

## Practice Questions

### EXAM 2

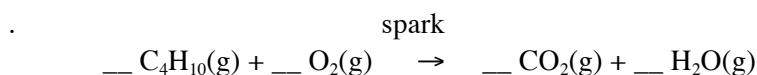
Iodine is found in sea water and plays an important biochemical role within the thyroid gland in humans. In sea water the form of iodine is the ion, which consists of 53 protons and 54 electrons. Therefore the ion is....

- a. positive and called an anion.
- b. positive and called a cation.
- c. negative and called an anion.
- d. negative and called a cation.

Use the Periodic Table to determine the formula of magnesium nitride.

- a.  $\text{Mg}_3\text{N}$
- b.  $\text{Mg}_3\text{N}_2$
- c.  $\text{MgN}$
- d.  $\text{Mg}_2\text{N}_3$
- e.  $\text{MgN}_2$

Butane,  $\text{C}_4\text{H}_{10}$ , burns to give carbon dioxide and water. What are the coefficients in the balanced equation for the reaction?



Calculate the molar mass (Molecular Weight) of  $(\text{NH}_4)_3\text{PO}_4$

- a. 113 g/mol
- b. 121 g/mol
- c. 149 g/mol
- d. 182 g/mol

Calculate the number of moles silver nitrate,  $\text{AgNO}_3$  (molar mass = 169.9g/mol), in 126 g of silver nitrate.

Select the formula for a compound that has 8 carbon atoms, 15 hydrogen atoms, 3 nitrogen atoms, and 3 oxygen atoms.

- a.  $\text{C}_8\text{H}_{15}\text{N}_3\text{O}_3$
- b.  $\text{C}_{15}\text{H}_8\text{N}_3\text{O}_3$
- c.  $\text{C}_{14}\text{H}_3\text{N}_3\text{O}$
- d.  $(\text{C}_8\text{H}_{15}\text{NO})_3$

Strychnine has received notoriety in murder mysteries as a poison. It has a formula of  $\text{C}_{21}\text{H}_{22}\text{N}_2\text{O}_2$ . How many moles of carbon atoms and oxygen atoms are there in one mole of strychnine?

- a. 21 mol of carbon atoms and 1 mol of oxygen atoms
- b. 21 mol of carbon atoms and 2 mol of oxygen atoms
- c. 22 mol of carbon atoms and 21 mol of oxygen atoms
- d. 2 mol of carbon atoms and 2 mol of oxygen atoms

The formula for the illegal drug cocaine is  $C_{17}H_{21}NO_4$  (molar mass = 303.4 g/mol). What is the percentage of oxygen in the compound?

- (a) 4.62%
- (b) 5.27%
- (c) 6.99%
- (d) 21.1%
- (e) 67.3%

How many valence electrons does aluminum have and which Nobel gas is isoelectronic with the aluminum ion?

- a. 2, He
- b. 2,  $N_2$
- c. 3, Ne
- d. 3, Ar
- e. 3, Xe

Place the following elements in order of **increasing** electronegativity: Be, Mg, Sr, Ca

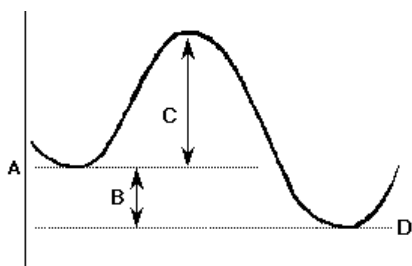
- a)  $Be < Mg < Sr < Ca$
- b)  $Be < Ca < Sr < Mg$
- c)  $Sr < Ca < Mg < Be$
- d)  $Sr < Mg < Ca < Be$

Predict the polarity of methyl alcohol,  $CH_3OH$ , and methane,  $CH_4$ . The geometry about the carbon atom is tetrahedral, and bent about the oxygen atom.

- a) Methyl alcohol is polar, and methane is nonpolar.
- b) Both are nonpolar.
- c) The polarities cannot be predicted.
- d) Methyl alcohol is nonpolar, and methane is polar.
- e) Both are polar.

Which physical state of matter exhibits the highest kinetic energy?

- a) solid state
- b) liquid state
- c) gaseous state
- d) metamixt state
- e) all of the above



In the reaction diagram above, which corresponds to the activation energy ( $E_{act}$ )?

- A , B, C, D, None

In the reaction diagram, the reaction is:

- a) Isothermic
- b) Eurythermic
- c) Exothermic
- d) Stenothermic
- e) Endothermic

Air is made up of nitrogen, oxygen, carbon dioxide, and other gases. Air is a(n)

- a. heterogeneous mixture.
- b. element.
- c. compound.
- d. pure substance.
- e. homogeneous mixture.

Carbon-12 is one of three carbon isotopes. The other two respectively have one more neutron or two more neutrons. Which of the three isotopes is the most abundant in nature?

