Chem 51, Spring 2016 Name_____
Exam 2 (Chp 2-Atoms and Radioactivity) 75 pt

Answer Questions 1-19 on your scantron. Only one answer for each question (2 pt ea).

2.1-2.3 Atomic structure, atomic number, mass number and isotopes
Fill in the blanks in the following statements using these answers (one answer per question):
A) electron(s) B) proton(s) C) neutron(s) D) nucleus E) electron cloud AB) mass

1. The atomic number on the periodic table equals the number of _____in the atom.

2. Most of the mass of an atom is found in the _____.

3. In a neutral atom the number of _____equals the number of protons.

4. The size of the atom is determined by the size of the _____.

5. What is the mass number of an atom of potassium that has 20 neutrons?
A) 15 B) 19 C) 35 D) 39 E) 59

6. Which of the following is TRUE for the atoms ^{12}C, ^{13}C and ^{14}C?
A) They all have the different mass numbers.
B) They are all radioactive.
C) They all have different atomic numbers.
D) They all have 6 neutrons.
E) They all have different numbers of protons.

7. Which of the following represents a pair of isotopes?
A) $^{14}_{6}C$, $^{14}_{7}N$ B) $^{1}_{1}H$, $^{2}_{1}H$ C) $^{32}_{16}S$,) $^{32}_{16}S^{-2}$ D) O_3, O_2

(15 pt) (2.2) Complete the following table:

Symbol	Number of Protons	Number of Neutrons	Number of Electrons	Mass Number	Name
$^{1}_{1}H$					
	12		12	24	
$^{9}_{4}Be$		5			

29 pt

2.6-2.9 Radioactivity

8. Exposure to nuclear radiation is unavoidable because some radioactive elements occur in nature.
A) TRUE B) FALSE

9. The nuclear symbol for a high energy electron is $^{0}_{-1}e$. This is also the symbol for designating a(n)
A) proton B) neutron C) gamma ray D) beta particle E) alpha particle

10. The form of radioactivity that penetrates matter most easily is:
A) alpha particles B) gamma rays C) beta particles D) protons

11. Which of the following is a way to minimize your exposure to radiation?
A) Wear a lead apron.
B) Keep a good distance.
C) Minimize time of exposure.
D) Wear lead lined gloves.
E) All of the above will minimize exposure.

13. Why is it important that radioisotopes used in diagnostic tests have short half-lives?
A) These radioisotopes have a greater activity so they are easier to monitor.
B) This minimizes harmful side effects of the radiation.
C) This is necessary so the radioisotopes will have high energy.
D) These radioisotopes are less expensive.
E) These radioisotopes are more abundant in nature.

14. What radioactive particle is missing in the following nuclear reaction?
$^{98}_{42}Mo + \_\_\_\_\_ \rightarrow {}^{99}_{42}Mo$
A) $^{1}_{1}p$ B) $^{1}_{0}n$ C) $^{0}_{-1}e$ D) $^{4}_{2}He$

15. When Phosphorous-30 loses a beta particle what is the product of this radioactive decay?
A) $^{30}_{14}Si$ B) $^{30}_{16}S$ C) $^{31}_{16}S$ D) $^{31}_{15}P$

16. A wooden object from a prehistoric site has a carbon-14 activity of 10 counts per minute (cpm) compared to 40 cpm for new wood. If carbon-14 has a half-life of 5730 years, what is the age of the wood?

A) 1430 yr B) 5730 yr C) 11,500 yr D) 17,200 yr E) 22,900 yr

17. Exposure to radiation is unavoidable because some radioactive elements occur naturally.
A) TRUE B) FALSE

18. Why is it important that radioisotopes used in diagnostic tests have short half-lives?
A) These radioisotopes have a greater activity so they are easier to monitor.
B) This minimizes the harmful side effects of the radiation.
C) This is necessary so the radioisotopes will have high energy.
D) These radioisotopes are less expensive.
E) These radioisotopes are more abundant in nature.

19. The nuclear reaction $^{126}_{50}\mathrm{Sn} \rightarrow {}^{126}_{51}\mathrm{Sb} + ?$ is an example of
C) gamma emission. D) alpha emission. E) beta emission.

22 pt

Complete the following nuclear decay equations (2 pt each):

$^{14}_{6}C \rightarrow$ _____ + $^{14}_{7}N$

$^{197}_{79}Au$ + _____ $\rightarrow$ ^{198}Au + $^{0}_{0}\gamma$

A 10 mL sample of gallium-67 contains 15 mCi.

(6 pt) How many becquerels (Bq), which is another way to measure radioactivity, are present?
(Hint: 1 Bq = 1 dps and 1 mCi = 3.7×10^7 dps)

(4 pt) If a patient is to receive a 3 mCi dose, how many mL should be injected?

(4 pt) If the amount of radioactive iodine-123 in a sample decreases from 0.400 to 0.100 g in 26.4 hours, what is the half life of iodine-123?

(6 pt) Iron-59 has a half-life of 45 days. If 168 g of radioactive iron (^{59}Fe) is received in the lab today, what percentage of the original is left after 270 days?

24 pt