Chapter 5 review questions.

10) The ΔE of a system that releases 12.4 J of heat and does 4.2 J of work on the surroundings is _____ J.

A) 16.6 B) 12.4 C) 4.2 D) -16.6 E) -8.2

12) Calculate the value of ΔE in joules for a system that loses 50 J of heat and has 150 J of work performed on it by the surroundings.

A) 50 B) 100 C) -100 D) -200 E) +200

15) The value of $\Delta H°$ for the reaction below is -72 kJ. _____ kJ of heat are released when 1.0 mol of HBr is formed in this reaction.

$$H_2(g) + Br_2(g) \rightarrow 2HBr(g)$$

A) 144 B) 72 C) 0.44 D) 36 E) -72

17) The value of $\Delta H°$ for the reaction below is -126 kJ. The amount of heat that is released by the reaction of 25.0 g of Na_2O_2 with water is _____ kJ.

$$2Na_2O_2(s) + 2H_2O(l) \rightarrow 4NaOH(s) + O_2(g)$$

A) 20.2 B) 40.4 C) 67.5 D) 80.8 E) -126

20) The value of $\Delta H°$ for the reaction below is -482 kJ. Calculate the heat (kJ) released to the surroundings when 12.0 g of CO (g) reacts completely.

$$2CO(g) + O_2(g) \rightarrow 2CO_2(g)$$

A) 2.89×10^3 B) 207 C) 103 D) 65.7 E) -482

Answer: D Answer: B Answer: D Answer: C

31) The molar heat capacity of a compound with the formula C_2H_6SO is 88.0 J/mol-K. The specific heat of this substance is _____ J/g-K.

A) 88.0 B) 1.13 C) 4.89 D) 6.88×10^3 E) -88.0

32) A sample of aluminum metal absorbs 9.86 J of heat, upon which the temperature of the sample increases from 23.2 °C to 30.5 °C. Since the specific heat capacity of aluminum is 0.90 J/g-K, the mass of the sample is _____ g.
A) 72 B) 1.5 C) 65 D) 8.1 E) 6.6

33) The specific heat capacity of lead is 0.13 J/g-K. How much heat (in J) is required to raise the temperature of 15g of lead from 22 °C to 37 °C?

A) 2.0 B) -0.13 C) 5.8×10^{-4} D) 29 E) 0.13

36) The specific heat of liquid bromine is 0.226 J/g-K. How much heat (J) is required to raise the temperature of 10.0 mL of bromine from 25.00 °C to 27.30 °C? The density of liquid bromine: 3.12 g/mL.

A) 5.20 B) 16.2 C) 300 D) 32.4 E) 10.4

Answers: 31 B 32 B 33 D 36 B

39) Given the following reactions

$Fe_2O_3(s) + 3CO(s) \rightarrow 2Fe(s) + 3CO_2(g)$ $\Delta H = -28.0$ kJ

$3Fe(s) + 4CO_2(s) \rightarrow 4CO_2(g) + Fe_3O_4(s)$ $\Delta H = +12.5$ kJ

the enthalpy of the reaction of Fe_2O_3 with CO

$3Fe_2O_3(s) + CO(g) \rightarrow CO_2(g) + 2Fe_3O_4(s)$ is _____ kJ.

A) -59.0 B) 40.5 C) -15.5 D) -109 E) +109

40) Given the following reactions

$N_2(g) + 2O_2(g) \rightarrow 2NO_2(g)$ $\Delta H = 66.4$ kJ

$2NO(g) + O_2(g) \rightarrow 2NO_2(g)$ $\Delta H = -114.2$ kJ

the enthalpy of the reaction of the nitrogen to produce nitric oxide

$N_2(g) + O_2(g) \rightarrow 2NO(g)$ is _____ kJ.

A) 180.6 B) -47.8 C) 47.8 D) 90.3 E) -180.6

46) Given the following reactions

$N_2(g) + O_2(g) \rightarrow 2NO(g)$ $\Delta H = +180.7$ kJ

$2NO(g) + O_2(g) \rightarrow 2NO_2(g)$ $\Delta H = -113.1$ kJ

the enthalpy of reaction for $4NO(g) \rightarrow 2NO_2(g) + N_2(g)$ is _____ kJ.

A) 67.6 B) 45.5 C) -293.8 D) -45.5 E) 293.8

Answer: 39 A 40 A 46 C

48) The value of $\Delta H°$ for the reaction below is -186 kJ.

$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$

The value of $\Delta H_f°$ for HCl (g) is _____ kJ/mol.

A) -3.72×10^2 B) -1.27×10^2 C) -93.0 D) -186 E) +186

50) Given the data in the table below, $\Delta H°_{rxn}$ for the reaction $Ca(OH)_2 + 2H_3AsO_4 \rightarrow Ca(H_2AsO_4)_2 + 2H_2O$ is _____ kJ.

Substance	$\Delta H_f°$ (kJ/mol)
$Ca(OH)_2$	-986.6
H_3AsO_4	-900.4
$Ca(H_2AsO_4)_2$	-2346.0
H_2O	-285.9

A) -744.9 B) -4519 C) -4219 D) -130.4 E) -76.4

52) Given the data in the table below, $\Delta H°_{rxn}$ for the reaction $C_2H_5OH(l) + O_2(g) \rightarrow CH_3CO_2H(l) + H_2O(l)$ is _____ kJ.

Substance	$\Delta H_f°$ (kJ/mol)
C_2H_4 (g)	52.3
C_2H_5OH (l)	-277.7
CH_3CO_2H (l)	-484.5
H_2O (l)	-285.8

A) -79.0 B) -1048.0 C) -476.4 D) -492.6
E) The value of $\Delta H_f°$ of $O_2(g)$ is required for the calculation.

63) Given the data in the table below and $\Delta H°_{rxn}$ for the reaction

$$SO_2Cl_2(g) + 2H_2O(l) \rightarrow H_2SO_4(l) + 2HCL(g) \qquad \Delta H° = -62 \text{ kJ}$$

$\Delta H°_f$ of HCl(g) is _____ kJ/mol.

Substance	$\Delta H_f°$ (kJ/mol)
SO_2 (g)	-297
SO_3 (g)	-396
SO_2Cl_2 (g)	-364
H_2SO_4 (l)	-814
H_2O (l)	-286

A) -184 B) 60 C) -92 D) 30 E) Insufficient data are given.

32) Of the following, $\Delta H_f°$ is <u>not</u> zero for _____.

A) $O_2(g)$ B) C (graphite) C) $N_2(g)$ D) $F_2(s)$ E) $Cl_2(g)$

3) The combustion of titanium with oxygen produces titanium dioxide:

$$Ti(s) + O_2(g) \rightarrow TiO_2(s)$$

When 2.060 g of titanium is combusted in a bomb calorimeter, the temperature of the calorimeter increases from 25.00 °C to 91.60 °C. In a separate experiment, the heat capacity of the calorimeter is measured to be 9.84 kJ/K. The heat of reaction for the combustion of a mole of Ti in this calorimeter is _____ kJ/mol.

A) 14.3 B) 19.6 C) -311 D) -0.154 E) -1.52×10^4

9) A 50.0-g sample of liquid water at 25.0 C is mixed with 29.0 g of water at 45.0 °C. The final temperature of the water is _____.

A) 102
B) 27.6
C) 35.0
D) 142
E) 32.3

Answer: 48 C 50 D 52 D 63 C 32 D 3 E 9 E