

Chemistry: A Molecular Approach, 2e (Tro)
Chapter 1 Matter, Measurement, and Problem Solving

Multiple Choice Questions

- 1) Molecules can be described as
A) mixtures of two or more pure substances.
B) mixtures of two or more elements that has a specific ratio between components.
C) two or more atoms chemically joined together.
D) heterogeneous mixtures.
E) homogeneous mixtures.

Answer: C

Diff: 1 Page Ref: 1.1

- 2) Give the composition of water.
A) two hydrogen atoms and two oxygen atoms
B) one hydrogen atom and one oxygen atom
C) two hydrogen atoms and one oxygen atom
D) one hydrogen atom and two oxygen atoms

Answer: C

Diff: 1 Page Ref: 1.1

- 3) Which of the following represents a *hypothesis*?
A) Sodium reacts with water to form sodium hydroxide and hydrogen gas.
B) Nitrogen gas is a fairly inert substance.
C) Nickel has a silvery sheen.
D) When a substance combusts, it combines with air.
E) When wood burns, heat is given off.

Answer: D

Diff: 1 Page Ref: 1.2

- 4) Which of the following represents a valid *hypothesis*?
A) Neon does not react with oxygen.
B) Sodium metal reacts violently with water.
C) Lead is soft and malleable.
D) Oxygen is a gas at room temperature.
E) Metals tend to lose electrons.

Answer: E

Diff: 1 Page Ref: 1.2

- 5) The statement, "In a chemical reaction, matter is neither created nor destroyed" is called
A) the Law of Conservation of Mass.
B) Dalton's Atomic Theory.
C) the Scientific Method.
D) the Law of Multiple Proportions.
E) the Law of Definite Proportions.

Answer: A

Diff: 1 Page Ref: 1.2

6) Dalton's Atomic Theory states

- A) that all elements have several isotopes.
- B) that matter is composed of small indestructible particles.
- C) that the properties of matter are determined by the properties of atoms.
- D) that energy is neither created nor destroyed during a chemical reaction.
- E) that an atom is predominantly empty space.

Answer: B

Diff: 1 Page Ref: 1.2

7) The Scientific Method

- A) is just a theory.
- B) is a strict set of rules and procedures that lead to inarguable fact.
- C) isn't used much in modern chemistry.
- D) is based on continued observation and experiment.
- E) is a framework for proving an argument you know to be true.

Answer: D

Diff: 1 Page Ref: 1.2

8) Which of the following statements is TRUE?

- A) A scientific law is fact.
- B) Once a theory is constructed, it is considered fact.
- C) A hypothesis is speculation that is difficult to test.
- D) An observation explains why nature does something.
- E) A scientific law summarizes a series of related observations.

Answer: E

Diff: 1 Page Ref: 1.2

9) Identify a liquid.

- A) definite volume and definite shape
- B) definite volume and no definite shape
- C) no definite shape and definite volume
- D) no definite shape and no definite volume

Answer: B

Diff: 1 Page Ref: 1.3

10) Identify a solid.

- A) copper
- B) oxygen
- C) water
- D) nitrogen
- E) air

Answer: A

Diff: 1 Page Ref: 1.3

11) Identify a liquid.

- A) oxygen
- B) copper
- C) salt
- D) mercury
- E) sugar

Answer: D

Diff: 1 Page Ref: 1.3

12) Which of the following statements about crystalline and amorphous solids is TRUE?

- A) A crystalline solid is composed of atoms or molecules arranged with long-range repeating order.
- B) An example of a crystalline solid is glass.
- C) An example of an amorphous solid is table salt (NaCl).
- D) An amorphous solid is composed of atoms or molecules with a majority of its volume empty.
- E) All of the above statements are TRUE.

Answer: A

Diff: 1 Page Ref: 1.3

13) Which of the following statements about the phases of matter is TRUE?

- A) In both solids and liquids, the atoms or molecules pack closely to one another.
- B) Solids are highly compressible.
- C) Gaseous substances have long-range repeating order.
- D) There is only one type of geometric arrangement that the atoms or molecules in any solid can adopt.
- E) Liquids have a large portion of empty volume between molecules.

Answer: A

Diff: 1 Page Ref: 1.3

14) Choose the pure substance from the list below.

- A) sea water
- B) sugar
- C) air
- D) lemonade
- E) milk

Answer: B

Diff: 1 Page Ref: 1.3

15) Choose the pure substance from the list below.

- A) tea
- B) a casserole
- C) carbon monoxide
- D) sugar water
- E) pomegranate juice

Answer: C

Diff: 1 Page Ref: 1.3

16) A substance that can't be chemically broken down into simpler substances is

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

Answer: B

Diff: 1 Page Ref: 1.3

17) A substance composed of two or more elements in a fixed, definite proportion is

- A) a homogeneous mixture.
- B) a heterogeneous mixture.
- C) a compound.
- D) a solution.
- E) an alloy.

Answer: C

Diff: 1 Page Ref: 1.3

18) Choose the element from the list below.

- A) sodium chloride
- B) water
- C) carbon dioxide
- D) helium
- E) rust

Answer: D

Diff: 1 Page Ref: 1.3

19) Choose the compound from the list below.

