Chapter 15
Exercises

Exercise 1

True or false? “ temperature is a measure of the total kinetic energy in a substance”.

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False. Temperature is a measure of average translational kinetic energy of molecules in a substance.

Exercise 2

A substance that heats up relatively quickly has a

A) high specific heat.

B) low specific heat.

C) high conductivity.

D) low conductivity.

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Exercise 3

The fact that a thermometer "takes its own temperature" illustrates

A) thermal equilibrium.

B) energy conservation.

C) the difference between heat and internal energy.

D) the fact that molecules are constantly moving.

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Exercise 4

Heat energy is measured in units of

A) joules.

B) calories.

C) Choices A and B are both true.

D) Choices A and B are both false.

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A) joules.

B) calories.

C) Choices A and B are both true.

D) Choices A and B are both false.

Exercise 5

Compared to a giant iceberg, a hot cup of coffee has

A) more internal energy and higher temperature.

B) higher temperature, but less internal energy.

C) a greater specific heat and more internal energy.

D) none of these

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Exercise 6

Ice tends to form first at the

A) surface of bodies of water.

B) bottom of bodies of water.

C) surface or bottom depending on the water depth.

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Exercise 7

When we enlarge a photograph of an iron ring, the image of the hole becomes

A) smaller.

B) larger.

C) neither smaller nor larger.

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When we enlarge a photograph of an iron ring, the image of the hole becomes

A) smaller.

B) larger.

C) neither smaller nor larger.

Exercise 8

When an iron ring is heated, the hole becomes

A) smaller.

B) larger.

C) neither smaller nor larger.

D) either smaller or larger, depending on the ring thickness.

Exercise 8

When an iron ring is heated, the hole becomes

A) smaller.

B) larger.

C) neither smaller nor larger.

D) either smaller or larger, depending on the ring thickness.

Exercise 9

As a piece of metal with a hole in it cools, the diameter of the hole

A) increases.

B) decreases.

C) remains the same.

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A) increases.

B) decreases.

C) remains the same.

Exercise 10

When a bimetallic bar made of copper and iron strips is heated, the bar bends toward the iron strip. The reason for this is

A) iron gets hotter before copper.

B) copper gets hotter before iron.

C) copper expands more than iron.

D) iron expands more than copper.

E) none of these

Exercise 10

When a bimetallic bar made of copper and iron strips is heated, the bar bends toward the iron strip. The reason for this is

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B) copper gets hotter before iron.

C) copper expands more than iron.

D) iron expands more than copper.

E) none of these

Exercise 11

If glass expanded more than mercury, then the column of mercury in a mercury thermometer would rise when the temperature

A) increases.

B) decreases.

C) neither of these

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B) decreases.

C) neither of these

Exercise 12

Consider a closed, sealed can of air placed on a hot stove. The contained air undergoes an increase in

A) mass.

B) pressure.

C) temperature.

D) all of these

E) two of these

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Exercise 13

Consider a sample of water at 0 degrees C. If the temperature is slightly increased, the volume of the water

A) increases.

B) decreases.

C) remains the same.

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A) increases.

B) decreases.

C) remains the same.

Exercise 14

When water at 4 degrees C is heated it expands. When water at 4 degrees C is cooled, it

A) contracts.

B) expands.

C) neither contracts nor expands.

Exercise 14

When water at 4 degrees C is heated it expands. When water at 4 degrees C is cooled, it

A) contracts.

B) expands.

C) neither contracts nor expands.

Exercise 15

During a very cold winter, water pipes sometimes burst. The reason for this is

A) the ground contracts when colder, pulling pipes apart.

B) water expands when freezing.

C) water contracts when freezing.

D) the thawing process releases pressure on the pipes.

E) none of these

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B) water expands when freezing.

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E) none of these

Exercise 16

Aluminum has a specific heat capacity more than twice that of copper. Place equal masses of aluminum and copper wire in a flame and the one to undergo the fastest increase in temperature will be

A) copper.

B) aluminum.

C) both the same

Exercise 16

Aluminum has a specific heat capacity more than twice that of copper. Place equal masses of aluminum and copper wire in a flame and the one to undergo the fastest increase in temperature will be

A) copper.

B) aluminum.

C) both the same

Exercise 17

The fact that desert sand is very hot in the day and very cold at night is evidence that sand has

A) a low specific heat.

B) a high specific heat.

C) no specific heat.

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C) no specific heat.

Exercise 18

Pour a liter of water at 40 degrees C into a liter of water at 20 degrees C and the final temperature of the two becomes

A) less than 30 degrees C.

B) at or about 30 degrees C.

C) more than 30 degrees C.

Exercise 18

Pour a liter of water at 40 degrees C into a liter of water at 20 degrees C and the final temperature of the two becomes

A) less than 30 degrees C.

B) at or about 30 degrees C.

C) more than 30 degrees C.

Exercise 19

At the same temperature, which move with the greater speed in the air?

A) very light molecules

B) heavier molecules

C) All will have equal average speeds.

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Exercise 20

Place a 1 kg block of iron at 40 degrees C into a 1 kg of water at 20 degrees C in a closed system. What is the final temperature of the two ?

(Water = 4186 J/kg ^{0}C , Iron = 448 J/kg ^{0}C)

Exercise 20

In a closed system, net heat $Q_{net} = 0$

$Q_{net} = Q_{water} + Q_{iron} = 0$

(1kg) (4186 J/kg ^{0}C)(t_f -20) + (1kg)(448 J/kg ^{0}C)(t_f -40) = 0

t_f = 21.9 ^{0} C