

**Test Bank for General Organic and Biological Chemistry Structures of Life 4th Edition by
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***General, Organic, and Biological Chemistry, 4e* (Timberlake)**

Chapter 2 Energy and Matter

2.1 Multiple-Choice Questions

1) An example of kinetic energy
is

- A) a coiled spring.
- B) running water.
- C) a tree.
- D) natural gas.
- E) chemical energy.

Answer: B Objective:

2.1 Global Outcomes:

GO7

2) The energy associated with the motion of particles in a substance is
called

- A) temperature.
- B) electrical energy.
- C) heat.
- D) chemical energy.
- E) potential energy.

Answer: C Objective:

2.1 Global Outcomes:

GO7

3) Which of the following is an example of potential energy?

- A) chewing food
- B) water stored in a reservoir
- C) burning wood
- D) a fan blade turning
- E) riding an exercise bike

Answer: B

Objective: 2.1

Global Outcomes: GO2

4) The phrase "ability to do work" is a definition
of

- A) specific heat.
- B) energy.

- C) calorie.
- D) heating.
- E) cooling.

Answer: B

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5) The energy stored in the chemical bonds of a carbohydrate molecule is

- A) specific heat.
- B) kinetic energy.
- C) potential energy.
- D) work.
- E) a calorie.

Answer: C

Objective: 2.1 Global

Outcomes: GO2

6) The energy of motion is referred to as

- A) work.
- B) freezing.
- C) specific heat.
- D) potential energy.
- E) kinetic energy.

Answer: E

Objective: 2.1

7) In which of the following would the particles move most rapidly?

- A) ice at $-20\text{ }^{\circ}\text{C}$
- B) water at $20\text{ }^{\circ}\text{C}$
- C) steam at $110\text{ }^{\circ}\text{C}$
- D) boiling water
- E) ice at $0\text{ }^{\circ}\text{C}$

Answer: C

Objective: 2.1 Global

Outcomes: GO2

8) 650. J is the same amount of energy as

- A) 155 cal
- B) 2720 cal
- C) 650 cal
- D) 1550 cal

E) 2.72 cal

Answer: A Objective: 2.1 Global

Outcomes: GO4

9) 3.25 kcal is the same amount of energy as

A) 3.25 J

B) 0.777 J

C) 777 J

D) 13600 J

E) 13.6 J

Answer: D

Objective: 2.1

Global Outcomes: GO4

10) Global warming is believed to result from all of the following except

A) burning of fossil fuels.

B) increasing levels of carbon dioxide in the atmosphere.

C) deforestation.

D) movement of the Earth closer to the Sun.

E) carbon dioxide trapping the heat produced by the Sun.

Answer: D

Objective: 2.2

Global Outcomes: GO9

11) A temperature of 41 °F is the same as

A) 5 °C.

B) 310 °C.

C) -9 °C.

D) 16 °C.

E) 42 °C.

Answer: A

Objective: 2.2 Global

Outcomes: GO4

12) If the temperature is 20 °C, what is the corresponding temperature on the Fahrenheit scale?

A) -22 °F

B) 68 °F

C) 43 °F

D) 239 °F

E) 94 °F

Answer: B

Objective: 2.2

Global Outcomes: GO4

13) If the temperature is $-55\text{ }^{\circ}\text{C}$, what is the corresponding temperature on the Kelvin scale?

A) 225 K

B) 218 K

C) 55 K

D) 273 K

E) 328 K

Answer: B

Objective: 2.2

Global Outcomes: GO4

14) A patient has a temperature of $38.5\text{ }^{\circ}\text{C}$. What is the temperature in degrees Fahrenheit?

A) $70.5\text{ }^{\circ}\text{F}$

B) $311\text{ }^{\circ}\text{F}$

C) $126.9\text{ }^{\circ}\text{F}$

D) $101.3\text{ }^{\circ}\text{F}$

E) $11.7\text{ }^{\circ}\text{F}$

Answer: D

Objective: 2.2

Global Outcomes: GO4

15) The temperature of liquid nitrogen is $-196\text{ }^{\circ}\text{C}$. What is the corresponding reading on the Kelvin scale?

