Name: _____ Practice Ph11 3-3

1. Silver-108 has a half-life of 2.4 minutes. If the initial mass is M the mass remaining after 7.2 minutes is
   a) M/8
   b) M/6
   c) M/4
   d) M/2

2. What is the source of the energy in the process of nuclear **fusion**?
   a) Oxidizing the critical mass.
   b) Splitting atoms into more energy.
   c) Internal atomic friction.
   d) Transformation of mass into energy.

3. In nuclear fusion the total mass-energy of the system before fusion compared to the total mass-energy of the system after fusion is
   a) the same
   b) larger
   c) smaller

4. Which one of the following represents a **fusion** reaction?
   a) $^{239}_{93}Np \longrightarrow {}^{239}_{94}Pu + {}^{0}_{-1}e$
   b) $^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{114}_{56}Ba + {}^{90}_{20}Kr + 2{}^{1}_{0}n + \text{energy}$
   c) $^{9}_{4}Be + {}^{4}_{2}He \longrightarrow {}^{12}_{6}C + {}^{1}_{0}n$
   d) $^{211}_{84}Po \longrightarrow {}^{207}_{82}Pb + {}^{4}_{2}He$

5. A sample of 4 g of cobalt isotope $^{60}_{27}Co$ is produced. If the half-life of $^{60}_{27}Co$ is 30 years, what will be the mass (in grams) of the cobalt remaining after 90 years?

Base your answers to questions 6-9 on the following information

A sample of isotopically pure radon gas ($^{222}_{86}Rn$) is sealed in a glass ampule. The half-life of radon is 4 days.

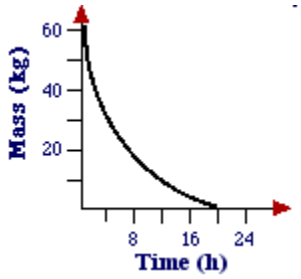
6. Which is an isotope of radon?
   a) $^{220}_{84}X$
   b) $^{222}_{86}X$
   c) $^{222}_{89}X$
   d) $^{220}_{86}X$

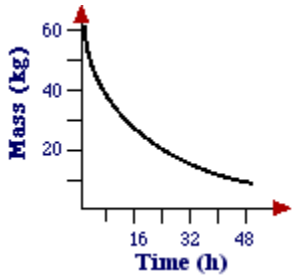
7. If the pressure inside the glass ampule were doubled the half-life of radon would
   a) be doubled
   b) be halved
   c) remain the same
   d) be quadrupled

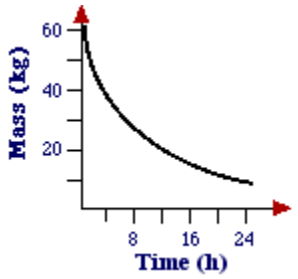
8. Twelve days after the radon gas is sealed in the glass ampule the fraction of radon gas remaining will be
   a) 1/16
   b) 1/2
   c) 1/4
   d) 1/8

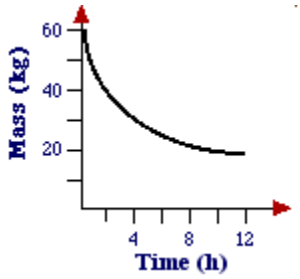
9. Several days later an analysis shows that there is a second gas in the sealed ampule. This second gas is most likely
   a) hydrogen
   b) oxygen
   c) nitrogen
   d) helium

10. Which one of the following graphs represents the decay of an element with a half-life of 8 hours?

a)


b)


c)


d)


11. At the atomic level, the reason that copper is different from gold is because;
   a) the number of neutrons is different.
   b) the number of protons in the neutral atom is different.
   c) the diffusion coefficient is different.
   d) the atomic mass is different.

12. How many neutrons does the nucleus of $^{19}_{10}Ne$ contain?
   a) 29
   b) 9
   c) 10
   d) 19

13. A tritium nucleus contains 1 proton and 2 neutrons. What is the atomic mass of the nucleus?
    a) 0
    b) 1
    c) 2
    d) 3

14. T F An atom of carbon-14 isotope has more protons than an atom of carbon-12 isotope.

15. The energy released in a nuclear reactor is converted to
    a) light energy
    b) sound energy
    c) kinetic energy
    d) electrical energy

16. A chain reaction in a nuclear reactor can by shut down by
    a) setting the master control switch to off.
    b) turning off the supply of uranium.
    c) inserting control rods to absorb neutrons.
    d) turning down the heat so the reaction can cool down.

17. If all of the following particles were travelling at the same velocity which would have the greatest energy?
    a) proton
    b) neutron
    c) alpha particle
    d) beta particle

18. During the process of radioactive decay which of the following occurs?
    a) mass, energy and charge are conserved
    b) energy only is conserved
    c) mass only is conserved
    d) charge only is conserved

19. Which of the following are **NOT** emitted by radioactive materials?
    a) gamma rays
    b) alpha particles
    c) protons
    d) electrons

20. Which of the following is another term for a helium nucleus?
    a) proton
    b) alpha particle
    c) gamma ray
    d) beta particle

21. How many neutrons remain in the nucleus **after** $^{210}_{84}Po$ decays by alpha emission?
    a) 208
    b) 82
    c) 84
    d) 124

22. In the interior of the sun, Hydrogen fuses to create Helium. Approximately 2.0×10^{6} kg of Hydrogen is converted into energy each second. How much mass could this energy raise to a height of 2.0 km?

23. A standard nuclear warhead contains the equivalent of 20.0 Megatons of TNT. One megaton of TNT is the equivalent of 5.0×10^{15} J. What mass of U-235 would be converted into energy in such a warhead?

24. How much mass must be converted into energy to produce 9.0×10^{10} J?
    a) 3.0×10^{-2} kg
    b) 1.0×10^{-6} kg
    c) 1.0×10^{6} kg
    d) 3.0×10^{2} kg