Key

Unit 2 Quiz Study Guide

1. Hydrogen sulfide is composed of two elements: hydrogen and sulfur. In an experiment, 8.448 g of hydrogen sulfide is fully decomposed into its elements.

a. If 0.472 g of hydrogen are obtained in this experiment, how many grams of sulfur must be obtained? 7.976 g

b. What fundamental law does this experiment demonstrate?

Law of conservation of mass

c. How is this law explained by Dalton's atomic theory?

That no ~~[illegible]~~ matter can be created or destroyed

2. A chemist finds that 36.50 g of nitrogen will react with 20.85 g, 41.68 g, 83.37 g, or 104.21 g of oxygen to form four different compounds.

a. Calculate the mass of oxygen per gram of nitrogen in each compound.

first compound 0.5712

second compound 1.142

third compound 2.284

fourth compound 2.855

3. The radius of an atom of lithium ion (Li^{+1}) is about 0.6 Å.

a. Express this distance in nanometers (nm).

$$0.6\ \text{Å} \times \frac{1\ \text{m}}{10^{10}\ \text{Å}} \times \frac{10^{9}\ \text{nm}}{1\ \text{m}} = 0.06\ \text{nm}$$

b. Express this distance in picometers (pm).

$$0.06\ \text{nm} \times \frac{10^{-9}\ \text{m}}{1\ \text{nm}} \times \frac{10^{12}\ \text{pm}}{1\ \text{m}} = 60\ \text{pm}$$

c. How many lithium ion (Li^{+1}) atoms would have to be lined up to span 1.0 cm?

$$0.6\ \text{Å} \times 2 = 1.2\ \text{Å} \times \frac{10^{-10}\ \text{m}}{1\ \text{Å}} \times \frac{100\ \text{cm}}{1\ \text{m}} = 1.2 \times 10^{-8}\ \text{cm}$$

$$1.0\ \text{cm} \times \frac{1\ \text{atom}}{1.2 \times 10^{-8}\ \text{cm}} = 8.33 \times 10^{7}\ \text{atoms}$$

4. How many protons, neutrons, and electrons are in the following atoms?

a. ^{15}N

protons 7

neutrons 8

electrons 7

b. ^{45}Sc

protons 21

neutrons 24

electrons 21

c. $^{24}Mg^{2+}$

protons 12

neutrons 12

electrons 10

5. Write the correct symbol, with both superscript and subscript, for each of the following. Use the list of elements in the front inside cover as needed.
(Enter your answer in the ${}^{A}_{Z}X$ form)

(a) The isotope of silicon that has ~~an equal number~~ one more neutron than protons

$^{29}_{14}Si$

(b) the isotope of cobalt with mass number 59

$^{59}_{27}Co$

6. Write the empirical formula corresponding to each of the following molecular formulas.

a. H_2O_2 HO

b. $C_{12}H_8Cl_4$ C_3H_2Cl

c. P_2Br_4 PBr_2

7. How many hydrogen atoms are in each of the following?

a. $C_{10}(H_2O)_{12}$ 24

b. $CH_2(CH_2)_2I$ 6

8. Write the chemical formula of the following

Strontium Perchlorate $Sr(ClO_4)_2$

Barium Iodide BaI_2

Copper (I) Nitride Cu_3N

9. Provide the name or chemical formula, as appropriate, for each of the following binary molecular substances.

CO carbon monoxide

P_2Cl_4 diphosphorus tetrachloride

Disulfur Decafluoride S_2F_{10}

Carbon Tetraiodide CI_4

10. Using the periodic table to guide you, predict the chemical formula and name of the compound formed by the following elements.

	Formula	Name
a. Ca and Cl	$CaCl_2$	calcium chloride
b. K and O	K_2O	potassium Oxide
c. Al and N	AlN	Aluminum nitride

11. Identify the specific element that corresponds to each of the following electron configurations, draw the Aufbau diagram for each, and indicate the number of unpaired electrons.

	Element	Aufbau Diagram	# of unshared electrons
$1s^2\ 2s^2\ 2p^5$	F	$\underset{1s}{\uparrow\downarrow}\ \underset{2s}{\uparrow\downarrow}\ \underset{2p}{\uparrow\downarrow\ \uparrow\ \uparrow}$	1
[Ar] $4s^2\ 3d^{10}\ 4p^4$	Se	[Ar] $\underset{4s}{\uparrow\downarrow}\ \underset{3d}{\uparrow\downarrow\ \uparrow\downarrow\ \uparrow\downarrow\ \uparrow\downarrow\ \uparrow\downarrow}\ \underset{4p}{\uparrow\downarrow\ \uparrow\ \uparrow}$	2
$1s^2\ 2s^1$	Li	$\underset{1s}{\uparrow\downarrow}\ \underset{2s}{\uparrow}$	1
[He] $2s^2\ 2p^3$	N	[He] $\underset{2s}{\uparrow\downarrow}\ \underset{2p}{\uparrow\ \uparrow\ \uparrow}$	3

1) 4.5E-18 J

2) 5.24E-23 J

3) 3.37E-19 J

4) 2.66E-19 J

5) 1.59E-18 kJ

6) 3.98E-19 J

7) 3.60E15 s^{-1} or Hz

8) 1.42E-4 J

9) 4.58E-19 J

10) 960 nm