

Nuclear Chemistry Problems - Radioactive Decay

(answers at end)

1. What particle is emitted when a Fr-210 nucleus decays to At-206?
 - (a) alpha
 - (b) beta
 - (c) neutron
 - (d) positron
 - (e) proton

2. What particle is emitted when a Ra-221 nucleus decays to Rn-217?
 - (a) alpha
 - (b) beta
 - (c) neutron
 - (d) positron
 - (e) proton

3. What particle is emitted when a Th-228 nucleus decays to Ra-224?
 - (a) alpha
 - (b) beta
 - (c) neutron
 - (d) positron
 - (e) proton

4. What particle is emitted when a F-20 nucleus decays to Ne-20?
 - (a) alpha
 - (b) beta
 - (c) neutron
 - (d) positron
 - (e) proton

5. What particle is emitted when an Ar-39 nucleus decays to K-39?
 - (a) alpha
 - (b) beta
 - (c) neutron
 - (d) positron
 - (e) proton

6. What particle is emitted when a Sr-90 nucleus decays radioactively to Y-90?
 - (a) alpha
 - (b) beta
 - (c) neutron
 - (d) positron
 - (e) proton

7. What particle is emitted when a carbon-11 nucleus decays to boron-11?
- (a) alpha
 - (b) beta
 - (c) neutron
 - (d) positron
 - (e) proton
8. What particle is emitted when a fluorine-17 nucleus decays to oxygen-17?
- (a) alpha
 - (b) beta
 - (c) neutron
 - (d) positron
 - (e) proton
9. What particle is emitted when a neon-19 nucleus decays to fluorine-19?
- (a) alpha
 - (b) beta
 - (c) neutron
 - (d) positron
 - (e) proton
10. What nuclide is produced when Pt-175 decays by alpha emission?
- (a) $^{76}_{171}\text{Os}$
 - (b) $^{175}_{76}\text{Os}$
 - (c) $^{171}_{78}\text{Pt}$
 - (d) $^{175}_{79}\text{Au}$
 - (e) $^{79}_{171}\text{Au}$
11. What nuclide is produced when U-235 decays by alpha emission?
- (a) $^{90}_{231}\text{Th}$
 - (b) $^{235}_{90}\text{Th}$
 - (c) $^{231}_{92}\text{U}$
 - (d) $^{235}_{93}\text{Np}$
 - (e) $^{231}_{93}\text{Np}$

12. What nuclide is produced when Ra-223 decays by alpha and gamma emission?

- (a) $^{219}_{86}\text{Rn}$
(b) $^{227}_{86}\text{Rn}$
(c) $^{227}_{88}\text{Ra}$
(d) $^{219}_{90}\text{Th}$
(e) $^{227}_{90}\text{Th}$

13. What radionuclide decays to Pb-210 by alpha emission?

- (a) $^{206}_{80}\text{Hg}$
(b) $^{206}_{80}\text{Hg}$
(c) $^{206}_{82}\text{Pb}$
(d) $^{214}_{84}\text{Po}$
(e) $^{214}_{84}\text{Po}$

14. What nuclide is produced when K-43 decays by beta emission?

- (a) $^{43}_{18}\text{Ar}$
(b) $^{42}_{19}\text{K}$
(c) $^{42}_{20}\text{Ca}$
(d) $^{43}_{20}\text{Ca}$
(e) $^{44}_{20}\text{Ca}$

15. What nuclide is produced when Pb-210 decays by beta emission?

- (a) $^{210}_{81}\text{Tl}$
(b) $^{212}_{81}\text{Tl}$
(c) $^{211}_{82}\text{Pb}$
(d) $^{210}_{83}\text{Bi}$
(e) $^{211}_{83}\text{Bi}$

16. What nuclide is produced when Ar-39 decays by beta and gamma emission?

- (a) $^{39}_{40}\text{Cl}$
- (b) $^{40}_{40}\text{Cl}$
- (c) $^{39}_{40}\text{Ar}$
- (d) $^{39}_{40}\text{K}$
- (e) $^{40}_{19}\text{K}$

17. What radionuclide decays to Fe-56 by beta emission?

- (a) $^{55}_{56}\text{Mn}$
- (b) $^{56}_{55}\text{Mn}$
- (c) $^{56}_{55}\text{Fe}$
- (d) $^{57}_{27}\text{Co}$
- (e) $^{57}_{27}\text{Co}$

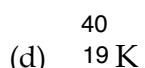
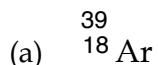
18. What nuclide is produced when N-13 decays by positron emission?