- A) magnesium
- B) water
- C) neon
- D) helium
- E) lithium

Answer: B

Diff: 1 Page Ref: 1.3

20) Decanting is

- A) a process in which the more volatile liquid is boiled off.
- B) dissolving a solid into a liquid.
- C) separating a solid from a liquid by pouring off the liquid.
- D) pouring a mixture through a filter paper to separate the solid from the liquid.
- E) heating a mixture of two solids to fuse them together.

Answer: C

Diff: 1 Page Ref: 1.3

21) Two or more substances in variable proportions, where the composition is constant throughout are

- A) a compound.
- B) an element.
- C) a heterogeneous mixture.
- D) a homogeneous mixture.
- E) a crystalline solid.

Answer: D

Diff: 1 Page Ref: 1.3

22) Two or more substances in variable proportions, where the composition is variable throughout are

- A) a solution.
- B) a homogeneous mixture.
- C) a compound.
- D) an amorphous solid..
- E) a heterogeneous mixture.

Answer: E

Diff: 1 Page Ref: 1.3

23) Choose the heterogeneous mixture from the list below.

- A) sports drink
- B) chlorine gas
- C) black coffee
- D) chicken noodle soup
- E) carbon (graphite)

Answer: D

Diff: 1 Page Ref: 1.3

24) Choose the homogeneous mixture from the list below.

- A) cola
- B) mud
- C) ice water
- D) salad dressing
- E) salsa

Answer: A

Diff: 1 Page Ref: 1.3

25) Choose the homogeneous mixture from the list below.

- A) soda (pop)
- B) air
- C) concrete
- D) trail mix
- E) blood

Answer: B

Diff: 2 Page Ref: 1.3

26) Which of the following are examples of physical change?

- A) sugar is dissolved in water
- B) coffee is brewed
- C) dry ice sublimates
- D) ice (solid water) melts
- E) All of these are examples of physical change.

Answer: E

Diff: 1 Page Ref: 1.4

27) Which of the following are examples of physical change?

- A) dew forms on a blade of grass
- B) a halloween light stick glows after shaking
- C) an egg solidifies during cooking
- D) a hydrogen balloon explodes when contacted with a flame
- E) None of the above are physical changes.

Answer: A

Diff: 1 Page Ref: 1.4

28) Which of the following are examples of a chemical change?

- A) copper building materials develop a green patina over time
- B) a match burns
- C) ethanol evaporates
- D) Both A and B are examples of chemical change.
- E) All of the above are examples of chemical change.

Answer: D

Diff: 1 Page Ref: 1.4

29) Which of the following are examples of a chemical change?

- A) coffee brewing
- B) water boiling
- C) leaves turning color in the fall
- D) salt dissolves in water
- E) None of the above are chemical changes.

Answer: C

Diff: 1 Page Ref: 1.4

30) A physical change

- A) occurs when iron rusts.
- B) occurs when sugar is heated into caramel.
- C) occurs when glucose is converted into energy within your cells.
- D) occurs when water is evaporated.
- E) occurs when propane is burned for heat.

Answer: D

Diff: 1 Page Ref: 1.4

- 31) A chemical change
- A) occurs when methane gas is burned.
 - B) occurs when paper is shredded.
 - C) occurs when water is vaporized.
 - D) occurs when salt is dissolved in water.
 - E) occurs when powdered lemonade is stirred into water.

Answer: A

Diff: 1 Page Ref: 1.4

- 32) Which of the following represents a physical property?

- A) Sodium metal is extremely reactive with chlorine gas.
- B) Mercury is a silvery liquid at room temperature.
- C) Aluminum has a tendency to "rust."
- D) Butane is highly flammable.
- E) Argon has an unreactive nature.

Answer: B

Diff: 1 Page Ref: 1.4

- 33) Which of the following represents a chemical property of hydrogen gas?

- A) It is gaseous at room temperature.
- B) It is less dense than air.
- C) It reacts explosively with oxygen.
- D) It is colorless.
- E) It is tasteless.

Answer: C

Diff: 1 Page Ref: 1.4

- 34) Which of the following statements about energy is FALSE?

- A) Energy can be converted from one type to another.
- B) The total energy of a system remains constant.
- C) Kinetic energy is the energy associated with its position or composition.
- D) Energy is the capacity to do work.
- E) Systems tend to change in order to lower their potential energy.

Answer: C

Diff: 1 Page Ref: 1.5

- 35) Define thermal energy.

- A) energy associated with the temperature of an object
- B) energy associated with the motion of an object
- C) energy associated with the force of an object
- D) energy associated with the gravity of an object

Answer: A

Diff: 1 Page Ref: 1.5

36) All of the following are SI base units of measurement, EXCEPT

- A) meter
- B) gram
- C) second
- D) kelvin
- E) mole

Answer: B

Diff: 1 Page Ref: 1.6

37) Identify the unit of measurement which is a SI base unit of measurement.

- A) second
- B) Celsius
- C) cup
- D) pound
- E) yard

Answer: A

Diff: 1 Page Ref: 1.6

38) Kilogram is a measure of

- A) mass
- B) time
- C) temperature
- D) length
- E) volume

Answer: A

Diff: 1 Page Ref: 1.6

39) Which of the following are examples of intensive properties?

