General Chemistry: Atoms First, 2e **(McMurry and Fay)**
Chapter 0   Chemical Tools: Experimentation and Measurement

0.1   Multiple Choice Questions

1) A consistent explanation of known observations is called
A) an experiment.
B) a hypothesis.
C) a prediction.
D) a theory.
Answer: D
Diff: 1
Topic: Section 0.1 Experiment→Hypothesis→Theory: Approaching Chemistry

2) An interpretation of the results of many tests is called
A) an experiment.
B) a hypothesis.
C) a prediction.
D) a theory.
Answer: B
Diff: 1
Topic: Section 0.1 Experiment→Hypothesis→Theory: Approaching Chemistry

3) The fundamental SI unit of mass is the
A) centigram.
B) gram.
C) kilogram.
D) milligram.
Answer: C
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry

4) Which of the following is a fundamental SI Unit?
A) centimeter
B) kilogram
C) microsecond
D) milliliter
Answer: B
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry

5) All of the following are fundamental SI units except the
A) gram.
B) Kelvin.
C) meter.
D) second.
Answer: A
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry

6) What symbol is used to express the factor, 10^{-6}?
A) M
B) m
C) μ
D) n
Answer: C
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry

7) What symbol is used to represent the factor 10^{-3}?
A) M
B) m
C) μ
D) n
Answer: B
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

8) What symbol is used to represent the factor 10^{-9}?
A) M
B) m
C) μ
D) n
Answer: D
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

9) The factor 0.01 corresponds to which prefix?
A) deka
B) deci
C) centi
D) milli
Answer: C
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

10) The factor 10^{-2} corresponds to which prefix?
A) deka
B) deci
C) centi
D) milli
Answer: C
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

11) Convert 5.100×10^{-3} to ordinary notation.
A) 0.0005100
B) 0.005100
C) 510.0
D) 5100
Answer: B
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry

12) Convert 0.003002 to standard scientific notation.
A) 3.002×10^{-3}
B) 3002×10^{-6}
C) 3.002×10^{3}
D) 3002×10^{6}
Answer: A
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry

13) A sailor circumnavigated the earth and covered 4,264,000 meters. Express this number in standard scientific notation.
A) 4.264×10^{-7} m
B) 4.264×10^{-6} m
C) 4.264×10^{6} m
D) 4.264×10^{7} m
Answer: C
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry

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

$$\frac{[(1\times10^5)\times(1\times10^2)]^2}{(1\times10^{-10})}$$

A) 1×10^{-6}
B) 1×10^4
C) 1×10^{24}
D) 1×10^{34}
Answer: C
Diff: 2
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

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

$$\frac{[(1\times10^{-5})\times(1\times10^2)]^2}{(1\times10^3)}$$

A) 1×10^0
B) 1×10^{-3}
C) 1×10^{-9}
D) 1×10^{-12}
Answer: C
Diff: 2
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

16) An astronaut uses a laboratory balance and weighs an object on earth and again on the moon. Which statement below about the weight and mass of the object is **true**?
A) The mass and weight will be identical on the earth and the moon.
B) The mass will be the same on earth and moon but the weight will be less on the moon.
C) The weight will be the same on earth and moon but the mass will be less on the moon.
D) Both the mass and weight will be different on earth and moon.
Answer: B
Diff: 1
Topic: Section 0.3 Fundamental Units: Measuring Mass

17) When measuring a solid metal block at constant temperature, which measurement will change in numerical value depending on the location where it is taken?
A) length
B) mass
C) volume
D) weight
Answer: D
Diff: 1
Topic: Section 0.3 Fundamental Units: Measuring Mass

18) One kilogram is slightly more than _____ U.S. pounds?
A) 0.5
B) 1
C) 2
D) 5
Answer: C
Diff: 1
Topic: Section 0.3 Fundamental Units: Measuring Mass

19) One gram is approximately the same as half the mass of a new U.S.
A) penny.
B) dime.
C) quarter.
D) dollar.
Answer: B
Diff: 1
Topic: Section 0.3 Fundamental Units: Measuring Mass

20) Which of the following is the greatest mass?
A) 1000 μg
B) 1.000×10^{-4} kg
C) 1.000×10^{-2} cg
D) 1.000×10^{-8} Mg
Answer: B
Diff: 2
Topic: Section 0.3 Fundamental Units: Measuring Mass
Algo. Option: algorithmic

21) The mass of a proton is 1.67×10^{-27} kg. What is the mass of a proton in Gigagrams?
A) 1.67×10^{-39} Gg
B) 1.67×10^{-36} Gg
C) 1.67×10^{-33} Gg
D) 1.67×10^{-30} Gg
Answer: C
Diff: 2
Topic: Section 0.3 Fundamental Units: Measuring Mass
Algo. Option: algorithmic

22) The mass of a single copper atom is 1.055×10^{-22} g. This is the same mass as
A) 1.055×10^{-16} mg.
B) 1.055×10^{-25} kg.
C) 1.055×10^{-28} µg.
D) 1.055×10^{-31} ng.
Answer: B
Diff: 2
Topic: Section 0.3 Fundamental Units: Measuring Mass
Algo. Option: algorithmic

