Extended Response

12.1 Zeroth Law of Thermodynamics: Thermal Equilibrium   69.

What is the meaning of efficiency in terms of a car engine?

   a. An engine's efficiency equals the sum of useful energy (work) and the input energy.
   b. An engine's efficiency equals the proportion of useful energy (work) to the input energy.
   c. An engine's efficiency equals the product of useful energy (work) and the input energy.
   d. An engine's efficiency equals the difference between the useful energy (work) and the input energy.

12.2 First law of Thermodynamics: Thermal Energy and Work   70.

Why does a bridge have expansion joints?

   a. because the bridge expands and contracts with the change in temperature
   b. because the bridge expands and contracts with the change in motion of objects moving on the bridge
   c. because the bridge expands and contracts with the change in total load on the bridge
   d. because the bridge expands and contracts with the change in magnitude of wind blowing

71.

Under which conditions will the work done by the gas in a system increase?

   a. It will increase when a large amount of energy is added to the system, and that energy causes an increase in the gas's volume, its pressure, or both.
   b. It will increase when a large amount of energy is extracted from the system, and that energy causes an increase in the gas's volume, its pressure, or both.
   c. It will increase when a large amount of energy is added to the system, and that energy causes a decrease in the gas's volume, its pressure, or both.
   d. It will increase when a large amount of energy is extracted from the system, and that energy causes a decrease in the gas's volume, its pressure, or both.

72.

How does energy transfer by heat aid in body metabolism?

   a. The energy is given to the body through the work done by the body (W) and through the intake of food, which may also be considered as the work done on the body. The transfer of energy out of the body is by heat ($-Q$).

b. The energy given to the body is by the intake of food, which may also be considered as the work done on the body. The transfer of energy out of the body is by heat $(-Q)$ and the work done by the body (W).

c. The energy given to the body is by the transfer of energy by heat (Q) into the body, which may also be considered as the work done on the body. The transfer of energy out of the body is the work done by the body (W).

d. The energy given to the body is by the transfer of energy by heat (Q) inside the body. The transfer of energy out of the body is by the intake of food and the work done by the body (W).

73.

Two distinct systems have the same amount of stored internal energy. Five hundred joules are added by heat to the first system, and 300 J are added by heat to the second system. What will be the change in internal energy of the first system if it does 200 J of work? How much work will the second system have to do in order to have the same internal energy?

a. 700 J; 0 J
b. 300 J; 300 J
c. 700 J; 300 J
d. 300 J; 0 J

12.3 Second Law of Thermodynamics: Entropy   74.

Why is it not possible to convert all available energy into work?

a. Due to the entropy of a system, some energy is always unavailable for work.
b. Due to the entropy of a system, some energy is always available for work.
c. Due to the decrease in internal energy of a system, some energy is always made unavailable for work.
d. Due to the increase in internal energy of a system, some energy is always made unavailable for work.

75.

Why does entropy increase when ice melts into water?

a. Melting converts the highly ordered solid structure into a disorderly liquid, thereby increasing entropy.
b. Melting converts the highly ordered liquid into a disorderly solid structure, thereby increasing entropy.
c. Melting converts the highly ordered solid structure into a disorderly solid structure, thereby increasing entropy.
d. Melting converts the highly ordered liquid into a disorderly liquid, thereby increasing entropy.

76.

Why is change in entropy lower for higher temperatures?

    a. Increase in the disorder in the substance is low for high temperature.
    b. Increase in the disorder in the substance is high for high temperature.
    c. Decrease in the disorder in the substance is low for high temperature.
    d. Decrease in the disorder in the substance is high for high temperature.

12.4 Applications of Thermodynamics: Heat Engines, Heat Pumps, and Refrigerators   77.

In the equation $W = Q_h - Q_c$, if the value of Q_c were equal to zero, what would it signify?

    a. The efficiency of the engine is 75 percent.
    b. The efficiency of the engine is 25 percent.
    c. The efficiency of the engine is 0 percent.
    d. The efficiency of the engine is 100 percent.

78.

Can the value of thermal efficiency be greater than 1? Why or why not?

    a. No, according to the first law of thermodynamics, energy output can never be more than the energy input.
    b. No, according to the second law of thermodynamics, energy output can never be more than the energy input.
    c. Yes, according to the first law of thermodynamics, energy output can be more than the energy input.
    d. Yes, according to the second law of thermodynamics, energy output can be more than the energy input.

79.

A coal power station transfers 3.0×10^{12} J by heat from burning coal and transfers 1.5×10^{12} J by heat into the environment. What is the efficiency of the power station?

    a. 0.33
    b. 0.5
    c. 0.66
    d. 1