

Chapter 1: Chemical Foundations

1) Which of the following is an example of a quantitative observation?

- A) The piece of metal is longer than the piece of wood.
- B) Solution 1 is much darker than solution 2.
- C) The liquid in beaker A is blue.
- D) The temperature of the liquid is 60°C.
- E) At least two of the above (A-D) are quantitative observations.

ANS: D

DIF: Easy

REF: 1.2

KEY: Chemistry | general chemistry | general concepts | scientific method

MSC: Conceptual

2) A quantitative observation

- A) contains a number and a unit
- B) does not contain a number
- C) always makes a comparison
- D) must be obtained through experimentation
- E) is none of these

ANS: A

DIF: Easy

REF: 1.2

KEY: Chemistry | general chemistry | general concepts | scientific method

MSC: Conceptual

3) Generally, observed behavior that can be formulated into a statement, sometimes mathematical in nature, is called a(n)

- A) observation
- B) measurement
- C) theory
- D) natural law
- E) experiment

ANS: D

DIF: Easy

REF: 1.2

KEY: Chemistry | general chemistry | general concepts | scientific method

MSC: Conceptual

4) The statement "The total mass of materials is not affected by a chemical change in those materials" is called a(n)

- A) observation
- B) measurement
- C) theory
- D) natural law
- E) experiment

ANS: D

DIF: Easy

REF: 1.2

KEY: Chemistry | general chemistry | general concepts | scientific method

MSC: Conceptual

5) A chemical theory that has been known for a long time becomes a law.

ANS: F DIF: Easy REF: 1.2
KEY: Chemistry | general chemistry | general concepts | scientific method
MSC: Conceptual

6) Which of the following metric relationships is incorrect?

- A) 1 microliter = 10^{-6} liters
- B) 1 gram = 10^3 kilograms
- C) 10^3 milliliters = 1 liter
- D) 1 gram = 10^2 centigrams
- E) 10 decimeters = 1 meter

ANS: B DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | prefixes
MSC: Quantitative

7) For which pair is the SI prefix not matched correctly with its meaning?

- A) mega = 10^6
- B) kilo = 1000
- C) deci = 10
- D) nano = 10^{-9}
- E) centi = 0.01

ANS: C DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | prefixes
MSC: Conceptual

8) A metric unit for length is

- A) gram
- B) milliliter
- C) yard
- D) kilometer
- E) pound

ANS: D DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | base unit
MSC: Conceptual

9) Which of the following is *not* a unit in the SI system?

- A) ampere
- B) candela
- C) Kelvin
- D) meter
- E) calorie

ANS: E DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | base unit
MSC: Conceptual

10) Order the four metric prefixes from smallest to largest.

- A) nano- < milli- < centi- < kilo-
- B) milli- < nano- < centi- < kilo-
- C) kilo- < centi- < nano- < milli-
- D) kilo- < centi- < milli- < nano-
- E) centi- < nano- < kilo- < milli-

ANS: A

DIF: Easy

REF: 1.3

KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | prefixes
MSC: Conceptual

11) 8.1 kilogram(s) contains this many grams.

- A) 8.1×10^2
- B) 8.1×10^3
- C) 81
- D) 0.81
- E) 8.1×10^{13}

ANS: B

DIF: Easy

REF: 1.3

KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | mass
MSC: Conceptual

12) Convert 0.3980 m to mm.

- A) 398.0 mm
- B) 3.980×10^{-3} mm
- C) 3.980×10^{-4} mm
- D) 0.03980 mm
- E) none of these

ANS: A

DIF: Easy

REF: 1.3

KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | prefixes
MSC: Conceptual

13) 6.1 seconds contain this many picoseconds.

- A) 6.1×10^{12}
- B) 6.1×10^{12}
- C) 6.1×10^9
- D) 6.1×10^9
- E) 6.1×10^{15}

ANS: A

DIF: Easy

REF: 1.3

KEY: Chemistry | general chemistry | general concepts | measurement | SI unit | prefixes
MSC: Conceptual

14) 9.49 seconds contain this many nanoseconds.

- A) 9.49×10^7
- B) 9.49×10^9
- C) 9.49×10^{12}
- D) 9.49×10^{10}
- E) 9.49×10^8

ANS: B DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit |
prefixesMSC: Conceptual

15) The distance of 21 km equals

- A) 0.021 m
- B) 0.21 m
- C) 210 m
- D) 2100 m
- E) 2.1×10^4 m

ANS: E DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement | SI unit |
prefixesMSC: Conceptual

16) What is the measure of resistance an object has to a change in its state of motion?

