Name: Key Class: _____ Date: _____

Atomic Structure and Theory Test

Multiple Choice (2 pts each)
Identify the letter of the choice that best completes the statement or answers the question.

A 1. Who first proposed an atomic theory based on scientific knowledge?
   a. John Dalton
   b. Jons Berzelius
   c. Robert Brown
   d. Dmitri Mendeleev

D 2. Experiments with cathode rays led to the discovery of the
   a. proton.
   b. nucleus.
   c. neutron.
   d. electron.

A 3. Who explained the behavior of positively charged particles being deflected from a metal foil as the nucleus?
   a. Ernest Rutherford
   b. John Dalton
   c. James Chadwick
   d. Niels Bohr

B 4. In the gold foil experiment, most of the particles fired at the foil
   a. bounced back.
   b. passed through the foil.
   c. were absorbed by the foil.
   d. combined with the foil.

C 5. The gold foil experiment led to the discovery of the
   a. electron.
   b. cathode ray.
   c. nucleus.
   d. neutron.

D 6. What did Rutherford conclude about the structure of the atom?
   a. An atom is indivisible.
   b. Electrons make up the center of an atom.
   c. An atom carries a positive charge.
   d. An atom contains a small, dense, positively charged central region.

B 7. A nuclear particle that has about the same mass as a proton, but with no electrical charge, is called a(n)
   a. nuclide.
   b. neutron.
   c. electron.
   d. isotope.

C 8. The nucleus of most atoms is composed of
   a. tightly packed protons.
   b. tightly packed neutrons.
   c. tightly packed protons and neutrons.
   d. loosely connected protons and electrons.

C 9. An aluminum isotope consists of 13 protons, 13 electrons, and 14 neutrons. Its mass number is
   a. 13.
   b. 14.
   c. 27.
   d. 40.

B 10. Isotopes are atoms of the same element that have different
   a. principal chemical properties.
   b. masses.
   c. numbers of protons.
   d. numbers of electrons.

C 11. When the light from excited atoms of an element is passed through a prism, the distinct colored lines produced are called
a. ground states.
b. excited states.
c. line-emission spectra.
d. electromagnetic spectra.

C 12. Bohr's theory helped explain why
a. electrons have negative charge.
b. most of the mass of the atom is in the nucleus.
c. excited hydrogen gas gives off certain colors of light.
d. atoms combine to form molecules.

A 13. If electrons in an atom have the lowest possible energies, the electrons are in their
a. ground states.
b. inert states.
c. excited states.
d. radiation-emitting states.

B 14. For an electron in an atom to change from the ground state to an excited state,
a. energy must be released.
b. energy must be absorbed.
c. radiation must be emitted.
d. the electron must make a transition from a higher to a lower energy level.

C 15. Most of the volume of an atom is occupied by the
a. nucleus.
b. nuclides.
c. electron cloud.
d. protons.

B 16. Atoms of the same element that have different masses are called
a. moles.
b. isotopes.
c. nuclides.
d. neutrons.

C 17. Isotopes of an element contain different numbers of
a. electrons.
b. protons.
c. neutrons.
d. nuclides.

18. Elements! Give the name for the symbol (must be spelled correctly) or the symbol for the name...you know the drill... (5 pts)

