

ANSWER KEY FOR PS #1 CHEM 113 -Drill on Concentrations - (Revised 1/2004)

•Chapter 11 - Chemistry , Zumdahl – (sections 11.1)

Text Questions : 9,11,12,13,14,25,27,29,31

Additional Problems:

Fill in the following table rounding to a "reasonable number of Significant Figures.

Solute	grams solute	grams H ₂ O	Volume of Solution	Density of Solution	% w/w solute	M solute	m solute	X solute
HC ₂ H ₃ O ₂	5.00 g	95.0 g	99.3 mL	1.007 g/mL	5.00 %w/w	0.839 M	0.877 m	0.0155
KNO ₃	202 g	918 g	1.00 L	1.120 g/mL	18.0 %w/w	2.00 M	2.17 m	0.03764
C ₁₂ H ₂₂ O ₁₁	54.0 g	36.0 g	69.8 mL	1.29 g/mL	60.0 %w/w	2.26 M	4.39 m	0.0732
H ₂ SO ₄	34.875 g	34.875 g	50.0 mL	1.40 g/mL	50.0%	7.12 M	10.2 m	0.155

Your answers may differ in the last digit by +/- 2 due to rounding !

ANSWER KEY FOR PS#2 CHEM 113 -Energy Concepts I (Energy Changes, Heat, Work, Heat Capacity) (Revised 1/2004)

Text: Zumdahl-Chapter 6 (6.1 -6.2)

Problems: 2,3,4,9,11,17,19,21,23,25,37,39,41,43,45,49,83,93.

Additional Problems:

1. The specific heat capacity of ethanol (C₂H₅OH) is 2.46 J/g-K. How many joules of heat are required to heat 193 grams of ethanol from 10.55°C to 47.32°C? * What is the molar heat capacity of ethanol? **

$$*q = mC\Delta T \quad m = 193 \text{ g}$$

$$C = 2.46 \text{ J/g K} \quad \rightarrow \quad \underline{q = 17,458 \text{ J} = 17.5 \text{ kJ}}$$

$$\Delta T = 36.77 \text{ K}$$

**use molar mass

$$\underline{\text{Molar heat capacity} = 113.4 \text{ J/mol K}}$$

2. What is the heat capacity of 348 grams of liquid water?

$$\text{use specific heat capacity of liquid water (4.18 J/g K) } \times 348 \text{ grams} \rightarrow \underline{= 1.46 \text{ kJ/K}}$$

3. How many kilojoules of heat are needed to raise the temperature of 2.06 kg of water from 35.14°C to 76.37°C?

$$q = mC\Delta T \quad m = 2060 \text{ g}$$

$$C = 4.18 \text{ J/g K} \quad \rightarrow \quad \underline{q = 355,023 \text{ J} = 355 \text{ kJ}}$$

$$\Delta T = 41.23 \text{ K}$$

4. An expanding gas absorbs 1.55 kJ of heat. If its internal energy increases by 1.32 kJ, does the system do work on its surroundings or have work done on it? * What quantity of work is involved? **

$$\Delta E = q + w \quad w = \Delta E - q \quad q = + 1.55 \text{ kJ} \text{ (“+” means absorbed by system)}$$

$$\Delta E = + 1.32 \text{ kJ} \text{ (“+” means increase in energy)}$$

$$\underline{\text{**}w = - 0.23\text{kJ} \text{ (“-“ means lost, *work done by the system on the surroundings)}}$$

5. A house is being designed to have passive solar energy features. Brickwork is to be incorporated into the interior of the house to act as a heat absorber. Each brick weighs approximately 1.8 kg. The specific heat of the brick is 0.85 J/g-K. How many bricks will need to be incorporated into the interior of the house to provide the same total heat capacity as 1000 gallons of water?

$$1000 \text{ gallons of water} = 3.784 \times 10^6 \text{ grams of water} \rightarrow \text{with a heat capacity of } 1.58 \times 10^7 \text{ J/K}$$

$$\text{Heat capacity per brick (1800 g)} \rightarrow 1.53 \times 10^3 \text{ J/brick K}$$

$$(1.58 \times 10^7 \text{ J/K}) / (1.53 \times 10^3 \text{ J/brick K}) = \underline{\text{about 10,300 bricks}}$$