Heat and Thermo 7

1. A piston moves in, so that 3500J of work is done to compress the gas.
    A. Since the gas is <u>compressed</u>, the work done on the gas =
    B. If the gas <u>gives up</u> 1200 J of heat to the surroundings, Q =
    C. * What is the change of energy of the gas?

2. A gas is compressed from 35 m³ to 22 m³ at 2500 Pa. 35 kJ of heat is removed from the gas. (1kJ = 1000 J.)

    A. * Calculate the work done, making sure to say "by" or "on" the gas.

    B. Is Q + or −?
    C. * What is the change of internal energy or the gas?

3. A system's initial internal energy is 27 J. Then heat is added to the system. The final internal energy is 34 J and the system does +26 J of work.

    A. * You have the initial and final internal energy of the system (the gas). Calculate ΔU, remembering that Δ is always final − initial.

    B. Is +26J on or by the gas?
    C. How much heat is added to the system?

4. Fill in the following table. Answers are on the bottom of the "Thermodynamic Processes" notes, but do it from memory, first.

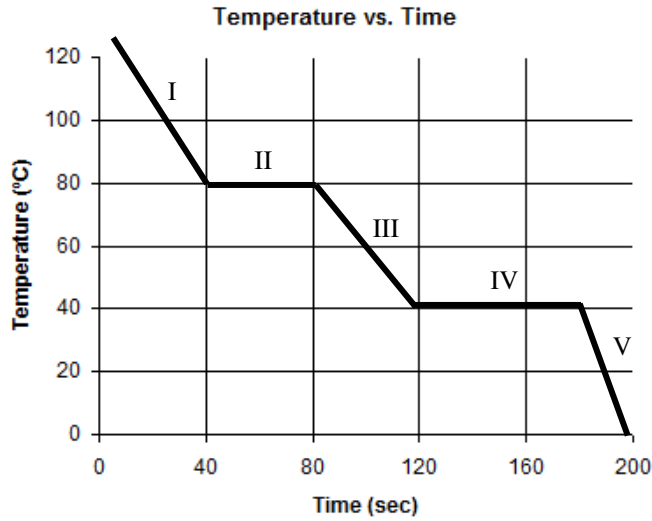 | Process | What equals 0 | First Law of Thermodynamics |
    | --- | --- | --- |
    | Isovolumetric | | |
    | Isothermal | | |
    | Adiabatic | | |

    Let me walk you thru the logic of the following question:

5. In an isothermal process +45 J of work is done by the gas.
    A. Since it is isothermal, what equals zero?
    B. Since it is positive work by the gas, is the gas being compressed or expanded?
    C. Due to the work, does the temperature of the gas want to increase or decrease?
    D. In order to keep the temperature from changing, will heat have to be added or removed?
    E. Calculate Q.

6. Imagine a cluttered house. The occupant of the house wants to have a party, so wishes to tidy up the living room and dining room.   Some of the clutter is placed outside at the curve to be thrown away. Some of the objects are put into a garage sale.

    A. Remembering that entropy is a measurement of chaos (like clutter), after the dining and living room are put in order, the entropy of these spaces has increased or decreased?

    B. In order to decrease this entropy, the owner of the house must do:

    C. A neighbor buys things in the garage sale and puts the objects in their own garage, causing the entropy of the neighboring garage to increase or decrease?

    D. The trash is taken to the city dump.   The trashed objects increase or decrease the entropy of the dump?

    E. So, the entropy of the house has _____ while the entropy of the whole city (including the neighbor's house and the dump) has _____.

7. Now imagine that owner is shut up into the house. [*Maybe there is a plague outside, OK*?!?] Anyway, nothing can go into or out of the house.   To decrease the entropy of the living and dining room, the clutter must be move somewhere else, thus _____ the entropy of the rest of the house.   The net change of entropy for the entire house would be positive or negative?

8. The graph shows the heat being removed at a rate of 500 J/sec. The object has a mass of 2 kg.

Temperature vs. Time

(Graph: Temperature (°C) vs. Time (sec). Segments labeled I, II, III, IV, V. I drops from 120 to 80 between 0 and 40 sec. II is flat at 80 from 40 to 80 sec. III drops from 80 to 40 from 80 to 120 sec. IV is flat at 40 from 120 to 180 sec. V drops from 40 downward near 200 sec.)

A. *Which segment shows freezing?
B. Which segment shows condensation?
C. Which segment shows the liquid phase?
D. Is the substance's molecules gaining or losing heat?
E. Is the substance's molecules gaining or losing internal kinetic energy?
F. What is the melting point (temp) for this substance?
G. What is the boiling point for this substance?

H. * How much time is the object in the liquid phase?

I. * How much heat is lost by the object in the liquid phase?

J. Calculate the specific heat of the substance in its liquid phase.

Q1: 2300 J 2A: 32.5kJ 2C: −2.5kJ 3A: +7 J

Q8: A: IV; H: 40 sec I: 20kJ