First Law of Thermodynamics Questions

1) Referring to Figure 18-2, a substance carried from point A to B absorbs 50 J and finds its internal energy has increased by 20 J. Going from B to C the internal energy decreases by 5 Joules.
   (a) How much work was done from A to B? **30 J**
   (b) How much heat was absorbed from B to C? **-5 J**
   (c) How much work was done going from B to C? **Zero**

2) 3.0 moles of gas expand from an initial volume of 0.040 m³ to final volume 0.085 m³ while the temperature of the gas is kept fixed at 300 K. How much work is done by the system?
   A) 5.6 kJ
   B) 6.6 kJ
   C) 7.6 kJ
   D) 8.6 kJ
   E) 14 kJ
   **Answer: A**

3) An expandable container holds 2.30 mole of He gas with an initial pressure of 770 kPa and an initial volume of 2.10 L. The gas expands isothermally to final pressure 350 kPa. How much heat is gained by the gas in this process?
   A) 1280 J
   B) 792 J
   C) 685 J
   D) 1370 J
   E) 1700 J
   **Answer: A**
4) An ideal gas undergoes the process a→b→c→a shown in Figure 18-3. The heat gained in process a→b is 546 J, while in process b→c the system loses 62 J. In process a→b the system performs 310 J of work, while in process c→a work is done on the system in the amount of 223 J. How much heat is gained by the system in process c→a?  
A) - 397 J  
B) - 62 J  
C) 223 J  
D) 18 J  
E) - 236 J  
Answer: A

5) An ideal gas undergoes the process a→b→c→a shown in Figure 18-3. \( P_a = P_c = 360.0 \text{ kPa}, V_b = V_c = 68.00 \text{ L}, V_a = 35.00 \text{ L}, \) and \( P_b = 560.0 \text{ kPa}. \) How much work is done by the system in this process?  
A) 2300 J  
B) 3300 J  
C) 2800 J  
D) 3800 J  
E) 3000 J  
Answer: B

6) An ideal gas undergoes the process a→b→c→a shown in Figure 18-3. \( P_a = P_c = 240 \text{ kPa}, V_b = V_c = 40 \text{ L}, V_a = 15 \text{ L}, \) and \( P_b = 400 \text{ kPa}. \) How much heat is gained by the system in this process?  
A) 1000 J  
B) 1500 J  
C) 2000 J  
D) 2500 J  
E) 3000 J  
Answer: C