Name_____

1. (8). Consider the following balanced equation:

   $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$

   a. Is the zinc being _____oxidized or _____reduced or _____neither?

   b. Write the net ionic equation for the reaction.

2. (4). Consider the following balanced equation:

   $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

If 2.4 moles of propane (C_3H_8) are reacted with an excess of oxygen, how many moles of carbon dioxide can be produced?

3. (4). How would you make calcium phosphate ($Ca_3(PO_4)_2$), an insoluble salt, using a precipitation reaction? (No need to balance the equation).

4. (4). How would you make calcium chloride ($CaCl_2$) using a neutralization reaction?

5. (4). What is the formula of manganese(IV) oxide?

6. (4). How many moles are contained in 50.0 g of bromobenzene, C_6H_5Br?

7. (10). Consider the following balanced equation:

$$C + FeO \rightarrow CO + Fe$$

When 0.40 moles of FeO (iron(II) oxide) were reacted with an excess of carbon, 18.4 g of iron (Fe) was recovered. Calculate (a) the theoretical yield of Fe and (b) the percent (%) yield of Fe.

Fe = 56; C = 12; O = 16.

8. (10). Balance the following reactions:

$$Cr^{+6} + Fe^{+2} \rightarrow Cr^{+3} + Fe^{+3}$$

$$CaC_2 + H_2O \rightarrow Ca(OH)_2 + C_2H_2$$

9. (4). What is the oxidation number of chlorine in sodium perchlorate, $NaClO_4$?

10. (4). Write the equilibrium constant expression, K_{eq}, for the following gas-phase reaction:

$CH_4(g) + 2Cl_2(g) \rightarrow CH_2Cl_2(g) + 2HCl(g)$

$K_{eq} =$

11. (4). Other things being equal, which of the following combinations of enthalpy and entropy is the most likely to result in a spontaneous reaction? (Check one box only).

Enthalpy	Entropy	Spontaneous?
Positive	Positive	
Negative	Negative	
Positive	Negative	
Negative	Positive	

12. (10). What is the theoretical yield of CuS (copper(II) sulfide) when 90.00 g of Cu are reacted with 60.00 g of sulfur according to the equation, Cu + S → CuS? (Hint: find the limiting reagent).

Name_____

13. (10). Calculate the overall energy of reaction for the reaction, $N_2 + O_2 \rightarrow 2NO$, given the following bond dissociation energies:

    N_2, 226 kcal/mol; O_2, 199 kcal/mol; NO, 145 kcal/mol.

14. (6). Check the processes (2) that involve a decrease in the entropy of the system:
    a. ____Water evaporates.
    b. ____The papers on your cluttered desk become neatly arranged in files.
    c. ____A truck smashes into a brick wall.
    d. ____A vine develops a flower that turns into a pumpkin.
    e. ____Gasoline is burned, providing energy and releasing carbon dioxide and water vapor
15. (4). Barium sulfate is a slightly soluble salt whose solubility in water can be expressed as follows:

$$BaSO4(s) = Ba^{2+} + SO_4^{2-}$$

$$K_{sp} = [Ba^{2+}][SO_4^{2-}] = 1.08 \times 10^{-10} \text{ at } 25 \text{ deg C}$$

where the terms in brackets are concentrations in units of moles per liter.
What is the concentration of sulfate ion in a saturated solution of barium sulfate if the concentration of barium ion is 1.00×10^{-4} moles per liter?

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16. (10). Consider the following reaction coordinate diagram to answer the questions that follow.

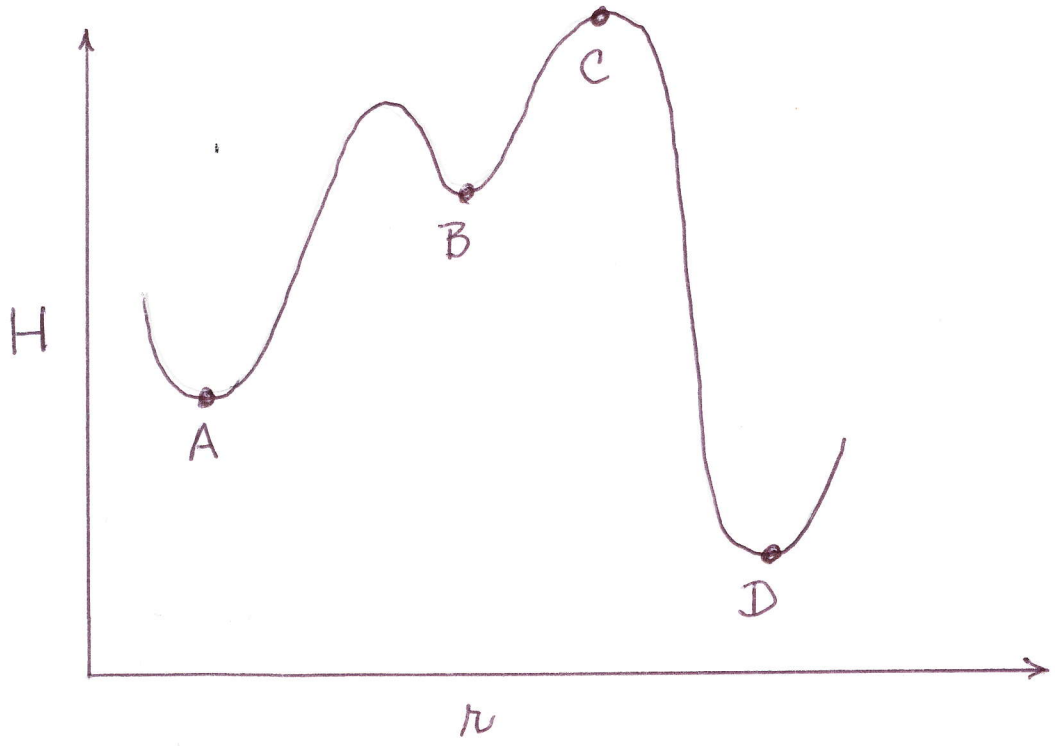
a. The reaction is _____endothermic; _____exothermic.

b. The energy of activation is given by the energy at point ____ minus the energy at point ___.

c. The transition state is represented by point ____.

d. The reactive intermediate is represented by point ____.

e. Which step is faster, A → B or B → D? (Circle your choice).



Name_____

Scoring

1. (8)_____
2. (4)_____
3. (4)_____
4. (4)_____
5. (4)_____
6. (4)_____
7. (10)____
8. (10)____
9. (4)_____
10. (4)_____
11. (4)_____
12. (10)____
13. (10)____
14. (6)_____
15. (4)_____
16. (10)____

Total (100) _____

Class median _____

Your adjusted score_____

Grade on this exam_____