a) As Arsenic

b) U Uranium

c) F Fluorine

d) W Tungsten

e) K Potassium

f) Pb Lead

g) Mercury Hg

h) Strontium Sr

i) Bromine Br

j) Calcium Ca

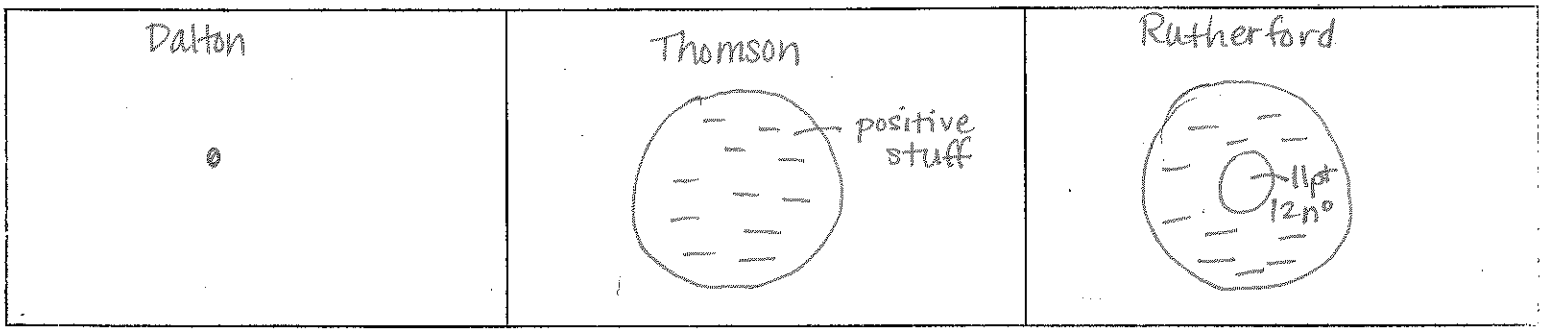
19. Convert 8.25×10^9 mm to km. Make sure you show your work for full credit... (2 pts)

$$8.25 \times 10^9 \text{ mm} \left| \frac{1 \text{ m}}{1000 \text{ mm}} \right| \frac{1 \text{ km}}{1000 \text{ m}} = 8250 \text{ km}$$

20. Fill in the following chart about these atoms or ions or isotopes...(one point each – total of 16 points)

Symbol	Charge	Mass #	Atomic #	# of Protons	# of Neutrons	# of Electrons
Al	+3	31	13	13	18	10
Fr	+1	223	87	87	136	86
Rn	Neutral	222	86	86	136	86
Ni	Neutral	58	28	28	30	28

21. Draw a Dalton, Thomson and Rutherford model of the neutral sodium-23 atom...include a legend explaining what each subatomic particle is drawn as... label each box so I know which diagram and drawn... (6 pts)



22. Circle the event in each group that came first... (5 pts)

a) discovery of the nucleus	or	discovery of the neutron	or	discovery of the electron
b) gold-foil experiment	or	cathode ray tube experiments	or	"The Big Bang Theory" premiers
c) plum pudding model	or	American Revolution	or	solid sphere model
d) idea that atoms exist	or	idea that atoms have particles	or	idea that atoms have energy levels
e) nucleus discovered	or	particles discovered in the atom	or	OHS built

23. Fill in the blank (4 pts - 1 pt for each blank)

a. An isotope is an atom of an element with a different number of neutrons. Since it has a different number of neutrons, it has a different mass.

b. An ion is an atom of an element with a charge. The atom becomes charged by again or losing electrons.

24. Answer the following question about the atoms listed in this chart... (10 pts)

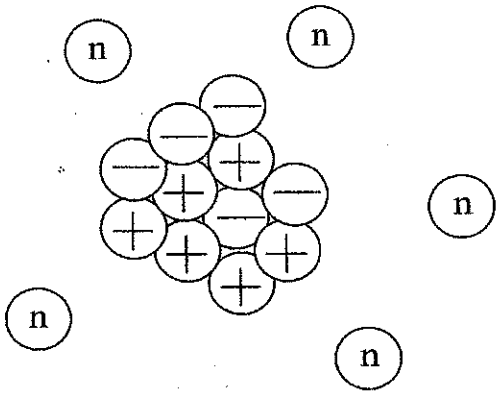
Letter	# of Protons	# of Neutrons	# of Electrons	Mass #
A	9	10	9	19
B	9	9	9	18
C	8	11	10	19
D	7	9	10	16

