

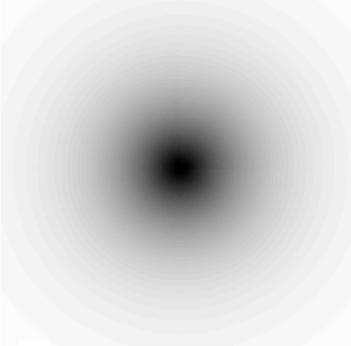
1. (8 pts.) The doctor said I was 173 cm tall. Not being a fan of the metric system I wondered, "How tall am I in feet and inches?" Remember 1 in = 2.54 cm.
1. _____
2. _____
3. _____
4. _____
5. _____
2. (8 pts.) You have recently been given a gift... a beautiful, big, green emerald. You wonder, should you be grateful or should you steer clear of your new friend. One simple way to test is to measure the density of the stone. The density of an emerald is typically between 2.70–2.78 g/mL. The stone was placed on a piece of weighing paper, and their combined weight was found to be 1.6749 g. The mass of the weighing paper was 0.501 g. When the stone is placed in a graduated cylinder filled with water, the level of the water goes from 5.00 mL to 5.43 mL. Did you get an emerald? Support your response with math.
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
3. (12 pts.) Oxygen-16 and oxygen-18 are two isotopes of oxygen.
- a. Oxygen-16 and oxygen-18 have different masses. This fact is **not** consistent with Dalton's atomic theory. What does Dalton's atomic theory say about the masses of an atom of a given element?
17. _____
18. _____
- b. How have modern scientists altered Dalton's atomic theory as it relates to identifying an element?

4. Regardless of the metal used to make a cathode ray tube, the same particles are observed streaming from the cathode to the anode.
- (6 pts.) What are these particles?

 - (6 pts.) Why can all of the metals create the same particles?
5. Rutherford shot tiny α -particles at a thin, gold foil. Atomic theory of the day predicted that the particles would pass straight through the foil. But that is not what Rutherford saw. Many of the particles went straight through, some were deflected slightly, and a few bounced back off of the foil.
- (6 pts.) Describe the model for atomic structure before Rutherford. That is, describe the Plum Pudding (a.k.a. chocolate chip cookie) model of atomic structure.

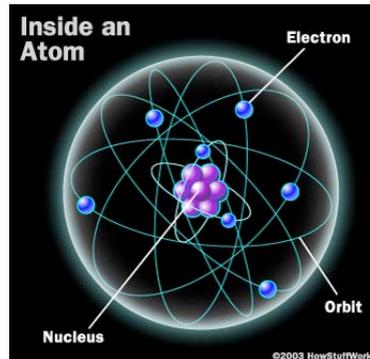
 - (6 pts.) Describe how Rutherford's model explains his observations?
6. (8 pts.) Name the subatomic particles that are found in the nucleus of an atom.

7. Below two graphical representations of an atom are presented.



<http://wikipedia.org>

Model 1



Model 2

a. (8 pts.) Describe what each model implies about the electrons and our ability to predict their locations in each atom.

b. (4 pts.) Which model more accurately represents the current theory about the structure of an atom and the location of the electrons that are part of the atom.

8. a. (6 pts.) Match the following masses with the correct subatomic particles: 1.0087 u, 1.0073 u, 0.00055 u.

electron _____ neutron _____ proton _____

b. (6 pts.) List the charges of the electron, the neutron, and the proton.

9. (6 pts.) Write the complete atomic symbols for fluorine-19, uranium-238, and lithium-7.

10. (8 pts.) Although Bohr's model of the atom was fatally flawed, he was the first scientist who proposed a model that starting from known, measurable quantities—like the masses of an electron and a proton and the charges of an electron and a proton—could predict the frequencies of light emitted by a hydrogen atom. Describe the important contribution that Bohr proposed in his “shell” model of the hydrogen atom.

11. Atoms on the periodic table are listed in order of increasing atomic number, but they aren't arranged as a simple list. There is a more complicated pattern of elements (two in the first row, eight in the second, eight in the third, eighteen in the fourth).

a. (6 pts.) Historically, why were elements grouped together?

b. (6 pts.) Why do we arrange the columns of elements on the table the way we do today? In other words, why are F, Cl, and Br in the same column of the periodic table?

12. (8 pts.) Determine the ground state electron configuration for Cl (that $1s^2 2s$ etc stuff).

13. (4 pts.) Is a cation positively or negatively charged.

14. a. (6 pts.) Are Mg and Rb metals or non-metals?

b. (6 pts.) When elements like Mg and Rb react, do they tend to gain or lose electrons?

15. a. (6 pts.) Are S and Cl metals or non-metals.

b. (6 pts.) When elements like S and Cl react, do they tend to gain or lose electrons?

16. a. (4 pts.) Predict the simplest formulas for compounds made from the following elements.

b. (4 pts.) Would these compounds be ionic or covalent?

i. Ca and Br

ii. O and S

iii. N and F

iv. K and N

a.

a.

a.

a.

b.

b.

b.

