Week 6 Quiz

Thursday, February 11, 2021 2:58 PM

Question 1: One mole of a monatomic gas undergoes three processes in a row: 1 → 2, 2 → 3, 3 → 1. These three processes are shown in the volume vs temperature graph where each label (1, 2, and 3) represent equilibrium states. Label each process as either: Isothermal, Isobaric, Isochoric, Adiabatic, or Other Process.

1 → 2: Constant Volume (Isochoric)

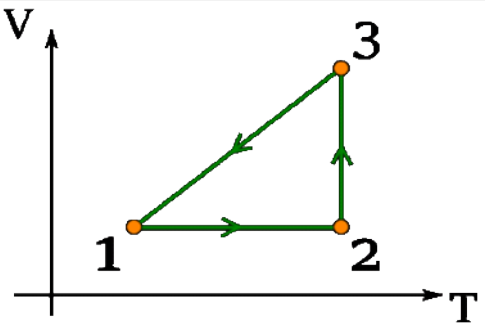
2 → 3: Constant Temperature (Isothermal)

3 → 1: V(T) has a linear realationship (Isobaric)

$$PV = nRT, \quad so \quad V = \frac{nR}{P}T$$

If V is to be linear with respect to T:

n, R, and P must be constants. Pressure must be a constant.



Question 2: Follow this link (https://boxsand.physics.oregonstate.edu/ph202-winter-20201-week-6-quiz-video) to a video that is hosted on BoxSand. In the video there are two identical chunks of ice at 0°C resting on different surfaces. The chunk of ice on the left is resting on acrylic glass. The chunk of ice on the right is resting on steel. Both surfaces, the acrylic glass and steel, are at the same room temperature and both have the roughly the same thickness and area. The pink foam block is there to prevent energy transfer via heat between the ground and the plates. The table might be useful in answering the parts below.

Material	Density (kg/m^3)	Melting Point (°C)	Specific Heat: **c** (J/(kg·K))	Thermal Conductivity: **k** (W/(m·K))
Liquid Water	1000	N/A	4180	0.560
Ice Solid H_20	919	0	2110	2.22
Acrylic Glass	1050	160	1270	0.19
Steel	7850	1500	490	50

Rubric
Q1 (3 points)
1 pt - each correct answer
Q2 (7 points)
Part (a)
1.5 pts - correct list of x-fer mechanisms
1 pt - conduction is greatest
Part (b)
2 pts - Thermal conductivity greater for metal
Part (c)
1.5 pts - Entropy change proportional to heat
1 pt - correct answer

(a) Consider the ice on the right as your system. Rank the three heat transfer mechanisms based on how prevalent they are in the process. Are any of them zero? Explain the reasoning of your ranking using words, pictures, plots, equations, or by other means.

(Conduction > Convection/Radiation). Comparing the two pieces of ice it is obvious the surface touching them has a great deal to do with how fast they melt. Since transfer due to touching is related to conduction, that must be the mechanism most prevalent in the case where the ice is on metal. Convection and radiation are both present but it is harder to decipher which is greater.

(b) Use the relevant physics we've learned this term to describe why the piece of ice on the right is melting faster than the piece of ice on the left.

The thermal conductivity for metal is higher than acrylic glass, so it should transfer energy at a faster rate. Both pieces of ice are roughly identical in all other ways.

(c) Use the relevant physics we've learned this term to rank the amount of entropy change in each piece of ice during the time shown in the video. Explain your reasoning of your ranking using words, pictures, plots, equations, or by other means.

($\Delta S_{metal} > \Delta S_{glass}$) The amount of entropy change in a system is proportional to the amount of heat transfer into/out of the system. Since the ice on the right completely melts, it must have a larger amount of heat transferred into it and thus a greater amount of change in entropy.