1. (8 pts.) My dog has a mass of 33.1 kg. What does my dog weigh in pounds. 1 lb = 0.4536 kg.

2. (8 pts.) You have recently been given a gift... a beautiful, big, red ruby. 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 a ruby is typically between 3.97–4.05 g/cm^3. The mass of the stone is 0.350 g. When you place the stone in a graduated cylinder filled with water, the level of the water goes from 6.00 mL to 6.13 mL. Did you get a ruby? Support your response with math; by the way, 1 mL = 1 cm^3.

3. (8 pts.) No matter where you get your salt (table salt) the ratio of the mass of sodium to the mass of chlorine in the salt is always 1 to 1.54. How does current atomic theory explain why the ratio is always 1 to 1.54 and never some other ratio, for example, 1 to 1.33?

4. (8 pts.) In a cathode ray tube, a beam of particles travels from one electrode to another electrode. When the beam travels through a magnetic field, the path of the beam changes (the beam bends). What does this experiment reveal about the beam.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

15. _____

16. _____

17. _____

18. _____

19. _____

5. (8 pts.) What cathode ray tube experiment helped determine that the beam in the cathode ray tube is a beam of particles? (Briefly describe the experiment.)
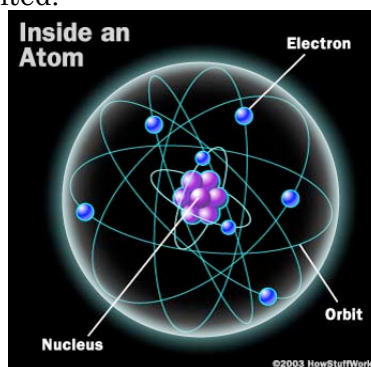
6. (8 pts.) Name the subatomic particles that are found in the nucleus of an atom.

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

http://wikipedia.org
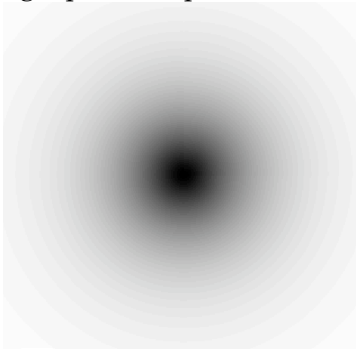
Model 1

Model 2

a. (8 pts.) Describe what each model implies about the electrons 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 atomic symbols for nitrogen-14, oxygen-16, and oxygen-17.

10. ^{18}F is often used as the tracer when Positron Emission Tomography (a PET scan) is performed. ^{18}F decomposes by releasing a positron. The symbol for a positron is given below.

   (8 pts) Complete the equation for the nuclear reaction where a positron is released from an ^{18}F atom. Remember to draw the complete symbol for ^{18}F and the atom that is produced by the positron emission.

$$\longrightarrow \quad {}^{0}_{+1}\beta$$
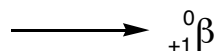
11. (4 pts.) Is mass conserved in the nuclear reaction occurring in a nuclear power plant? Explain.

12. a. (2 pts.) Which form of radiation—α particles, β particles, or γ rays—requires the most shielding to stop it?

   b. (2 pts.) Which requires the least shielding?

13. (4 pts.) Is an anion positively or negatively charged.

14. (6 pts.) When elements like Li and Ca react, do they tend to gain or lose electrons?

15. (6 pts.) When elements like Br and O 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. K and O	ii. P and Cl	iii. C and F	iv. Mg and S
a.	a.	a.	a.
b.	b.	b.	b.

H 2.1	Electronegativities of Selected Elements						He
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—O	C—S	F—C	Br—Br

18. (10 pts.) Describe how you determine whether a molecule is polar or nonpolar.

A selection of possible 3D structures is drawn below.