A) 77 K

B) 127 K

C) -91 K

D) 48 K

E) 146 K

Answer: A

Objective: 2.2

Global Outcomes: GO4

16) On a hot day, the thermometer read $95\text{ }^{\circ}\text{F}$. What is the temperature in degrees Celsius?

A) $77\text{ }^{\circ}\text{C}$

- B) 113 °C
- C) 35 °C
- D) 63 °C
- E) 178 °C

Answer: C

Objective: 2.2

Global Outcomes: GO4

17) Absolute zero is

- A) the freezing point of water using the Celsius scale.
- B) the boiling point of liquid nitrogen.
- C) the temperature on the Kelvin scale corresponding to 32 °F.
- D) the coldest temperature possible.
- E) the freezing point of liquid nitrogen.

Answer: D

Objective: 2.2

Global Outcomes: GO7

18) Helium is a(n)

- A) compound.
- B) heterogeneous mixture.
- C) element.
- D) homogeneous mixture.
- E) electron.

Answer: C

Objective: 2.3

Global Outcomes: GO2

19) Air is a(n)

- A) compound.
- B) heterogeneous mixture.
- C) element.
- D) homogeneous mixture.
- E) None of the above.

Answer: D Objective:

2.3 Global Outcomes: GO7

20) Coins in a piggy bank is a(n)

- A) compound.
- B) heterogeneous mixture.
- C) element.
- D) homogeneous mixture.

E) None of the above.

Answer: B

Objective: 2.3

Global Outcomes: GO2

21) Gold in a wedding ring is a(n)

A) compound.

B) heterogeneous mixture.

C) element.

D) homogeneous mixture.

E) None of the above.

Answer: C

Objective: 2.3

Global Outcomes: GO2

22) The primary substances of which all other things are composed are

A) molecules.

B) compounds.

C) elements.

D) electrons.

E) protons.

Answer: C

Objective: 2.3

Global Outcomes: GO2

23) Which of the following is a property of a solid?

A) It takes the shape of the container.

B) It fills the volume of the container.

C) The particles move at a rapid rate.

D) The interactions between its particles are very weak.

E) The particles have fixed positions and are very close together.

Answer: E

Objective: 2.4

Global Outcomes: GO2

24) Which of the following is a physical property of both liquids and gases?

A) has its own shape

B) has a definite volume

C) has strong interactions between its particles

D) has randomly arranged particles

E) has large spaces between molecules

Answer: D Objective: 2.4

Global Outcomes: GO2

25) Which one of the following properties describes a liquid?

- A) has its own shape
- B) particles are close together and move randomly
- C) particles move very rapidly
- D) fills the entire volume of the container
- E) There is essentially no interaction between the particles.

Answer: B Objective: 2.4

Global Outcomes: GO2

26) The physical state(s) present when a substance is melting is (are)

- A) solid.
- B) liquid.
- C) gas.
- D) solid + liquid.
- E) liquid + gas.

Answer: D

Objective: 2.4 Global

Outcomes: GO2

27) The formation of a gas resulting from the escape of high-energy particles from the surface of a liquid is known as

- A) evaporation.
- B) deposition.
- C) boiling.
- D) melting.
- E) sublimation.

Answer: A Objective:

2.4 Global Outcomes:

GO2

28) When a solid is converted directly to a gas, the change of state is called

- A) freezing.
- B) melting.
- C) boiling.
- D) condensation.
- E) sublimation.

Answer: E Objective:

2.4 Global Outcomes:

GO7

- 29) In a gas, the distance between the particles is
- A) very close relative to the size of the molecules.
 - B) close relative to the size of the molecules.
 - C) fixed relative to the size of the molecules.
 - D) small relative to the size of the molecules.
 - E) very large relative to the size of the molecules.

Answer: E Objective: 2.4

Global Outcomes: GO2

30) Which of the following does NOT involve a change of state?