23) A student weighed 3000. µg of sulfur in the lab. This is the same mass as
A) 3.000×10^{-6} g.
B) 3.000×10^{-3} kg.
C) 3.000×10^{3} mg.
D) 3.000×10^{6} ng.
Answer: D
Diff: 1
Topic: Section 0.3 Fundamental Units: Measuring Mass
Algo. Option: algorithmic

24) The number of cm in 1.0 in is closest to _____.
A) 1.0
B) 1.5
C) 2.0
D) 2.5
Answer: D
Diff: 1
Topic: Section 0.4 Fundamental Units: Measuring Length

25) The thickness of a U.S. dime is approximately one
A) m.
B) cm.
C) mm.
D) µm.
Answer: C
Diff: 1
Topic: Section 0.4 Fundamental Units: Measuring Length

26) Convert 1 μm to meters.
A) 1×10^{-9} m
B) 1×10^{-6} m
C) 1×10^{-3} m
D) 1×10^{6} m
Answer: B
Diff: 2
Topic: Section 0.4 Fundamental Units: Measuring Length
Algo. Option: algorithmic

27) The average distance between nitrogen and oxygen atoms is 115 pm in a compound called nitric oxide. What is this distance in centimeters?
A) 1.15×10^{-9} cm
B) 1.15×10^{-8} cm
C) 1.15×10^{12} cm
D) 1.15×10^{16} cm
Answer: B
Diff: 2
Topic: Section 0.4 Fundamental Units: Measuring Length
Algo. Option: algorithmic

28) The diameter of an atom is approximately 1×10^{-10} m. What is the diameter in millimeters?
A) 1×10^{-16} mm
B) 1×10^{-13} mm
C) 1×10^{-7} mm
D) 1×10^{-4} mm
Answer: C
Diff: 2
Topic: Section 0.4 Fundamental Units: Measuring Length
Algo. Option: algorithmic

29) The diameter of the nucleus of an atom is approximately 1×10^{-15} meters. If 1 nm is equal to 10 Ångstroms, what is the diameter of the nucleus in Ångstroms?
A) 1×10^{-23} Å
B) 1×10^{-8} Å
C) 1×10^{-7} Å
D) 1×10^{-5} Å
Answer: D
Diff: 2
Topic: Section 0.4 Fundamental Units: Measuring Length
Algo. Option: algorithmic

30) What is the coldest temperature possible?
A) 0°C
B) 0°F
C) 0 K
D) none of these
Answer: C
Diff: 2
Topic: Section 0.5 Fundamental Units: Measuring Temperature

31) If the melting point of titanium metal is 1672°C, what is its melting point in Kelvins?
A) 897 K
B) 1399 K
C) 1945 K
D) 3042 K
Answer: C
Diff: 2
Topic: Section 0.5 Fundamental Units: Measuring Temperature
Algo. Option: algorithmic

32) Which of the following is the **lowest** temperature?
A) 37°C
B) 54°F
C) 313 K
D) All of these temperatures are all equal.
Answer: B
Diff: 2
Topic: Section 0.5 Fundamental Units: Measuring Temperature
Algo. Option: algorithmic

33) Which one of the following statements about temperature scales is **false**?
A) The boiling point of water on the Fahrenheit scale is 212 degrees.
B) The Celsius degree is smaller than the Fahrenheit degree.
C) The freezing point of water on the Celsius scale is 0 degrees.
D) All temperatures on the Kelvin scale are positive numbers.
Answer: B
Diff: 1
Topic: Section 0.5 Fundamental Units: Measuring Temperature

34) The freezing point of methane is -295°F and the boiling point is -263°F. The temperature of
the surface of Titan, a moon of Saturn, is 93 K. If methane exists on Titan, it is
A) a gas.
B) a liquid.
C) a solid.
D) a plasma.
Answer: B
Diff: 3
Topic: Section 0.5 Fundamental Units: Measuring Temperature

35) The nighttime and daytime temperatures on Mercury are 13 K and 683 K respectively. The melting point and boiling point of sulfur is 246°F and 832°F. Which of the following statements is **true**? On Mercury sulfur exists
A) only in the liquid state.
B) only in the solid state.
C) as both a liquid and a gas.
D) as both a liquid and a solid.
Answer: D
Diff: 3
Topic: Section 0.5 Fundamental Units: Measuring Temperature

36) One liter is approximately the same as one U.S.
A) ounce.
B) pint.
C) quart.
D) gallon.
Answer: C
Diff: 1
Topic: Section 0.6 Derived Units: Measuring Volume

37) Which of the following volumes is equal to 10 mL?
A) 10 cm^3
B) 10 dm^3
C) 0.10 L
D) 0.00010 kL
Answer: A
Diff: 1
Topic: Section 0.6 Derived Units: Measuring Volume
Algo. Option: algorithmic

38) Convert 100 cm^3 to m^3.
A) 1×10^{-4} m^3
B) 1×10^0 m^3
C) 1×10^4 m^3
D) 1×10^8 m^3
Answer: A
Diff: 2
Topic: Section 0.6 Derived Units: Measuring Volume
Algo. Option: algorithmic

39) Convert 15 m^3 to liters.
A) 1.5×10^{-2} L
B) 1.5 L
C) 1.5×10^2 L
D) 1.5×10^4 L
Answer: D
Diff: 2
Topic: Section 0.6 Derived Units: Measuring Volume
Algo. Option: algorithmic

