

# Thermochemistry Worksheet Answers

## Useful Values:

Heat of Fusion for Water:  $\Delta H_{\text{fus}} = 6 \text{ kJ/mol}$

**Common error: not converting to moles**

Heat of Vaporization for Water:  $\Delta H_{\text{vap}} = 45 \text{ kJ/mol}$

**Common error: same**

1 calorie = 4.18 Joules

Material	Specific Heat in Joules/g/K	in Cal/g/K
Water (ice)	2.05	0.490
Water (liquid)	4.18	1.00
Water (gas)	2.08	0.498

**Common error here:**

**using moles instead of grams.**

1. How much energy does it take to warm the following substances the listed amount?

a. 20g of ice from  $-45^\circ \text{C}$  to  $-15^\circ \text{C}$ ?

**294 calories / 1230 Joules**

b. 20g of water from  $25^\circ \text{C}$  to  $55^\circ \text{C}$ ?

**600 calories / 2508 Joules**

c. 20g of water vapor from  $130^\circ \text{C}$  to  $160^\circ \text{C}$ ?

**299 calories / 1249 Joules**

2. To melt ice, one must bring ice to the freezing point ( $0^\circ \text{C}$ ), and then thaw it into water. How much heat would it take to melt...

a. 30g of ice at  $0^\circ \text{C}$ ?

**10 kJ**

**(10,000 J)**

b. 30g of ice at  $-40^\circ \text{C}$ ?

**12.46 kJ**

**(12,460 J)**

3. To boil water, one must raise it to the boiling point ( $100^\circ \text{C}$ ), and then boil it into steam. How much heat would it take to boil...

a. 40g of water at  $100^\circ \text{C}$ ?

**100 kJ**

**(100,000 Joules)**

b. 40g of water at  $90^\circ \text{C}$ ?

**101.7 kJ**

**(101,672 Joules)**

c. 40g of water at  $0^\circ \text{C}$ ?

**116.7 kJ**

**(116,720 Joules)**

d. 40g of ice at  $0^\circ \text{C}$ ?

**130.1 kJ**

**(130,053 Joules)**

e. 40g of ice at  $-80^\circ \text{C}$ ?

**136.6 kJ**

**(136,613 Joules)**

4. If 700 calories of heat raise 400g of Phonium by  $20^\circ \text{C}$ , what is the specific heat of Phonium? **0.0875 cal/g/K**

5. How much heat energy is stored in 2g of ice at  $-30^\circ \text{C}$ ? (remember: use Kelvin)

**238 cal / 996 J**

6. How much heat energy is stored in 2g of Phonium at  $70^\circ \text{C}$ ? (Assume Phonium is a solid at  $70^\circ \text{C}$ ) **1672 cal**

7. If 100g of water at  $10^\circ \text{C}$  comes in contact with \_\_\_\_\_, what will the final temperature be?

(Remember, you have the specific heat of Phonium from question 4.)

a. 100g of water at  $90^\circ \text{C}$

**$50^\circ \text{C}$**

b. 100g of Phonium at  $90^\circ \text{C}$  (Hint: the water and Phonium end at the same temperature)  **$16.44^\circ \text{C}$**

**Common error: 6.44 degrees is the temperature change, and the water gets warmer.**

c. 20g of Phonium at  $90^\circ \text{C}$

**$11.38^\circ \text{C}$**

d. 1g of Phonium at  $90^\circ \text{C}$

**$10.07^\circ \text{C}$**

8. If 450g of Phakelite at  $100^\circ \text{C}$  is added to 1000g of water at  $20^\circ \text{C}$ , the temperature of the water increases by  $5^\circ$ . What is the specific heat of Phakelite? **0.148 cal/g/K**

8. If 450g of Nonsensium at  $500^\circ \text{C}$  is added to 1000g of water at  $20^\circ \text{C}$ , the temperature of the water increases by  $25^\circ$ . What is the specific heat of Nonsensium? **0.122 cal/g/K**

# Guided And Study Workbook Thermochemistry Answers

**David Margolese, David W. Oxtoby**



## **Guided And Study Workbook Thermochemistry Answers:**

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