- A) density
- B) volume
- C) mass
- D) None of the above are examples of intensive properties.
- E) All of the above are examples of intensive properties.

Answer: A

Diff: 1 Page Ref: 1.6

40) Which of the following are examples of extensive properties?

- A) mass
- B) color
- C) density
- D) temperature
- E) taste

Answer: A

Diff: 1 Page Ref: 1.6

41) Identify the common substance that has the highest density.

- A) sugar
- B) water
- C) glass
- D) lead
- E) aluminum

Answer: D

Diff: 1 Page Ref: 1.6

42) Identify the common substance that has the lowest density.

- A) ice
- B) aluminum
- C) copper
- D) table salt
- E) sugar

Answer: A

Diff: 1 Page Ref: 1.6

43) If the temperature is 178°F, what is the temperature in degrees celsius?

- A) 352°C
- B) 451°C
- C) 67°C
- D) 81.1°C
- E) 378°C

Answer: D

Diff: 2 Page Ref: 1.6

44) If a solution has a temperature of 355 K, what is its temperature in degrees celsius?

- A) 165°C
- B) 628°C
- C) 179°C
- D) 279°C
- E) 82°C

Answer: E

Diff: 2 Page Ref: 1.6

45) The outside temperature is 35°C, what is the temperature in K?

- A) -238 K
- B) 308 K
- C) 95 K
- D) 31 K
- E) 63 K

Answer: B

Diff: 2 Page Ref: 1.6

46) Determine the density of an object that has a mass of 149.8 g and displaces 12 .1 mL of water when placed in a graduated cylinder.

- A) 8.08 g/mL
- B) 1.38 g/mL
- C) 12 .4 g/mL
- D) 18.1 g/mL
- E) 11.4 g/mL

Answer: C

Diff: 2 Page Ref: 1.6

47) Determine the volume of an object that has a mass of 455.6 g and a density of 19.3 g/cm³.

- A) 87.9 mL
- B) 42 .4 mL
- C) 18.5 mL
- D) 23.6 mL
- E) 31.2 mL

Answer: D

Diff: 2 Page Ref: 1.6

48) Determine the mass of an object that has a volume of 88.6 mL and a density of 9.77 g/mL.

- A) 298 g
- B) 1100 g
- C) 907 g
- D) 568 g
- E) 866 g

Answer: E

Diff: 2 Page Ref: 1.6

49) The outside air temperature is 30°F, what is the temperature in Kelvin?

- A) 303 K
- B) 307 K
- C) 274 K
- D) 272 K

Answer: D

Diff: 3 Page Ref: 1.6

50) The outside temperature is 35°C, what is the temperature in °F?

- A) 95°F
- B) 31°F
- C) 121°F
- D) 5.4°F
- E) 63°F

Answer: A

Diff: 3 Page Ref: 1.6

51) A student performs an experiment to determine the density of a sugar solution. She obtains the following results: 1.11 g/mL, 1.81 g/mL, 1.95 g/mL, 1.75 g/mL. If the actual value for the density of the sugar solution is 1.75 g/mL, which statement below best describes her results?

- A) Her results are precise, but not accurate.
- B) Her results are accurate, but not precise.
- C) Her results are both precise and accurate
- D) Her results are neither precise nor accurate.
- E) It isn't possible to determine with the information given.

Answer: D

Diff: 1 Page Ref: 1.7

52) A student performs an experiment to determine the density of a sugar solution. She obtains the following results: 1.71 g/mL, 1.73 g/mL, 1.67 g/mL, 1.69 g/mL. If the actual value for the density of the sugar solution is 1.40 g/mL, which statement below best describes her results?

- A) Her results are precise, but not accurate.
- B) Her results are accurate, but not precise.
- C) Her results are both precise and accurate
- D) Her results are neither precise nor accurate.
- E) It isn't possible to determine with the information given.

Answer: A

Diff: 1 Page Ref: 1.7

53) A student performs an experiment to determine the density of a sugar solution. She obtains the following results: 1.79 g/mL, 1.81 g/mL, 1.80 g/mL, 1.81 g/mL. If the actual value for the density of the sugar solution is 1.80 g/mL, which statement below best describes her results?

- A) Her results are precise, but not accurate.
- B) Her results are accurate, but not precise.
- C) Her results are both precise and accurate
- D) Her results are neither precise nor accurate.
- E) It isn't possible to determine with the information given.

Answer: C

Diff: 1 Page Ref: 1.7

54) Systematic error is defined as

- A) error that tends to be too high or too low.
- B) error that has equal probability of being too high and too low.
- C) error that averages out with repeated trials.
- D) error that is random.

Answer: A

Diff: 1 Page Ref: 1.7

55) Read the water level with the correct number of significant figures.

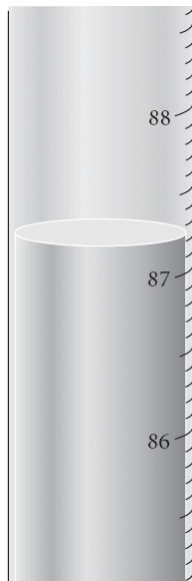


- A) 5 mL
- B) 5.3 mL
- C) 5.32 mL
- D) 5.320 mL
- E) 5.3200 mL

Answer: B

Diff: 2 Page Ref: 1.7

56) Read the temperature with the correct number of significant figures.