40) Which of the following is the **smallest** volume?
A) 44 cm^3
B) 1.0 dL
C) 5.5×10^3 mL
D) 1×10^8 nL
Answer: A
Diff: 2
Topic: Section 0.6 Derived Units: Measuring Volume
Algo. Option: algorithmic

41) 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
Topic: Section 0.7 Derived Units: Measuring Density
Algo. Option: algorithmic

42) The density of aluminum is 2.702 g/cm^3. What is the final liquid level of water if 1.130 ounces of aluminum is dropped into a graduated cylinder containing 15.90 mL of water?
A) 17.08 mL
B) 21.66 mL
C) 27.76 mL
D) 47.95 mL
Answer: C
Diff: 3
Topic: Section 0.7 Derived Units: Measuring Density

43) A gold ingot weighs 5.50 lbs. If the density of gold is 19.31 g/cm^3, and the length and width of the ingot are 12.0 cm and 3.00 cm respectively, what is the height of the ingot?
A) 6.50×10^{-3} cm
B) 3.59 cm
C) 10.2 cm
D) 1.34×10^3 cm
Answer: B
Diff: 4
Topic: Section 0.7 Derived Units: Measuring Density

44) The estimated mass of the planet Jupiter is 1.90×10^{27} kg and the density is believed to be 1.34 g/cm^3. If Jupiter were a perfect sphere, what would be its **diameter**? For a sphere, $V = 4/3 \pi r^3$.
A) 6.96×10^6 m
B) 6.96×10^7 m
C) 1.39×10^7 m
D) 1.39×10^8 m
Answer: D
Diff: 3
Topic: Section 0.7 Derived Units: Measuring Density

45) The volume of a well is 40.0 ft^3. How many kilograms of concrete will it take to fill the well if the density of concrete is 2.85 g/cm^3?
A) 3.47 kg
B) 3.23×10^3 kg
C) 3.47×10^3 kg
D) 3.23×10^6 kg
Answer: B
Diff: 3
Topic: Section 0.7 Derived Units: Measuring Density

46) A mass of mercury occupies 0.750 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) 0.0437 L
B) 0.0777 L
C) 12.9 L
D) 22.9 L
Answer: C
Diff: 3
Topic: Section 0.7 Derived Units: Measuring Density
Algo. Option: algorithmic

47) 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. If the density of water is 0.990 g/mL at 45°C, how many kilograms of water are required for a person to walk 30 kilometers in Death Valley?
A) 8.7 kg
B) 70 kg
C) 3.5×10^2 kg
D) 7.0×10^2 kg
Answer: A
Diff: 5
Topic: Section 0.7 Derived Units: Measuring Density

48) Specific gravity of a liquid is often defined as the ratio of the density of a substance to the density of water. If the specific gravity of X relative to water is 0.800 and the specific gravity of Y relative to water is 1.50, which of the following statements is **false**?
A) If X is a liquid, Y will float on X.
B) If X is a solid, X will float in water.
C) If Y is a liquid, water will float on Y.
D) If Y is a liquid, X will float in Y.
Answer: A
Diff: 3
Topic: Section 0.7 Derived Units: Measuring Density

49) A piece of plastic weighing 1.157 g has a volume of 1.48 cm^3. A piece of wood has the same volume but weighs 3.85 g. The density of liquid X is 0.765 g/mL and the density of liquid Z is 1.13 g/mL. The two liquids are immiscible. If the plastic and wood are added to the two liquids, what is the order of layers from top to bottom in the container?
A) liquid X, liquid Z, plastic, wood
B) liquid X, plastic, liquid Z, wood
C) plastic, wood, liquid Z, liquid X
D) wood, liquid Z, plastic, liquid X
Answer: B
Diff: 2
Topic: Section 0.7 Derived Units: Measuring Density

50) Calculate the kinetic energy of a 150-g baseball moving at a speed of 40. m/s (89 mph).
K. E. = $1/2mv^2$.
A) 6.0 J
B) 1.2×10^2 J
C) 6.0×10^3 J
D) 1.2×10^5 J
Answer: B
Diff: 2
Topic: Section 0.8 Derived Units: Measuring Energy
Algo. Option: algorithmic

51) The average mass of an oxygen atom is 5.3×10^{-26} kg. Calculate the kinetic energy of a mole of oxygen atoms, all moving at a speed of 400 m/s (1000 mph). K. E. $= 1/2mv^2$.
A) 8.2×10^{-21} J
B) 2600 J
C) 5200 J
D) 13,000 J
Answer: B
Diff: 3
Topic: Section 0.8 Derived Units: Measuring Energy

52) The nutritional calorie (abbreviated Cal) is equal to
A) 1 mcal.
B) 4.184 J.
C) 4.184 cal.
D) 1 kcal.
Answer: D
Diff: 1
Topic: Section 0.8 Derived Units: Measuring Energy

53) A student measured the diameter of a sphere and determined the average value. His measurements are 5.17 cm, 5.16 cm, 5.16 cm, and 5.17 cm. If the true diameter is 6.18 cm, what can be said about the student's results?
A) It is accurate and precise.
B) It is accurate but not precise.
C) It is precise but not accurate.
D) It is neither precise nor accurate.
Answer: C
Diff: 1
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement

54) 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: 1
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

