

Spring 2013 Student Performance Analysis with Instructional Guidance

Chemistry Standards of Learning



Presentation may be paused and resumed
using the arrow keys or the mouse.

Mass and Charge of Subatomic Particles

SOL CH.2

The student will investigate and understand that the placement of elements on the periodic table is a function of their atomic structure. The periodic table is a tool used for the investigations of

c) mass and charge characteristics of subatomic particles;

Mass and Charge of Subatomic Particles (CH.2c)

Students need additional practice with abstract science concepts at the atomic and subatomic levels.

1. The net charge on an aluminum ion is +3 because there are-

- a) 10 protons and 13 electrons in the atom
- b) 13 protons and 10 neutrons in the nucleus
- c) 10 neutrons and 13 electrons in the atom
- d) 13 protons and 10 electrons in the atom

2. An atom contains 70 protons, 70 electrons, and 99 neutrons. What is the mass number?

- A) 239
- B) 169
- C) 140
- D) 70

Instructional Guidance CH.2c

Mass and Charge of Subatomic Particles

Students need more experiential opportunities as well as models and simulations while engaging in the historical development of quantum theory.

Suggested laboratory investigation from the Enhanced Scope and Sequence Activity:

“Atomic Structure: Periodic Table”

http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/atomic_structure_periodic_relationships/sess_CH-2defg1h.pdf

Instructional Guidance CH.2c

Mass and Charge of Subatomic Particles

Virginia Science Activities, Models, and Simulations (SAMS)

<http://www.doe.virginia.gov/instruction/science/resources/sams/chemistry.docx>

Protons: ●●●
Neutrons: ●●●
Electrons: ●●●

Neutral Atom

Lithium

Model:
 Orbits
 Cloud

Element

H	He																
Li	Be																
Na	Mg																
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf
Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At					

Net Charge

0

Mass Number

6

Show

Element Name
 Neutral/Ion
 Stable/Unstable

Build an Atom

Atom Symbol Game

PHET



Types of Chemical Bonds

SOL CH.3

The student will investigate and understand how conservation of energy and matter is expressed in chemical formulas and balanced equations. Key concepts include
d) bonding types;

Types of Chemical Bonds (CH.3d)

Which of these compounds is most likely to contain a nonpolar covalent bond?

- a) H_2
- b) SO_2
- c) CH_4
- d) CaCl_2

Instructional Guidance CH.3d

Types of Chemical Bonds

Students would benefit from more opportunities to explore the nature of different chemical bond types.

- **Making observations between ionic and covalent compounds:** investigate properties and their interactions with other substances.

- **Enhanced Scope and Sequence Lessons:** “*Aspirin Lab*” and “*A Crystal Lab*”

- **Models and Simulations:**

<http://www.doe.virginia.gov/instruction/science/resources/sams/index.shtml>

<http://concord.org/stem-resources/chemical-bonds>



Organic Chemistry

SOL CH.6

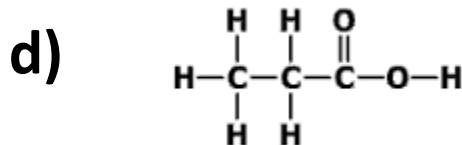
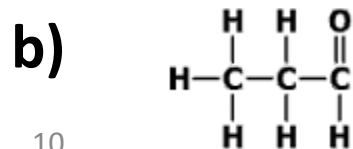
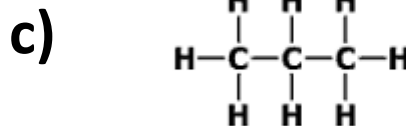
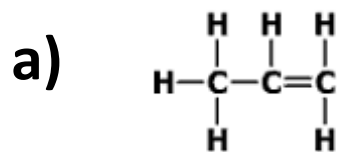
The student will investigate and understand how basic chemical properties relate to organic chemistry and biochemistry. Key concepts include

- a) unique properties of carbon that allow multi-carbon compounds; and
- b) uses in pharmaceuticals and genetics, petrochemicals, plastics, and food.

Organic Chemistry (CH.6a)

