

***An Introduction to General, Organic, and Biological Chemistry, 11e (Timberlake)***  
**Chapter 1 Chemistry and Measurement**

**1.1 Multiple-Choice Questions**

1) Water, H<sub>2</sub>O, is an example of a(n) \_\_\_\_\_.

- A) chemical
- B) solid
- C) wave
- D) electric charge
- E) element

Answer: A

Page Ref: 1.1

2) In this list, which substance can be classified as a chemical?

- A) salt
- B) sleep
- C) cold
- D) heat
- E) temperature

Answer: A

Page Ref: 1.1

3) One example of a chemical used in toothpaste is \_\_\_\_\_.

- A) chlorine
- B) sulfur
- C) carbon dioxide
- D) calcium carbonate
- E) sugar

Answer: D

Page Ref: 1.1

4) Which of the following is not a chemical?

- A) salt
- B) water
- C) light
- D) carbon dioxide
- E) sugar

Answer: C

Page Ref: 1.1

5) Sodium fluorophosphate is a chemical used in toothpaste to \_\_\_\_\_.

- A) make the paste white
- B) disinfect the toothbrush
- C) keep the paste from spoiling
- D) remove plaque
- E) strengthen tooth enamel

Answer: E

Page Ref: 1.1

6) Chlorofluorocarbons are broken down in the atmosphere by \_\_\_\_\_.

- A) nitrogen dioxide
- B) ozone
- C) iron
- D) AIDS
- E) ultraviolet light

Answer: E

Page Ref: 1.1

7) When a part of the body is injured, substances called \_\_\_\_\_ are released.

- A) aspirins
- B) pain relievers
- C) nitrogen oxides
- D) chlorofluorocarbons
- E) prostaglandins

Answer: E

Page Ref: 1.1

8) The production of smog from NO gas requires \_\_\_\_\_.

- A) nitrogen
- B) chlorine
- C) water
- D) oxygen
- E) CFCs

Answer: D

Page Ref: 1.1

9) Chlorofluorocarbons are destructive to the \_\_\_\_\_.

- A) ozone produced at ground level in traffic
- B) water in the upper atmosphere
- C) nitrogen dioxide in smog
- D) ozone layer in the upper atmosphere
- E) copper in telephone wiring

Answer: D

Page Ref: 1.1

10) Titanium dioxide is a chemical used in toothpaste to \_\_\_\_\_.

- A) make the paste white
- B) disinfect the toothbrush
- C) keep the paste from spoiling
- D) remove plaque
- E) strengthen tooth enamel

Answer: A

Page Ref: 1.1

11) One way to enhance your learning in chemistry is to \_\_\_\_\_.

- A) study a little every day
- B) form a study group
- C) go to office hours
- D) be an active learner
- E) all the above

Answer: E

Page Ref: 1.2

12) In order to enhance your learning in chemistry, you should not \_\_\_\_\_.

- A) study a little every day
- B) form a study group
- C) go to office hours
- D) be an active learner
- E) wait until the night before the exam to study

Answer: E

Page Ref: 1.2

13) Which of the following is a chemical?

- A) sugar
- B) heat
- C) light
- D) noise
- E) a wave

Answer: A

Page Ref: 1.1

14) 5.21 cm is the same distance as

- A) 0.0521 m.
- B) 52.1 dm.
- C) 5.21 mm.
- D) 0.00521 km.
- E) 5210 m.

Answer: A

Page Ref: 1.9

15) How many centimeters are there in 57.0 in.?

- A) 22 cm
- B) 0.0445 cm
- C) 145 cm
- D) 22.4 cm
- E) 140 cm

Answer: C

Page Ref: 1.9

16) The amount of space occupied by a substance is its

- A) mass.
- B) density.
- C) weight.
- D) length.
- E) volume.

Answer: E

Page Ref: 1.3

17) Which of the following is the basic unit of volume in the metric system?

- A) liter
- B) kilogram
- C) meter
- D) centimeter
- E) gram

Answer: A

Page Ref: 1.3

18) Which of the following is a measurement of mass in the metric system?

