South Pasadena • AP Chemistry

Name _____

Period ___ Date ___/___/___

6 • Energy and Chemical Reactions

PRACTICE TEST

1. How many joules are equivalent to 37.7 cal?
   a) 9.01 J
   b) 4.184 J
   c) 1.51 J
   d) 158 J

2. The quantity of heat that is needed to raise the temperature of a sample of a substance 1.00 degree is called its
   a) heat capacity
   b) specific heat
   c) enthalpy
   d) kinetic energy

3. Equal masses of two substances, A & B, each absorb 25 Joules of energy. If the temperature of A increases by 4 degrees and the temperature of B increases by 8 degrees, one can say that
   a) the specific heat of A is double that of B.
   b) the specific heat of B is double that of A.
   c) the specific heat of B is negative.
   d) the specific heat of B is triple that of A.

4. If 25 J are required to change the temperature of 5.0 g of substance A by 2.0°C, what is the specific heat of substance A?
   a) 250 J/g°C
   b) 63 J/g°C
   c) 10. J/g°C
   d) 2.5 J/g°C

5. How much energy is required to change the temperature of 2.00 g aluminum from 20.0°C to 25.0°C? The specific heat of aluminum is 0.902 J/g°C.
   a) 2.3 J
   b) 9.0 J
   c) 0.36 J
   d) 0.090 J

6. Consider the thermal energy transfer during a chemical process. When heat is transferred to the system, the process is said to be _____ and the sign of ΔH is _____.
   a) exothermic, positive
   b) endothermic, negative
   c) exothermic, negative
   d) endothermic, positive

7. What is the ΔE for a system which has the following two steps:
   Step 1: The system absorbs 60 J of heat while 40 J of work are performed on it.
   Step 2: The system releases 30 J of heat while doing 70 J of work.
   a) 100 J
   b) 90 J
   c) 30 J
   d) zero

8. When two solutions react the container "feels hot." Thus,
   a) the reaction is endothermic.
   b) the reaction is exothermic.
   c) the energy of the universe is increased.
   d) the energy of both the system and the surroundings is decreased.

9. The equation for the standard enthalpy of formation of N_2O_3 is
   a) $N_2O(g) + O_2(g) \rightarrow N_2O_3(g)$
   b) $N_2O_5(g) \rightarrow N_2O_3(g) + O_2(g)$
   c) $NO(g) + NO_2(g) \rightarrow N_2O_3(g)$
   d) $N_2(g) + {}^3/_2\ O_2(g) \rightarrow N_2O_3(g)$

10. For the general reaction
    $2\ A + B_2 \rightarrow 2\ AB$, ΔH is +50.0 kJ.
    We can conclude that
    a) the reaction is endothermic.
    b) the surroundings absorb energy.
    c) the standard enthalpy of formation of AB is -50.0 kJ.
    d) the molecule AB contains less energy than A or B_2.

11. Calculate the enthalpy of combustion of C_3H_6:
    $C_3H_6(g) + {}^9/_2O_2(g) \rightarrow 3CO_2 + 3H_2O$
    using the following data:
    $3C(s) + 3H_2(g) \rightarrow C_3H_6(g)$ $\Delta H° = 53.3$ kJ
    $C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H° = -394$ kJ
    $H_2(g) + {}^1/_2O_2(g) \rightarrow H_2O(l)$ $\Delta H° = -286$ kJ
    a) -1517 kJ c) -626 kJ
    b) 1304 kJ d) -2093 kJ

12. Which one of the following would have an enthalpy of formation value (ΔH_f) of zero?
    a) $H_2O(g)$ c) $H_2O(l)$
    b) $O(g)$ d) $O_2(g)$

13. Calculate the heat of vaporization of titanium (IV) chloride: $TiCl_4(l) \rightarrow TiCl_4(g)$
    using the following enthalpies of reaction:
    $Ti(s) + 2Cl_2(g) \rightarrow TiCl_4(l)$ $\Delta H° = -804.2$ kJ
    $TiCl_4(g) \rightarrow 2Cl_2(g) + Ti(s)$ $\Delta H° = 763.2$ kJ
    a) -1567 kJ c) 1165 kJ
    b) -783.7 kJ d) 41 kJ

14. Calculate the enthalpy of reaction for:
    $D + F \rightarrow G + M$
    using the following equations and data:
    $G + C \rightarrow A + B$ $\Delta H° = +277$ kJ
    $C + F \rightarrow A$ $\Delta H° = +303$ kJ
    $D \rightarrow B + M$ $\Delta H° = -158$ kJ
    a) -132 kJ c) +422 kJ
    b) -422 kJ d) +132 kJ

15. Calculate the standard enthalpy of the reaction for the process
    $3NO(g) \rightarrow N_2O(g) + NO_2(g)$
    using the standard enthalpies of formation (in kJ/mol): NO = 90; N_2O = 82.1; NO_2 = 34.0
    a) -153.9 kJ c) -26.1 kJ
    b) 206 kJ d) 386 kJ

16. The standard molar enthalpy of combustion is -1277.3 kJ for the combustion of ethanol.
    $C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(g)$
    Calculate the standard molar enthalpy of formation for ethanol based on the following standard enthalpies of formation:
    $\Delta H°_f\ CO_2 = -393.5$ kJ/mol
    $\Delta H°_f\ H_2O = -241.8$ kJ/mol
    a) -642.7 kJ/mol c) 235.1 kJ/mol
    b) -235.1 kJ/mol d) 642.7 kJ/mol

17. Calculate the amount of heat needed to change 25.0 g ice at 0°C to water at 0°C. The heat of fusion of H_2O = 333 J/g;

a) 56.5 kJ c) 7.06 kJ

b) 8.33 kJ d) 463 kJ

Questions 18-20: (1/2 point each)

The following data was collected in an experiment similar to the Specific Heat experiment performed in class. Fill in the missing values. (Assume the calorimeter has a calorimeter constant of 0 J/°C)

Data & Calculations		Glass Beads
	mass of glass beads	4.88 g
	mass of water	10.14 g
	initial temperature of water	19.2 °C
	initial temperature of beads	89.2 °C
	final temperature of mixture	24.8 °C
18.	temp change of water (°C)	
18.	temp change of hot beads (°C)	
19.	change in energy of water, q_{water} (J)	
	change in energy of calorimeter (J)	0 J
19.	change in energy of beads, q_{beads} (J)	
20.	specific heat of beads ($J \cdot g^{-1} \cdot °C^{-1}$)	
	accepted value of specific heat	.833
20.	% error	

Answers: (Please use CAPITAL letters) **- V1**

1.		11.	
2.		12.	
3.		13.	
4.		14.	
5.		15.	
6.		16.	
7.		17.	
8.			
9.		18.	
10.		18.	
		19.	
		19.	
		20.	
		20.	