55) Which of the following is an exact number?
A) 0.507 grams
B) 1.13 liters
C) 2 people
D) 5.37°C
Answer: C
Diff: 1
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement

56) The measured mass of a sample of iron was 1.23 g. Which digit in the measurement has the least certainty?
A) the first digit, 1
B) the middle digit, 2
C) the last digit, 3
D) They are all certain digits.
Answer: C
Diff: 1
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement

57) How many of the following numbers contain 3 significant figures?
        0.105   6.010   0.0100 8.00 × 10^2
A) one
B) two
C) three
D) four
Answer: C
Diff: 1
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

58) How many significant figures are there in the answer to the following problem?
        $(8.881 × 2.100) + 0.590 = ?$
A) one
B) two
C) three
D) four
Answer: D
Diff: 2
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

59) What is the answer for the following multiplication when the correct number of significant figures are used?

$$23.8216 \times 81.66 = ?$$

A) 1945
B) 1945.271856
C) 1.95×10^3
D) 1945.27
Answer: A
Diff: 2
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement

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

$$23.1 + 0.5588 + 17 = ?$$

A) one
B) two
C) three
D) four
Answer: B
Diff: 2
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

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

$$\frac{[(131.7 - 119) \times 1.05]}{0.500} = ?$$

A) one
B) two
C) three
D) four
Answer: B
Diff: 2
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

62) A propane molecule contains 3 atoms of carbon. The number 3 represents how many significant figures?
A) one
B) two
C) three
D) infinite
Answer: D
Diff: 1
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

63) Round off 507,506 to four significant figures.
A) 5075
B) 5076
C) 5.075×10^5
D) 5.076×10^5
Answer: C
Diff: 1
Topic: Section 0.10 Rounding Numbers
Algo. Option: algorithmic

64) Round off 507,506 to three significant figures.
A) 507
B) 508
C) 5.07×10^5
D) 5.08×10^5
Answer: D
Diff: 1
Topic: Section 0.10 Rounding Numbers

65) Each of the numbers in the following calculation represents a quantity measured by a student in the laboratory.

$$P = \frac{0.1000 \times 0.08206 \times 298.15}{1.0068}$$

After performing the calculation, the student's calculator appeared as shown below:
To the correct number of significant figures what is the value of P?

2 .	4	3	0	0	9	4

hyp	log	ln		on/c
sin	cos	tan		y^x
1/x	x^2	$x^{1/2}$		/
7	8	9		X
4	5	6		-
1	2	3		+
0	.	ee		=

A) 2
B) 2.43
C) 2.430
D) 2.430094
Answer: C
Diff: 2
Topic: Section 0.10 Rounding Numbers

66) Each of the numbers in the following calculation represents a quantity measured by a student in the laboratory.

$$g = 0.0220 \times \frac{1}{44.0} \times 12.0$$

After performing the calculation, the student's calculator appeared as shown below:
To the correct number of significant figures what is the value of g?
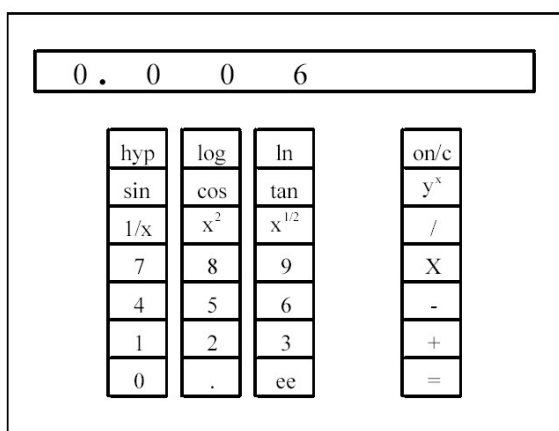
A) 6×10^{-3}
B) 6.0×10^{-3}
C) 6.00×10^{-3}
D) 6.000×10^{-3}
Answer: C
Diff: 2
Topic: Section 0.10 Rounding Numbers

67) To the correct number of significant figures, an automobile traveling at 28 mi/h is traveling at _____ km/h (1 km = 0.6214 mi).
A) 17
B) 17.40
C) 45
D) 45.06
Answer: C
Diff: 2
Topic: Section 0.11 Converting Measurements from One Unit to Another

68) An automobile uses gasoline at a rate of 35 mi/gal, which is the same as _____ km/L
(1 km = 0.6214 mi, 1 gal = 3.78 L).
A) 5.8
B) 15
C) 82
D) 210
Answer: B
Diff: 2
Topic: Section 0.11Converting Measurements from One Unit to Another

69) If 1.4% of the mass of a human body is calcium, how many kilograms of calcium are there in a 173-pound man?
A) 1.1 kg Ca
B) 5.3 kg Ca
C) 1.1×10^2 kg Ca
D) 5.3×10^2 kg
Answer: A
Diff: 2
Topic: Section 0.11Converting Measurements from One Unit to Another
Algo. Option: algorithmic

70) A fishing boat accidentally spills 15 barrels of diesel oil into the ocean. Each barrel contains 42 gallons. If the oil film on the ocean is 2.5×10^2 nm thick, how many square meters will the oil slick cover?
A) 9.5×10^{-3} m^2
B) 9.5×10^6 m^2
C) 9.5×10^7 m^2
D) none of these
Answer: B
Diff: 3
Topic: Section 0.11Converting Measurements from One Unit to Another
Algo. Option: algorithmic

71) An international group of zookeepers with successful breeding programs made the following animal exchanges last year. Using the same bartering system, how many oryxes can a zoo obtain in exchange for 15 flamingos?