- A) milliliter
- B) centimeter
- C) kilogram
- D) Celsius
- E) meter

Answer: C

Page Ref: 1.3

19) A value of 25 °C is a measurement of

- A) distance.
- B) volume.
- C) temperature.
- D) mass.
- E) density.

Answer: C

Page Ref: 1.3

20) A value of 36 mL is a measure of

- A) density
- B) mass
- C) temperature
- D) volume
- E) distance

Answer: D

Page Ref: 1.3

21) A value of 345 mm is a measure of

- A) density
- B) mass
- C) temperature
- D) volume
- E) distance

Answer: E

Page Ref: 1.3

22) The measurement 0.000 004 3 m, expressed correctly using scientific notation, is

- A)  $4.3 \times 10^{-7}$  m.
- B)  $4.3 \times 10^{-6}$  m.
- C)  $4.3 \times 10^6$  m.
- D)  $0.43 \times 10^{-5}$  m.
- E) 4.3 m.

Answer: B

Page Ref: 1.4

23) Which of the following conversion factors is a measured number?

- A) 10 cm/dm
- B) 12 in/ft
- C) 16 oz/lb
- D) 25 miles/gallon
- E) 12 eggs/dozen

Answer: D

Page Ref: 1.5

24) The measurement of the gravitational pull on an object is its

- A) volume.
- B) weight.
- C) mass.
- D) length.
- E) size.

Answer: B

Page Ref: 1.3

25) Which of the following measurements has three significant figures?

- A) 0.005 m
- B) 510 m
- C) 0.510 m
- D) 0.051 m
- E) 5100 m

Answer: C

Page Ref: 1.5

26) 1.00 pint of milk has a volume of how many milliliters? (2 pints = 1 quart)

- A) 472 mL
- B) 530. mL
- C) 1000 mL
- D) 1890 mL
- E) 106 mL

Answer: A

Page Ref: 1.9

27) Which of the following numbers contains the designated correct number of significant figures?

- A) 0.04300     5 significant figures
- B) 0.00302     2 significant figures
- C) 156 000     3 significant figures
- D) 1.04     2 significant figures
- E) 3.0650     4 significant figures

Answer: C

Page Ref: 1.5

28) The number of significant figures in the measurement of 45.030 mm is

- A) none.
- B) three.
- C) four.
- D) five.
- E) six.

Answer: D

Page Ref: 1.5

29) How many significant figures are in the number 0.00208?

- A) six
- B) two
- C) three
- D) four
- E) five

Answer: C

Page Ref: 1.5

30) Which of the following examples illustrates a number that is correctly rounded to three significant figures?

- A) 4.05438 grams to 4.054 grams
- B) 0.03954 grams to 0.040 grams
- C) 103.692 grams to 103.7 grams
- D) 109 526 grams to 109 500 grams
- E) 20.0332 grams to 20.0 grams

Answer: E

Page Ref: 1.6

31) A calculator answer of 423.6059 must be rounded off to three significant figures. What answer is reported?

- A) 423
- B) 424
- C) 1.7420
- D) 423.6
- E) 423.7

Answer: B

Page Ref: 1.6

32) Which of the answers for the following conversions contains the correct number of significant figures?

A)  $2.543 \text{ m} \times \frac{39.4 \text{ in.}}{1 \text{ m}} = 100.1942 \text{ in}$

B)  $2 \text{ L} \times \frac{1.06 \text{ qt}}{1 \text{ L}} = 2.12 \text{ qt}$

C)  $24.95 \text{ min} \times \frac{1 \text{ hr}}{60 \text{ min}} = 0.4158 \text{ hr}$

D)  $12.0 \text{ ft} \times \frac{12 \text{ in.}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} = 370 \text{ cm}$

E)  $24.0 \text{ kg} \times \frac{1 \text{ lb}}{2.20 \text{ kg}} = 11 \text{ lb}$

Answer: C

Page Ref: 1.6

33) What is the correct answer for the calculation of a volume (in mL) with measured numbers