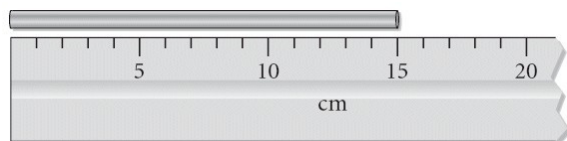


- A) 87°C
- B) 87.2°C
- C) 87.20°C
- D) 87.200°C
- E) 87.2000°C

Answer: C

Diff: 2 Page Ref: 1.7

57) Read the length of the metal bar with the correct number of significant figures.

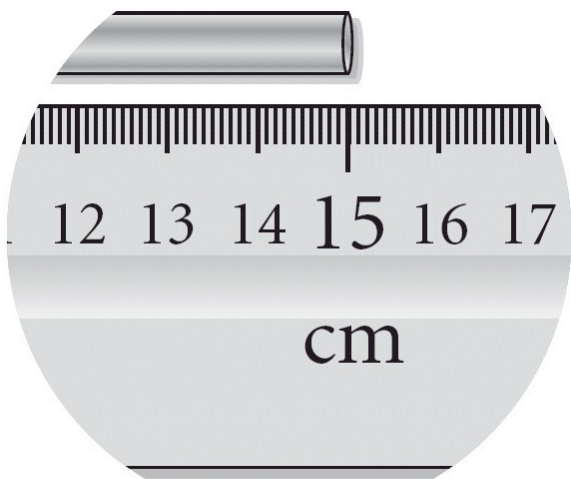


- A) 20 cm
- B) 15 cm
- C) 15.0 cm
- D) 15.00 cm
- E) 15.000 cm

Answer: C

Diff: 2 Page Ref: 1.7

58) Read the length of the metal bar with the correct number of significant figures.



- A) 20 cm
- B) 15 cm
- C) 15.0 cm
- D) 15.00 cm
- E) 15.000 cm

Answer: D

Diff: 2 Page Ref: 1.7

59) How many significant figures are in 1009.630 mL?

- A) 3
- B) 4
- C) 5
- D) 6
- E) 7

Answer: E

Diff: 2 Page Ref: 1.7

60) How many significant figures are in 3.408×10^4 m?

- A) 3
- B) 4
- C) 5
- D) 7
- E) 8

Answer: B

Diff: 2 Page Ref: 1.7

61) How many significant figures are in the measurement, 463.090 m?

- A) 2
- B) 3
- C) 4
- D) 5
- E) 6

Answer: E

Diff: 2 Page Ref: 1.7

62) How many significant figures are in the measurement, 0.0005890 g?

- A) 4
- B) 5
- C) 6
- D) 7
- E) 8

Answer: A

Diff: 2 Page Ref: 1.7

63) How many significant figures are in the measurement, 20.300 m?

- A) 3
- B) 4
- C) 5
- D) 1
- E) 2

Answer: C

Diff: 2 Page Ref: 1.7

64) What answer should be reported, with the correct number of significant figures, for the following calculation? $(433.621 - 333.9) \times 11.900$

- A) 1.19×10^3
- B) 1.187×10^3
- C) 1.1868×10^3
- D) 1.18680×10^3
- E) 1.186799×10^3

Answer: A

Diff: 2 Page Ref: 1.7

65) What answer should be reported, with the correct number of significant figures, for the following calculation? $(249.362 + 41) / 63.498$

- A) 4.6
- B) 4.57
- C) 4.573
- D) 4.5728
- E) 4.57277

Answer: B

Diff: 3 Page Ref: 1.7

66) What answer should be reported, with the correct number of significant figures, for the following calculation? $(965.43 \times 3.911) + 9413.4136$

- A) 13189
- B) 13189.2
- C) 1.32×10^4
- D) 1.3×10^4
- E) 1.319×10^4

Answer: A

Diff: 3 Page Ref: 1.7

67) What wavelength of light would you report in units of nm, if the light had a wavelength of 7.60×10^{-10} m?

- A) 7.60×10^{-3} nm
- B) 7.60×10^{-19} nm
- C) 1.32 nm
- D) 0.760 nm
- E) 760 nm

Answer: D

Diff: 2 Page Ref: 1.8

68) How many mg does a 433 kg sample contain?

- A) 4.33×10^{-4} mg
- B) 4.33×10^7 mg
- C) 4.33×10^{-3} mg
- D) 4.33×10^6 mg
- E) 4.33×10^8 mg

Answer: E

Diff: 2 Page Ref: 1.8

69) How many kL does a 1.25×10^8 cL sample contain?

- A) 1.25×10^3 kL
- B) 1.25×10^{13} kL
- C) 1.25×10^4 kL
- D) 1.25×10^{12} kL
- E) 1.25×10^2 kL

Answer: A

Diff: 2 Page Ref: 1.8

70) How many cm^3 are contained in 3.77×10^4 mm^3 ?

- A) 3.77×10^4 cm^3
- B) 3.77×10^1 cm^3
- C) 3.77×10^{-10} cm^3
- D) 3.77×10^{20} cm^3
- E) 3.77×10^6 cm^3

Answer: B

Diff: 2 Page Ref: 1.8

71) How many mL are in 2.54 L?

