Review Sheet – Advanced Chemistry, ch 4 & 24
Atomic Structure and Nuclear Chemistry

Name: KEY 14-15 Date:__________ Period:___

Test Expectations

The student should be able:

- *Order and describe the development of early atomic theory and compare and contrast various scientists' contributions.*
- *Apply chemical symbols to determine the quantity of subatomic particles of given atoms or isotopes and vice versa.*
- *Apply isotopic abundance to calculate average atomic mass of isotopes.*
- *Calculate the mass percentage of elements within compounds.*
- *Describe the characteristics of subatomic particles*
- *Describe the characteristics of each type of nuclear decay*
- *Describe the four fundamental forces and explain how each could result in nuclear decay*
- *Perform calculations to determine if a radioisotope will undergo alpha or beta decay*
- *Compare and contrast nuclear reactions (fission and fusion)*
- *Explain real world applications of nuclear reactions*
- *Write nuclear equations*
- *Perform half life calculations*

1. Define each of the following terms clearly and completely on a separate sheet of paper. Also, be able to define any vocabulary terms listed in the study guides at the end of ch 4 and ch 24.

SEE NOTES + TEXT BOOK

- Atom
- Cathode ray tube
- Electron
- Proton
- Neutron
- Subatomic particle
- Atomic mass unit
- Atomic number
- Mass number
- Atomic mass
- Ion
- Isotope

2. Use a periodic table to complete the following chart.

Chemical Symbol	Atomic Number	Number of Electrons	Number of Neutrons	Atom or ion?	Isotope notation
$^{128}_{52}Te^{2-}$	52	54	76	ion	Te-128
$^{25}_{12}Mg$	12	12	13	atom	Mg-12
$^{79}_{34}Se^{+}$	34	33	45	ion	Se-79
$^{137}_{56}Ba$	56	56	81	atom	Ba-137

3. Calculate the average atomic weight for magnesium using the information below.

mass number	exact weight	percent abundance
24	23.985042	78.99
25	24.985837	10.00
26	25.982593	11.01

$$= \left(\frac{23.985042 \times 78.99}{100}\right) + \left(\frac{24.985837 \times 10.00}{100}\right) + \left(\frac{25.982593 \times 11.01}{100}\right)$$

$$= 24.305052 \text{ amu}$$

4. Describe each of the following scientists contributions to our understanding of atomic structure.
(What did they discover/hypothesize? How did their experiment support their theory? Has their theory been disproven or built-upon by another scientist? If so, by whom & how?)

↳ see notes for evidence

A. Democritus v. Aristotle

↓ Atomos

↘ 4 "elements"

B. Dalton

Atoms

4 laws

C. Crookes

created cathode Ray tubes

D. Thomson

used cathode Ray tube to i.d. electrons.

E. Rutherford

used gold foil exp. to i.d. nucleus

F. Moseley

used X-Rays to i.d. protons

G. Becquerel/Marie & Pierre Curie

identified radioactivity

H. Millikan

oil drop experiment to determine charge + mass of electron

I. Chadwick

id. neutron

J. Bohr

used light + math to suggest electrons exist in orbits.

Sample Practice Problems for Nuclear:

5. Determine if the following isotopes will undergo radioactive decay. If so, which type of decay will occur? (What graph do you have in your notes that can be used to help you determine which isotopes will undergo radioactive decay?)

A. Pm-165 $\frac{n}{p} = \frac{104}{61} = \frac{1.7}{1} > \frac{1.5}{1}$ which should be ratio for stable isotopes with atomic # between 21-83, so beta decay.