- A) melting ice
- B) freezing water
- C) vaporization of alcohol
- D) sublimation of dry ice
- E) pouring water into a vacuum-insulated bottle

Answer: E

Objective: 2.4

Global Outcomes: GO2

31) A heating curve illustrates

- A) what a substance looks like as it is heated.
- B) what happens to the particles of a substance as it is heated.
- C) what happens to the heat applied as the temperature is increased.
- D) the changes in the temperature and physical state of a substance as it is heated.
- E) the chemical changes that occur as the substance is heated.

Answer: D

Objective: 2.4

Global Outcomes: GO9

32) Which of the following does NOT represent a step on the heating curve of water?

- A) The temperature of steam cannot exceed 100 °C.
- B) The temperature of ice remains at 0 °C as it melts.
- C) The temperature of liquid water increases linearly as it is heated.
- D) The temperature of liquid water remains at 100 °C as it boils.
- E) Both liquid water and ice are present at 0 °C.

Answer: A

Objective: 2.4

Global Outcomes: GO9

33) Which of the following is an example of a physical change?

- A) grinding coffee beans
- B) baking a cake
- C) converting water to hydrogen and oxygen
- D) digesting a cheeseburger
- E) burning coal

Answer: A Objective:

2.4 Global Outcomes:

GO2

34) Which of the following would NOT be a physical change?

- A) freezing water to make ice cubes
- B) tearing a piece of aluminum foil
- C) boiling water for soup
- D) burning gasoline in a lawnmower
- E) melting gold to make jewelry

Answer: D Objective: 2.4

Global Outcomes: GO2

35) Which of the following is a chemical change?

- A) cutting a rope
- B) bending a steel rod
- C) making a snowman
- D) burning sugar
- E) melting gold

Answer: D Objective:

2.4 Global Outcomes: GO2

36) Which of the following is a physical change?

- A) baking a cake
- B) dry ice subliming
- C) fermenting grapes to produce wine
- D) digesting a meal
- E) a tomato ripening

Answer: B Objective:

2.4 Global Outcomes:

GO2

37) The specific heat of a substance is the amount of heat needed to

- A) change 1 g of the substance from the solid to the liquid state.
- B) raise the temperature of 1 g of the substance by 1 °C.
- C) change 1 g of the substance from the liquid to the solid state.

- D) convert 1 g of a liquid to gas.
- E) convert 1 g of a solid to a gas.

Answer: B

Objective: 2.5

Global Outcomes: GO2

38) A kilocalorie of heat is required to raise the temperature of

- A) 1 g of water from 14 °C to 15 °C.
- B) 1 g of water by 10 °C.
- C) 10 g of water by 10 °C.
- D) 100 g of water by 10 °C.
- E) 100 g of water by 100 °C.

Answer: D

Objective: 2.5

Global Outcomes: GO7

39) How many calories are required to raise the temperature of a 35.0 g sample of iron from 25 °C to 35 °C? Iron has a specific heat of 0.108 cal/g °C.

- A) 38 cal
- B) 1.1 cal
- C) 3.8 cal
- D) 93 cal
- E) 130 cal

Answer: A

Objective: 2.5

Global Outcomes: GO4

40) How many calories are required to increase the temperature of 13 g of alcohol from 11 °C to 23 °C? The specific heat of alcohol is 0.588 cal/g °C.

- A) 83 cal
- B) 0.63 cal
- C) 92 cal
- D) 0.54 cal
- E) 170 cal

Answer: C

Objective: 2.5

Global Outcomes: GO4

41) How many calories are required to raise the temperature of a 150. g sample of gold from 25 °C to 175 °C? The specific heat of gold is 0.0308 cal/g °C.

- A) 4.62 cal

- B) 116 cal
- C) 22500 cal
- D) 693 cal
- E) 130 cal

Answer: D

Objective: 2.5

Global Outcomes: GO4

42) Raising the temperature of 10.0 g of water from 10.0 °C to 20.0 °C requires 100.0 cal of energy, while raising the temperature of 10.0 g of aluminum from 10.0 °C to 20.0 °C requires 22 cal. More calories are required to heat the water because

- A) water is a liquid and aluminum is a solid at 10.0 °C.
- B) ten grams of water occupies a larger volume than 10.0 g of aluminum.
- C) water has a greater potential energy than aluminum.
- D) water has a larger specific heat than aluminum.
- E) 10.0 °C is closer to the melting point of water than to the melting point of aluminum.