a. Which letters represent isotopes of each other? A & B

b. Which letters represents ions? C & D

c. Which letters have the same mass number? A & C

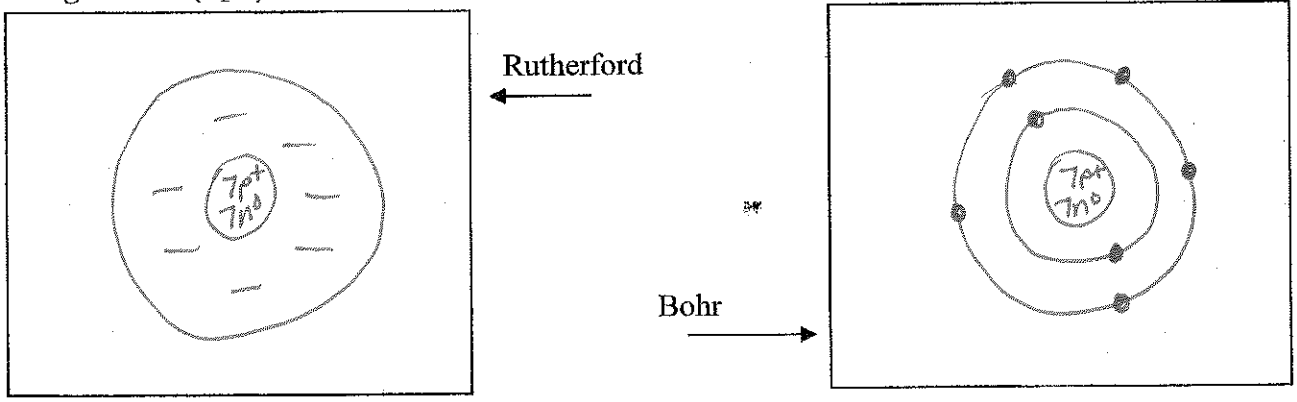
25. Little Drew is told to draw Rutherford's model of the neutral ***carbon – 12*** atom... here's what he drew... (What are two things that Drew did wrong and what should he have done instead? (1 point per box- total of 4 points)



What he did wrong...	What he should have done...
n° on outside of nucleus	e⁻ on outside
5 n° 5 e⁻	should be 6n° & 6e⁻

pt all together in nucleus — spread them out

26. Draw an atom of the most common isotope of neutral nitrogen as Rutherford and Bohr would have imagined it... (4 pts)...



27. From the diagrams above, explain where the Rutherford model of the atom fell short and what Bohr proposed differently... (5 pts)

Rutherford's model does not have the electrons in specific orbits around the nucleus.

28. In a paragraph, describe Ernest Rutherford's experiment and what lead him to change the outlook on the atom. Include the experiment by name, a description of the experiment, the major component of the atom his experiment brought forth. Include diagrams if it helps support your paragraph and any scientists that aided in his discoveries... (5 pts)

* paragraph/grammar/argument
* Gold Foil Experiment
* particles shot @ gold foil
* something solid in atom/particles went straight through
* nucleus/p+ added to atom

29. Mike measured out 3.2 grams of Pt in lab. Knowing that atoms are extremely small, he was curious on how many platinum atoms existed within his measured amount.

a. How many moles of platinum does Mike have? (5 pts)

$$3.2\text{g Pt} \left| \frac{1\text{mol Pt}}{195.1\text{g Pt}} \right. = 0.016\text{mol Pt}$$

b. How many atoms of platinum does Mike have? (5 pts)

$$0.016\text{mol Pt} \left| \frac{6.02\times10^{23}\text{atoms}}{1\text{mol Pt}} \right. = 9.632\times10^{21}\text{atoms Pt}$$

c. What is the mass of 2.75×10^{24} atoms of platinum? (5 pts)

$$2.75\times10^{24}\text{atoms Pt} \left| \frac{1\text{mol Pt}}{6.02\times10^{23}\text{atoms Pt}} \right| \frac{195.1\text{g Pt}}{1\text{mol Pt}} = 891.24\text{g Pt}$$

30. Which of Dalton's 5 principles was disproven and by whom? How did he prove otherwise? (5 pts)

Dalton's principle disproven: Atoms cannot be subdivided

Disproven by: Thomson with the cathode-ray Tube discovered the electron!