- (a) $^{12}_{6}\text{C}$
- (b) $^{13}_{6}\text{C}$
- (c) $^{14}_{6}\text{C}$
- (d) $^{14}_{7}\text{N}$
- (e) $^{13}_{8}\text{O}$

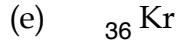
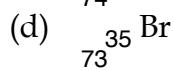
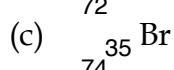
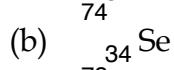
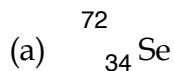
19. What nuclide is produced when O-15 decays by positron emission?

- (a) $^{14}_{7}\text{N}$
- (b) $^{15}_{7}\text{N}$
- (c) $^{14}_{8}\text{O}$
- (d) $^{15}_{9}\text{F}$
- (e) $^{16}_{9}\text{F}$

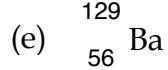
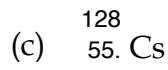
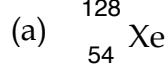
20. What nuclide is produced when K-40 decays by positron emission?



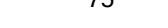
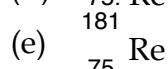
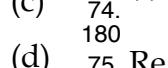
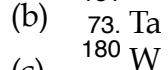
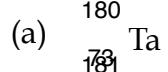
21. What radionuclide decays to Br-73 by positron emission?



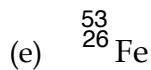
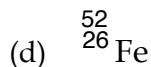
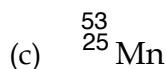
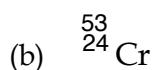
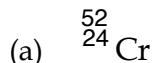
22. What nuclide is produced when a Cs-129 nucleus decays by electron capture?



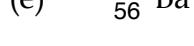
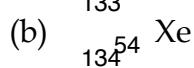
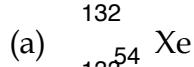
23. What nuclide is produced when a W-181 nucleus decays by electron capture?



24. What nuclide is produced when a Mn-52 nucleus decays by electron capture?

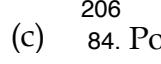
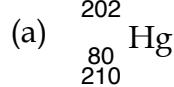


25. What radionuclide decays to Cs-133 by electron capture?



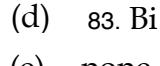
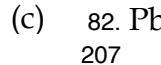
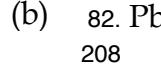
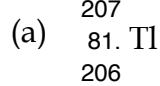
Radioactive Decay Series

26. In the final step of the uranium-238 disintegration series, the parent nuclide decays to lead-206 and an alpha particle. What is the parent nuclide?



(e) none of the above

27. In the final step of the uranium-235 disintegration series, the parent nuclide decays to lead-207 and a beta particle. What is the parent nuclide?



(e) none of the above

28. In the final step of the thorium-232 disintegration series, the parent nuclide decays to lead-208 and an alpha particle. What is the parent nuclide?

- (a) $^{208}_{83}\text{Bi}$
- (b) $^{212}_{83}\text{Bi}$
- (c) $^{208}_{84}\text{Po}$
- (d) $^{212}_{84}\text{Po}$
- (e) none of the above

29. The uranium-238 decay series begins with the emission of an alpha particle. If the daughter decays by beta emission, what is the resulting nuclide?

- (a) $^{234}_{89}\text{Ac}$
- (b) $^{233}_{90}\text{Th}$
- (c) $^{234}_{90}\text{Th}$
- (d) $^{233}_{91}\text{Pa}$
- (e) $^{234}_{91}\text{Pa}$

30. The uranium-235 decay series begins with the emission of an alpha particle. If the daughter decays by beta emission, what is the resulting nuclide?

- (a) $^{231}_{89}\text{Ac}$
- (b) $^{230}_{90}\text{Th}$
- (c) $^{231}_{90}\text{Th}$
- (d) $^{230}_{91}\text{Pa}$
- (e) $^{231}_{91}\text{Pa}$

31. The thorium-232 decay series begins with the emission of an alpha particle. If the daughter decays by beta emission, what is the resulting nuclide?

- (a) $^{228}_{87}\text{Fr}$
- (b) $^{227}_{88}\text{Ra}$
- (c) $^{228}_{88}\text{Ra}$
- (d) $^{227}_{89}\text{Ac}$
- (e) $^{228}_{89}\text{Ac}$

Answer Key

1A, 2A, 3A, 4B, 5B, 6B, 7D, 8D, 9D, 10A, 11A, 12A, 13E, 14D, 15D, 16D, 17B, 18B, 19B,
20B, 21E, 22B, , 23B, 24A, 25D, 26D, 27A, 28D, 29E, 30E, 31E