3 oryxes = 1 tiger	2 flamingos = 1 anteater
1 camel = 6 anteaters	5 lemurs = 1 rhino
1 rhino = 4 monkeys	3 lemurs = 1 camel
3 monkeys = 1 tiger	1 rhino = 4 oryxes

A) one oryx
B) three oryxes
C) four oryxes
D) five oryxes
Answer: B
Diff: 3
Topic: Section 0.11 Converting Measurements from One Unit to Another

72) One year is equivalent to
A) 2.91×10^{12} ps
B) 3.15×10^{16} ns
C) 3.25×10^{8} ms
D) 2.91×10^{20} fs
Answer: B
Diff: 2
Topic: Section 0.11 Converting Measurements from One Unit to Another

73) You are visiting the planet Lagmom. The money exchange rates are shown below. How many Lagmom fizzbarts will you receive in exchange for $500 at the Lagmom Spaceport Currency Exchange counter?

$1.00 = 10 razz	1 morb = 25 pobs
5 pobs = 1 fizzbart	5 razz = 1 tanta
1 tanta = 2 morbs	

A) 5.00×10^{2} fizzbarts
B) 1.00×10^{3} fizzbarts
C) 1.00×10^{4} fizzbarts
D) 5.00×10^{5} fizzbarts
Answer: C
Diff: 2
Topic: Section 0.11 Converting Measurements from One Unit to Another

74) The LD_{50} values for several chemicals are listed below. These chemicals were tested on laboratory mice. Which was the most toxic to the mice in small amounts?
A) aspirin 1.5 g/kg
B) chloroform, 3.2 g/kg
C) ethyl alcohol, 10.6 g/kg
D) sodium cyclamate, 17 g/kg
Answer: A
Diff: 1
Topic: FYI The Risks and Benefits of Chemicals

75) The LD_{50} values for several chemicals are listed below. These chemicals were tested on laboratory mice. Which was the least toxic to the mice in small amounts?
A) aspirin 1.5 g/kg
B) chloroform, 3.2 g/kg
C) ethyl alcohol, 10.6 g/kg
D) sodium cyclamate, 17 g/kg
Answer: D
Diff: 1
Topic: FYI The Risks and Benefits of Chemicals

76) Liquids A, B, and C are insoluble in one another (i.e., they are immiscible). A, B, and C have densities of 0.998 g/cm^3, 1.050 g/cm^3, and 1.102 g/cm^3, respectively. Which drawing represents the result of placing all three liquids into the same graduated cylinder?
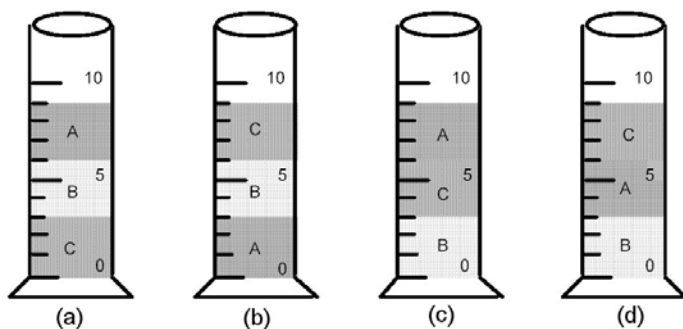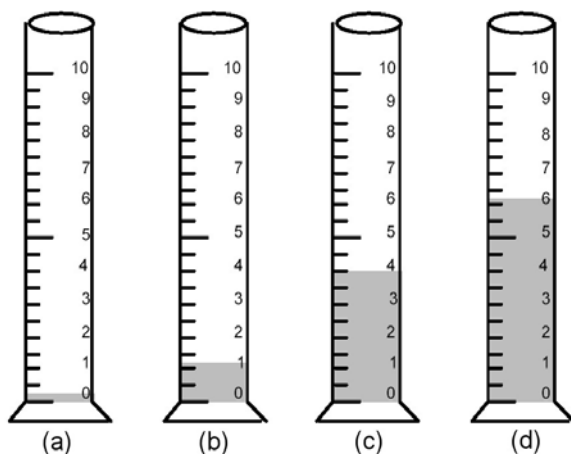

A) drawing (a)
B) drawing (b)
C) drawing (c)
D) drawing (d)
Answer: A
Diff: 1
Topic: Conceptual Problems

77) A certain liquid has a density of 1.25 g/cm^3. Which drawing below most closely represents the volume of this liquid needed to obtain 5.00 g of the liquid?
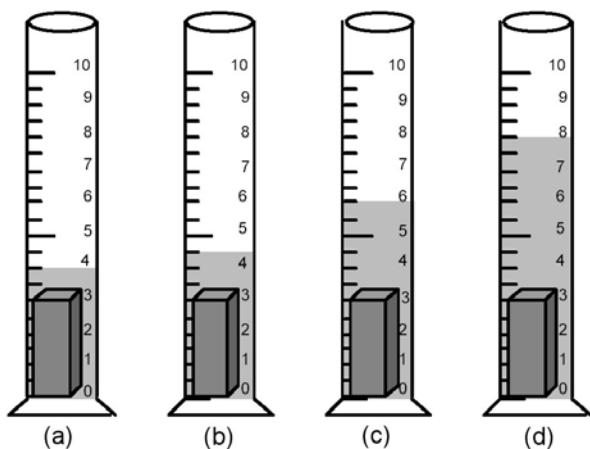

