**Multiple Choice**

1. Ethane gas, C2H6, burns completely according to:

2C2H6(g) + 7O2(g) → 4CO2(g) + 6H2O(*l*)

How many grams of ethane gas would be required to heat 855 g of water from 25oC to 98oC? (The specific heat of water = 4.184 J/g oC)

A) 9 B) 8 C) 7 D) 5

1. 200.0 g of copper metal at 120oC was placed in a constant pressure calorimeter of negligible heat capacity containing 350.0 g of water at 20oC. Calculate the final temperature of the system. (The copper metal and the water).

(The specific heat of copper = 0.385 J/g oC).

(The specific heat of water = 4.184 J/g oC).

A) 26 B) 27 C) 25 D) 24

1. The molar heat of combustion of caffeine, C8H10O2N4 (molar mass = 194.44 g/mol), is 4226 kJ/mol. When 1.23 g of Caffeine was combusted in a constant volume bomb calorimeter containing 800 g of water, a temperature rise of 5.0oC was observed. What is the heat capacity of the bomb calorimeter in kJ/oC, excluding its water content (The specific heat of water = 4.184 J/g oC).

A) 3.5 B) 3.0 C) 2.5 D) 2.0

4. Calculate (in kJ) for:

2C8H18(*l*) + 21O2(g) → 8CO(g) + 8CO2(g) + 18H2O(*l*)

Given:

2C8H18(*l*) + 25O2(g) → 16CO2(g) + 18H2O(*l*)

2CO(g) + O2(g) → 2CO2(g)

A) -8215 B) -8756 C) -8998 D) -9050

5. Calculate the work done (in kJ) when 3 moles of liquid water vaporizes at 1.0 atm and 100oC (assume that the volume of liquid water is negligible compared with that of steam at 100oC and ideal gas behavior).

A) -8.3 B) -8.8 C) -9.3 D) -9.8

1. Given . Calculate the change in internal energy, E, for the following reaction occurring at 1.0 atm and 25oC.

2C(graphite) + O2(g) → 2CO(g)

A) -113.5 B) -108.5 C) -219.5 D) -224.5

7. The solubility of O2 gas is 2.80×10-4 M in the surface water of a lake at sea level at a pressure of 1 atm and temperature of 25oC and the mole fraction of O2 is 0.20. Calculate the molarity of O2 in the surface water of a lake at the top of a mountain where the pressure is 0.80 atm and the temperature is 25oC and the mole fraction of O2 is 0.15.

A) 2.44×10-4 M B) 1.95×10-4 M C) 1.79×10-4 M D) 1.68×10-4 M

1. What is the mass (in kg) of urea, (NH2)2CO, (non-electrolyte and non-volatile) that must be dissolved in 10.0 kg of water to give a solution that freezes at -10oC. (Kf water = 1.86 oC/m)

A) 3.23 B) 3.47 C) 4.12 D) 4.34

1. The osmotic pressure of 0.01 M MgSO4 solution at 25oC is 0.318 atm. Calculate the van't Hoff factor (i) for MgSO4 (an electrolyte) at this concentration.

A) 1.5 B) 1.4 C) 1.3 D) 1.2

1. A solution of 0.150 g of lysozyme (a non-electrolyte and non-volatile hormone) in 210 ml of a solution has an osmotic pressure of 0.953 torr at 25oC. Calculate (in g/mol) the molar mass of lysozyme.

A) 24385 B) 216674 C) 17124 D) 13936

1. F2 gas reacts with ClO2 gas according to:

F2(g) + 2ClO2(g) → 2FClO2(g)

use the following data to determine the value of the reaction rate constant.

|  |  |  |  |
| --- | --- | --- | --- |
| Experiment | [F2]o M | [ClO2]o M | Initial rate (/M.s) |
| 1 | 0.1 | 0.01 | 1.2×10-3 |
| 2 | 0.1 | 0.04 | 4.8×10-3 |
| 3 | 0.2 | 0.01 | 2.4×10-3 |

A) 1.2/M.s B) 2.4/M.s C) 4.8/M.s D) 0.24/M.s

1. A first order reaction A→ B is 25% completed in 45 min. Calculate (in min) the half life of the reaction.

A) 86.8 B) 99.3 C) 101.5 D) 108.4

1. At 25oC the rate constant for the first-order decomposition of a pesticide solution is 6.4×10-3 min-1. If the starting concentration of pesticide is 0.80 M, what concentration will remain after 40 min?

A) 0.62 M B) 0.56 M C) 0.52 M D) 0.48 M

1. The activation energy for the following reaction is 60190 J/mol:

2HI → H2 + I2

by what factor will the rate constant increase when the temperature is raised from 10oC to 29oC.

A) 7 B) 6 C) 5 D) 4

1. Which statement of the following is true?

A) The activation energy of a chemical reaction increases as the temperature decreases.

B) The activation energy of a chemical reaction increases as the temperature increases.

C) The activation energy of a chemical reaction doesn't depend on the temperature.

D) The activation energy of a chemical reaction increases in the presence of the catalyst.