- A) mass
- B) weight
- C) volume
- D) length
- E) none of these

ANS: A DIF: Easy REF: 1.3
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual

17) The degree of agreement among several measurements of the same quantity is called _____. It reflects the reproducibility of a given type of measurement.

- A) accuracy
- B) error
- C) precision
- D) significance
- E) certainty

ANS: C DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual

18) As part of the calibration of a new laboratory balance, a 1.000-g mass is weighed with the following results:

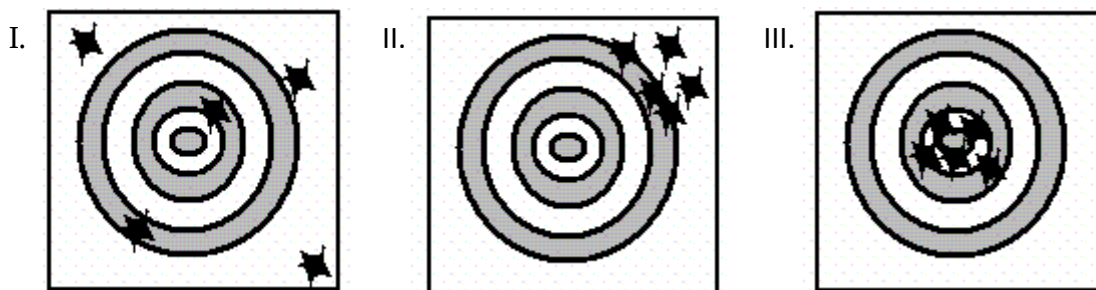
Trial	Mass
1	1.201 $\pm$ 0.001
2	1.202 $\pm$ 0.001
3	1.200 $\pm$ 0.001

The balance is:

- A) Both accurate and precise.
- B) Accurate but imprecise.
- C) Precise but inaccurate.
- D) Both inaccurate and imprecise.
- E) Accuracy and precision are impossible to determine with the available information.

ANS: C DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual

Consider the following three archery targets:



19) Which of the following figure(s) represent a result having high precision?

- A) Figure I only
- B) Figure II only
- C) Figure III only
- D) Figure I and Figure II
- E) Figure II and Figure III

ANS: E DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual

20) Which of the following statements concerning these figures is correct?

- A) Figure I represents systematic error and Figure II represents random error.
- B) Figure I represents random error and Figure II represents systematic error.
- C) Figure I and Figure II represent random error.
- D) Figure I and Figure II represent systematic error.
- E) Figure III represents no errors.

ANS: B DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual

21) Which of the following is the least probable concerning five measurements taken in the lab?

- A) The measurements are accurate and precise.
- B) The measurements are accurate but not precise.
- C) The measurements are precise but not accurate.
- D) The measurements are neither accurate nor precise.
- E) All of these are equally probable.

ANS: B DIF: Easy REF: 1.4
KEY: Chemistry | general chemistry | general concepts | measurement
MSC: Conceptual

- 22) You measure water in two containers: a 10-mL graduated cylinder with marks at every mL, and a 1-mL pipet marked at every 0.1 mL. If you have some water in each of the containers and add them together, to what decimal place could you report the total volume of water?

A) 0.01 mL
B) 0.1 mL
C) 1 mL
D) 10 mL
E) none of these

ANS: B DIF: Moderate REF: 1.4

KEY: Chemistry | general chemistry | general concepts | measurement | significant figures

MSC: Conceptual

- 23) The agreement of a particular value with the true value is called

A) accuracy
B) error
C) precision
D) significance
E) certainty

ANS: A DIF: Easy REF: 1.4

KEY: Chemistry | general chemistry | general concepts | measurement

MSC: Conceptual

- 24) The amount of uncertainty in a measured quantity is determined by:

A) both the skill of the observer and the limitations of the measuring instrument
B) neither the skill of the observer nor the limitations of the measuring instrument
C) the limitations of the measuring instrument only
D) the skill of the observer only
E) none of these

ANS: A DIF: Easy REF: 1.4

KEY: Chemistry | general chemistry | general concepts | measurement

MSC: Conceptual

- 25) A scientist obtains the number 0.045006700 on a calculator. If this number actually has four (4) significant figures, how should it be written?

A) 0.4567
B) 0.4501
C) 0.0450
D) 0.04500
E) 0.04501

ANS: E DIF: Easy REF: 1.5

KEY: Chemistry | general chemistry | general concepts | measurement | significant figures | rounding

MSC: Conceptual

- 26) Express the number 0.000333 in scientific notation.

A) 333×10^{-6}
B) 3.33×10^2

