

(1) Which of the following is an example of an observation? (1 Point)

- A) All matter is composed of small, indestructible particles called atoms.
- B) Reactions occur due to the transfer of electrons.
- C) When a can of soda pop is opened, a fizzing sound is heard.
- D) Flammable objects contain phlogiston.
- E) none of the above

(2) The distance between the two hydrogen atoms in a molecule of water is 0.000000000172 m. Express this distance in scientific notation. (1 Point)

- A)  $1.72 \times 10^{-9}$  m
- B)  $1.72 \times 10^{-10}$  m
- C)  $0.172 \times 10^{-10}$  m
- D)  $17.2 \times 10^9$  m
- E)  $1.72 \times 10^{10}$  m

(3) The wavelength of blue light is 0.00000045 m. Express this wavelength in scientific notation. (1 Point)

- A)  $4.5 \times 10^{-6}$  m
- B)  $4.5 \times 10^6$  m
- C)  $4.5 \times 10^{-7}$  m
- D)  $4.5 \times 10^7$  m
- E)  $0.45 \times 10^{-7}$  m

(4) In the number 48.93, which digit is estimated? (1 Point)

- A) 4
- B) 8
- C) 9
- D) 3
- E) None of the above, all digits are certain.

(5) The correct number of significant figures in the number 0.027090 is: (1 Point)

- A) 7
- B) 6
- C) 5
- D) ambiguous
- E) none of the above

(6) The correct number of significant figures in the number  $4.0 \times 10^{-2}$  is: (1 Point)

- A) 1
- B) 2
- C) 3
- D) ambiguous.
- E) none of the above

(7) Determine the answer to the following equation with correct number of significant figures:  
 $13.96 - 4.9102 + 71.5 = \underline{\hspace{2cm}}$  (1 Point)

- A) 80.5498
- B) 81
- C) 80.5
- D) 80.55
- E) none of the above

(8) Determine the answer to the following equation with correct number of significant figures:  
 $(17.103 + 2.03) \times 1.02521 = \underline{\hspace{2cm}}$  (1 Point)

- A) 19.6153
- B) 19.62
- C) 19.6
- D) 20
- E) none of the above

(9) The correct prefix for the multiplier 0.1 is: (1 Point)

- A) tera.
- B) deci.
- C) femto.
- D) pico.
- E) none of the above

(10) The correct multiplier for the prefix milli is: (1 Point)

- A)  $10^{-3}$
- B)  $10^{-6}$
- C)  $10^{-9}$
- D)  $10^{-12}$
- E) none of the above

(11) Which of the following items is a mixture? (1 Point)

- A) water
- B) helium
- C) brass
- D) sugar
- E) none of the above

(12) How would you classify salt water? (1 Point)

- A) pure substance-compound
- B) mixture-heterogeneous
- C) pure substance-element
- D) mixture-homogeneous
- E) none of the above

(13) How would you classify sugar? (1 Point)

- A) pure substance-compound
- B) mixture-heterogeneous
- C) pure substance-element
- D) mixture-homogeneous
- E) none of the above

(14) If you hold a solid piece of pure gallium metal in your hand, your body heat will melt the gallium into its liquid form. This illustrates which of the following? (1 Point)

- A) distillation
- B) physical change
- C) chemical change
- D) chemical property
- E) none of the above

(15) When methane is burned with oxygen the products are carbon dioxide and water. If you produce 36 grams of water and 44 grams of carbon dioxide from 16 grams of methane, how many grams of oxygen were needed for the reaction? (1 Point)

- A) 32 g
- B) 80 g
- C) 96 g
- D) 64 g
- E) none of the above

(16) Which of the following items is NOT a common unit of energy? (1 Point)

- A) joule
- B) torr
- C) calorie
- D) kilowatt-hour
- E) none of the above

(17) What is the value of 335 K on the Celsius temperature scale? (1 Point)

- A) 62
- B) 167
- C) 608
- D) 66.4
- E) none of the above

(18) What is the specific heat ( $\text{J/g} \cdot ^\circ\text{C}$ ) of a metal object whose temperature increases by  $3.0^\circ\text{C}$  when 17.5 g of metal was heated with 38.5 J? (1 Point)

- A) 4.18
- B) 0.15
- C) 0.73
- D) 1.4
- E) none of the above

(19) How much heat (kJ) is needed to raise the temperature of 100.0 grams of water (4.182 J/g °C) from 25.0°C to 50.0°C? (1 Point)

