

Technology Enhanced Questions

[http://www.doe.virginia.gov/testing/sol/practice\\_items/index.shtml#science](http://www.doe.virginia.gov/testing/sol/practice_items/index.shtml#science)

Toolbar

Periodic Table

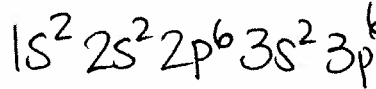
2. Directions: Click and drag each selected superscript into a box. You must select all of the correct superscripts. Some boxes could be blank.

Complete the electron configuration for argon (Ar) at the ground state.

Superscripts

1s 2s 2p 3s 3p 4s

1	2	3
4	5	6
7	8	9



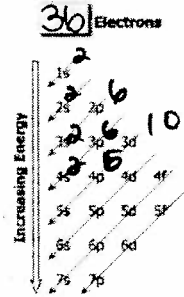
3. Directions: Type your answer in the box. Use "+" or "-" for the electrical charge.

-1

What is the oxidation number of a fluoride ion?

4. Directions: Type your answer in the box. Your answer must be a whole number.

How many electrons are needed to completely fill the orbitals from 1s to 4p?



1. Directions: Click and drag each electron spin arrow to the appropriate box. You must place all spins in the correct order. Each arrow may be used more than once.

Write the orbital notation for silicon (Si) at the ground state.

Orbital notation for Si:

4s:

3p:  $\uparrow\downarrow$   $\uparrow$   $\uparrow$

2p:  $\uparrow\downarrow$   $\uparrow\downarrow$   $\uparrow\downarrow$

1s:  $\uparrow\downarrow$

Electron Spins:  $\uparrow$   $\downarrow$

5. Directions: Click and drag each selected coefficient to the box. Each box must have a coefficient. Use the lowest possible coefficients to balance this chemical equation.

Chemical equation:  $2Al + 1Fe_2O_3 \rightarrow 1Al_2O_3 + 2Fe$

Coefficients: 1 2 3, 4 5 6, 7 8 9

6. Directions: Click on a box to choose the items you want to select. You must select all of the correct items.

A change in which of these could affect the chemical equilibrium of a closed system?

Concentration Pressure Catalyst Volume Temperature

7. Directions: Type your answer in the box. Your answer must be in decimal form.

Calculate the volume occupied by  $8.85 \times 10^{23}$  particles of an ideal gas at STP.

Handwritten solution:

$8.85 \times 10^{23}$  particles  $\frac{32.9L}{6.02 \times 10^{23} \text{ particles/mole}}$  = 0.56 mole

$0.56 \text{ mole} \times 22.4L$  = 12.5L

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

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.

Handwritten solution:

$0.50 \text{ mole} \times 1.30L = 0.65 \text{ mole}$

$\frac{10.5g}{0.65 \text{ mole}} = 16.15 \text{ g/mol}$

9. Directions: Click on a box to choose the compounds you want to select. You must select all of the correct compounds. Which of these are organic compounds?

Structural formulas for CH<sub>4</sub>, NH<sub>3</sub>, HCN, H<sub>2</sub>O, H<sub>2</sub>SO<sub>4</sub>, and H<sub>2</sub>N<sub>2</sub>.

10. Directions: Click on a box to choose the items you want to select. You must select all of the correct items. Which of these polymers are naturally occurring?

Polystyrene Polyester Teflon DNA

11. What is the electron configuration of scandium (Sc) in Sc(NO<sub>3</sub>)<sub>3</sub>?

Handwritten solution:

Neutral Sc:  $1s^2 2s^2 2p^6 3s^2 3p^4 3d^1$

ion Sc:  $1s^2 2s^2 2p^6 3s^2 3p^4$

Sc(NO<sub>3</sub>)<sub>3</sub>:  $1s^2 2s^2 2p^6 3s^2 3p^4 3d^1$

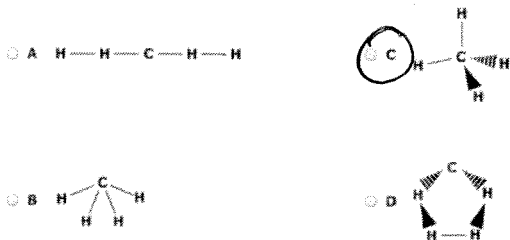
12. Which formula represents a molecule with fully saturated carbon (C) atoms?