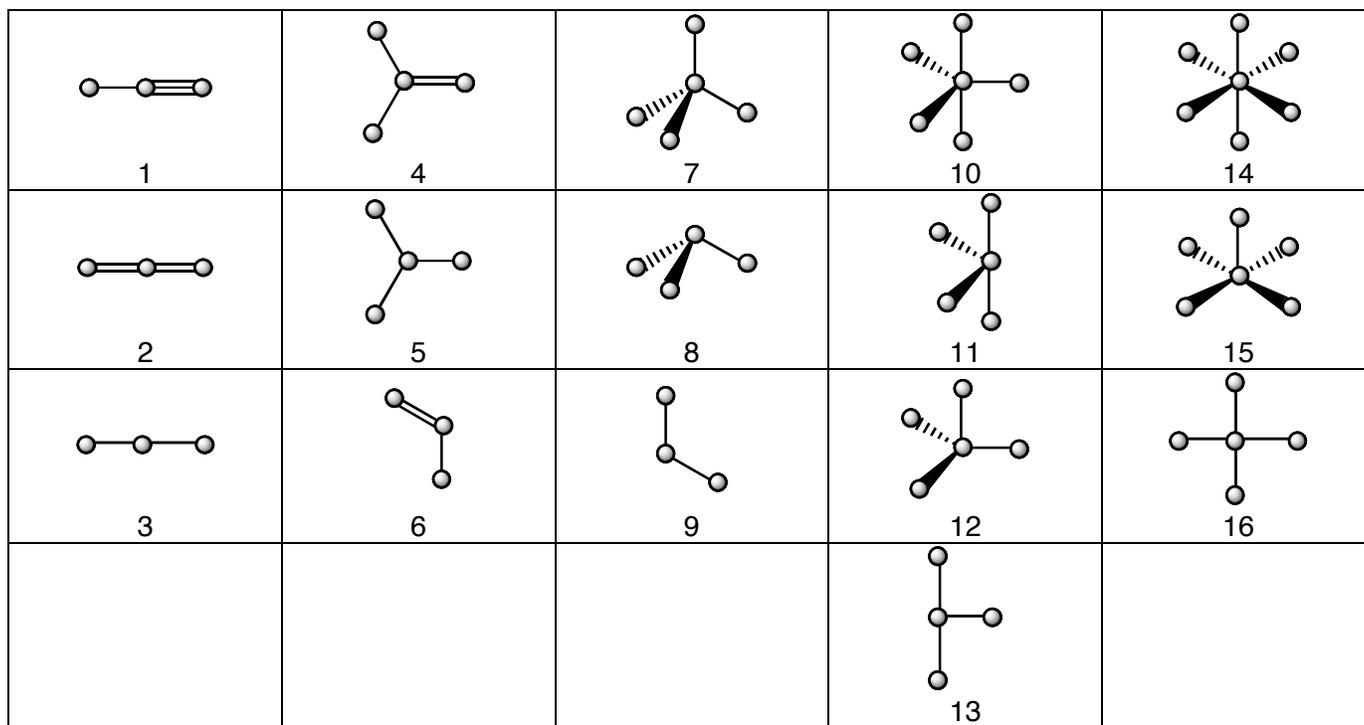
b.

Electronegativities of Selected Elements							He
H 2.1							
Li 1.0	Be 1.5	B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne
Na 0.9	Mg 1.2	Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0	Ar
						Br 2.8	Kr

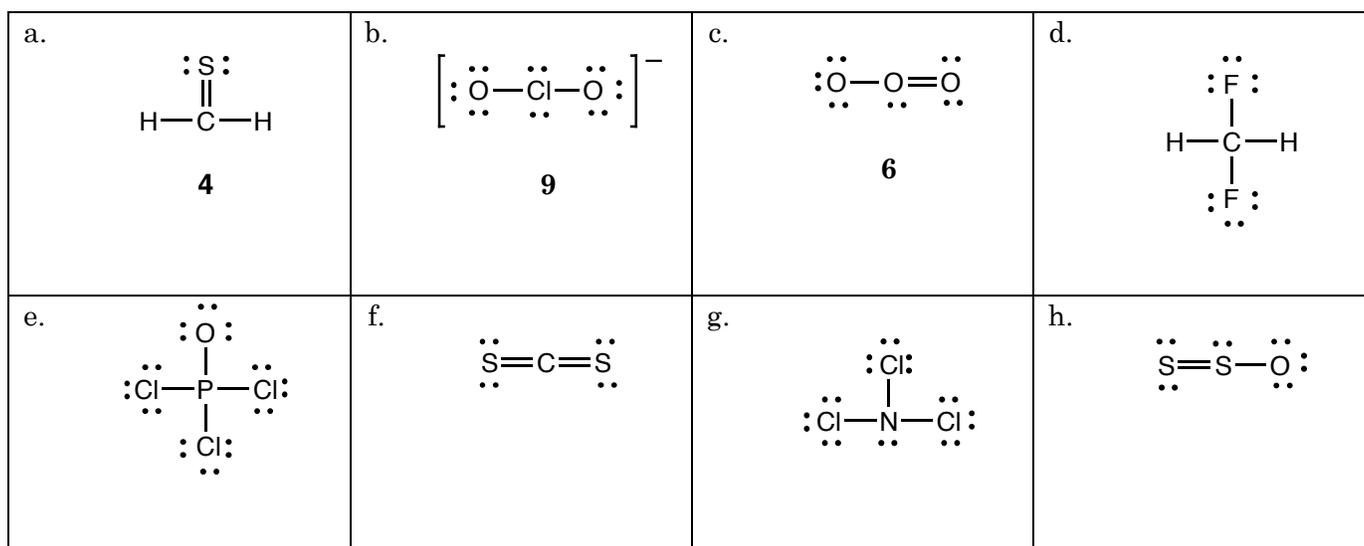
17. (8 pts.) For the bonds drawn below, indicate which would be polar and which would be nonpolar. For each polar bond, indicate the positive and negative ends of the bonds.

H—P	C—Cl	O—Si	F—F
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A selection of possible 3D structures is drawn below. The lines represent bonds, and the balls represent atoms.



18. (8 pts.) Match the correct shape drawn above to the following Lewis structures.



a = 4; b = 9; c = 6; d = 7
e = 7; f = 2; g = 8; h = 6