



Matching: Conduction, Convection, Radiation

22. Radiation Heat transfer without contact and without movement a "mass" of particles. This is the process by which the Sun's energy travels through empty space on its way to the Earth.
23. Conduction Heat transfer by touch; when hot object touches cold object, the rapidly moving molecules of the hot object bump into the molecules of the cold object, causing them to begin moving faster. The molecules of the hot object lose some energy in the process, thus they slow down.
24. Convection Heat transfer by the "wholesale movement" of a warm mass of some substance (e.g. blobs rising in a lava lamp)

Part II: Short Answer

1. Describe some hypothetical examples demonstrating how a hotter object (higher temperature) can have less thermal energy than a colder object.

A snow field has more molecules, so it has more thermal energy than a human.

2. What is happening to an object that is...

a) gaining heat of vaporization?

Turning liquid to gas (evaporating)

b) losing heat of vaporization?

Turning gas to liquid (condensing)

3. What is happening to an object that is...

a) gaining heat of fusion?

Solid ~~to~~ to liquid (melting)

b) losing heat of fusion?

Liquid to solid (freezing)

4. Skip #4.

- 5-8. Suppose you have a sealed balloon full of air (ordinary latex balloon, tied off). You heat the balloon.

5. What are the four most common gases in the air inside the balloon, in order of prevalence?

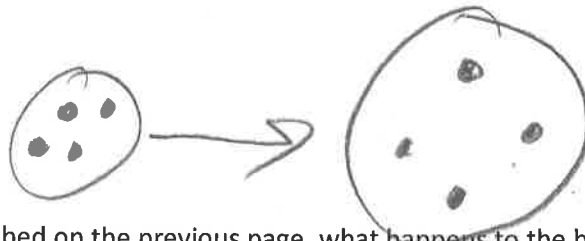
$N_2$ ,  $O_2$ , Ar,  $CO_2$

6. As you heat the balloon, what happens to its volume? Explain why.

Expands. Molecules speed up, pushing the walls of the balloon outward.

7. As you heat the balloon as described above, what happens to the balloon's mass? Explain how you know.

No change, because no stuff is added or removed.



8. As you heat the balloon described on the previous page, what happens to the balloon's overall density? Explain your reasoning.

Density decreases, because there is the same amount of stuff in a bigger space. Less crowded.

9. If you screw the lid onto an empty 2-liter soda bottle, and then you rapidly squeeze the bottle, what happens to the temperature of the air inside the bottle? Explain why.

Temperature increases, because you push the molecules, speeding them up.

- 10-12. You can make a cloud in a 2-liter bottle by adding some smoke and some water. Then you screw the cap on tight and squeeze the bottle. After that, you need to release the bottle.

10. What necessary role does the squeezing play?

Squeezing heats up the air, causing water to evaporate into the air.

11. What necessary role does the releasing play?

Releasing cools the air, causing water in the air to condense.

12. What role does the smoke play?

Smoke provides a surface for the water to condense upon.

13. Give a very brief (one sentence) explanation for why hot air rises.

Hot air is less dense than normal air.

14. Explain why rising air produces clouds.

a. What happens to air's volume as it rises? Why?

Volume increases, because there is less pressure.

b. What happens to air's temperature as it rises? Why?

Gets colder, because air expands.

c. As air rises, what ~~happens~~ causes clouds to appear?

Cooling causes water to condense.

14. Explain why sinking air produces clear skies.

a. What happens to air's volume as it sinks? Why?

Volume shrinks because there is more pressure.

b. What happens to air's temperature as it sinks? Why?

Temperature heats up because air is being squeezed.

c. As air sinks, what ~~happens~~ causes clouds to disappear?

Heating causes water to evaporate.

17. Explain why, under the right conditions, sweating makes humans cooler.

- Sweat evaporates.
- Sweat needs heat to evaporate.
- Sweat takes heat from humans

18. If you put a sealed container of cream in a bowl of ice, and then you mix rock salt into the ice, the cream will freeze. Explain why.

- Salt melts ice
- Ice needs heat in order to melt.
- Ice takes this heat from the cream.