B. Po-218
$\frac{n}{p} = \frac{134}{84} = \frac{1.59}{1}$ but # p > 83 so alpha decay.

C. Th-229
$\frac{n}{p} = \frac{139}{90} = \frac{1.5}{1}$ but # p > 83 so alpha decay.

6. Balance the following nuclear equations:

A. $^{230}_{90}Th \longrightarrow {}^{4}_{2}He + {}^{226}_{88}Ra$

B. $^{210}_{84}Po + {}^{0}_{-1}e \longrightarrow {}^{210}_{83}Bi$ (NOT ON TEST)

C. $^{14}_{6}C \longrightarrow {}^{14}_{7}N + {}^{0}_{-1}\beta$

7. Write nuclear equations for the decay of the radioisotopes listed below:

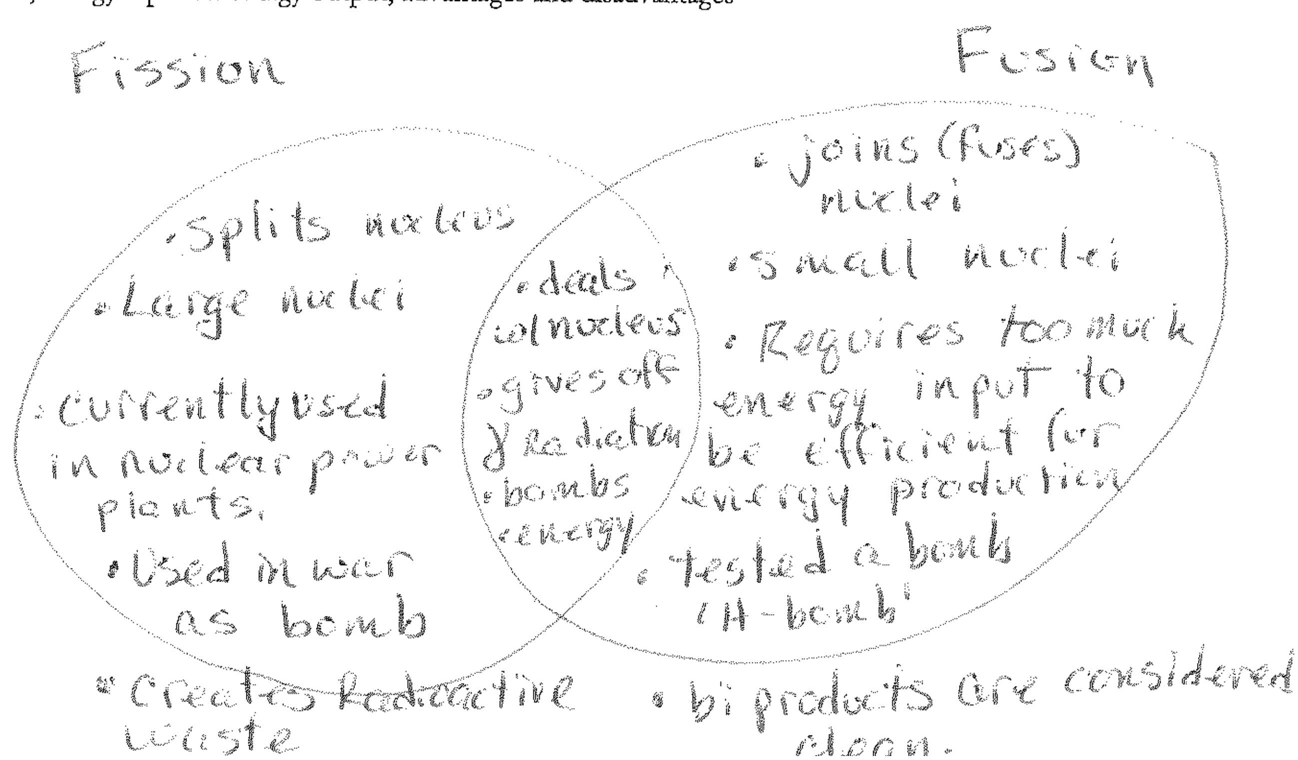
A. alpha decay of radium-226

$^{226}_{88}Ra \rightarrow {}^{4}_{2}\alpha + {}^{222}_{86}Rn$

B. beta decay of H-3

$^{3}_{1}H \rightarrow {}^{0}_{-1}\beta + {}^{3}_{2}He$

8. Below, construct a Venn Diagram, comparing and contrasting fission and fusion. Consider: reactants, products, real life applications, energy input vs. energy output, advantages and disadvantages



9. In 5.49 seconds, 1.20 g of argon-35 decays to leave only 0.15 g. What is the half-life of argon-35?

$n = \frac{t}{T}$

$N_0 = 1.20g$

$N = 0.15g$

$t = 5.49 s$

$T = ?$

$$T = \frac{t \cdot \ln(\frac{1}{2})}{\ln(\frac{N}{N_0})}$$

$$T = \frac{5.49 \cdot \ln(\frac{1}{2})}{\ln(\frac{0.15}{1.20})}$$

$$T = 1.83$$

$$n = \frac{5.49}{1.83} = 3$$

10. If the half-life of iodine-131 is 8.10 days, how much of a 50g sample will be left after 2 hours?

$T = 8.10$ days $= 194.4$ hrs

$N_0 = 50g$

$N = ?$

$t = 2$ hrs

① convert 8.10 days to hours

$$8.10 \text{ days} \times \frac{24 \text{ hrs}}{1 \text{ day}} = 194.4 \text{ hrs}$$

$$N = N_0 \left(\tfrac{1}{2}\right)^{t/T}$$

$$N = 50 \left(\tfrac{1}{2}\right)^{2/194.4}$$

$$N = 49.6 g$$

↑ Bad sigfigs.

*****Be sure to revisit, and more importantly REDO any past homework assignments, classwork problems, and laboratory activities. Remember, you don't always remember what you don't know, until you try the problem again*****