Conduction, Convection, Radiation List which process is occurring for each of the following.

1. A microwave oven cooking your dinner. **radiation**
2. Causes winds on earth. **convection**
3. You sit near a campfire.**radiation**
4. An iron is used to iron your clothes. **conduction**
5. Your doctor takes an X-ray of your body.**radiation**
6. How a space-heater warms an entire room. **convection**
7. Walking across hot sand burns your feet. **conduction**
8. Cause of sea breezes. **convection**
9. A metal spoon sits in soup, and the spoon heats up. **conduction**

Dice Games In the dice game *Entropia* each player has two, identical four-sided dice that are rolled each round. The game lasts very long and there are thousands of players, so you decide to employ the aid of statistics. A.) Make a table of all the combinations of two dice configurations (micro states) and the corresponding total number of each combination (macro state). B.) What is the probability of each macro state? C.) How can entropy be used to understand the outcome of a large number dice rolls?

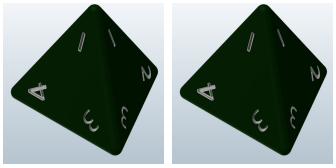


Table 1: A.)

Micro States		Macro State
Die 1	Die 2	Both Dice
1	1	2
1	2	3
1	3	4
1	4	5
2	1	3
2	2	4
2	3	5
2	4	6
3	1	4
3	2	5
3	3	6
3	4	7
4	1	5
4	2	6
4	3	7
4	4	8

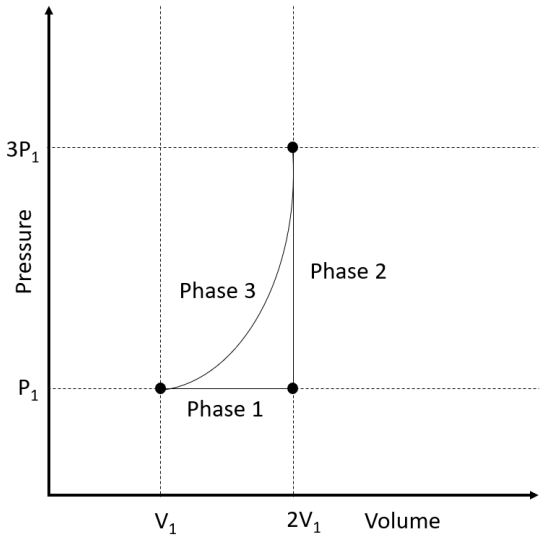
[0]Select problems may be modified from Walsh, Harrison, or the Internet.

Table 2: B.)

Macro State	Probability
2	$\frac{1}{16}$
3	$\frac{2}{16}$
4	$\frac{3}{16}$
5	$\frac{4}{16}$
6	$\frac{3}{16}$
7	$\frac{2}{16}$
8	$\frac{1}{16}$

C.) The system tends towards the least ordered state. Meaning, the most common roll is a 5, can be made up in the most random ways (1&4, 4&1, 3&2, 2&3); unlike the ordered 2 that can only come from rolling snake eyes (1&1). Thus the system tends towards the more random state, just like entropy increases.

Make a Plot A gas starts at pressure (P_1) and volume (V_1). During phase 1 it doubles in volume while maintaining constant pressure. Next (phase 2) it triples its pressure only. For phase 3 it returns to its original pressure and volume.
Make a P-V Diagram of the above phases. Label each of the points and each leg of the phase.
Next describe what happens to the remaining state variable during each phase.
If you can name the change that occurred during each phase.
For each phase what do you know about the thermal energy? Work? Heat?



Phase 1: Temperature doubles, Isobaric process, Thermal Energy increases, Work is P_1V_1, Heat doubles
Phase 2: Temperature triples, Isochoric process, Thermal Energy increases, Work is 0, Heat triples
Phase 3: Temperature drops by a factor of 6, Can't know what kind of process, Thermal Energy decreases, Work is difficult to calculate but is the area under the curve, Heat drops by a factor of 6

Internal Energy Compute the internal energy change and temperature change for the two processes involving 1 mole of an ideal monatomic gas.

1. 1500 J of heat are added to the gas and the gas does no work and no work is done on the gas
2. 1500 J of work are done on the gas and the gas does no work and no heat is added or taken away from the gas

1.

$$\Delta U = Q - W = 1500J - 0 = 1500J \tag{1}$$
$$\Delta U = 1500J = \frac{3}{2}nR\Delta T = \frac{3}{2}(1)(8.31)\Delta T \tag{2}$$
$$\implies \Delta T = 120K \tag{3}$$

2.

$$\Delta U = Q - W = 0 - (-1500J) = +1500J \tag{4}$$
$$\Delta U = 1500J = \frac{3}{2}nR\Delta T = \frac{3}{2}(1)(8.31)\Delta T \tag{5}$$
$$\implies \Delta T = 120K \tag{6}$$