- A) 10450
- B) 0.598
- C) 1.05
- D) 10.5
- E) none of the above

(20) Suppose it took 108 joules of energy to raise a bar of gold from 25.0°C to 29.7°C. Given that the specific heat capacity of gold is 0.128 J/g • °C, what is the mass (in grams) of the bar of gold? (1 Point)

- A)  $6.5 \times 10^1$  g
- B)  $1.8 \times 10^2$  g
- C)  $1.28 \times 10^2$  g
- D)  $1.08 \times 10^2$  g
- E) none of the above

(21) How many protons are found in C-14? (1 Point)

- A) 8
- B) 14
- C) 6
- D) 0
- E) none of the above

(22) What is the charge on a lithium atom that contains 2 e<sup>-</sup>? (1 Point)

- A) 2+
- B) 3+
- C) 1-
- D) 1+
- E) none of the above

(23) A fictional element has two isotopes, each making up 50% of the population. Isotope 1 has a mass of 80.0 amu, Isotope 2 has a mass of 85.0 amu. Calculate the atomic mass of the fictional element. (1 Point)

- A) 82.5 amu
- B) 42.5 amu
- C) 40 amu
- D) 165 amu
- E) none of the above

(24) An atom that has the same number of neutrons as  $^{138}_{56}\text{Ba}$  is: (1 Point)

- A)  $^{138}_{55}\text{Cs}$
- B)  $^{136}_{56}\text{Ba}$
- C)  $^{137}_{57}\text{La}$
- D)  $^{136}_{54}\text{Xe}$
- E) none of the above

(25) When elements combine to form compounds, (1 Point)

- A) their properties are an average of all elements in the compound.
- B) their properties change completely.
- C) their properties do not change.
- D) their properties are completely random.
- E) none of the above

(26) The law of constant composition states: (1 Point)

- A) Matter cannot be either created or destroyed in a chemical reaction.
- B) The nucleus is a dense region of positive charge that always contains protons and neutrons.
- C) All samples of a given compound have the same proportions of their constituent elements.
- D) All atoms of a given element have a constant composition and are different than atoms of any other element.
- E) none of the above

(27) What is the oxygen-to-hydrogen mass ratio for  $\text{H}_2\text{O}_2$ ? (1 Point)

- A) 0.125
- B) 4
- C) 8
- D) 16

(28) Which of the following statements about chemical formulas is FALSE? (1 Point)

- A) The subscripts represent the relative number of each type of atom in the compound.
- B) The subscripts represent the relative mass of each type of atom in the compound.
- C) The subscripts do not change for a given compound.
- D) Different compounds made of the same elements have different subscripts.
- E) All of the statements are true.

(29) How many total atoms are in the formula  $\text{Al}_2(\text{CO}_3)_3$ ? (1 Point)

- A) 8
- B) 9
- C) 12
- D) 14
- E) none of the above

(30) How many oxygen atoms are in the formula  $\text{Al}_2(\text{CO}_3)_3$ ? (1 Point)

- A) 3
- B) 9
- C) 1
- D) 6
- E) none of the above

(31) What is the correct formula for a compound that has three oxygen atoms and one sulfur atom?

- A)  $\text{O}_3\text{S}$  (1 Point)
- B)  $\text{SO}_3$
- C)  $3\text{OS}$
- D)  $\text{SO}_3$
- E) none of the above

(32) Carbon monoxide is considered which of the following? (1 Point)

- A) atomic element
- B) molecular element
- C) molecular compound
- D) ionic compound
- E) none of the above

(33) What is the formula for an ionic compound made of magnesium and sulfur? (1 Point)

- A)  $\text{MgS}$
- B)  $\text{MgS}_2$
- C)  $\text{Mg}_2\text{S}$
- D)  $\text{Mg}_2\text{S}_3$
- E) none of the above

(34) The formula for potassium chlorate is  $\text{KClO}_3$ . The formula for magnesium chloride is  $\text{MgCl}_2$ . What is the formula for magnesium chlorate? (1 Point)

- A)  $\text{MgClO}_3$
- B)  $\text{Mg}_2\text{ClO}_3$
- C)  $\text{Mg}(\text{ClO}_3)_2$
- D)  $\text{Mg}_2(\text{ClO}_3)_3$
- E) none of the above

(35) What is the name of the molecular compound  $\text{SF}_5$ ? (1 Point)

- A) sulfur hexafluoride
- B) sulfur heptafluoride
- C) monosulfur tetrafluoride
- D) sulfur pentafluoride
- E) none of the above

(36) The key to success in chemistry is: (1 Point)

- A) curiosity.
- B) mathematical skills.
- C) commitment.
- D) practice.
- E) all of the above

(37) What is the difference between a scientific law and a scientific theory? [Short Answer] (3 Points)