Practice Quiz: Nuclear Chemistry

1. Who discovered radioactivity?
A. Geiger B. Curie C. Roentgen D. Becquerel E. Rutherford

2. Which of the following types of radioactive decay does not produce new element?
A. gamma emission B. electron capture C. beta emission
D. alpha emission E. double beta emission

3. In this equation $^{108}_{49}\text{In} \rightarrow {}^{108}_{48}\text{Cd} + ?$, what particle or type of radiation needs to be included on the right-hand side in order to balance it?
A. alpha B. beta C. gamma D. positron E. proton

4. Which one of the following equations correctly represents positron decay of $^{40}_{19}\text{K}$?
A. $^{40}_{19}\text{K} \rightarrow {}^{36}_{17}\text{Cl} + {}^{4}_{2}\text{He}$ B. $^{40}_{19}\text{K} + {}^{0}_{-1}\text{e} \rightarrow {}^{40}_{18}\text{Ar}$
C. $^{40}_{19}\text{K} + {}^{0}_{1}\text{e} \rightarrow {}^{40}_{20}\text{Ca}$ D. $^{40}_{19}\text{K} \rightarrow {}^{40}_{20}\text{Ca} + {}^{0}_{-1}\beta$
E. $^{40}_{19}\text{K} \rightarrow {}^{40}_{18}\text{Ar} + {}^{0}_{1}\beta$

5. An isotope with a high value of *N*/*Z* will tend to decay through
A. α decay. B. β decay. C. positron decay. D. electron capture. E. γ decay.

6. An isotope with $Z > 83$, which lies close to the band of stability, will generally decay through
A. α decay. B. β decay. C. γ decay. D. positron decay. E. electron capture.

7. A scintillation counter
A. measures the signal coming from an ionized gas.
B. measures light emissions from excited atoms.
C. depends on an avalanche of electrons generated as a particle moves through a tube of argon gas.
D. detects high energy radiation better than low energy radiation.
E. detects an electric current in a gas.

8. A 7.85×10^{-5} mol sample of copper-61 emits 1.47×10^{19} positrons in 90.0 minutes. What is the decay constant for copper-61?
A. 0.00230 h^{-1} B. 0.00346 h^{-1} C. 0.207 h^{-1} D. 0.311 h^{-1}
E. None of these choices is correct.

9. A 9.52×10^{-5} mol sample of rubidium-86 emits 8.87×10^{16} β particles in one hour. What is the half-life of rubidium-86?
A. 2.23×10^{-3} h B. 1.55×10^{-3} h C. 448 h D. 645 h
E. None of these choices is correct.

10. A pure sample of tritium, ^{3}H, was prepared and sealed in a container for a number of years. Tritium undergoes β decay with a half-life of 12.32 years. How long has the container been sealed if analysis of the contents shows there are 5.25 mol of ^{3}H and 6.35 mol of ^{3}He present?
A. 2.34 y B. 3.38 y C. 9.77 y D. 14.1 y E. 25.6 y

Answers

1. *(p. 1066)* D

2. *(p. 1068)* A

3. *(p. 1069)* D

4. *(p. 1069)* E

5. *(p. 1071)* B

6. *(p. 1071)* A

7. *(p. 1075)* B

8. *(p. 1076)* C

9. *(p. 1076, 1077)* C

10. *(p. 1078)* D