

NAME _____

5. (3). True or false. (Circle your choice). The boiling point of water is decreased by the addition of common table salt (NaCl).
6. (3). Consider a mixture of blood and an aqueous salt (NaCl) solution. If the concentration of the salt solution is less than the isotonic concentration (0.15 M), the blood cells will _____ burst; _____ shrink due to osmosis.
7. (5). What happens when a strong acid like HBr, a covalently bonded gas, is dissolved in water? (A simple equation will do).
8. (5). What is the hydrogen ion concentration in a solution whose pH is 3.50?
9. (5). What is the pH of a buffer system that contains 0.200 M hydrocyanic acid (HCN) and 0.150 M sodium cyanide (NaCN)? The pKa of hydrocyanic acid is 9.31.
10. (5). How many milliliters of 0.50 M NaOH solution are required to titrate (exactly neutralize) 40.0 mL of a 0.10 M solution of hydrochloric acid (HCl)?

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11. (5). If a 2.760 g sample of a gas maintains a pressure of 450 mm Hg when contained in a 2.0 L flask at 20 deg C, what is the molecular weight of the gas?

12. (5). A sample of gas has a volume of 250 mL at 0.500 atm pressure and 50 deg C. What would the volume be if the pressure is increased to 1.25 atm at 100 deg C?

13. (5). How many grams of NaOH are contained in 50 mL of a 1.50 M solution?

14. (5). Hydrogen and oxygen react according to the equation, $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g})$. How many liters of oxygen are required to react with 5.20 L hydrogen at STP?

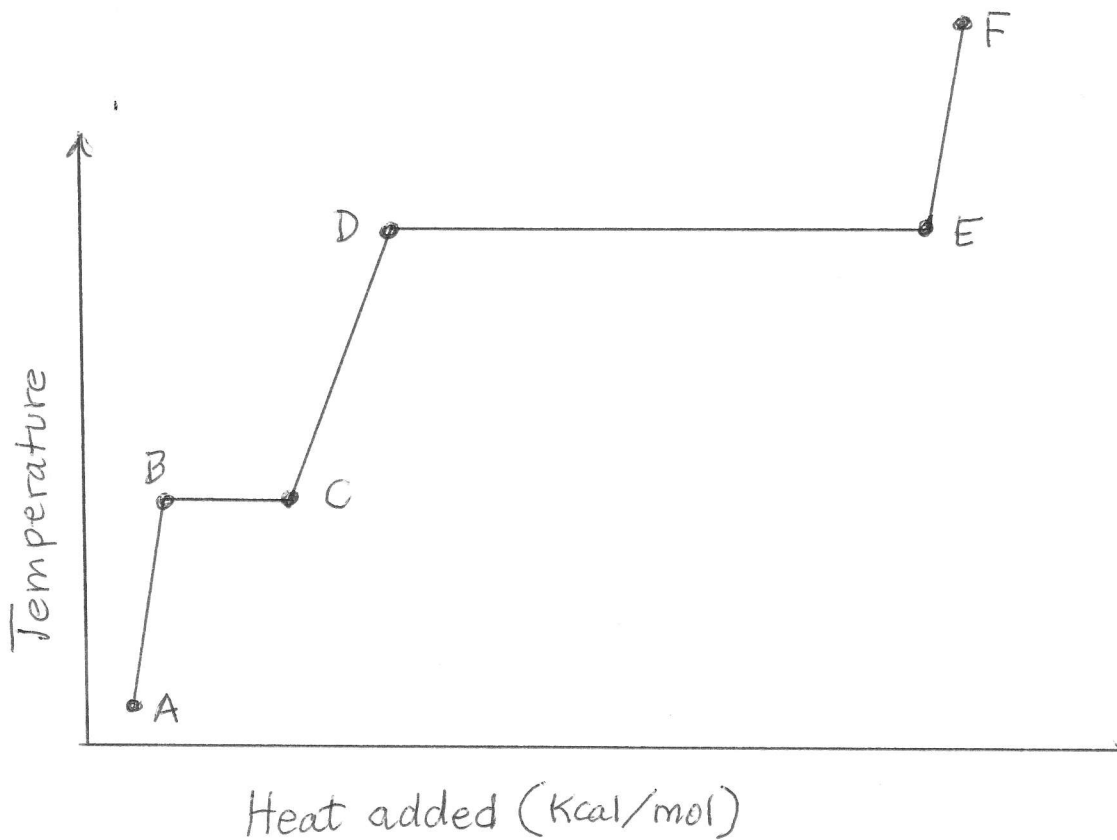
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15. (5). Write the equation for the reaction of formate ion (HCOO^-), a weak Brønsted base, with water. Is the resulting solution acidic or basic?
16. (5). If 15.0 g of CO_2 gas has a volume of 0.30 L at 310 K, what is its pressure in mm Hg?
17. (6). Write the equation for the reaction between hydrocyanic acid (HCN) and fluoride ion (F^-). The pK_a 's are 3.46 (HF) and 9.31 (HCN). Does the reaction as written favor the left-hand side (LHS) _____ or the right-hand side (RHS) _____?

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18. (6). Answer these questions based on the general heating curve – shown below -- for a molecular compound such as water.

- a. The solid and liquid phases are in equilibrium between points ____ and ____.
- b. The pure liquid phase exists between points ____ and ____.
- c. The heat of vaporization is given by the difference in heat (ΔH) between points ____ and ____.



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USEFUL INFORMATION

$$K_w = 10^{-14}; \quad pK_a + pK_b = 14; \quad pH + pOH = 14$$

$$\text{Henderson-Hasselbalch equation: } pH = pK_a + \log\left\{\frac{[\text{base}]}{[\text{acid}]}\right\}$$

$$\text{Gas constant } R = 0.0821 \text{ L-atm per mol-K or } 62.4 \text{ L-mmHg per mol-K}$$

$$\text{Ideal gas law: } PV = nRT$$

$$K = 273 + ^\circ C$$

$$760 \text{ mmHg} = 760 \text{ torr} = 1.000 \text{ atm} = 14.7 \text{ psi}$$

Scoring

- | | |
|--------------|-------------------------------|
| 1. (5)_____ | 11. (5)_____ |
| 2. (5)_____ | 12. (5)_____ |
| 3. (20)_____ | 13. (5)_____ |
| 4. (6)_____ | 14. (5)_____ |
| 5. (3)_____ | 15. (5)_____ |
| 6. (3)_____ | 16. (5)_____ |
| 7. (5)_____ | 17. (6)_____ |
| 8. (5)_____ | 18. (6)_____ |
| 9. (5)_____ | Total no of points:104 |
| 10. (5)_____ | Your Raw Total _____ |

Class Median: Raw _____ or _____ Percent

Your adjusted score: _____ Percent

Your letter grade equivalent on this exam _____