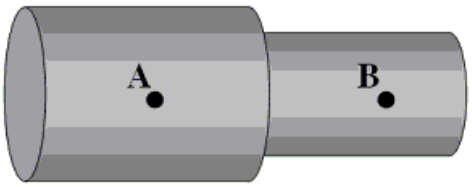

29:011 College Physics I **Practice Exam IV**

(The actual exam will have 15 questions.)

1. The density of the liquid flowing through the horizontal pipe in the drawing is 1200 kg/m^3. The radius of the pipe at point A is 0.50 m and the radius of the pipe at point B is 0.25 m. If the flow speed at point A is 7 m/s, what is the difference in pressure, $P_B - P_A$, between points B and A?



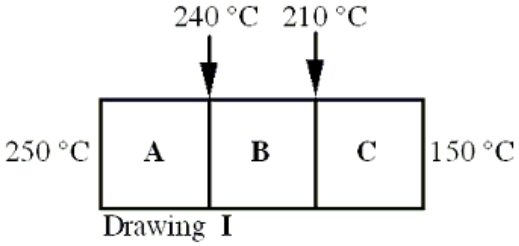
A) -1.9×10^3 Pa
B) $+3.8 \times 10^3$ Pa
C) -2.5×10^4 Pa
D) $+5.0 \times 10^4$ Pa
E) -4.4×10^4 Pa

2. The coefficient of linear expansion of steel is 12×10^{-6}/C°. A railroad track is made of individual rails of steel 1.0 km in length. By what length would these rails change between a cold day when the temperature is 14 °F and a hot day at 86 °F?
A) 0.62 cm B) 24 cm C) 48 cm D) 480 cm E) 620 cm

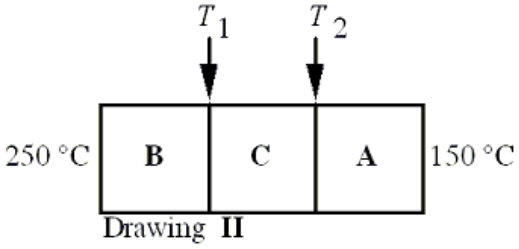
3. A thermos bottle contains 3.0 kg of water and 2.0 kg of ice in thermal equilibrium at 0 °C. How much heat is required to bring the system to thermal equilibrium at 50 °C?
A) 1.05×10^6 J B) 1.30×10^6 J C) 1.72×10^6 J
D) 2.26×10^6 J E) 1.13×10^7 J

4. Complete the following statement: The space between the inner walls of a thermos bottle is evacuated to minimize heat transfer by
A) radiation. B) conduction. C) conduction, convection, and radiation.
D) conduction and radiation. E) conduction and convection.

5. A slab of insulation is made of three layers, as Drawing **I** indicates. Each of the layers **A**, **B**, and **C** has the same thickness, but a different thermal conductivity. Heat flows through the slab, and the temperatures are as shown. What are the temperatures T_1 and T_2 in Drawing **II** where the layers are arranged in a different order?



Drawing **I**



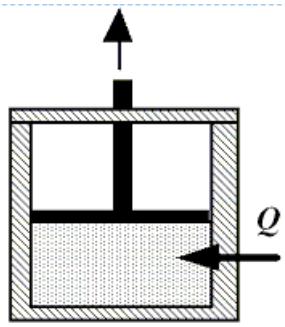
Drawing **II**

A) $T_1 = 230$ °C and $T_2 = 170$ °C
B) $T_1 = 200$ °C and $T_2 = 180$ °C
C) $T_1 = 220$ °C and $T_2 = 160$ °C
D) $T_1 = 180$ °C and $T_2 = 160$ °C
E) $T_1 = 210$ °C and $T_2 = 190$ °C

6. How many moles are in a 0.53-kg sample of sulphur dioxide, SO_2? (atomic masses: C = 32 u; O = 16 u)
   A) 5.2
   B) 8.3
   C) 48
   D) 1.6×10^4
   E) 5.0×10^{24}

7. At what temperature would one mole of molecular nitrogen (N_2) have 7.0×10^3 J of *translational* kinetic energy? Note: the atomic mass of N is 14 u.
   A) 130 °C B) 290 °C C) 480 °C D) 560 °C E) 720 °C

8. Enclosed beneath the moveable piston in the drawing is 4.8 moles of a monatomic ideal gas. The gas performs work on the piston as 2300 J of heat are added from the surroundings. During the process, the temperature of the gas decreases by 45 K. How much work does the gas perform?



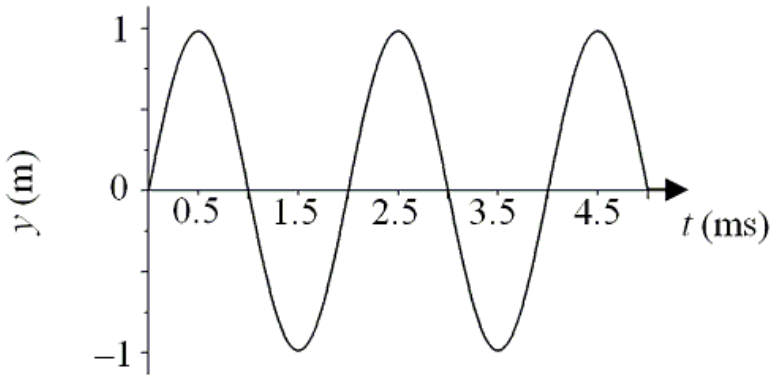
   A) 5.0×10^3 J
   B) 3.2×10^3 J
   C) 1.4×10^3 J
   D) 6.0×10^2 J
   E) 4.4×10^3 J

9. An ideal monatomic gas undergoes an adiabatic process; and its internal energy *decreases* by 50 J. Which pair of choices below is correct for this process?

	work done	*heat exchanged*
A)	50 J by the system	zero joules
B)	50 J on the system	zero joules
C)	50 J by the system	100 J supplied
D)	zero joules	50 J removed
E)	zero joules	50 J added

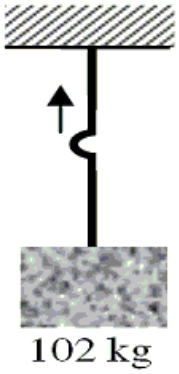
10. A heat engine operates in a Carnot cycle between reservoirs of temperatures 1000 K and 400 K. It is found to discharge 20 J of heat per cycle to the cold reservoir. What is the work output per cycle?
    A) 10 J
    B) 20 J
    C) 30 J
    D) 40 J
    E) 50 J

11. The speed of sound in a certain metal block is 2.00×10^3 m/s. The graph shows the amplitude (in meters) of a wave traveling through the block versus time (in milliseconds). What is the wavelength of this wave?



A) 0.5 m
B) 1.5 m
C) 3.0 m
D) 4.0 m
E) 6.0 m

12. A steel wire of mass 0.400 kg and length 0.640 m supports a 102-kg block. The wire is struck exactly at its midpoint causing a small displacement. How long does it take the peak of this displacement to reach the top of the wire?



A) 2.00×10^{-3} s
B) 4.00×10^{-3} s
C) 6.00×10^{-3} s
D) 8.00×10^{-3} s
E) 1.60×10^{-2} s

13. The decibel level of a jackhammer is 125 dB relative to the threshold of hearing. Determine sound intensity produced by the jackhammer.
A) 1.0 W/m^2
B) 3.2 W/m^2
C) 4.8 W/m^2
D) 12 W/m^2
E) 88 W/m^2

Answers

1. E
2. C
3. C
4. E
5. C
6. B
7. B
8. A
9. A
10. C
11. D
12. D
13. B