

**CHEM 150**  
**Exam 1**

---

Name \_\_\_\_\_

**Multiple Choice**

Identify the letter of the choice that best completes the statement or answers the question.

- \_\_\_\_\_ 1. Which of the following is synonymous with "fact"?
- a hypothesis
  - an observation which is reproducible
  - an observation which is not reproducible
  - none of these
- \_\_\_\_\_ 2. Sometimes the same word can have different meanings. In the United States the word billion means "a thousand million" but in Britain the word billion means "a million million." Which of the following corresponds to the "British Billion"?
- $1 \times 10^{-9}$
  - $1 \times 10^{-6}$
  - $1 \times 10^9$
  - $1 \times 10^{12}$
- \_\_\_\_\_ 3. The dimensions of a piece of wood are 2.8 meters x 14 cm x 120 mm. What is the volume of this piece of wood?
- $4.7 \times 10^3 \text{ mm}^3$
  - $4.7 \times 10^3 \text{ cm}^3$
  - $4.7 \times 10^4 \text{ cm}^3$
  - $4.7 \times 10^3 \text{ m}^3$
- \_\_\_\_\_ 4. An object weighs 75.7 kg. What is the weight of this object expressed in the English system? [1 pound = 453.6 grams]
- 16.7 pounds
  - 34.3 pounds
  - 167 pounds
  - 343 pounds
- \_\_\_\_\_ 5. A particular model of "hybrid" car can travel 53.0 miles/gallon of gas. What is this fuel efficiency expressed in the metric system? [1 quart = 0.946 liter; 1 mile = 1.609 km]
- 8.71 km/liter
  - 20.2 km/liter
  - 22.5 km/liter
  - 90 km/liter
- \_\_\_\_\_ 6. Which state of matter retains its volume but adapts its shape to that of its container is?
- solid
  - liquid
  - gas
  - none of these

- \_\_\_ 7. Which of the following is true of ice, water and steam?
- they are three different chemical substances
  - they are the same substance in different chemical states
  - they are the same substance in different physical states
  - they are the same substance in different chemical and physical states

- \_\_\_ 8. The densities of the coinage metals (copper, silver and gold) are as follows:

$$\text{copper} = 8.95 \text{ g/cm}^3 \quad \text{silver} = 10.49 \text{ g/cm}^3 \quad \text{gold} = 19.32 \text{ g/cm}^3$$

A sample of material is found to weigh 14.03 grams, and have a volume of  $1.20 \text{ cm}^3$ . This is a sample of which of the coinage metals?

- copper
  - silver
  - gold
  - it is not one of the coinage metals
- \_\_\_ 9. Which of the following statements is true about a swinging pendulum?
- its kinetic energy is greatest when it is at the extreme (the highest point) of its swing
  - its potential energy is greatest when it is at the extreme (the highest point) of its swing
  - its kinetic energy does not change as it swings
  - its potential energy does not change as it swings
- \_\_\_ 10. If 47.0 calories of energy raised the temperature of a lead sample from  $28.3^\circ\text{C}$  to  $30.1^\circ\text{C}$  what is the mass of the sample? [specific heat of lead =  $0.0380 \text{ cal/g}\cdot^\circ\text{C}$ ]
- 26.1 g
  - 687 g
  - $1.24 \times 10^3 \text{ g}$
  - $2.27 \times 10^3 \text{ g}$
- \_\_\_ 11. Which of the following techniques would be most effective in separating the components of salt water?
- decantation
  - evaporation
  - filtration
  - they are all equally effective
- \_\_\_ 12. The fertilizer ammonium phosphate has nitrogen, hydrogen, phosphorous and oxygen atoms in the ratio 3:12:1:4. Which of the following is a correct (but unconventional) way to write the chemical formula for ammonium phosphate?
- $\text{Am}_3\text{H}_{12}\text{PO}_4$
  - $\text{Na}_3\text{H}_{12}\text{PhO}_4$
  - $\text{N}_3\text{H}_{12}\text{PO}_4$
  - none of these