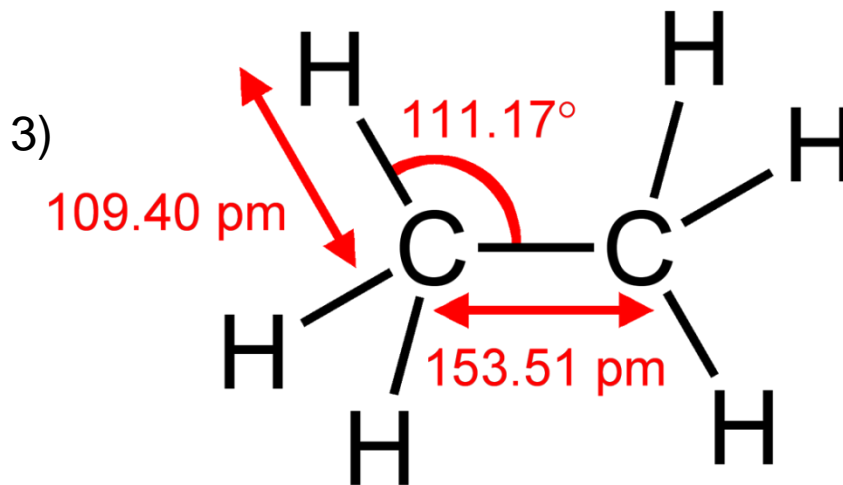
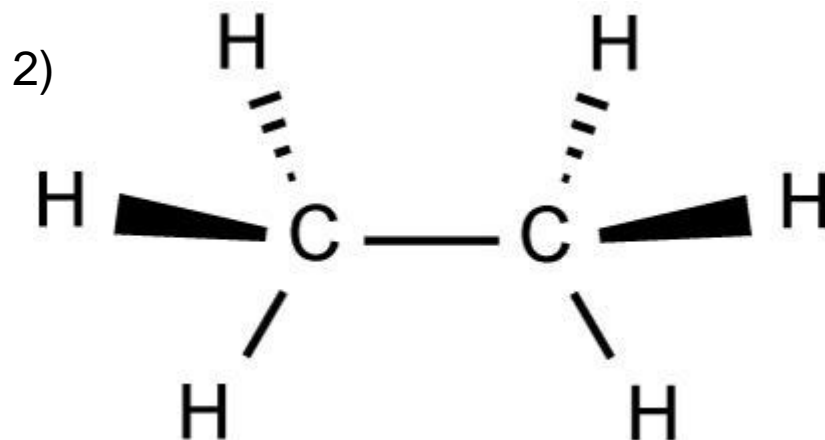
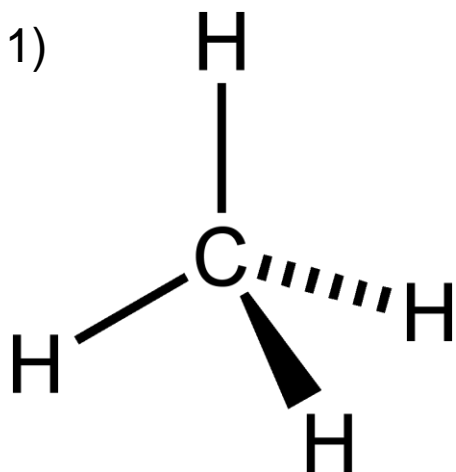
Students need additional practice investigating attributes of organic compounds.

Which formula represents a molecule with fully saturated carbon (C) atoms?



Instructional Guidance CH.6

Organic Chemistry



Stoichiometry

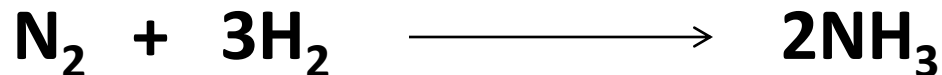
SOL CH.4

The student will investigate and understand that chemical quantities are based on molar relationships. Key concepts include

- b) stoichiometric relationships;
- c) solution concentrations;

Stoichiometry (CH.4b)

Students need additional practice with items that require the application of mathematical relationships and calculations.



If 6 liters of hydrogen gas are used, how many liters of nitrogen gas will be needed for the above reaction at STP?

- a) 2 liters
- b) 3 liters
- c) 4 liters
- d) 12 liters

Solution Concentrations (CH.4c)

Students need additional practice calculating answers using significant digits.

Directions: Type your answer in the box. Your answer must be in decimal form. Use significant figures in your answer.

Calculate the molar mass of a solute in a 1.30 L solution with a molarity of 0.50 M containing 10.5 g of the solute.

$\frac{\text{g}}{\text{mol}}$

Correct answers: 16 OR 16.

Technical assistance with significant digits:

http://www.doe.virginia.gov/instruction/science/resources/tech_assistance_significant_digits.pdf

Instructional Guidance CH.4b and CH.4c

Stoichiometry and Solution Concentrations

Suggested laboratory investigations using the Enhanced Scope and Sequence Lessons:

For opportunities to use stoichiometric relationships:

“Predicting products and writing equations”

http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/chemical_formulas_reactions/ess_CH-3b1abc.pdf

“Moles Lab Activities”

http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/molar_relationships/ess_CH-4abcd1abcbg.pdf

For opportunities to use solutions and perform calculations of solution concentrations:

“Solution Concentrations”

http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/molar_relationships/ess_CH-4c1bfg2h3abd.pdf

Practice Items

This concludes the student performance information for the spring 2013 Chemistry SOL test.

Additionally, test preparation practice items for Chemistry can be found on the Virginia Department of Education Web site at:

http://www.doe.virginia.gov/testing/sol/practice_items/index.shtml#science

Contact Information

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