AP Physics 2 - Test 03 - Thermodynamics Pt. 2

Score:

1. A rectangular piece of metal 3 cm high by 6 cm wide has a hole cut in its center 1cm high by 4 cm wide. As the metal is warmed from 0oC to 1000C, what will happen to the dimensions of the hole?

A) both height and width will increase

B) both height and width will decrease

C) height will increase while width will decrease

D) height will decrease while width will increase

2. A fan blows the air and gives it kinetic energy. An hour after the fan has been turned off, what has happened to the kinetic energy of the air?

A) it turns into thermal energy

B) it turns into sound energy

C) it turns into potential energy

D) it turns into electrical energy

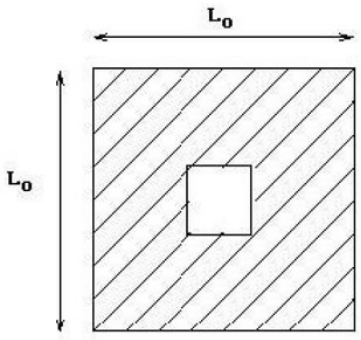
3. A uniform square piece of metal has initial side length L_0. A square piece is cut out of the center of the metal. The temperature of the metal is now raised so that the side lengths are increased by 4%. What has happened to the area of the square piece cut out of the center of the metal?

A) It is increased by 8 %

B) It is increased by 4%

C) It is decreased by 4%

D) It is decreased by 8%



4. 100 J is added to a sample of ideal gas as heat. The gas then expands against a piston, doing 70 J of work. During this process

A) The temperature of the gas increases.

B) The temperature of the gas decreases.

C) The temperature of the gas stays the same.

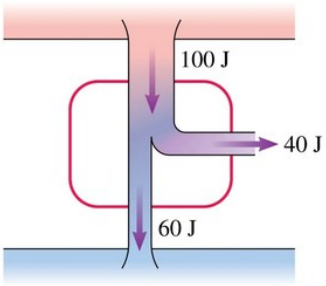
5. A large –20°C ice cube is dropped into a super-insulated container holding a small amount of 5°C water, then the container is sealed. Ten minutes later, is it possible that the temperature of the ice cube will be colder than –20°C?

A) Yes

B) No

C) Maybe. It would depend on other factors.

6. The efficiency of this heat engine is



(A) 1.0
(B) 0.6
(C) 0.5
(D) 0.4
(E) 0.2

7. The following pairs of temperatures represent the temperatures of hot and cold reservoirs for heat engines. Which heat engine has the highest possible efficiency?

(A) 300°C, 30°C
(B) 250°C, 30°C
(C) 200°C, 20°C
(D) 100°C, 10°C
(E) 90°C, 0°C

8. A large –20°C ice cube is dropped into a super-insulated container holding a small amount of 5°C water, then the container is sealed. Ten minutes later, the temperature of the ice (and any water that has melted from the ice) will be warmer than –20°C. This is a consequence of

(A) The first law of thermodynamics.
(B) The second law of thermodynamics.
(C) The third law of thermodynamics.
(D) Both the first and the second laws.
(E) Joule's law.

9. Two rods are precisely 10.000 cm long. Rod 1 is made of aluminum, with a coefficient of linear expansion $\alpha = 24 \times 10^{-6}$ /K. Rod 2 is made of steel, and has $\alpha = 12 \times 10^{-6}$ /K. Rod 1 is heated by 10°C while rod 2 is heated by 20°C. After heating, which rod is longer?

(A) Rod 1
(B) Rod 2
(C) Both rods have the same length.

10. The amount of heat energy it takes for 1 kg of a material to change state from liquid to solid or solid to liquid is

(A) Specific Heat
(B) Heat of Fusion
(C) Heat of Vaporization
(D) Temperature

11. An electric power plant uses energy from burning coal to generate steam at 450°C. The plant is cooled by 20°C water from a nearby river. If burning coal provides 100 MJ of heat, what is the theoretical minimum amount of heat that must be transferred to the river during the conversion of heat to electric energy?

