^-$  is 27) \_\_\_\_\_
- \_\_\_\_\_
- A)  $1.3 \times 10^{-6} \text{ M}$   
 B)  $7.6 \times 10^{-9} \text{ M}$   
 C)  $1.3 \times 10^{+8} \text{ M}$   
 D)  $6.4 \times 10^{-5} \text{ M}$   
 E)  $7.6 \times 10^{-23} \text{ M}$
- 28) What is the pH of a solution in which  $[\text{H}_3\text{O}^+] = 3.8 \times 10^{-8} \text{ M}$ ? 28) \_\_\_\_\_
- A)  $1.0 \times 10^{-8}$               B) 3.80              C)  $2.6 \times 10^{-7}$               D) 7.42              E) 6.58
- 29) What is the value of  $[\text{H}_3\text{O}^+]$  in a solution with  $\text{pH} = 10.82$ ? 29) \_\_\_\_\_
- A)  $6.6 \times 10^{-4} \text{ M}$   
 B) 3.18 M  
 C) 1.03 M  
 D) 10.82 M  
 E)  $1.5 \times 10^{-11} \text{ M}$

- 30) The pH of a 250. mL sample of a buffer solution is 9.85. If 1.0 mL of 6 M HCl is added, the pH of the resulting mixture is closest to \_\_\_\_\_  
 A) 0.00                      B) 10.00                      C) 1.65                      D) 9.70                      E) 7.00
- 31) What is the concentration of a nitric acid solution if a 10.00 mL sample of the acid requires 31.25 mL of 0.135 M KOH for neutralization? \_\_\_\_\_  
 A) 0.422 M                      B) 0.844 M                      C) 0.135 M                      D) 0.211 M                      E) 0.0432 M
- 32) Which compound produces a basic solution when dissolved in water? \_\_\_\_\_  
 A) NaF                      B) KCl                      C) NH<sub>4</sub>Cl                      D) KClO<sub>4</sub>                      E) Ca(NO<sub>3</sub>)<sub>2</sub>
- 33) Which is the best description of a beta particle? \_\_\_\_\_  
 A) charge +2; mass of 4 amu; high penetrating power  
 B) charge 0; mass of 0 amu; high penetrating power  
 C) charge -1; mass of 0 amu; medium penetrating power  
 D) charge -1; mass of 0 amu; high penetrating power  
 E) charge +2; mass of 4 amu; low penetrating power
- 34) Which form of radiation is generally considered the most dangerous? \_\_\_\_\_  
 A)  $\alpha$   
 B)  $\beta$   
 C)  $\gamma$   
 D) positron  
 E) all of the above
- 35) Which product is formed by alpha emission from polonium-208? The atomic number of polonium is 84. \_\_\_\_\_  
 A)  $^{204}_{82}\text{Pb}$                       B)  $^{208}_{83}\text{Bi}$                       C)  $^{209}_{84}\text{Po}$                       D)  $^{208}_{85}\text{At}$                       E)  $^{212}_{86}\text{Rn}$
- 36) Approximately how old is a fossil that has a little more than 6% of its original radioactivity? The half-life of carbon-14 used in dating artifacts is 5700 years. \_\_\_\_\_  
 A) 34,200 years  
 B) 20,000 years  
 C) 57,000 years  
 D) 11,400 years  
 E) 5,700 years
- 37) The amount of radiation that produces  $2.1 \times 10^9$  units of charge in 1 cm<sup>3</sup> of air is the \_\_\_\_\_  
 A) rem.                      B) curie.                      C) rad.                      D) roentgen.                      E) sievert.
- 38) A rem is \_\_\_\_\_  
 A) a unit that that measures both the energy and the penetrating power of different types of radiation.  
 B) a unit used to measure the amount of radiation absorbed per gram of tissue.  
 C) the amount of radiation that produces  $2.1 \times 10^9$  units of charge in one cubic centimeter of air.  
 D) the SI unit for radiation absorbed.  
 E) the amount of radioactive substance that undergoes  $3.7 \times 10^{10}$  disintegrations per second.

## Answer Key

Testname: 104\_F09\_E2D

- 1) E
- 2) E
- 3) A
- 4) A
- 5) B
- 6) C
- 7) A
- 8) C
- 9) D
- 10) C
- 11) D
- 12) B
- 13) E
- 14) C
- 15) C
- 16) B
- 17) D
- 18) A
- 19) B
- 20) B
- 21) B
- 22) E
- 23) A
- 24) D
- 25) B
- 26) E
- 27) A
- 28) D
- 29) E
- 30) D
- 31) A
- 32) A
- 33) C
- 34) C
- 35) A
- 36) B
- 37) D
- 38) A