Answer: D Objective: 2.5

Global Outcomes: GO2

43) The number of calories needed to raise the temperature of 32 g of water from 12 °C to 54 °C is

- A) 384 cal.
- B) 1.3 cal.
- C) 1300 cal.
- D) 1700 cal.
- E) 0.76 cal.

Answer: C

Objective: 2.5

Global Outcomes: GO4

44) The specific heat of copper is 0.0920 cal/g °C, and the specific heat of silver is 0.0562 cal/g °C. If 100 cal of heat is added to one g of each metal at 25 °C, what is the expected result?

- A) The copper will reach a higher temperature.
- B) The silver will reach a higher temperature.
- C) The two samples will reach the same temperature.
- D) The copper will reach a temperature lower than 25 °C. E) The silver will soften.

Answer: B

Objective: 2.5

Global Outcomes: GO2

45) A burn from steam at 100 °C is expected to be more severe than a burn from boiling water at 100 °C because

A) the steam is hotter than the boiling water.

B) there is more steam than water.

C) the steam will give off a large amount of heat as it condenses.

D) you are more likely to come into contact with the steam than with the boiling water. E)

All of these answers are correct.

Answer: C

Objective: 2.5

Global Outcomes: GO2

46) A 2.5 g sample of french fries is placed in a calorimeter with 500.0 g of water at an initial temperature of 21 °C. After combustion of the french fries, the water has a temperature of 48 °C. What is the caloric value (kcal/g) of the french fries?

A) 14 kcal/g

B) 11 kcal/g

C) 0.14 kcal/g

D) 4.2 kcal/g

E) 5.4 kcal/g

Answer: E Objective:

2.5, 2.6 Global

Outcomes: GO9

47) A potato contains 20 g of carbohydrate. If carbohydrate has a caloric value of 4 kcal/g, how many kcal are obtained from the carbohydrate in the potato?

A) 5 kcal

B) 20 kcal

C) 40 kcal

D) 60 kcal

E) 80 kcal

Answer: E

Objective:

2.6

Global Outcomes: GO4

48) The dietary calorie (Cal) is equal to (2.6)

A) 1000 kilocalories.

B) 1000 calories.

C) 100 calories.

D) 10 calories.

E) 1 calorie.

Answer: B

Objective: 2.6 Global

Outcomes: GO7

49) A cheeseburger from a fast food restaurant contains 19 g of fat, 20 g of carbohydrate, and 28 g of protein. How many kcal of energy does the cheeseburger contain? (The accepted caloric values for foods are 4.0 kcal/g for carbohydrate, 9 kcal/g for fat, and 4 kcal/g for protein.)

Report the answer to 2 significant figure s.

A) 70. kcal

B) 360 kcal

C) 17 kcal

D) 630 kcal

E) 280 kcal

Answer: B

Objective:

2.6

Global Outcomes: GO4

50) A serving of fish contains 50 g of protein and 4 g of fat. If protein has a caloric value of 4.0 kcal/g and fat has 9.1 kcal/g, how many kcal are in the serving? Report the answer to 2 significant figures.

A) 240 kcal

B) 54.0 kcal

C) 470 kcal

D) 220 kcal

E) 490 kcal

Answer: A

Objective: 2.6

Global Outcomes: GO4

51) A slice of pizza contains 29 g of carbohydrate, 13 g of protein and an unknown amount of fat. If the pizza contains 280 kcal, how many grams of fat are present? Report the answer to 2 significant figures.

A) 10. g

B) 12 g

C) 25 g

D) 55 g

E) 250 g

Answer: B

Objective: 2.6

Global Outcomes: GO4

52) A diet has a total caloric intake of 1400 kcal. The diet consists of 50.% carbohydrate, 35% protein, and 15% fat. The number of kcal of protein in the diet is

- A) 700 kcal.
- B) 490 kcal.
- C) 210 kcal.
- D) 460 kcal.
- E) 1200 kcal.