Structural formulas for A (propene), B (propane), C (propyne), and D (propanoic acid).

13. Which statement describes how plastics differ from nucleic acids?

- A Plastics are synthetic polymers, but nucleic acids are natural polymers.
- B Plastics are formed from repeated subunits, but nucleic acids are not.
- C Plastics are formed from organic compounds, but nucleic acids are not.
- D Plastics are polymers, but nucleic acids are monomers.

14. Which geometric structure most accurately illustrates the shape of a molecule of CH<sub>4</sub>?



Properties of CH<sub>2</sub>Cl<sub>2</sub>

Heat of Fusion	Heat of Vaporization
4.60 $\frac{\text{kJ}}{\text{mol}}$	28.06 $\frac{\text{kJ}}{\text{mol}}$

15. Applying 7.80 kJ of heat melts what mass of solid CH<sub>2</sub>Cl<sub>2</sub> at its melting point?

- A 23.6 g
- B 50.1 g
- C 144 g
- D 306 g

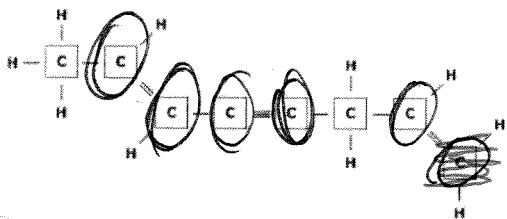
$$\frac{7.80 \text{ kJ}}{4.60 \text{ kJ/mol}} = \frac{x \text{ g}}{28.06 \text{ kJ/mol}}$$

(MM)

$$x = 84.93 \text{ g}$$

18. Directions: Click on the correct answers.

Select all of the carbon atoms that make this theoretical molecule unsaturated.

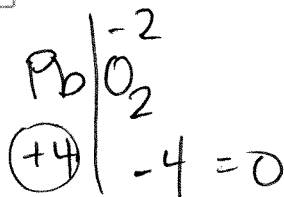


19. Directions: Click and drag the correct answers to the box.

What is the name of the compound PbO<sub>2</sub> according to IUPAC rules?

The chemical name is

dilead	<input checked="" type="radio"/> oxide
tetralead	oxygen
lead(II)	dioxide
<input checked="" type="radio"/> lead(IV)	tetraoxide



16. Directions: Type your answer in the box. Round to the nearest hundredth place.

Calculate the atomic mass of the theoretical element using the data in the table.

Isotope Data for a Theoretical Element

Naturally Occurring Isotope	Mass Number	Relative Abundance
1	10	92%
2	11	6.5%
3	13	1.5%

10.11

$$(10 \times 0.92) + (11 \times 0.065) + (13 \times 0.015)$$

17. Directions: Click on the correct answer.

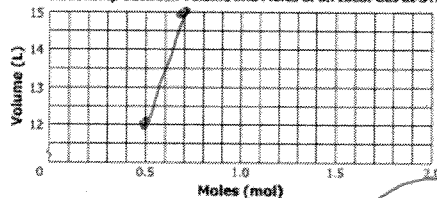
Select the column in which all elements exist as diatomic molecules at room temperature.

6 C	7 N	8 O	9 F	10 Ne
14 Si	15 P	16 S	17 Cl	18 Ar
32 Ge	33 As	34 Se	35 Br	36 Kr
50 Sn	51 Sb	52 Te	53 I	54 Xe

20. Directions: Click on the grid to plot each point. Line segments will connect the points.

Plot two points to form a line from the data set that correctly shows the relationship between volume and moles of an ideal gas at STP.

Relationship Between Volume and Moles of an Ideal Gas at STP



Data Set A		Data Set B		Data Set C	
Volume (L)	Approximate Moles (mol)	Volume (L)	Approximate Moles (mol)	Volume (L)	Approximate Moles (mol)
12	1.1	12	1.9	12	0.5
15	1.3	15	1.5	15	0.7

$$1 \text{ mole} = 22.4 \text{ L}$$