A) 2.54×10^{-3} mL

B) 2.54×10^1 mL

C) 2.54×10^3 mL

D) 2.54×10^{-1} mL

E) 2.54×10^2 mL

Answer: C

Diff: 2 Page Ref: 1.8

72) How many mm are in 3.20 cm?

A) 3.20×10^1 mm

B) 3.20×10^{-1} mm

C) 3.20×10^{-2} mm

D) 3.20×10^2 mm

E) 3.20×10^3 mm

Answer: A

Diff: 2 Page Ref: 1.8

73) A recipe requires 1.89 liters of milk for a soup base. How many quarts are needed?

A) 1.79 qts

B) 2.00 qts

C) 1.89 qts

D) 2.10 qts

E) 2.15 qts

Answer: B

Diff: 2 Page Ref: 1.8

74) If an object has a density of 8.65 g/cm^3 , what is its density in units of kg/m^3 ?

A) $8.65 \times 10^{-3} \text{ kg/m}^3$

B) $8.65 \times 10^{-7} \text{ kg/m}^3$

C) $8.65 \times 10^3 \text{ kg/m}^3$

D) $8.65 \times 10^1 \text{ kg/m}^3$

E) $8.65 \times 10^{-1} \text{ kg/m}^3$

Answer: C

Diff: 3 Page Ref: 1.8

75) If a room requires 25.4 square yards of carpeting, what is the area of the floor in units of ft^2 ?
(3 ft = 1 yd)

A) 76.2 ft^2

B) 8.47 ft^2

C) 282 ft^2

D) 229 ft^2

E) 68.6 ft^2

Answer: D

Diff: 3 Page Ref: 1.8

76) A person is 64.00 inches tall. How tall is she in cm?

- A) 162.6 cm
- B) 25.20 cm
- C) 25.60 cm
- D) 192.0 cm
- E) 128.0 cm

Answer: A

Diff: 3 Page Ref: 1.8

77) A person weighs 77.1 kg. What is his weight in pounds?

- A) 154 pounds
- B) 170 pounds
- C) 35.0 pounds
- D) 162 pounds

Answer: B

Diff: 3 Page Ref: 1.8

78) A person is 1.890 yards tall. How tall is he in cm?

- A) 172.8 cm
- B) 1.728 cm
- C) 2.232 cm
- D) 4.801 cm
- E) 14.40 cm

Answer: A

Diff: 3 Page Ref: 1.8

79) An alligator is 244.0 cm long. How long is he in feet?

- A) 8.00 feet
- B) 96.0 ft
- C) 20.3 ft
- D) 6.00 ft
- E) 9.00 ft

Answer: A

Diff: 3 Page Ref: 1.8

80) How many cm are in 22.2 ft?

- A) 4.70 cm
- B) 105 cm
- C) 56.4 cm
- D) 677 cm
- E) 0.728 cm

Answer: D

Diff: 3 Page Ref: 1.8

81) If the walls in a room are 955 square feet in area, and a gallon of paint covers 15 square yards, how many gallons of paint are needed for the room? (3 ft = 1 yd)

- A) 47 gallons
- B) 21 gallons
- C) 7.1 gallons
- D) 24 gallons
- E) 2.3 gallons

Answer: C

Diff: 4 Page Ref: 1.8

82) Gas is sold for \$1.399 per liter in Toronto, Canada. Your car needs 12.00 gallons. How much will your credit card be charged in Canadian dollars?

- A) \$16.79
- B) \$67.15
- C) \$4.44
- D) \$63.54

Answer: D

Diff: 5 Page Ref: 1.8

Algorithmic Questions

1) Crude oil is an example of

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

Answer: C

Diff: 2 Page Ref: 1.3

2) Gasoline is an example of

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

Answer: D

Diff: 2 Page Ref: 1.3

3) Gold is an example of

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

Answer: B

Diff: 2 Page Ref: 1.3

- 4) Ammonia is an example of
A) a compound.
B) an element.
C) a heterogeneous mixture.
D) a homogeneous mixture.

Answer: A

Diff: 2 Page Ref: 1.3

- 5) What symbol is used to represent the factor 10^1 ?
A) M
B) da
C) μ
D) n

Answer: B

Diff: 1 Page Ref: 1.6

- 6) Which of the following is the **smallest** volume?
A) 44 cm^3
B) 1.0 dL
C) $5.5 \times 10^3 \text{ mL}$
D) $1.0 \times 10^8 \text{ nL}$

Answer: A

Diff: 1 Page Ref: 1.6

- 7) What symbol is used to represent the factor 10^{-1} ?
A) M
B) m
C) μ
D) d

Answer: D

Diff: 1 Page Ref: 1.6

- 8) The factor 1,000,000 corresponds to which prefix?
A) deka
B) deci
C) mega
D) milli

Answer: C

Diff: 1 Page Ref: 1.6

- 9) The factor 10^{-3} corresponds to which prefix?
A) deka
B) deci
C) milli
D) centi

Answer: C

Diff: 1 Page Ref: 1.6

10) What decimal power does the abbreviation f represent?