(a) (b) (c) (d)

A) drawing (a)
B) drawing (b)
C) drawing (c)
D) drawing (d)
Answer: C
Diff: 2
Topic: Conceptual Problems

78) A certain solid has a density of 8.0 g/cm^3. If 4.0 g of this solid are placed into 4.00 mL of water, which drawing below most closely represents the volume of water after the solid is added?
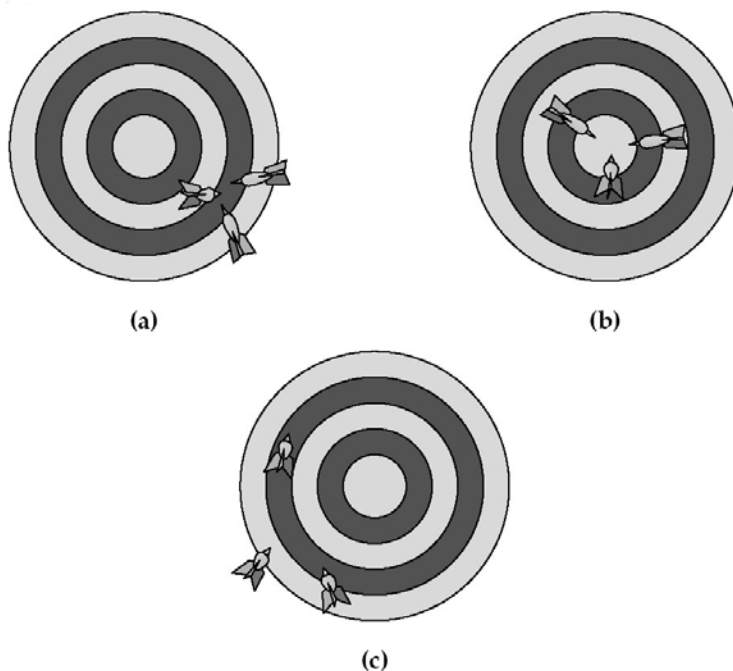

(a)   (b)   (c)   (d)

A) drawing (a)
B) drawing (b)
C) drawing (c)
D) drawing (d)
Answer: B
Diff: 3
Topic: Conceptual Problems

Use the drawings below to answer the following questions.

(a)

(b)

(c)

79) If hitting the bullseye is the desired result, Figure (a) represents
A) good accuracy and good precision.
B) good accuracy and poor precision.
C) poor accuracy and good precision.
D) poor accuracy and poor precision.
Answer: C
Diff: 2
Topic: Conceptual Problems

80) If hitting the bullseye is the desired result, Figure (b) represents
A) good accuracy and good precision.
B) good accuracy and poor precision.
C) poor accuracy and good precision.
D) poor accuracy and poor precision.
Answer: A
Diff: 2
Topic: Conceptual Problems

81) If hitting the bullseye is the desired result, Figure (c) represents
A) good accuracy and good precision.
B) good accuracy and poor precision.
C) poor accuracy and good precision.
D) poor accuracy and poor precision.
Answer: D
Diff: 2
Topic: Conceptual Problems

82) To the correct number of significant figures, what is the temperature reading on the following Celsius thermometer?
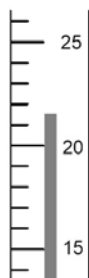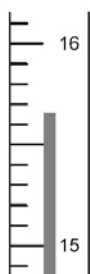

A) 21°C
B) 21.7°C
C) 21.70°C
D) 22°C
Answer: B
Diff: 1
Topic: Conceptual Problems

83) To the correct number of significant figures, what is the temperature reading on the following Celsius thermometer?
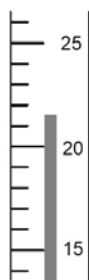

A) 15°C
B) 15.6°C
C) 15.67°C
D) 16°C
Answer: C
Diff: 1
Topic: Conceptual Problems

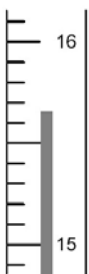84) What is the temperature reading on the following Celsius thermometer in degrees Kelvin?

A) 2.95×10^2°K
B) 21.7°K
C) 21.6°K
D) 2.9×10^2°K
Answer: A
Diff: 2
Topic: Conceptual Problems

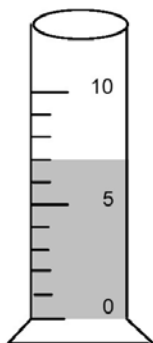85) What is the temperature reading on the following Celsius thermometer in degrees Kelvin?

A) 2.8882×10^2°K
B) 15.6°K
C) 15.67°K
D) 288°K
Answer: A
Diff: 2
Topic: Conceptual Problems

86) To the correct number of significant figures, what is the volume of the liquid in the graduated cylinder?

A) 7 mL
B) 7.0 mL
C) 7.7 mL
D) 8 mL
Answer: B
Diff: 1
Topic: Conceptual Problems

87) To the correct number of significant figures, what is the level of the liquid in the buret?