Answer: B

Objective: 2.6

Global Outcomes: GO4

53) One cup of kidney beans contains 15 g of protein, 1 g of fat, and 42 g of carbohydrate. How many kilocalories, to two significant figures, does this sample contain?

- A) 60 kcal
- B) 88 kcal
- C) 230 kcal
- D) 240 kcal
- E) 520 kcal

Answer: D

Objective: 2.6 Global

Outcomes: GO4

2.2 Short Answer Questions

1) The energy of motion is called _____ energy. Answer: kinetic Objective: 2.1

Global Outcomes: GO2

2) The lowest temperature on the Kelvin scale is _____ kelvin.

Answer: 0 (zero)

Objective: 2.2

Global Outcomes: GO2

3) The simplest type of pure substance is an _____.

Answer: element

Objective: 2.3

Global Outcomes: GO2

4) A mixture which has uniform properties is a _____ mixture.

Answer: homogeneous

Objective: 2.3

Global Outcomes: GO2

5) The change of state from solid to gas is termed _____.

Answer: sublimation

Objective: 2.4

Global Outcomes: GO2

6) When a liquid boils, the process by which the molecules leave its surface is called _____.

Answer: evaporation Objective:

2.4 Global Outcomes:

GO2

7) The units of specific heat are _____.

Answer: cal/g °C or J/g °C

Objective: 2.5

Global Outcomes: GO7

8) The nutritional calorie (Cal) is the same as _____ cal. Answer: 1000

Objective: 2.6

Global Outcomes: GO7

9) Will the caloric value of a 100. g hamburger be higher or lower than the caloric value of 100 . g of sugar?

Answer: higher. (2.6)

Objective: 2.6

Global Outcomes: GO2

10) Will the caloric value of a 100.g hamburger be higher or lower than the caloric value of 100 . g of cooking oil?

Answer: lower

Objective: 2.6

Global Outcomes: GO2

Bromine (Br₂) has a freezing point of -7 °C, and a boiling point of 60 °C.

Indicate the state or change of state occurring at each temperature.

11) 30 °C Answer: liquid Objective: 2.4 Global Outcomes: GO3

12) 60 °C

Answer: boiling

Objective: 2.4

Global Outcomes: GO3

13) $-7\text{ }^{\circ}\text{C}$ Answer: melting Objective: 2.4 Global Outcomes: GO3

14) $-15\text{ }^{\circ}\text{C}$

Answer: solid

Objective: 2.4

Global Outcomes: GO3

15) $70\text{ }^{\circ}\text{C}$ Answer: gas

Objective: 2.4 Global

Outcomes: GO3

2.3 True/False Questions

1) As heat is removed from a solid, its temperature decreases.

Answer: TRUE

Objective: 2.1

Global Outcomes: GO2

2) Water freezes at $100\text{ }^{\circ}\text{C}$.

Answer: FALSE

Objective: 2.2

Global Outcomes: GO2

3) A solid has a constant shape and volume.

Answer: TRUE

Objective: 2.3

Global Outcomes: GO2

4) Molecules of a gas are very close together. Answer: FALSE Objective: 2.3

Global Outcomes: GO2

5) Water vapor is a gas.

Answer: TRUE

Objective: 2.4

Global Outcomes: GO2

6) When a liquid is boiling, its temperature does not change.

Answer: TRUE
Objective: 2.4
Global Outcomes: GO2

7) Condensation occurs when a liquid is converted to a solid.
Answer: FALSE
Objective: 2.4
Global Outcomes: GO2

8) As a solid melts, its temperature does not change.
Answer: TRUE
Objective: 2.4
Global Outcomes: GO2

9) The temperature at which water melts and freezes is the same.
Answer: TRUE
Objective: 2.4
Global Outcomes: GO2