- \_\_\_ 13. Which subatomic particle(s) is(are) found in the nucleus?
- electrons
  - neutrons
  - protons
  - protons and neutrons
- \_\_\_ 14. Which is true of isotopes of an element?
- they have different numbers of electrons
  - they have different numbers of neutrons
  - they have different numbers of protons
  - they have different chemical properties
- \_\_\_ 15. Suppose that at some time in the future chemists produce element X with atomic number 118 and it is found that this element has two isotopes.  $^{296}\text{X}$  has an abundance of 38.00% and  $^{301}\text{X}$  has an abundance of 62.00%. What is the atomic weight of X?
- 296 amu
  - 298.5 am
  - 299.1 amu
  - 301 amu
- \_\_\_ 16. How many electrons can be accommodated in the fourth shell of an atom?
- 2
  - 8
  - 18
  - 32
- \_\_\_ 17. Which of the following is true of the ionization energy of the elements?
- ionization energy generally decreases as we move left to right and decreases as we move top to bottom in the periodic table
  - ionization energy generally decreases as we move left to right and increases as we move top to bottom in the periodic table
  - ionization energy generally increases as we move left to right and decreases as we move top to bottom in the periodic table
  - ionization energy generally increases as we move left to right and increases as we move top to bottom in the periodic table
- \_\_\_ 18. Which of the following is true of a cation?
- it has equal numbers of protons and electrons
  - it has fewer protons than electrons
  - it has more protons than electrons
  - the relationship between protons and electrons depends on the specific cation
- \_\_\_ 19. Which of the following atoms is least likely to form an ion?
- fluorine
  - magnesium
  - silicon
  - sodium

- \_\_\_ 20. For which types of elements do we sometimes use the "ous/ic" system in naming ions?
- alkali metals
  - halogens
  - noble gases
  - transition metals
- \_\_\_ 21. Which of the following endings is generally associated with a monatomic anion?
- ...ade
  - ...ate
  - ...ic
  - ...ide
- \_\_\_ 22. If the name of an ion ends in "ate" what type of ion is it most likely to be?
- a monatomic anion
  - a monatomic cation
  - a polyatomic anion
  - a poly atomic cation
- \_\_\_ 23. What is the formula of the compound formed by sodium and bromine?
- NaBr
  - NaBr<sub>2</sub>
  - NaBr<sub>3</sub>
  - Na<sub>2</sub>Br
- \_\_\_ 24. What is the formula of the compound formed between the ammonium ion and the carbonate ion?
- NH<sub>4</sub>CO<sub>3</sub>
  - NH<sub>4</sub>(CO<sub>3</sub>)<sub>2</sub>
  - (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>
  - (NH<sub>4</sub>)<sub>3</sub>CO<sub>3</sub>
- \_\_\_ 25. AgCl is a chemical commonly used in photography. What is the correct name for AgCl?
- monosilver monochloride
  - silver chloride
  - silver chlorine
  - silver monochlorine
- \_\_\_ 26. In which of the following cases is a polar covalent bond formed?
- when an electron is transferred from one atom to another
  - when the electrons of a bond are shared equally by the two atoms
  - when the electrons of a bond are shared unequally by the two atoms
  - when a metallic element forms a bond with a non-metallic element
- \_\_\_ 27. Which Greek letter is used in denoting the spatial distribution of charge in a polar bond?
- alpha,  $\alpha$
  - beta,  $\beta$
  - gamma,  $\gamma$
  - delta,  $\delta$

- \_\_\_\_\_ 28. How many electrons are associated with a double bond?
- 1
  - 2
  - 4
  - 6
- \_\_\_\_\_ 29. Which of the following statements is true of Lewis structures?
- we can write Lewis structures for anions
  - we can write Lewis structures for cations
  - we can write Lewis structures for molecules
  - all of the above are true
- \_\_\_\_\_ 30. How many bonds does a carbon atom typically form?
- 2
  - 4
  - 6
  - 8

### Lewis Dot Structures

31. In the space provided, draw the Lewis dot structure of the element/compound (remember to include lone pair electrons, if present, into your drawing):

a. Sodium (2 points)

b. Tin (2 points)

c.  $\text{PH}_3$  (3 points)

d.  $\text{CH}_2\text{O}$  (3 points)

32. . Predict for each of the following ions if it is stable or unstable. (1 point each):

a.  $\text{K}^{2+}$

b.  $\text{S}^{2-}$

c.  $\text{Be}^+$

33. Write the chemical formula of the compound ammonium carbonate. (2 points)

34. Name the ionic compound  $\text{FeSO}_4$ . (2 points)

35. In each case, tell whether the bond is ionic, polar covalent, or non-polar covalent. (1 point each)

a.  $\text{MgF}_2$

b.  $\text{NCl}_3$

c.  $\text{Br}_2$