A) 0.2 mL
B) 0.29 mL
C) 0.3 mL
D) 0.35 mL
Answer: D
Diff: 1
Topic: Conceptual Problems

0.2   Algorithmic Questions

1) What symbol is used to represent the factor 10^{-3}?
A) M
B) m
C) μ
D) n
Answer: B
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

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

$$\frac{[(1\times10^1)\times(1\times10^6)]^2}{(1\times10^{-6})}$$

A) 1×10^2
B) 1×10^8
C) 1×10^{20}
D) 1×10^{26}
Answer: C
Diff: 2
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

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

$$\frac{[(1\times10^{-5})\times(1\times10^2)]^2}{(1\times10^3)}$$

A) 1×10^0
B) 1×10^{-3}
C) 1×10^{-9}
D) 1×10^{-12}
Answer: C
Diff: 2
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

4) Which of the following is the greatest mass?
A) 10,000,000 µg
B) 1.000×10^0 kg
C) 1.000×10^0 cg
D) 1.000×10^{-4} Mg
Answer: B
Diff: 2
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

5) The mass of a proton is 1.67×10^{-27} kg. What is the mass of a proton in nanograms?
A) 1.67×10^{-21} ng
B) 1.67×10^{-18} ng
C) 1.67×10^{-15} ng
D) 1.67×10^{-12} ng
Answer: C
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

6) The mass of a single copper atom is 1.055×10^{-22} g. This is the same mass as
A) 1.055×10^{-16} mg.
B) 1.055×10^{-25} kg.
C) 1.055×10^{-28} µg.
D) 1.055×10^{-31} ng.
Answer: B
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

7) A student weighed 3000. µg of sulfur in the lab. This is the same mass as
A) 3.000×10^{-6} g.
B) 3.000×10^{-3} kg.
C) 3.000×10^{-3} mg.
D) 3.000×10^6 ng.
Answer: D
Diff: 2
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

8) Convert 5 μm to meters.
A) 5×10^{-9} m
B) 5×10^{-6} m
C) 5×10^{-3} m
D) 5×10^{6} m
Answer: B
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

9) The average distance between nitrogen and oxygen atoms is 115 pm in a compound called nitric oxide. What is this distance in decimeters?
A) 1.15×10^{-10} dm
B) 1.15×10^{-9} dm
C) 1.15×10^{11} dm
D) 1.15×10^{15} dm
Answer: B
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

10) The diameter of an atom is approximately 1×10^{-10} m. What is the diameter in decimeters?
A) 1×10^{-24} dm
B) 1×10^{-21} dm
C) 1×10^{-9} dm
D) 1×10^{-6} dm
Answer: C
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

11) The diameter of the nucleus of an atom is approximately 1×10^{-15} m. If 1 nm is equal to 10 Angstroms, what is the diameter of the nucleus in Angstroms?
A) 1×10^{-23} Å
B) 1×10^{-8} Å
C) 1×10^{-7} Å
D) 1×10^{-5} Å
Answer: D
Diff: 2
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

12) If the melting point of tungsten metal is 3422°C, what is its melting point in Kelvin temperature?
A) 1869 K
B) 3149 K
C) 3695 K
D) 6192 K
Answer: C
Diff: 2
Topic: Section 0.5 Fundamental Units: Measuring Temperature
Algo. Option: algorithmic

13) Which of the following is the **lowest** temperature?
A) 72°C
B) 75°F
C) 348 K
D) All of these temperatures are all equal.
Answer: B
Diff: 1
Topic: Section 0.5 Fundamental Units: Measuring Temperature
Algo. Option: algorithmic

14) Which of the following volumes is equal to 20 mL?
A) 20 cm^3
B) 20 dm^3
C) 0.20 L
D) 0.00020 kL
Answer: A
Diff: 2
Topic: Section 0.6 Derived Units: Measuring Volume
Algo. Option: algorithmic

15) Convert 1000 cm^3 to m^3.
A) 1×10^{-3} m^3
B) 1×10^1 m^3
C) 1×10^5 m^3
D) 1×10^9 m^3
Answer: A
Diff: 2
Topic: Section 0.6 Derived Units: Measuring Volume
Algo. Option: algorithmic

16) Convert 45 m^3 to liters.
A) 4.5×10^{-2} L
B) 4.5 L
C) 4.5×10^2 L
D) 4.5×10^4 L
Answer: D
Diff: 2
Topic: Section 0.6 Derived Units: Measuring Volume
Algo. Option: algorithmic

17) Which of the following is the **smallest** volume?
A) 11 cm^3
B) 0.25 dL
C) 1.4×10^3 mL
D) 2.5×10^7 nL
Answer: A
Diff: 2
Topic: Section 0.6 Derived Units: Measuring Volume
Algo. Option: algorithmic

18) What symbol is used to represent the factor 10^{-2}?
A) M
B) m
C) μ
D) c
Answer: D
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

19) The factor 10 corresponds to which prefix?
A) centi
B) deci
C) deka
D) milli
Answer: C
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

20) The factor 10^1 corresponds to which prefix?
A) centi
B) deci
C) deka
D) milli
Answer: C
Diff: 1
Topic: Section 0.2 Experimentation and Measurement in Chemistry
Algo. Option: algorithmic

