Name _____

Period ___   Date ___/___/___

24• Nuclear Chemistry

P R A C T I C E   T E S T

1. Henri Becquerel was best known for:
    (A) discovering x-rays
    (B) coining the term "radioactivity"
    (C) discovering radioactivity
    (D) making new elements

2. Marie Sklodowska Curie was best known for:
    (A) discovering Curium, Cm
    (B) learning about radioactivity
    (C) discovering x-rays
    (D) sustained nuclear fission

3. Iodine-131 undergoes "beta decay". What other particle is produced?
    (A) Xe-131   (C) I-130
    (B) Te-131   (D) Sb-127

4. What is the charge carried by a beta particle?
    (A) -1   (B) 0   (C) +1   (D) +2

5. What type of radiation is simply a very energetic form of light?
    (A) alpha   (C) gamma
    (B) beta   (D) positron

6. Md-256 decays spontaneously with a half-life of 1.5 hours. Which one of the following statements is true about Md-256 after 3.0 hours?
    (A) All of the Md-256 will be decayed.
    (B) 75% of the Md-256 will remain.
    (C) 50% of the Md-256 will remain.
    (D) 25% of the Md-256 will remain.

7. In a decay series of Th-232, the first three steps involve an alpha decay and then two beta decays. What is the result of these decays?
    (A) Th-228   (C) Fr-224
    (B) Rn-228   (D) Pb-207

Questions 8 - 10 refer to this graph:
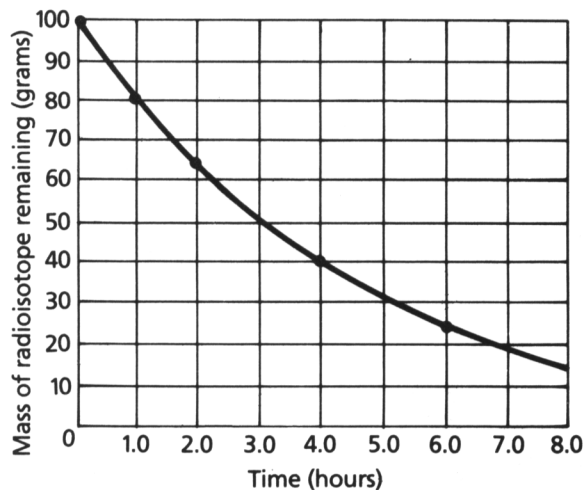
8. According to the above data, what is the half-life of the substance?
    (A) 1.0 hrs   (C) 3.0 hrs
    (B) 2.3 hrs   (D) 8.0 hrs

9. What percent of the original sample remains after 4 hours?
    (A) 80%   (C) 60%
    (B) 75%   (D) 40%

10. Sketch on the graph above, a curve for a substance whose half-life is 2.0 hrs.

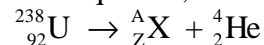11. Iodine-131 has a half-life of 8 days. What percent of a sample remains after 24 days?
    (A) 75%   (C) 50%   (B) 25%   (D) 12.5%

12. Which of the following describes what occurs in the fission process?
    (A) a heavy nucleus is fragmented into lighter ones.
    (B) a neutron is split into a proton and an electron.
    (C) two light nuclei are combined into a heavier one.
    (D) a particle and an anti-particle turn completely into energy.

13. The measured mass of neutral Li-6 is 6.01512 amu. What is the mass defect of this isotope?

mass electron	0.0005468 amu
mass proton	1.007277 amu
mass neutron	1.008665 amu

    (A) 0.03435 amu   (C) 0.04947 amu
    (B) 0.01512 amu   (D) 0.03038 amu

14. One mole of H_2O has a mass of 18.0 grams or 0.0180 kg. Knowing that the speed of light, c, is 3.0×10^8 m/s, calculate the energy in one mole of H_2O if all of its mass were changed to energy.
[Note: 1 J = 1 kg·m^2/s^2]
    (A) 1.6×10^{15} J   (C) 1.8×10^{18} J
    (B) 5.4×10^{10} J   (D) 2.0×10^{13} J

15. The "control rods" in a nuclear reactor are designed to absorb _____ and are made of the element ____
    (A) energy, Cd
    (B) uranium atoms, Pb
    (C) alpha particles, water
    (D) neutrons, Hf

16. The rate constant for decay of ^{218}Po is 0.231 min^{-1}. What is the half-life of this isotope?
    (A) 0.231 min   (C) 13.6 min
    (B) 3.00 min   (D) 4.33 min

17. Which of the following is a fission reaction?

a) $^{238}_{92}U + ^{1}_{0}n \rightarrow ^{239}_{92}U$

b) $^{235}_{92}U + ^{1}_{0}n \rightarrow ^{139}_{56}Ba + ^{94}_{36}K + 3^{1}_{0}n$

c) $^{2}_{1}H + ^{3}_{1}H \rightarrow ^{4}_{2}He + ^{1}_{0}n$

d) $^{1}_{1}p + ^{0}_{-1}e \rightarrow ^{1}_{0}n$

18. Which of the following is a fusion reaction?

a) $^{238}_{92}U + ^{1}_{0}n \rightarrow ^{239}_{92}U$

b) $^{235}_{92}U + ^{1}_{0}n \rightarrow ^{139}_{56}Ba + ^{94}_{36}K + 3^{1}_{0}n$

c) $^{2}_{1}H + ^{3}_{1}H \rightarrow ^{4}_{2}He + ^{1}_{0}n$

d) $^{1}_{1}p + ^{0}_{-1}e \rightarrow ^{1}_{0}n$

19. In the nuclear equation,
$$^{238}_{92}U \rightarrow ^{A}_{Z}X + ^{4}_{2}He$$
the letters Z and A are, respectively
    (A) 90 and 242   (C) 94 and 234
    (B) 94 and 242   (D) 90 and 234

20. Radioactive C-14 has a half-life of about 5,000 years. If a fossil is only about 6% as radioactive as expected for living tissue of the same mass, the age of the fossil is about:
    (A) 5,000 yrs   (C) 20,000 yrs
    (B) 10,000 yrs   (D) 40,000 yrs

21. The half-life of ^{210}Bi is 5.0 days. What is the rate constant for decay for this isotope, with the correct units?
    (A) 0.20 days   (C) 0.14 days
    (B) 0.20 days^{-1} (D) 0.14 days^{-1}

22. A 10.0 gram sample of thorium-227 decays to 8.51 grams in a period of 3.00 days. What is the rate constant for this decay?
    (A) 0.0611 day^{-1} (C) 0.0851 day^{-1}
    (B) 0.0913 day^{-1} (D) 0.0538 day^{-1}

23. A sample of neptunium-234, with a half-life of 4.40 days, is allowed to decay for 7.10 days. What percent of the original sample remains?
    (A) 19.9%   (C) 30.6%
    (B) 61.9%   (D) 32.7%

24. Cobalt-64 decays by a first order process by the emission of a beta particle. The Co-64 isotope has a half-life of 7.8 minutes. How long will it take for 15/16 of the cobalt to undergo decay?
    (A) 7.8 min   (C) 23.4 min
    (B) 15.6 min   (D) 31.2 min

25. Referring to the figure below, which one of these corresponds to the fission process?
    (A) III → II
    (B) I → II
    (C) III → V
    (D) V → IV