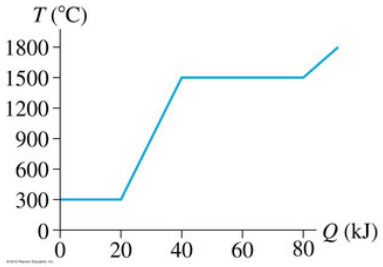
A) 100 MJ

B) 90 MJ

C) 60 MJ

D) 40 MJ

12. An experiment measures the temperature of a 200 g substance while steadily supplying heat to it. The temperature vs heat graph is provided. Which following statement must be true?



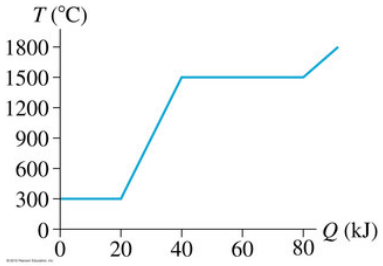
A) The material starts by melting, the increases temperature steadily as a liquid, before boiling into a gas, the steadily increases temperature again.

B) The material starts by condensing into a liquid from a gas state, then solidifies into a solid.

C) The material's thermal energy does not change during the times in which the graph is horizontal.

D) It took more heat energy to melt the material into a liquid than it did to boil the material.

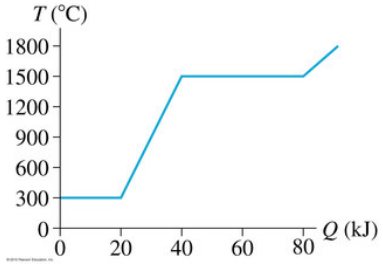
13. An experiment measures the temperature of a 200 g substance while steadily supplying heat to it. Which value is larger?



A) Heat of Fusion

B) Heat of Vapoization

14. An experiment measures the temperature of a 200 g substance while steadily supplying heat to it. What is the specific heat of the substance during the liquid phase?



A) 0.012 J/(kg*K)

B) 0.060 J/(kg*K)

C) 17 J/(kg*K)

D) 83 J/(kg*K)

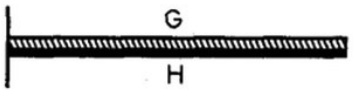
15. As shown in the figure, a bimetallic strip, consisting of metal G on the top and metal H on the bottom, is rigidly attached to a wall at the left. The coefficient of linear thermal expansion for metal G is less than that of metal H. If the strip is uniformly heated, it will

A remain horizontal, but get longer.

B remain horizontal, but get shorter.

C curve downward.

D curve upward.

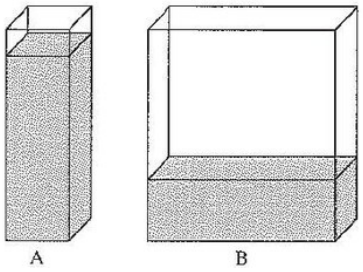


16. Containers A and B hold equal volumes of water at the same temperature. The temperatures of both containers are increased by the same amount. Does the height of the water in A *go up* by a larger amount, smaller amount, or the same amount as the water goes up in B?

A Larger amount

B Smaller amount

C Same Amount



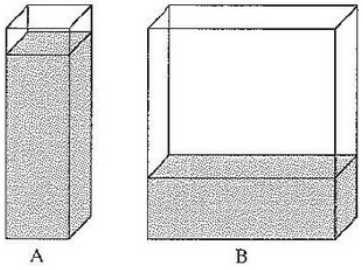
17. Containers A and B hold equal volumes of water at the same temperature. The temperatures of both containers are increased by the same amount. Suppose both containers have the same thickness, but B has a length in the x-direction that is 5x that of container A. By how much farther will the water in container A go up in comparison to how high Container B's water goes?

A 2.34x

B 5x

C 25x

D 125x



18. Entropy can only decrease when

A You are looking at phase changes

B You are looking at any system

C You are looking at a non-isolated system

D Entropy can never decrease