- A) 1×10^6
- B) 1×10^3
- C) 1×10^{-1}
- D) 1×10^{-15}
- E) 1×10^{-12}

Answer: D

Diff: 1 Page Ref: 1.6

11) What decimal power does the abbreviation pico represent?

- A) 1×10^6
- B) 1×10^9
- C) 1×10^{-1}
- D) 1×10^{-12}
- E) 1×10^{-15}

Answer: D

Diff: 1 Page Ref: 1.6

12) What is the volume (in cm^3) of a 63.4 g piece of metal with a density of 12.86 g/cm^3 ?

- A) 4.93
- B) 19.5
- C) .425
- D) 6.65
- E) none of the above

Answer: A

Diff: 2 Page Ref: 1.6

13) A piece of metal ore weighs 8.25 g. When a student places it into a graduated cylinder containing water, the liquid level rises from 21.25 mL to 26.47 mL. What is the density of the ore?

- A) 0.312 g/mL
- B) 0.633 g/mL
- C) 1.58 g/mL
- D) 3.21 g/mL

Answer: C

Diff: 2 Page Ref: 1.6

14) A mass of mercury occupies 0.950 L. What volume would an equal mass of ethanol occupy? The density of mercury is 13.546 g/mL and the density of ethanol is 0.789 g/mL .

- A) 0.0553 L
- B) 0.0613 L
- C) 16.3 L
- D) 18.1 L

Answer: C

Diff: 2 Page Ref: 1.6

15) If the melting point of vanadium metal is 1910°C , what is its melting point in Kelvin?

- A) 1029 K
- B) 1637 K
- C) 2183 K
- D) 3470 K

Answer: C

Diff: 3 Page Ref: 1.6

16) Which of the following is the **lowest** temperature?

- A) 42°C
- B) 57°F
- C) 318 K
- D) All of these temperatures are all equal.

Answer: B

Diff: 3 Page Ref: 1.6

17) How many significant figures are in the measurement 5.34 g ?

- A) 1
- B) 2
- C) 4
- D) 3
- E) 5

Answer: D

Diff: 1 Page Ref: 1.7

18) The correct answer (reported to the proper number of significant figures) to the following is _____.

$$11.5 \times 8.78 = \underline{\hspace{2cm}}$$

Answer: 101

Diff: 2 Page Ref: 1.7

19) Round the following number to four significant figures and express the result in standard exponential notation: 229.613

- A) 0.2296×10^3
- B) 229.6
- C) 2.296×10^{-2}
- D) 2.296×10^2
- E) 22.96×10^{-1}

Answer: D

Diff: 2 Page Ref: 1.7

20) Which of the following numbers has the greatest number of significant figures?

A) 0. 5070

B) 0 .201

C) 418000

D) 6.02×10^{24}

Answer: A

Diff: 2 Page Ref: 1.7

21) How many of the following numbers contain 3 significant figures?

0. 408

9.040

0.0 400

9.05×10^{24}

A) one

B) two

C) three

D) four

Answer: C

Diff: 2 Page Ref: 1.7

22) How many significant figures are there in the answer to the following problem?

$$(9.992 \times 3.200) + 0.610 = ?$$

A) one

B) two

C) three

D) four

Answer: C

Diff: 2 Page Ref: 1.7

23) How many significant figures are there in the answer for the following problem?

$$56.4 + 0.8822 + 21 = ?$$

A) one

B) two

C) three

D) four

Answer: B

Diff: 2 Page Ref: 1.7

24) How many significant figures are there in the answer for the following problem?

$$\frac{[(143.7 - 121) \times 2.06]}{0.600} = ?$$

A) one

B) two

C) three

D) four

Answer: B

Diff: 2 Page Ref: 1.7

25) An acetylene molecule contains 2 atoms of carbon. The number 2 represents how many significant figures?

- A) one
- B) two
- C) three
- D) infinite

Answer: D

Diff: 2 Page Ref: 1.7

26) Round off 00 907506 to four significant figures.

- A) 00 91
- B) 9076
- C) 9100
- D) 9.075×10^5

Answer: D

Diff: 2 Page Ref: 1.7

27) The width, length, and height of a large, custom-made shipping crate are 1.22 m, 3.22 m, and 0.83 m, respectively. The volume of the box using the correct number of significant figures is _____ m³.

- A) 3.26057
- B) 3.3
- C) 3.26
- D) 3.261
- E) 3.2606

Answer: B

Diff: 2 Page Ref: 1.7

28) The correct answer (reported to the proper number of significant figures) to the following is _____.

$$(1815 - 1806) \times (9.11 \times 7.92) = \underline{\hspace{2cm}}$$

Answer: 600

Diff: 4 Page Ref: 1.7

29) Without using a calculator, solve the following problem:

$$\frac{[(1 \times 10^4) \times (1 \times 10^3)]^2}{(1 \times 10^{-9})}$$

- A) 1×10^{-4}
- B) 1×10^5
- C) 1×10^{23}
- D) 1×10^{32}

Answer: C

Diff: 1 Page Ref: 1.8

30) Without using a calculator, solve the following problem:

$$\frac{[(1 \times 10^{-8}) \times (1 \times 10^5)]^2}{(1 \times 10^6)}$$

- A) 1×10^6
- B) 1×10^0
- C) 1×10^{-12}
- D) 1×10^{-18}

Answer: C

Diff: 1 Page Ref: 1.8

31) Which of the following is the greatest mass?