21) A piece of metal ore weighs 9.00 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) 0.340 g/mL
B) 0.580 g/mL
C) 1.72 g/mL
D) 2.94 g/mL
Answer: C
Diff: 2
Topic: Section 0.7 Derived Units: Measuring Density
Algo. Option: algorithmic

22) A laboratory procedure requires 4.67 g of a liquid whose density is 1.034 g/mL. What volume of liquid should be used for this procedure?
A) 4.83 mL
B) 4.52 mL
C) 0.221 mL
D) 5.70 mL
Answer: B
Diff: 2
Topic: Section 0.7 Derived Units: Measuring Density
Algo. Option: algorithmic

23) A mass of mercury occupies 0.650 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) 0.0378 L
B) 0.0896 L
C) 11.2 L
D) 26.4 L
Answer: C
Diff: 3
Topic: Section 0.7 Derived Units: Measuring Density
Algo. Option: algorithmic

24) Calculate the kinetic energy of a 150-g baseball moving at a speed of 36. m/s (81 mph). K. E. = $1/2mv^2$.
A) 5.4 J
B) 9.7×10^1 J
C) 5.4×10^3 J
D) 9.7×10^4 J
Answer: B
Diff: 2
Topic: Section 0.8 Derived Units: Measuring Energy
Algo. Option: algorithmic

25) Which of the following numbers has the greatest number of significant figures?
A) 0.8010
B) 0.504
C) 742000
D) 9.05×10^{24}
Answer: A
Diff: 1
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

26) How many of the following numbers contain 3 significant figures?
0.206   7.020   0.0200 7.03 × 10^{24}
A) one
B) two
C) three
D) four
Answer: C
Diff: 1
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

27) How many significant figures are there in the answer to the following problem?
$(8.881 \times 2.100) + 0.590 = ?$
A) one
B) two
C) three
D) four
Answer: D
Diff: 2
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

28) How many significant figures are there in the answer for the following problem?
57.5 + 0.9933 + 32 = ?
A) one
B) two
C) three
D) four
Answer: B
Diff: 2
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

29) How many significant figures are there in the answer for the following problem?
$$\frac{[(165.7 - 143) \times 4.08]}{0.800} = ?$$
A) one
B) two
C) three
D) four
Answer: B
Diff: 2
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

30) A methane molecule contains 1 atom of carbon. The number 1 represents how many significant figures?
A) one
B) two
C) three
D) infinite
Answer: D
Diff: 1
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement
Algo. Option: algorithmic

31) Round off 807509 to four significant figures.
A) 0081
B) 8076
C) 8100
D) 8.075×10^5
Answer: D
Diff: 1
Topic: Section 0.10 Rounding Numbers
Algo. Option: algorithmic

32) If 1.4% of the mass of a human body is calcium, how many kilograms of calcium are there in a 173-pound man?
A) 1.1 kg Ca
B) 5.3 kg Ca
C) 1.1×10^2 kg Ca
D) 5.3×10^2 kg
Answer: A
Diff: 2
Topic: Section 0.11Converting Measurements from One Unit to Another
Algo. Option: algorithmic

33) A fishing boat accidentally spills 9.0 barrels of diesel oil into the ocean. Each barrel contains 42 gallons. If the oil film on the ocean is 2.5×10^2 nm thick, how many square meters will the oil slick cover?
A) 5.7×10^{-3} m^2
B) 5.7×10^6 m^2
C) 5.7×10^7 m^2
D) none of these
Answer: B
Diff: 2
Topic: Section 0.11Converting Measurements from One Unit to Another
Algo. Option: algorithmic

34) 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 20. kilometers in Death Valley.
A) 5.9 L
B) 23 L
C) 61 L
D) 93 L
Answer: A
Diff: 2
Topic: Section 0.8 Derived Units: Measuring Energy
Algo. Option: algorithmic

0.3 Short Answer Questions

1) The **difference** between the boiling point and freezing point of water is 100°C, which is
_____ kelvins.
Answer: 100
Diff: 1
Topic: Section 0.5 Fundamental Units: Measuring Temperature

2) Volume is a derived unit having the dimensions (unit length)^x, where x = _____.
Answer: 3
Diff: 1
Topic: Section 0.6 Derived Units: Measuring Volume

3) The quantity 3.00 cm^3 is the same as _____ mL.
Answer: 3.00
Diff: 1
Topic: Section 0.6 Derived Units: Measuring Volume

4) The density of lead is 11.3 g/cm^3. The volume occupied by 227 g of lead is _____ cm^3.
Answer: 20.1
Diff: 2
Topic: Section 0.7 Derived Units: Measuring Density

5) The density of mercury is 13.6 g/cm^3. The mass of 38.0 cm^3 of mercury is _____ g.
Answer: 517
Diff: 2
Topic: Section 0.7 Derived Units: Measuring Density

6) _____ refers to how well a number of independent measurements agree with one another,
whereas _____ refers to how close to the true value a given measurement is.
Answer: precision, accuracy
Diff: 1
Topic: Section 0.9 Accuracy, Precision and Significant Figures in Measurement

7) The quantity 1.0567 qt rounded to two significant figures is _____ qt.
Answer: 1.1
Diff: 1
Topic: Section 0.10 Rounding Numbers