

Name: _____

1. Helium condenses into the liquid phase at approximately 4 K. What temperature, in degrees Fahrenheit, does this correspond to?
 - a. -182
 - b. -269
 - c. -118
 - d. -452 <=
 - e. -484

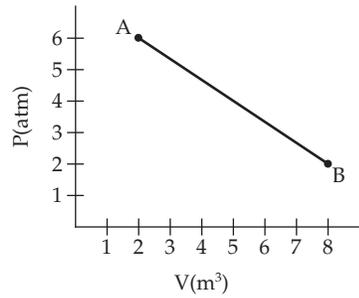
2. A bridge is made with segments of concrete 50 m long. If the linear expansion coefficient is $12 \times 10^{-6} (\text{°C})^{-1}$, how much spacing (in cm) is needed to allow for expansion during an extreme temperature change of 150°F?
 - a. 10
 - b. 2.5
 - c. 7.5
 - d. 5.0 <=
 - e. 9.5

3. A helium-filled balloon has a volume of 1 m^3 . As it rises in the earth's atmosphere, its volume expands. What will its new volume be (in m^3) if its original temperature and pressure are 20°C and 1 atm, and its final temperature and pressure are -40°C and 0.1 atm?
 - a. 4
 - b. 6
 - c. 8 <=
 - d. 10
 - e. 1.5

4. Two identical containers, *A* and *B*, hold equal amounts of the same ideal gas at the same P_o , V_o and T_o . The pressure of *A* then decreases by a half while its volume doubles; the pressure of *B* doubles while its volume decreases by a half. Which statement correctly describes the temperatures of the gases after the changes?
 - a. $T_A = 0.5T_B = T_o$.
 - b. $T_B = 0.5T_A = T_o$.
 - c. $T_B = T_A = T_o$. <=
 - d. $T_A = 2T_B = T_o$.
 - e. $T_B = 2T_A = T_o$.

5. When the product $\alpha(T_f - T_i)$ of the coefficient of linear expansion, α , and the temperature change, $T_f - T_i$, is *large*, a length L_i of a solid substance expands in length to Hint: Set up a differential equation for L_f
- $L_f = L_i[1 + \alpha(T_f - T_i)]$.
 - $L_f = \alpha L_i(T_f - T_i)$
 - $L_f = L_i[1 + \ln(\alpha(T_f - T_i))]$.
 - $L_f = L_i e^{\alpha(T_f - T_i)}$. <=
 - $L_f = L_i[1 + e^{\alpha(T_f - T_i)}]$.
6. A 5-kg piece of lead (specific heat $0.03 \text{ cal/g} \cdot ^\circ\text{C}$) having a temperature of 80°C is added to 500 g of water having a temperature of 20°C . What is the final equilibrium temperature (in $^\circ\text{C}$) of the system?
- 79
 - 26
 - 54
 - 34 <=
 - 20
7. A cup of coffee is enclosed on all sides in an insulated cup $1/2 \text{ cm}$ thick in the shape of a cube 10 cm on a side. The temperature of the coffee is 95°C , and the temperature of the surroundings is 21°C . Find the rate of heat loss (in J/s) due to conduction if the thermal conductivity of the cup is $2 \times 10^{-4} \text{ cal/s} \cdot \text{cm} \cdot ^\circ\text{C}$.
- 62
 - 74 <=
 - 230
 - 160
 - 12
8. Determine the work done by 5 moles of an ideal gas that is kept at 100°C in an expansion from 1 liter to 5 liters.
- $2.5 \times 10^4 \text{ J}$ <=
 - $1.1 \times 10^4 \text{ J}$
 - $6.7 \times 10^3 \text{ J}$
 - $2.9 \times 10^3 \text{ J}$
 - $8.4 \times 10^3 \text{ J}$

9. A gas expands as shown in the graph. If the heat taken in during this process is 1.02×10^6 J and $1 \text{ atm} = 1.01 \times 10^5 \text{ N/m}^2$, the change in internal energy of the gas (in J) is



- a. -2.42×10^6
 b. -1.40×10^6 <=
 c. -1.02×10^6
 d. 1.02×10^6
 e. 1.40×10^6
10. For an astronaut working outside a spaceship, the greatest loss of heat would occur by means of
- a. conduction.
 b. convection.
 c. radiation. <=
 d. conduction and convection.
 e. conduction and radiation.