- a. the isotope with 6 neutrons
- b. the isotope with 7 neutrons
- c. the isotope with 8 neutrons

The molar mass of iron is:

- a. 6 grams
- b. 12 grams
- c.  $6.02 \times 10^{23}$  grams
- d. 26 grams
- e. 55 grams

Atoms in molecules auto-arrange themselves in 3 dimensions to maximize the \_\_\_\_\_ of opposite charges between the atoms and minimize the \_\_\_\_\_ of like charges of the atoms, to produce the best favorable arrangement of all atoms in a molecule illustrated.

Which two that best complete the statement?

- a. distance apart
- b. proximity
- c. attraction
- d. repulsion
- e. strength
- f. weakness

Hannah prepared a 1.0 M (mol/L) solution of  $\text{CaCl}_2$ . Which action(s) will increase the concentration of the solution?

- (1) Add more  $\text{CaCl}_2$
- (2) Evaporate water
- (3) Drain solution

- |   |
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| <ul style="list-style-type: none"><li>a. (1) only</li><li>b. (1) and (2)</li><li>c. (2) and (3)</li><li>d. (1) and (3)</li><li>e. (1), (2), and (3)</li></ul> |
|---|

***True (A) / False (B)***

A molecule is mostly empty space.

In the Periodic Table, the relative size of atoms increases across a row and down a column.

In the Periodic Table, electronegativity of atoms increases across a row and decreases down a column.

A balloon containing 22.4 liters of hydrogen gas at zero degrees Celsius and a pressure of one atmosphere will contain the same number of oxygen atoms in a balloon of the same size at the same pressure and temperature.

Matter and energy cannot be created or destroyed, but they can inter-convert from either, energy to matter, or matter to energy.

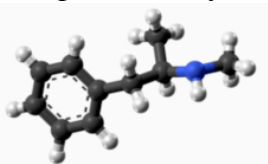
Plants remarkably combine two molecules using enzyme catalysts found in chlorophyll to form molecules of sugar and diatomic oxygen molecules.

The burning of methane or any hydrocarbon, such as octane, involves both breaking bonds and forming bonds.

Hydrogen and helium nuclei fuse together and form other atoms that have heavier nuclei. Ions with positive charges are non-metals.

Atoms having the same electronegativities are expected to form no bonds.

Receptors in enzymes and cells have no effect on biological reactions.



***A structure of methamphetamine is shown above.*** It is a structure of a stereoisomer, which has a mirror image.

Opening a house door in the winter will let the cold come into the warmth of the house.

The temperature ( $^{\circ}\text{C}$ ) remains constant when a liquid boils.

The change of state from a liquid to a gas requires energy from the surroundings.

Metals generally have lower heat capacities than water. ( $\text{J}/(\text{g}\cdot\text{K})$  or  $\text{J}/(\text{mol}\cdot\text{K})$ )

Adipose tissue (fat) can help a person's core body temperature stay warm in cold climates or in cold water.

Units of energy (joules or calories) never relate to other units: °C, kg, m, s, watts, coulombs, newtons, or volts.

A catalyst raises the Energy of Activation and lowers the rate of chemical reactions.

A 1.0 M solution of sodium chloride is a weaker electrolyte solution than a 1.0 M solution of calcium chloride.

How much energy (kJ) is produced from the complete combustion of one gallon of isooctane ( $C_8H_{18}$ , gasoline),  $d = 0.69 \text{ g/mL}$ ? The heat of reaction, that is, the amount of energy produced per mole of isooctane, is  $-5,460.0 \text{ kJ/mol}$ .

**REVIEW ALL resources in re: 3-d Shapes & Lewis Structures**

One example:

a) Draw a Lewis structure for a methane molecule,  $CH_4$ ,



b) Provide the total number of *bonding pairs* of electrons in the molecule.

c) Provide the total number of *free pairs* of electrons.

d) Identify the molecular shape of the molecule.

e) Is the C-H bond: ionic, covalent or polar covalent?

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f) Is the molecule polar or nonpolar?

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*Be well versed in covalent bonding, Lewis structures, and electronic & molecular shapes*, particularly of ammonia,  $NH_3$ , water,  $H_2O$ , and methane,  $CH_4$ .

**Recommended REVIEW**

\* ChemWiki/Libre text Vocabulary I and II to use in matching questions.

\* All Guiding Questions, all embedded i-clicker Powerpoint questions, all Simulation questions, all Worksheets, and all Quiz & Lab questions through *Solutions & Aqueous Reactions*. (Acids-Bases will not be on Exam #2.)

Some Examples:

**TED: Mole / Guiding Questions**  
**How big is a mole? (calculations)**

**Worksheet**  
**Moles & Molar Masses II (calculations)**  
*Atoms / Compounds / Molecular Formulas*