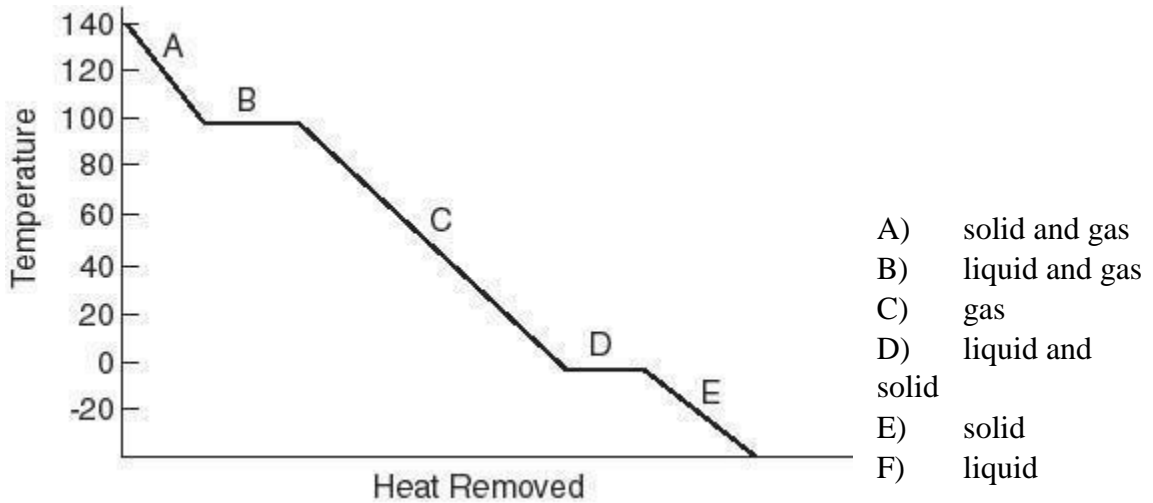
10) The units of specific heat are cal g/°F.
Answer: FALSE
Objective: 2.5
Global Outcomes: GO2

11) Carbohydrates and proteins have the same caloric value per gram. Answer: TRUE
Objective: 2.6
Global Outcomes: GO2

12) Condensation occurs when a liquid is converted to a solid.
Answer: FALSE
Objective: 2.4
Global Outcomes: GO2

2.4 Matching Questions

Identify the physical state(s) corresponding to the regions on the cooling curve below.



1) A
Objective: 2.4
Global Outcomes: GO3

2) B
Objective: 2.4
Global Outcomes: GO3

3) C
Objective: 2.4
Global Outcomes: GO3

4) D
Objective: 2.4
Global Outcomes: GO3

5) E
Objective: 2.4
Global Outcomes: GO3

Answers: 1) C 2) B 3) F 4) D 5) E

Match the state of matter with each of the following descriptions of a substance.

- A) solid
- B) liquid
- C) solid + liquid
- D) liquid + gas

E) gas

6) Particles are held close together in a random pattern. Objective: 2.4
Global Outcomes: GO2

7) Great distances exist between the particles. Objective: 2.4

8) This substance is boiling. Objective: 2.4
Global Outcomes: GO2

9) This material has a definite volume, and a definite shape. Objective: 2.4
Global Outcomes: GO2

10) This substance is melting.
Objective: 2.4
Global Outcomes: GO2

Answers: 6) B 7) E 8) D 9) A 10) C

Identify each of the following transformations as a chemical or physical change

A) physical
B) chemical

11) water evaporating
Objective: 2.4 Global
Outcomes: GO2

12) a button falling off of a shirt
Objective: 2.4
Global Outcomes: GO2

13) silver tarnishing
Objective: 2.4
Global Outcomes: GO2

14) cutting the grass
Objective: 2.4 Global

Outcomes: GO2

15) a nail rusting

Objective: 2.4 Global

Outcomes: GO2

16) baking a cake

Objective: 2.4 Global

Outcomes: GO2

17) placing photographs in a scrapbook

Objective: 2.4

18) formation of green leaves on a plant Objective: 2.4

Global Outcomes: GO2

19) burning leaves

Objective: 2.4

Global Outcomes: GO2

20) melting ice

Objective: 2.4 Global Outcomes:

GO2

Answers: 11) A 12) A 13) B 14) A 15) B 16) B 17) A 18) B 19) B 20) A