Chapter 14 Heat and Temperature Notes

Section 1:

**Temperature**

- The degree of “__________” or “__________” of an object.
- Related to the __________________________ of an object’s atoms or molecules
- What makes something hot?
  - Particles that make up __________________________
  - They have _______________
  - When you heat something the ______________________________

**Kinetic Energy**

- transferred as _______________________
- __________________________ no matter what state they are in.

<table>
<thead>
<tr>
<th>Kinetic Energy</th>
<th>Temperature</th>
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</table>

**Measuring Temperature**

- __________________________- mechanical or electrical device for ______________________________.
- Early thermometer was invented by __________.
- How thermometer works:
  - Most materials ____________________________
  - _________ thermometers have a large bulb hooked to a narrow tube.
  - When the liquid ________________________________.
  - Won’t work if too _________ or __________
- Metals ___________ when heated
- Different metals ____________________________
- Hook two metals together to make a thermometer that turns
- ________________ Thermometers
  - Used in thermostats

**Limits on Temperature**

- **Upper Limit**
  - ____________________________
  - Plasma found in _________ = millions of degrees C
- **Lower Limit**
  - Definite limit called ____________________________
  - ________________ will slow down SO much, they will ______________________________
  - Out of ________, so they _______ get any colder

**Temperature Scales**

- Three different scales:
  1. Fahrenheit- ____________
  2. Celsius- ____________ standard
  3. Kelvin- starts at ________________ but same degree size as Celsius

- In the US we know at _________ water freezes and _________ water boils.
Measuring Temperature

• The absolute temperature scale is called the ____________________.
• Absolute zero is ______.
• The melting point of ice is _____, and the boiling point of water is 373 K.
• There are ________________ numbers on the Kelvin scale.

Converting Temperature

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1. Water freezes at 32°F, what is this in Celsius?</td>
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<tr>
<td>In Kelvin?</td>
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<tr>
<td>2. Water boils at 100°C. What is this in Fahrenheit?</td>
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<tr>
<td>In Kelvin?</td>
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<td>3. Lead melts at 600 K, what is this in Celsius?</td>
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<tr>
<td>In Fahrenheit?</td>
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<td>4. Body temperature is 98.6°F, what is this in Celsius?</td>
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<tr>
<td>In Kelvin?</td>
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<tr>
<td>5. Methanol boils at 75°C, what is this in Fahrenheit?</td>
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<tr>
<td>In Kelvin?</td>
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</tbody>
</table>

Practice Problems: Temperature Scales

Heat

• Heat is the ______________________ transferred from one thing to another due __________
• Always moves from ________ temperature to ______ temperature.
• ________ molecules (high temperature) hit ________ molecules (low temperature) and ________________
• ______________________ tells you ____________ of heat transferring.
Section 2: Energy Transfer

Heat can be transferred 3 different ways:
1. Conduction
2. Convection
3. Radiation

Conduction
• Transferred of energy by _____________________
• Works well in some _____, then liquids, and _____________________.
• ______________ - materials that allow heat to pass through them
  • Most ___________
• ______________ - materials that don't let heat pass through them well
  • ______________________

Convection
• Transferring __________________________________
• __________ and ________ are fluids
• When heated they ________, become less __________
• They ________, replaced by ________________ fluids
• Make a circular flow called a _________________

Radiation
• Energy transferred by __________________________
  • Ex: infrared radiation, ____________, ultraviolet rays
• Can travel through __________________________
• When wave hit object they make _______________________________.

Specific Heat
• Some materials ______________________
• Others require a ___________________________ to change their____________________________
• Specific heat measures the __________________________ to raise the temperature ______________
• Table on page 485 (Learn to use it)
• Water has a high specific heat of ______________________
• The amount of energy required to change the temperature of substance __________________________.
• Metals have a ______________________

Calculating Specific Heat
• Energy = ________________________________
  • energy = cm\(\Delta T\)
  • mass= kg
  • energy= Joules
  • Temperature= ___
  • c=___________________
Practice Problems: Specific Heat

1. How much energy must be transferred as heat to 200 kg of water in a bathtub to raise the water’s temperature from 25 °C to 37 °C?

2. How much heat does it take to change the temperature of 3 kg of water by 75 K?

3. How much energy is needed to increase the temperature of 0.755 kg of iron from 283 K to 403 K?

Temperature vs. Time Graph

- Adding energy ___________________ or ___________________, not both at the same time.

Section 3: Using Heat

First Law of Thermodynamics

- When thermal energy transfers as heat, it does so ______________________________. The energy ______________________________ is ______________________________.
- Whenever heat flows into or out of a system, the gain or loss of thermal energy ______________________________. (You can’t get something from nothing because energy and matter are ______________________________).

Second Law of Thermodynamics

- Energy transfers as heat always moves from a ______________________________. (You can’t break even; you can’t return to the __________________ state because __________________ always increases).
- __________________ is the tendency for natural systems to become ______________________________.
  - Any system that is left to itself will fall apart. This means Entropy __________________.
  - __________________________ with every transfer or energy transformation.
Thermodynamics

• __________ increases average ______________
• __________________________ is the process in which energy is transferred by work

Heat Engines

• Heat engines ___________________________ to __________________________ through the process of __________________________.
• Internal combustion engines
• __________ inside the engine
  • A _______________ is the part of the engine in which ______________________ becomes ______________________.
• 4 strokes: __________, Compression, __________, and exhaust