$\frac{28.58}{16 \times 8.02} ?$

- A) 0.22 mL
- B) 0.223 mL
- C) 57 mL
- D) 14 mL
- E) 14.3 mL

Answer: A

Page Ref: 1.6

34) When  $2610 + 11.7 + 0.22$  are added, the answer to the correct number of decimal places is

- A) 2621.92  
B) 2621.9  
C) 2621  
D) 2620  
E) 2600

Answer: D

Page Ref: 1.6

35) What is the answer, with the correct number of decimal places, for this problem?

$$4.392 \text{ g} + 102.40 \text{ g} + 2.51 \text{ g} =$$

- A) 109.302 g  
B) 109 g  
C) 109.3 g  
D) 109.30 g  
E) 110 g

Answer: D

Page Ref: 1.6

36) The correct answer for the addition of  $7.5 \text{ g} + 2.26 \text{ g} + 1.311 \text{ g} + 2 \text{ g}$  is

- A) 13.071 g.  
B) 13 g.  
C) 13.0 g.  
D) 10 g.  
E) 13.1 g.

Answer: B

Page Ref: 1.6

37) Which of the following measurements are not equivalent?

- A)  $25 \text{ mg} = 0.025 \text{ g}$   
B)  $183 \text{ L} = 0.183 \text{ kL}$   
C)  $150 \text{ ms} = 0.150 \text{ s}$   
D)  $84 \text{ cm} = 8.4 \text{ mm}$   
E)  $24 \text{ dL} = 2.4 \text{ L}$

Answer: D

Page Ref: 1.7

38) In which of the following is the metric unit paired with its correct abbreviation?

- A) microgram / mg  
B) milliliter / mL  
C) centimeter / km  
D) kilogram / cg  
E) gram / gm

Answer: B

Page Ref: 1.7



39) Which of the following is the largest unit?

- A) millimeter
- B) micrometer
- C) meter
- D) decimeter
- E) kilometer

Answer: E

Page Ref: 1.7

40) What is the metric relationship between grams and micrograms?

- A)  $1 \text{ g} = 100 \mu\text{g}$
- B)  $1 \text{ g} = 1\,000\,000 \mu\text{g}$
- C)  $1 \text{ g} = 0.000\,001 \mu\text{g}$
- D)  $1 \text{ g} = 1000 \mu\text{g}$
- E)  $1 \text{ g} = 0.001 \mu\text{g}$

Answer: B

Page Ref: 1.7

41) What is the conversion factor for the relationship between millimeters and centimeters?

- A)  $1 \text{ mm}/1 \text{ cm}$
- B)  $10 \text{ mm}/1 \text{ cm}$
- C)  $1 \text{ cm}/1 \text{ mm}$
- D)  $100 \text{ mm}/1 \text{ cm}$
- E)  $10 \text{ cm}/1 \text{ mm}$

Answer: B

Page Ref: 1.8

42) Which of the following is the smallest unit?

- A) gram
- B) milligram
- C) kilogram
- D) decigram
- E) microgram

Answer: E

Page Ref: 1.7

43) The cubic centimeter ( $\text{cm}^3$  or cc) has the same volume as a

- A) cubic inch.
- B) cubic liter.
- C) milliliter.
- D) centimeter.
- E) cubic decimeter.

Answer: C

Page Ref: 1.7

44) 9.31 g is the same mass as

- A) 931  $\mu\text{g}$ .
- B) 931 kg.
- C) 93.1 cg.
- D) 9310 mg.
- E) 0.0931 dg.

Answer: D

Page Ref: 1.7

45) According to the United States Food and Drug Administration, the recommended daily requirement of protein is 44 g. This is \_\_\_\_\_ of protein.

- A) 1248.5 oz
- B) 320 000 oz
- C) 1.6 oz
- D) 0.0605 oz
- E) 150 000 oz

Answer: C

Page Ref: 1.8

46) Which of the following setups would convert centimeters to feet?

- A)  $\text{cm} \times \frac{2.54 \text{ in.}}{1 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$
- B)  $\text{cm} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{12 \text{ in.}}{1 \text{ ft}}$
- C)  $\text{cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$
- D)  $\text{cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{12 \text{ in.}}{1 \text{ ft}}$
- E)  $\text{cm} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$

Answer: C

Page Ref: 1.9

47) A conversion factor set up correctly to convert 15 inches to centimeters is

- A) 100 cm/1 m.
- B) 1 inch/2.54 cm.
- C) 1 cm/10 mm.
- D) 2.54 cm/1 inch.
- E) 10 cm/1 inch.

