

## 13.1 and 13.2 + CHEM 1311 Review

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### I. CHEM 1311 Review

1. A weather forecaster predicts the temperature will reach 31°C. What is this temperature (a) in K, (b) in °F?
2. How many significant figures are in each of the following numbers (assume that each number is a measured quantity)? (a) 4.003, (b)  $6.023 \times 10^{23}$ , (c) 5000.
3. How many significant figures does each of the following numbers have? (a) 0.02670, (b) 328.0, (c) 7000.0, and (d) 0.00200.
4. Give the answer to the following problem to the maximum number of significant figures:  $50.00 \times 27.8 \times 0.1167$ .
5. Give the answer to the following problem to the maximum number of significant figures:  
$$(2.776 \times 0.0050) - (6.7 \times 10^{-3}) + (0.036 \times 0.0271)$$
6. If a woman has a mass of 115 lb, what is her mass in grams? Note: 1 lb = 453.6 g.

7. The average speed of a nitrogen molecule in air at 25°C is 515 m/s. Convert this speed to miles per hour. Note: 1 mile = 1.6093 km.

8. Earth's oceans contain approximately  $1.36 \times 10^9$  km<sup>3</sup> of water. Calculate the volume in liters.

9. What is the mass in grams of 1.00 gal of water? The density of water is 1.00 g/mL. Note: 1.057 qt = 1 L.

10. How many protons, neutrons, and electrons are in an atom of (a)  $^{197}\text{Au}$ , (b) Strontium-90?

11. Magnesium has three isotopes with mass numbers 24, 25, and 26. (a) Write the complete chemical symbol (superscript and subscript) for each. (b) How many neutrons are in an atom of each isotope?

12. Which of these compounds would you expect to be ionic: N<sub>2</sub>O, Na<sub>2</sub>O, CaCl<sub>2</sub>, SF<sub>4</sub>?

13. Select the most electronegative element from the list below.

- A) B
- B) C
- C) O
- D) H
- E) N

14. The greatest degree of ionic character is anticipated for the bond between which of the following?

- A) H and C.
- B) H and Cl.
- C) Br and Cl.
- D) C and Cl.
- E) H and Br.

15. Which of these substances contain both covalent and ionic bonds?

- A) HCN
- B) CH<sub>4</sub>
- C) NH<sub>4</sub>Cl
- D) H<sub>2</sub>O<sub>2</sub>
- E) H<sub>2</sub>S

16. Calculate the formula weight of (a) sucrose, C<sub>12</sub>H<sub>22</sub>O<sub>11</sub> (table sugar); and (b) calcium nitrate, Ca(NO<sub>3</sub>)<sub>2</sub>.

17. Without using a calculator, arrange these samples in order of increasing numbers of carbon atoms: 12 g <sup>12</sup>C, 1 mol C<sub>2</sub>H<sub>2</sub>, 9 × 10<sup>23</sup> molecules of CO<sub>2</sub>.

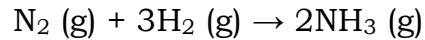
18. Calculate the number of H atoms in 0.350 mol of C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>.

19. What is the molar mass of glucose? C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>?

20. Calculate the number of moles of glucose ( $C_6H_{12}O_6$ ) in a 5.380 g sample.

21. Calculate the mass, in grams, of 0.433 mol of calcium nitrate.

22. The most important commercial process for converting  $N_2$  from the air into nitrogen-containing compounds is based on the reaction of  $N_2$  and  $H_2$  to form ammonia ( $NH_3$ ).



How many moles of  $NH_3$  can be formed from 3.0 mol of  $N_2$  and 6.0 mol of  $H_2$ ?

## II. 13.1 — The Solution Process

The formation of solutions is favored by the increase in \_\_\_\_\_ that accompanies mixing.

Three kinds of intermolecular interactions are involved in solution formation:

1.

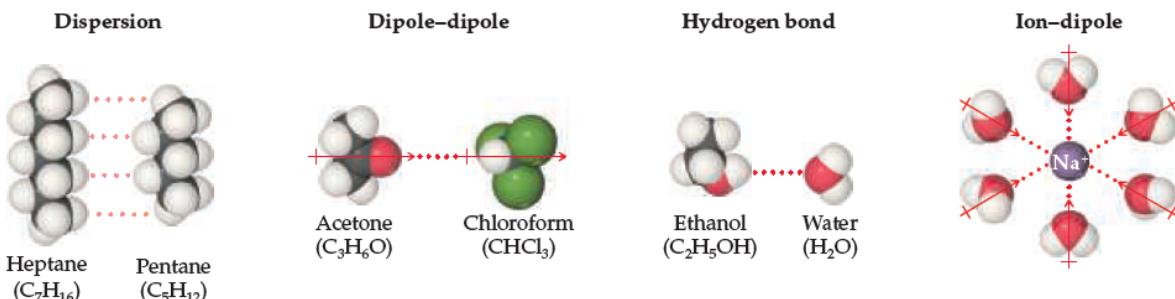
2.

3.



### Go Figure

Which atom in water points toward  $\text{Na}^+$  in the ion-dipole interaction? Why?



▲ Figure 13.2 Intermolecular interactions involved in solutions.

How does an Ion-dipole form when a salt is dissolved in water?

1.

2.

3.

Define **Solvation** –

Define **Hydration** –

Solution processes are typically accompanied by changes in \_\_\_\_\_.

- For example,

### III. 13.2 — Saturated Solutions and Solubility | **PART #1**

As a solid solute begins to dissolve in a solvent, the concentration of solute particles in solution \_\_\_\_\_, increasing the chances that some solute particles will collide with the surface of the solid and reattach.

- Basically, the dissolved “stuff” will become undissolved because there’s too much “stuff” in solution.

Define **Crystallization** –

The process of dissolution and crystallization occur in dynamic equilibrium, meaning they continuously occur at equal rates.

