Section 4D Review

Name: ____________________

1) What is the mass of $NaClO_3$ solute dissolved in 3.0 kg of water to make a 0.25 m solution.

80 g

2) Calculate the mole fraction of sulfur dioxide in air when a sample of air has 1.5 g of SO_2 in 40 g of nitrogen and 15 g of oxygen.

0.012

3a) What is the new freezing point for a 300 g water solution that contains 95 g of KCl.

-15.8 ^{O}C

b) What is the new boiling point of the above solution.

104.4 ^{O}C

3) A 150 g water solution contains 15.0 g of ammonium sulfate. What is the freezing and boiling point of the solution?

4) List several examples of sources of natural background radiation.

Food, air, water, phones, TV, the ground, space.

5a) What are the 5 types of ionizing radiation?

Alpha, beta, gamma, UV and X rays

5b) List the types of nuclear radiation from most penetrating ability to least.

Gamma > Beta > Alpha

6a) What happens to the intensity of the radiation as the distance increases?

It goes down exponentially, doubling the distance cuts the radiation by ¼.

6b) Why is lead the best at shielding from nuclear radiation?

Lead is the most dense, keeping the radiation from travelling through the material.

7) What is the difference between ionizing radiation and nonionizing radiation?

Ionizing radiation is particle or electromagnetic radiation that can cause the ionization of atoms or molecules, and is considered dangerous. Non-ionizing radiation is EM radiation that does not remove electrons from an atom or molecule and is considered unharmful.

8) The following data is recorded when conducting an experiment in freezing point depression of water:

Mass of beaker	150.63 g
Mass of beaker with water	309.54 g
Freezing point of water	2.1 ^{O}C
Mass of beaker, water and solute	324.52 g
Freezing point of water solution	-2.2 ^{O}C
Solute's ionization (given)	4

What is the molar mass of the solute?

164 g/mol

9) List, in chronological order, the discovery of the nucleus and subatomic particles. Also, describe changes to the atomic models as each of these objects were discovered.

Dalton proposed a model of the atom that each element was made of small spheres. Thomson discovered the electron, which he included into Dalton's model as electrons imbedded in a positive mass. Rutherford discovered the nucleus, and include that as a positive center, surrounded by negative electron. Rutherford later discovered the proton as part of the nucleus. Chadwick later discovered the neutron and put that in the nucleus as well.

10) What is the difference between fission and fusion?

Fission is the splitting of a nucleus into two smaller nuclei. Fusion is the combining of two small nuclei into one larger nucleus. Both of these nuclear processes release massive amounts of energy.

11) Complete the following transmutations reactions:

$^{238}_{92}U + {}^{12}_{6}C \longrightarrow 4{}^{1}_{0}n + {}^{246}_{98}Cf$

$^{239}_{94}Pu + 2{}^{1}_{0}n \longrightarrow {}^{0}_{-1}e + {}^{241}_{95}Am$

12a) Write the alpha decay for neptunium-239.

$^{239}_{93}Np \longrightarrow {}^{4}_{2}\alpha + {}^{235}_{91}Pa$

12b) Write the beta decay for bismuth-214.

$^{214}_{83}Bi \longrightarrow {}^{0}_{-1}\beta + {}^{214}_{84}Po$

13) Carbon-14 has a half-life of 5730 years. If a fossil is found to have 1/16 of the amount of a carbon-14 in a living bone, then how old is the fossil?

4 half-lives, 22,920 y old

14) Xenon-133 is a radiotracer used to identify problems in the lungs. The half-life of Xenon-133 is 5.2 days. If, upon application, a patient is injected with 3.0 g of the radioactive isotope, how much will be left in their system after 26 days?

0.094 g

Answers: 1) 80 g 2) 0.012 3a) -15.8 ^{O}C 3b) 104.4 ^{O}C 4) 101.1 ^{O}C, -4.2 ^{O}C
8) 164 g/mol 13) 22,920 y old 14) 0.094 g