Answer: D

Page Ref: 1.8

48) How many pounds are in 3.5 kg?

- A) 7.7 lb
- B) 1.59 lb
- C) 0.629 lb
- D) 1.6 lb
- E) 7.70 lb

Answer: A

Page Ref: 1.9

49) How many liters of soft drink are there in 5.25 qt?

- A) 4950 L
- B) 55.7 L
- C) 4.95 L
- D) 5.57 L
- E) 5.0 L

Answer: C

Page Ref: 1.9

50) What is 6.5 m converted to inches?

- A) 1700 in
- B) 1651 in
- C) 39 in
- D) 260 in
- E) 255.9 in

Answer: D

Page Ref: 1.9

51) How many kilograms are in 30.4 lb?

- A) 13.8 kg
- B) 14 kg
- C) 67 kg
- D) 66.88 kg
- E) 66.9 kg

Answer: A

Page Ref: 1.9

52) A nugget of gold with a mass of 521 g is added to 50.0 mL of water. The water level rises to a volume of 77.0 mL. What is the density of the gold?

- A) 10.4 g/mL
- B) 6.77 g/mL
- C) 1.00 g/mL
- D) 0.0518 g/mL
- E) 19.3 g/mL

Answer: E

Page Ref: 1.10

53) A dose of aspirin of 5.0 mg per kilogram of body weight has been prescribed to reduce the fever of an infant weighing 8.5 pounds. The number of milligrams of aspirin that should be administered is

- A) 19 mg.
- B) 53 mg.
- C) 1.6 mg.
- D) 5.0 mg.
- E) 0.59 mg.

Answer: A

Page Ref: 1.9

54) A doctor's order is 0.125 g of ampicillin. The liquid suspension on hand contains 250 mg/5.0 mL. How many milliliters of the suspension are required?

- A) 0.0025 mL
- B) 3.0 mL
- C) 2.5 mL
- D) 6.3 mL
- E) 0.0063 mL

Answer: C

Page Ref: 1.9

55) Which one of the following substances will float in gasoline, which has a density of 0.66 g/mL? The density of each substance is shown in parentheses.

- A) table salt (D = 2.16 g/mL)
- B) balsa wood (D = 0.16 g/mL)
- C) sugar (D = 1.59 g/mL)
- D) aluminum (D = 2.70 g/mL)
- E) mercury (D = 13.6 g/mL)

Answer: B

Page Ref: 1.10

56) What is the mass of 2.00 L of an intravenous glucose solution with a density of 1.15 g/mL?

- A) 0.0230 kg
- B) 2.30 kg
- C) 1.15 kg
- D) 0.0150 kg
- E) 0.575 kg

Answer: B

Page Ref: 1.10

57) Mercury has a specific gravity of 13.6. How many milliliters of mercury have a mass of 0.35 kg?

- A) 0.0257 mL
- B) 0.026 mL
- C) 25.7 mL
- D) 26 mL
- E) 4760 mL

Answer: D

Page Ref: 1.10

58) What is the density of a substance with a mass of 45.00 g and a volume of 26.4 mL?

- A) 1.70 g/mL
- B) 1.7 g/mL
- C) 0.59 g/mL
- D) 0.587 g/mL
- E) 45.0 g/mL

Answer: A

Page Ref: 1.10

59) What is the mass of 53 mL of ethanol, which has a density of 0.79 g/mL?

- A) 67.1 g
- B) 41.9 g
- C) 42 g
- D) 67 g
- E) 53 g

Answer: C

Page Ref: 1.10

60) A liquid has a volume of 34.6 mL and a mass of 46.0 g. What is the density of the liquid?