- A) 1000 μg
- B) $1.000 \times 10^{-4} \text{ kg}$
- C) $1.000 \times 10^{-4} \text{ cg}$
- D) $1.000 \times 10^{-8} \text{ Mg}$

Answer: B

Diff: 2 Page Ref: 1.8

32) The mass of a proton is $1.67 \times 10^{-27} \text{ kg}$. What is the mass of a proton in picograms?

- A) $1.67 \times 10^{-18} \text{ pg}$
- B) $1.67 \times 10^{-15} \text{ pg}$
- C) $1.67 \times 10^{-12} \text{ pg}$
- D) $1.67 \times 10^{-9} \text{ pg}$

Answer: C

Diff: 2 Page Ref: 1.8

33) The mass of a single zinc atom is $1.086 \times 10^{-22} \text{ g}$. This is the same mass as

- A) $1.086 \times 10^{-16} \text{ mg}$.
- B) $1.086 \times 10^{-25} \text{ kg}$.
- C) $1.086 \times 10^{-28} \mu\text{g}$.
- D) $1.086 \times 10^{-31} \text{ ng}$.

Answer: B

Diff: 2 Page Ref: 1.8

34) A student weighed 30.00 μg of sulfur in the lab. This is the same mass as

- A) $3.000 \times 10^{-8} \text{ g}$.
- B) $3.000 \times 10^{-5} \text{ kg}$.
- C) $3.000 \times 10^{-5} \text{ mg}$.
- D) $3.000 \times 10^4 \text{ ng}$.

Answer: D

Diff: 2 Page Ref: 1.8

35) Convert 4 μm to meters.

A) $4 \times 10^{-9} \text{ m}$

B) $4 \times 10^{-6} \text{ m}$

C) $4 \times 10^{-3} \text{ m}$

D) $4 \times 10^6 \text{ m}$

Answer: B

Diff: 2 Page Ref: 1.8

36) The average distance between nitrogen and oxygen atoms is 115 pm in a compound called nitric oxide. What is this distance in millimeters?

A) $1.15 \times 10^{-8} \text{ mm}$

B) $1.15 \times 10^{-7} \text{ mm}$

C) $1.15 \times 10^{13} \text{ mm}$

D) $1.15 \times 10^{17} \text{ mm}$

Answer: B

Diff: 2 Page Ref: 1.8

37) The diameter of an atom is approximately $1 \times 10^{-10} \text{ m}$. What is the diameter in millimeters?

A) $1 \times 10^{-16} \text{ mm}$

B) $1 \times 10^{-13} \text{ mm}$

C) $1 \times 10^{-7} \text{ mm}$

D) $1 \times 10^{-4} \text{ mm}$

Answer: C

Diff: 2 Page Ref: 1.8

38) Which of the following volumes is equal to 40 mL?

A) 40 cm^3

B) 40 dm^3

C) 0.40 L

D) 0.00040 kL

Answer: A

Diff: 2 Page Ref: 1.8

39) Convert 10 cm^3 to m^3 .

A) $1 \times 10^{-5} \text{ m}^3$

B) $1 \times 10^{-1} \text{ m}^3$

C) $1 \times 10^3 \text{ m}^3$

D) $1 \times 10^7 \text{ m}^3$

Answer: A

Diff: 2 Page Ref: 1.8

40) Convert 35 m^3 to liters.

A) $3.5 \times 10^{-2} \text{ L}$

B) 3.5 L

C) $3.5 \times 10^2 \text{ L}$

D) $3.5 \times 10^4 \text{ L}$

Answer: D

Diff: 2 Page Ref: 1.8

41) $38.325 \text{ lbs} = \underline{\hspace{2cm}}$ grams. ($1 \text{ lb} = 454 \text{ g}$)

Answer: 17400

Diff: 4 Page Ref: 1.8

42) If 1.4% of the mass of a human body is calcium, how many kilograms of calcium are there in a 185-pound man?

A) 1.2 kg Ca

B) 5.7 kg Ca

C) $1.2 \times 10^2 \text{ kg Ca}$

D) $5.7 \times 10^2 \text{ kg}$

Answer: A

Diff: 5 Page Ref: 1.8

43) A fishing boat accidentally spills 3.0 barrels of diesel oil into the ocean. Each barrel contains 42 gallons. If the oil film on the ocean is $2.5 \times 10^2 \text{ nm}$ thick, how many square meters will the oil slick cover?

A) $1.9 \times 10^{-3} \text{ m}^2$

B) $1.9 \times 10^6 \text{ m}^2$

C) $1.9 \times 10^7 \text{ m}^2$

D) none of these

Answer: B

Diff: 5 Page Ref: 1.8

44) Because of the high heat and low humidity in the summer in Death Valley, California, a visitor requires about one quart of water for every two miles traveled on foot. Calculate the approximate number of liters required for a person to walk 10. kilometers in Death Valley.

A) 2.9 L

B) 12 L

C) 30 L

D) 47 L

Answer: A

Diff: 5 Page Ref: 1.8

45) The estimated costs for remodelling the interior of an apartment are: three 1-gallon cans of paint at \$13.22 each , two paint brushes at \$9.53 each , and \$135 for a helper. The total estimated cost with the appropriate significant figures is \$_____.