1	4	7	10	14
2	5	8	11	15
3	6	9	12	16
			13	
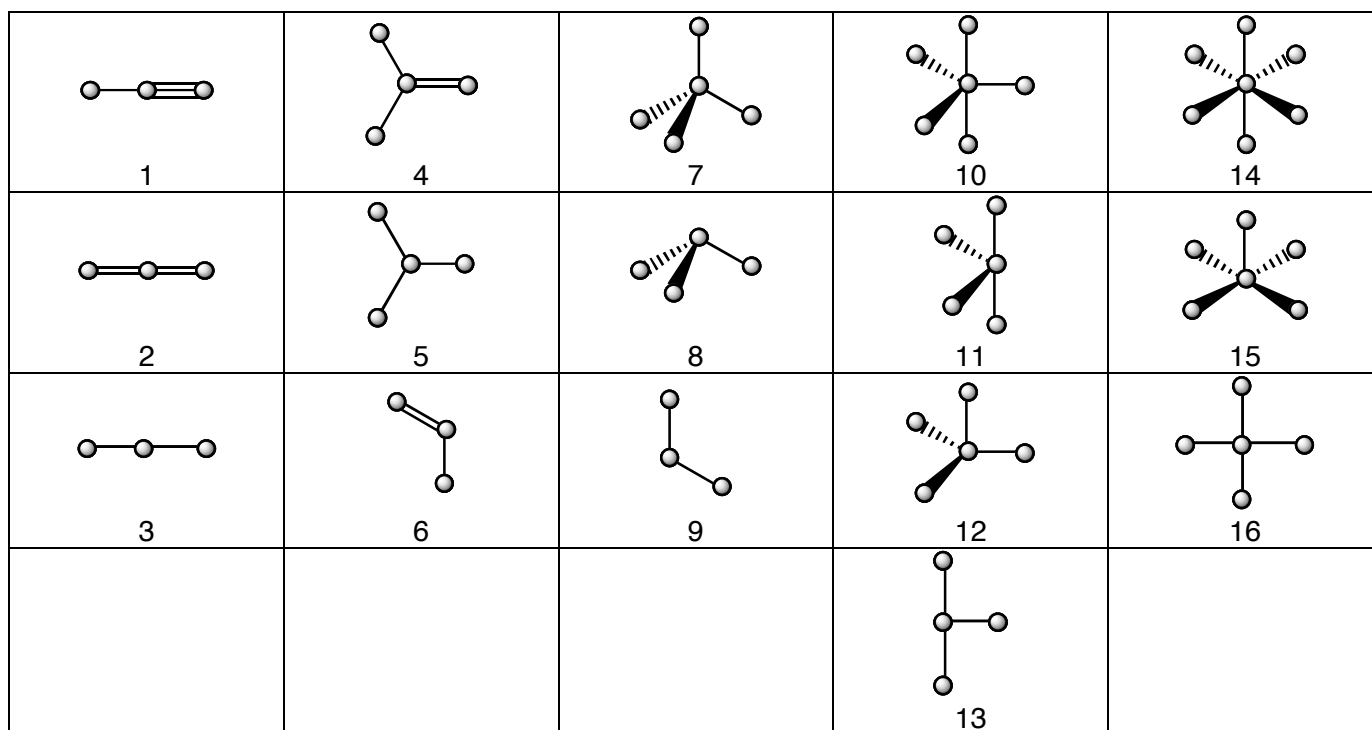
19. (8 pts.) Match the correct shape drawn above to the following Lewis structures.

a.	b.	c.	d.
$\left[\begin{array}{c} :\!\ddot{O}\!: \\ :\!\ddot{O}\!-\!\overset{..}{Cl}\!-\!\ddot{O}\!: \\ :\!\ddot{O}\!: \end{array}\right]^{-}$	$\begin{array}{c} :\!\ddot{O}\!: \\ :\!\overset{..}{Cl}\!-\!\overset{..}{S}\!-\!\overset{..}{Cl}\!: \end{array}$	$\begin{array}{c} :\!\ddot{O}\!: \\ \| \\ :\!\overset{..}{Cl}\!-\!C\!-\!\overset{..}{Cl}\!: \end{array}$	$:\!\overset{..}{\underset{..}{Cl}}\!-\!\overset{..}{\underset{..}{S}}\!-\!\overset{..}{\underset{..}{Cl}}\!:$

e.	f.	g.	h.
$:\!\overset{..}{\underset{..}{O}}\!-\!\overset{..}{\underset{..}{S}}\!=\!\ddot{O}$	$\overset{..}{\underset{..}{O}}\!=\!C\!=\!\overset{..}{\underset{..}{S}}$	$\left[\overset{..}{\underset{..}{O}}\!=\!\overset{..}{N}\!-\!\overset{..}{\underset{..}{O}}\!:\right]^{-}$	$\begin{array}{c} H \\ \| \\ :\!\overset{..}{\underset{..}{Cl}}\!-\!Si\!-\!\overset{..}{\underset{..}{Cl}}\!: \\ \| \\ H \end{array}$