

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS  
PHYSICS DEPARTMENT  
QUIZ #3- CHAPTER 18

NAME:

Key

ID#

SECTION#

1. Which of the following statements is CORRECT for a gas undergoing an adiabatic process?
- A. The pressure of the gas remains constant.
  - B. The internal energy of the gas is always zero.
  - C. There is no heat exchange between the gas and its environment.
  - D. The temperature of the gas remains constant.
  - E. The volume of the gas remains constant.
2. A thermometer, of mass 0.06 kg and specific heat 836 J/(kg K), reads 15 °C. It is then completely immersed in 0.15 kg of water of specific heat 4190 J/(kg K). The final temperature reading of the thermometer in the water is 45 °C. Assuming no heat losses from the system to the environment, what was the initial temperature of the water?

$$Q_{\text{gained}} = |Q_{\text{lost}}|$$
$$(m c \Delta T)_{\text{thermometer}} = |(m c \Delta T)|_{\text{water}}$$
$$0.06 \times 836 (45 - 15) = 0.15 \times 4190 (T_i - 45)$$
$$1504.8 = 628.5 T_i - 28282.5$$

$$T_i = 47.4^\circ\text{C}$$

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1. Which of the following statements is CORRECT for a gas undergoing a constant volume process?
- A. The heat lost by the gas is zero.
  - B. The change in internal energy of the gas is zero.
  - C. There is no heat exchange between the gas and its environment.
  - D. The work done by the gas is zero.
  - E. The work is always positive.
2. When the temperature of a sphere of a certain material is raised by  $75^{\circ}\text{C}$ , the sphere's volume increases  $6.9 \times 10^{-5} \text{ m}^3$ . If the original volume was  $1.8 \times 10^{-2} \text{ m}^3$ , find the coefficient of linear expansion of the material the sphere is made of.

$$\Delta V = V_i 3\alpha \Delta T$$

$$6.9 \times 10^{-5} = 1.8 \times 10^{-2} \times 3\alpha \times 75$$

$$\boxed{\alpha = 1.7 \times 10^{-5} / \text{C}^{\circ}}$$

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QUIZ #3- CHAPTER 18

NAME: Key ID# \_\_\_\_\_ SECTION# \_\_\_\_\_

1. Which of the following statements is CORRECT for a gas undergoing a cyclic process?
- A. The heat lost by the gas is zero.
  - B. The change in internal energy of the gas is always zero.
  - C. There is no heat exchange between the gas and its environment.
  - D. The work done by the gas is zero.
  - E. The work is always positive.
2. One mole of an ideal gas is taken through the cyclic process ABCA as shown in the figure. What is the net heat transfer during the cycle?

$$\Delta E_{int} = Q_{net} - W_{net} = 0$$

$$Q_{net} = W_{net} = \text{Area enclosed}$$

$$W_{net} = -\frac{1}{2} (5-3)(2-1) \times 10^3$$
$$= -10^3 \text{ J}$$

$Q_{net} = -1000 \text{ J}$