- A) 1.00 g/mL
- B) 1.33 g/mL
- C) 0.752 g/mL
- D) 1330 g/mL
- E) 0.663 g/mL

Answer: B

Page Ref: 1.10

61) The density of a solution is 1.18 g/mL. Its specific gravity is

- A) 11.8.
- B) 0.118.
- C) 0.847.
- D) 1.18.
- E) 1.2.

Answer: D

Page Ref: 1.10

62) Diamond has a density of 3.52 g/mL. What is the volume in cubic centimeters of a diamond with a mass of 15.1 g?

- A) 4.3 cm<sup>3</sup>
- B) 4.29 cm<sup>3</sup>
- C) 0.233 cm<sup>3</sup>
- D) 53 cm<sup>3</sup>
- E) 53.2 cm<sup>3</sup>

Answer: B

Page Ref: 1.10

63) The ratio of the mass of a substance to its volume is its

- A) specific gravity.
- B) density.
- C) buoyancy.
- D) weight.
- E) conversion factor.

Answer: B

Page Ref: 1.10

64) The EPA limit for lead in the soil of play areas is 400 ppm. This is the same as

- A) 400 mg lead in each gram of soil.
- B) 400 g lead in each kilogram of soil.
- C) 400 mg lead in each kilogram of soil.
- D) 400  $\mu\text{g}$  lead in each kilogram of soil.
- E) 400  $\mu\text{g}$  lead in each milligram of soil.

Answer: C

Page Ref: 1.8

65) A 50.0 mL urine sample has a mass of 50.7 g. The specific gravity of the urine is

- A) 1.014 g/mL.
- B) 0.986 g/L.
- C) 1.01.
- D) 0.986.
- E) 50.7.

Answer: C

Page Ref: 1.10

## 1.2 True/False Questions

1) The reddish-brown color of smog is due to  $\text{NO}_2$ .

Answer: TRUE

Page Ref: 1.1

2) Chloroflourocarbons are broken down in the upper atmosphere to produce oxygen,  $\text{O}_2$ .

Answer: FALSE

Page Ref: 1.1

3) Titanium dioxide in toothpaste is used as a detergent.

Answer: FALSE

Page Ref: 1.1

4) Alchemists believed there were four components of nature: earth, fire, air, and water.

Answer: TRUE

Page Ref: 1.1

5) Organic chemistry is the study of substances that contain carbon.

Answer: TRUE

Page Ref: 1.1

6) Working with a group of students can help you learn chemistry.

Answer: TRUE

Page Ref: 1.2

7) It is a good idea to wait until the night before an exam to start to study.

Answer: FALSE

Page Ref: 1.2

8) Paracelsus was a Greek philosopher.

Answer: FALSE

Page Ref: 1.1

9) The number 0.0500 has four significant figures.

Answer: FALSE

Page Ref: 1.5

10) The number 650 000 has two significant figures.

Answer: TRUE

Page Ref: 1.5

11) When the measured number 0.0090 is multiplied by the measured number 87.10, the answer has two significant figures.

Answer: TRUE

Page Ref: 1.6

12) A  $\mu\text{g}$  is larger than a mg.

Answer: FALSE

Page Ref: 1.7

13) There are 1000  $\mu\text{g}$  in a mg.

Answer: TRUE

Page Ref: 1.7

14) A cubic centimeter is a unit of length.

Answer: FALSE

Page Ref: 1.3

### 1.3 Short Answer Questions

1) A substance that consists of one type of matter and always has the same composition and properties is called a \_\_\_\_\_.

Answer: chemical

Page Ref: 1.1

2) The brown color of smog is caused by \_\_\_\_\_.

Answer: nitrogen dioxide

Page Ref: 1.1

3) Any material used in or produced by a chemical reaction is a \_\_\_\_\_.

Answer: chemical

Page Ref: 1.1

4) An abrasive used in toothpaste is \_\_\_\_\_.

Answer: calcium carbonate

Page Ref: 1.1

5) The study of substances that contain the element carbon is called \_\_\_\_\_.

Answer: organic chemistry

Page Ref: 1.1

6) The substance the alchemists thought could turn metals into gold was called \_\_\_\_\_.

Answer: the philosopher's stone

Page Ref: 1.1

7) The substances released when tissues are injured are \_\_\_\_\_.

