

Name (printed) _____

Name (signature as on ID) _____

Lab Section Number _____

Exam IV Chaps. 12,14-16 in Young/Geller

Multiple Choice questions. Circle the correct answer. No work needs to be shown.

(6 pts) 1. n moles of an ideal gas initially has pressure $p_1 = 5.0 \times 10^3$ Pa and volume $V_1 = 1.0 \times 10^{-3}$ m³. The gas undergoes a process for which the final pressure is $p_2 = 2.0 \times 10^3$ Pa and the final volume is 4.0×10^{-3} m³. In this process, the internal energy of the gas

- a (a) increases
(b) decreases
(c) stays the same

(6 pts) 2. A circular hole is drilled in a steel plate. When the temperature of the plate is 20°C the diameter of the hole is 3.000 cm. When the temperature of the plate is raised to 100°C, the diameter of the hole is

- a (a) larger than 3.000 cm
(b) 3.000 cm
(c) smaller than 3.000 cm

(6 pts) 3. n moles of an ideal gas expands while the temperature of the gas remains constant. In this process the entropy of the gas

- (a) remains constant
(b) decreases
c (c) increases

(6 pts) 4. A person listening to a siren from a stationary police car observes the wavelength of that sound. The car now drives rapidly toward the person. Compared to the wavelength when the car is at rest, once the car is moving

- (a) the wavelength is the same
(b) the wavelength is longer
c (c) the wavelength is shorter

(6 pts) 5. The first overtone standing wave for a sound wave in a pipe that is open at both ends has wavelength 3.60 m. The speed of sound in air is 340 m/s. The length of the pipe is

- (a) 0.90 m
- (b) 1.20 m
- (c) 1.80 m
- (d) 2.70 m
- e (e) 3.60 m
- (f) 4.80 m
- (g) none of the above answers

(6 pts) 6. In one cycle a heat engine accepts 600 J of heat energy from the high energy reservoir and rejects 200 J of heat energy into the low temperature reservoir. In one cycle the amount of work performed by the engine is

- (a) 200 J
- b (b) 400 J
- (c) 600 J
- (d) 800 J
- (e) none of the above answers

(6 pts) 7. An ideal gas undergoes an adiabatic compression in which the volume of the gas decreases. (In an adiabatic process the heat flow Q is zero.) In this process the internal energy of the gas

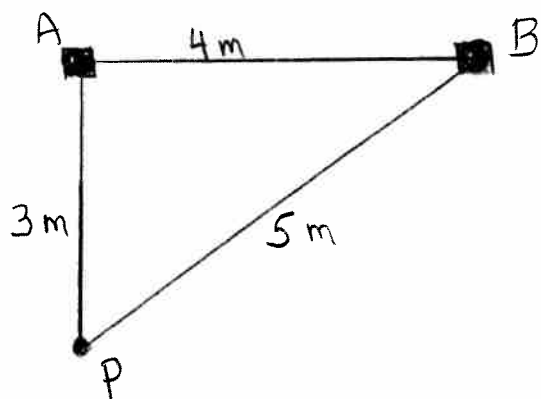
- a (a) increases
- (b) decreases
- (c) stays the same

(6 pts) 8. A siren emits sound waves uniformly in all directions. If the acoustic power output of the siren is 452 W, what is the intensity of the sound at a distance of 3.0 m from the siren?

- a (a) 4 W/m²
- (b) 12 W/m²
- (c) 50 W/m²
- (d) 151 W/m²
- (e) 452 W/m²
- (f) none of the above answers

On the following problems show all your work. Partial credit will be given if earned. Write your answers in the blanks provided.

(16 pts) 9. Two small speakers, A and B , operate from the same amplifier and emit coherent sound waves of frequency f . The speed of the sound waves is 340 m/s. Point P is 3.0 m from speaker A and 5.0 m from speaker B . What is the smallest value of f for which there will be destructive interference at point P ?



Ans. 85 Hz

(18 pts) 10. In a container of negligible mass, 0.200 kg of ice at an initial temperature of -40°C is mixed with a mass m of water that has initial temperature 80°C . No heat is lost to the surroundings. If the final temperature of the system is 20°C , what is the mass m of the water that was initially at 80°C ?

(For ice, $c = 2010 \text{ J}/(\text{kg}\cdot\text{C}^{\circ})$. For water $c = 4190 \text{ J}/(\text{kg}\cdot\text{C}^{\circ})$, $L_f = 3.34 \times 10^5 \text{ J}/\text{kg}$ and $L_v = 2.26 \times 10^6 \text{ J}/\text{kg}$.)

Ans. 0.396 kg

(18 pts) 11. Five moles of a monatomic ideal gas undergoes the process shown in the figure. State 1 has pressure $p_1 = 1.0 \times 10^3$ Pa and volume $V_1 = 2.0 \times 10^{-3}$ m³. State 2 has pressure $p_2 = 4.0 \times 10^3$ Pa and volume $V_2 = 5.0 \times 10^{-3}$ m³. The gas has $C_V = 3R/2$.

(a) In the process, what is the heat flow Q ?

Ans. 34.5 J

(b) Does heat flow into the gas or out of the gas?

Ans. into

