

Unit 6 Heat Study Guide
Conceptual Physics

Name: Key
Period: _____ Date: _____

Review all worksheets and book problems!

Vocabulary:

Temperature
Celsius
Fahrenheit
Kelvin
Thermal Expansion
Thermal equilibrium
Phase change
Heat
Conduction
Convection
Radiation

Specific Heat Capacity
Newton's Law of Cooling
Global Warming
Greenhouse gas effect
Thermodynamics
First law of thermodynamics
Second law of thermodynamics
Adiabatic
Entropy
Heat engine

Possible Questions:

1. Gold has a specific heat of $0.129 \text{ J}/(\text{g}\times^\circ\text{C})$. How many joules of heat energy are required to raise the temperature of 15 grams of gold from 22°C to 85°C ?

$$Q = mc\Delta T = 15 \cdot 0.129 \cdot (85 - 22) = \boxed{121.9 \text{ J}}$$

2. If 335 g of water at 65.5°C loses 9750 J of heat, what is the final temperature of the water? Liquid water has a specific heat of $4.18 \text{ J}/(\text{g}\times^\circ\text{C})$.

$$-9750 = 335 \cdot 4.18 \cdot (T_f - 65.5)$$
$$\boxed{T_f = 58.5^\circ\text{C}}$$

3. What is temperature a measurement of? What is the coldest possible temperature?

$\overset{\uparrow}{\text{KE}}$; 0 Kelvin

4. Why was the Kelvin scale adopted by scientists?

Because Kelvin measures when KE can theoretically be zero

5. What is the difference between temperature, thermal energy, and heat?

temp: a numerical # measuring KE
thermal: internal energy of a system
heat: a way to describe thermal energy

6. A heat engine exhausts 8200J of heat while performing 3200J of work. What is the efficiency of this engine?

$$e = \frac{W}{Q_{\text{total}}} = \frac{3200}{3200 + 8200} = \boxed{28.1\%}$$

7. A Carnot engine operates between 410K and 290K. How much heat must be given to the engine to produce 2500J of work? (Hint: solve for heat output and then calculate the heat rejected.)

$$e = \frac{410 - 290}{410} = 29.3\%$$

$$e = \frac{2500}{2500 + \text{output}} = .293$$

$$\text{output} = 6032 + 2500 = \boxed{8532\text{ J}}$$

8. What is the greenhouse gas effect and how does it affect our global temperature? Be sure to describe the difference in solar and terrestrial radiation wavelengths.

where gases trap in terrestrial radiation (long wavelength) so the solar radiation (short wavelength) gets trapped and heats up the earth's surface

9. Explain how a refrigerator works and what would happen if you were to leave the door open.

The room would heat up due to motor running, the air would simply circulate other than that.

10. At what temperature would the molecules of a gas have three times the average kinetic energy they have at a 20°C room temperature?

$$20^\circ\text{C} + 273 = 293\text{ K} \times 3 = 879\text{ K}$$

$$\underline{\quad - 273 \quad}$$

$$\boxed{606^\circ\text{C}}$$