Answer: prostaglandins

Page Ref: 1.1

8) Substances which prevent spoilage are called \_\_\_\_\_.

Answer: antioxidants

Page Ref: 1.1

9) The chemical used to make cans and foil is \_\_\_\_\_.

Answer: aluminum

Page Ref: 1.1

*Round off each of the following to three significant figures.*

10) 504.85

Answer: 505

Page Ref: 1.6

11) 8.3158

Answer: 8.32

Page Ref: 1.6

12) 25 225

Answer: 25 200

Page Ref: 1.6

13)  $6.3477 \times 10^4$

Answer:  $6.35 \times 10^4$

Page Ref: 1.6



14) 399870

Answer:  $4.00 \times 10^5$

Page Ref: 1.6

15) 58.5422

Answer: 58.5

Page Ref: 1.6

16) 0.003 4088

Answer: 0.00341

Page Ref: 1.6

*Express each of the following numbers using scientific notation.*

17) 351 000 000 000

Answer:  $3.51 \times 10^{11}$

Page Ref: 1.4

18) 0.000 860

Answer:  $8.60 \times 10^{-4}$

Page Ref: 1.4

19) 5 207 000

Answer:  $5.207 \times 10^6$

Page Ref: 1.4

20) 0.000 000 050

Answer:  $5.0 \times 10^{-8}$

Page Ref: 1.4

*State the number of significant figures in each of the following measurements.*

21) 0.705 m

Answer: 3

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22) 680 000 km

Answer: 2

Page Ref: 1.5

23) 0.008090 cm

Answer: 4

Page Ref: 1.5

24) 28.050 km

Answer: 5

Page Ref: 1.5

25) 0.0005 L

Answer: 1

Page Ref: 1.5

26) 75.00 m

Answer: 4

Page Ref: 1.5

27)  $2.043 \times 10^4$  mm

Answer: 4

Page Ref: 1.5

28)  $6.1 \times 10^{-5}$  mL

Answer: 2

Page Ref: 1.5

29)  $9.00 \times 10^6$  g

Answer: 3

Page Ref: 1.5

## 1.4 Matching Questions

*Are the numbers in each of the following statements measured or exact?*

A) exact

B) measured

1) In the U.S. system there are 12 inches in one foot.

Page Ref: 1.5

2) The patient's blood sugar level is 350 mg/dL.

Page Ref: 1.5

3) There are 452 pages in a book.

Page Ref: 1.5

4) The rabbit weighs 2.5 pounds.

Page Ref: 1.5

5) 1 liter is equal to 1.06 quarts.

Page Ref: 1.5

6) There are 100 capsules in the bottle.

Page Ref: 1.5

7) The patient's temperature is 100.1 °F.

Page Ref: 1.5

8) I lost 14 pounds on my diet last month.

Page Ref: 1.5

Answers: 1) A 2) B 3) A 4) B 5) B 6) A 7)B 8) B

*Match the type of measurement to the unit given below.*

- A) temperature
- B) mass
- C) distance
- D) volume
- E) density

9) milliliter  
Page Ref: 1.3

10) mm  
Page Ref: 1.3

11) gram  
Page Ref: 1.3

12) 125 K  
Page Ref: 1.3

13) kilometer  
Page Ref: 1.3

14) milligram  
Page Ref: 1.3

Answers: 9) D 10) C 11) B 12) A 13) C 14) B

*Select the correct prefix to complete the equality.*

- A) 10
- B) 0.001
- C) 1000
- D) 100
- E) 1

15) 1 mL = \_\_\_\_\_ L  
Page Ref: 1.7

16) 1 m = \_\_\_\_\_ mm  
Page Ref: 1.7

17) 1 cm = \_\_\_\_\_ mm  
Page Ref: 1.7

18) 1 dL = \_\_\_\_\_ mL  
Page Ref: 1.7

19) 1 mL = \_\_\_\_\_ cc  
Page Ref: 1.7

20) 1 kg = \_\_\_\_\_ g  
Page Ref: 1.7

Answers: 15) B 16) C 17) A 18) D 19) E 20) C