- A) 193.72
- B) 1.9×10^2
- C) 194
- D) 2×10^2
- E) 193.7

Answer: C

Diff: 5 Page Ref: 1.8

46) How many liters of wine can be held in a wine barrel whose capacity is 26.0 gal?

1 gal = 4 qt = 3.7854 L.

- A) 1.46×10^{-4}
- B) 0.146
- C) 98.4
- D) 6.87×10^3
- E) 6.87

Answer: C

Diff: 5 Page Ref: 1.8

47) The recommended adult dose of Elixophyllin[®], a drug used to treat asthma, is 6.00 mg/kg of body mass. Calculate the dose in milligrams for a 115-lb person. 1 lb = 453.59 g.

- A) 24
- B) 1,521
- C) 1.5
- D) 313
- E) 3.1×10^5

Answer: D

Diff: 5 Page Ref: 1.8

48) The density of air under ordinary conditions at 25°C is 1.19 g/L. How many kilograms of air are in a room that measures $11.0 \text{ ft} \times 11.0 \text{ ft}$ and has an 10.0 ft ceiling? 1 in. = 2.54 cm (exactly); $1 \text{ L} = 10^3 \text{ cm}^3$

- A) 3.66
- B) 0.152
- C) 4.08×10^4
- D) 0.0962
- E) 40.8

Answer: E

Diff: 5 Page Ref: 1.8

49) How many liters of air are in a room that measures $10.0 \text{ ft} \times 11.0 \text{ ft}$ and has an 8.00 ft ceiling? $1 \text{ in.} = 2.54 \text{ cm}$ (exactly); $1 \text{ L} = 10^3 \text{ cm}^3$

A) 2.49×10^4

B) 92.8

C) 26.8

D) 2.68×10^7

E) 8.84×10^5

Answer: A

Diff: 5 Page Ref: 1.8

Matching Questions

Match the following.

A) 10^{-3}

B) 10^{-6}

C) 10^{-1}

D) 10^3

E) 10^6

F) 10^{-2}

G) 10^{-9}

1) kilo

Diff: 1 Page Ref: 1.6

2) centi

Diff: 1 Page Ref: 1.6

3) milli

Diff: 1 Page Ref: 1.6

4) nano

Diff: 1 Page Ref: 1.6

5) micro

Diff: 1 Page Ref: 1.6

6) deci

Diff: 1 Page Ref: 1.6

7) mega

Diff: 1 Page Ref: 1.6

Answers: 1) D 2) F 3) A 4) G 5) B 6) C 7) E

Short Answer Questions

1) Define an atom.

Answer: An atom is the submicroscopic particle that constitutes the fundamental building block of ordinary matter.

Diff: 1 Page Ref: 1.1

2) Define matter.

Answer: Matter is anything that occupies space and has mass.

Diff: 1 Page Ref: 1.3

3) A sample of liquid isopropyl alcohol is placed in a sealed container. Some of the volatile isopropyl alcohol vaporizes. Does the mass of the sealed container and its contents change during the vaporization? Explain.

Answer: No. The vaporized isopropyl alcohol is just in a different physical state. It still has mass and therefore the gas plus the remaining liquid and container have the same total mass after the vaporization of some of the isopropyl alcohol.

Diff: 1 Page Ref: 1.4

4) What is the difference between a physical property and a chemical property? Give an example of each.

Answer: A physical property is something that can be observed without changing the chemical identity of the substance, such as color or scent. A chemical property can only be observed while the chemical identity of a substance is changing, such as sodium metals tendency to react with water to form hydrogen gas and sodium hydroxide.

Diff: 1 Page Ref: 1.4

5) Define energy.

Answer: Energy is the capacity to do work.

Diff: 1 Page Ref: 1.5

6) Define the law of the conservation of energy.

Answer: Energy is neither created or destroyed.

Diff: 1 Page Ref: 1.5

7) A flash drive contains 4 gigabytes. How many bytes does it contain?

Answer: 4,000,000,000 bytes or 4,292,967,296 byte if someone is computer literate

Diff: 1 Page Ref: 1.6

8) Describe the difference between an intensive and extensive property using examples.

Answer: An intensive property does NOT depend on the amount of the substance present, such as color or density. An extensive property is one that does depend on the amount of the substance, such as mass or volume.

Diff: 1 Page Ref: 1.6

9) What happens to the density of a sample of iron metal as it is heated from room temperature to 100°C? (This is below the melting point of iron)

Answer: Since the mass of the iron stays constant, but the volume increases as the temperature is raised, the density of the iron decreases upon heating.

Diff: 1 Page Ref: 1.6

10) What does it mean to be an exact number? Give an example of an exact number.

Answer: An exact number has an infinite number of significant figures even though we typically don't write many of them out. If there are 26 people in a classroom, there are exactly 26.00000.... people in that room. There is no possibility of a half person, so this is an exact whole number with no ambiguity.

Diff: 1 Page Ref: 1.7

11) Define random error.

Answer: Random error has an equal probability of being too high or too low.

Diff: 1 Page Ref: 1.7