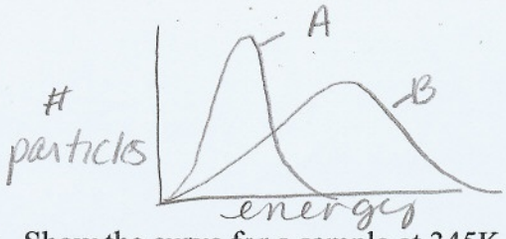
Key

Unit 5

Review



1. Sketch a Maxwell Boltzmann Curve. Show the curve for a sample at 345K. Label it A. Show the curve for the same sample at 490K. Label it B.

2. True or False: The relationship between the average kinetic energy of the particles in a sample is indirectly proportional to the temperature.

3. Given w = 0, an endothermic reaction has the following.
A) +ΔH and -ΔE
B) - ΔH and +ΔE
C) + ΔH and +ΔE
D) - ΔH and -ΔE

$\Delta E = q(\Delta H) + w$ $\quad (+) = (+) + 0$ $\quad \Delta H = +$ for endothermic

4. Calculate the E for a system that has 13J of work done on it and releases 33J of heat. (+) (−)

$\Delta E = (13) + (-33) = -20\ J$

5. Define the Δheat of formation. Why are the Δheat of formation for elements zero?

The change in enthalpy from the formation of one mole of a pure substance formed from its elements
Zero because they are a reference point

6. The internal energy can be increased by _____.

(a) transferring heat from the surroundings to the system (absorb energy $q=(+)$) T
(b) transferring heat from the system to the surroundings (release energy $q=(-)$) F
(c) doing work on the system (absorbs work) (+) T

A) a only
B) b only
C) c only
D) a and c
E) b and c

7.) Which of the following processes is endothermic?
A) the freezing of water exo
B) the combustion of butane exo
C) a hot cup of coffee (system) cools on a countertop exo
D) the chemical reaction in a "hot pack" often used to treat sore muscles exo
E) the vaporization of rubbing alcohol endo
liquid → gas

8. The value of ΔE for a system that performs 111 kJ of work on its surroundings and gains 89 kJ of heat is _____ kJ. (−) (+)
A) -111
B) -200
C) 200
D) -22
E) 22

$E = q + w$
$89 + (-111) =$

9. An 8.29 g sample of calcium carbonate [CaCO3 (s)] absorbs 50.3 J of heat, upon which the temperature of the sample increases from 21.1 °C to 28.5 °C. What is the specific heat of calcium carbonate?

$50.3 = (8.29)(x)(28.5 - 21.1)$

$x = .820\ J/g°C$

A) .63
B) .82
C) 1.1
D) 2.2
E) 4.2

10. In the reaction below, $\Delta Hf°$ is zero for _____.

$Ni\ (s) + 2CO\ (g) + 2PF_3\ (g) \rightarrow Ni(CO)_2\ (PF_3)_2\ (l)$

A) Ni (s)
B) CO (g)
C) PF_3 (g)
D) $Ni(CO)_2(PF_3)_2$ (l)
E) both CO (g) and PF_3 (g)

11. Given the data in the table below, $\Delta H°rxn$ for the reaction

$3NO_2\ (g) + H_2O\ (l) \rightarrow 2HNO_3\ (aq) + NO\ (g)$

is _____ kJ.

Substance	$\Delta H_f°$ (kJ/mol)
H_2O (l)	-286
NO (g)	90
NO_2 (g)	34
HNO_3 (aq)	-207
NH_3 (g)	-46

$\Delta H = [(2 \cdot -207) + 90] - [(3 \times 34) + -286]$

$(-324) - (-184)$

A) 64
B) 140
C) -140
D) -508
E) -64

12. In the presence of excess oxygen, methane gas burns in a constant-pressure system to yield carbon dioxide and water:

$CH4\ (g) + 2O2\ (g) \rightarrow CO2\ (g) + 2H2O\ (l) \quad \triangle H = -890.0\ kJ$

Calculate the value of q (kJ) in this exothermic reaction when 1.70 g of methane is combusted at constant pressure.

A) -94.6
B) 0.0306
C) -0.0106
D) 32.7
E) -9.46×104

mol CH4 = 1.70 g X 1mol/16 g = .106 mol
.890kJ/1mole = x kJ/.106 mole = -94.6 kJ

13.

13. Which one of the following conditions would always result in an increase in the internal energy of a system?

A) The system loses heat and does work on the surroundings.

B) The system gains heat and has work done on it by the surroundings.

C) The system loses heat and has work done on it by the surroundings.

D) The system gains heat and does work on the surroundings.

E) None of the above is correct.

14. Energy that is associated with the temperature of an object and is dependent of its mass is called

A) kinetic energy

B) thermal energy

C) potential energy

D) chemical energy

15. How much energy is evolved during the formation of 197 g of Fe, according to the reaction below?

$Fe_2O_3(s) + 2\ Al(s) \rightarrow Al_2O_3(s) + 2\ Fe(s)\ \Delta H°rxn = -852\ kJ$

A) 1.52 x 103 kJ

B) 3.02 x 103 kJ

C) 8.40 x 103 kJ

D) 964 kJ

E) 482 kJ