

CHAPTER 13

1. The study of radioactive elements.
2. Radioactive.
3. Radioactive decay.
4. c, e.
5. True.
6. False.
7. The N:P ratio gives an idea of how stable a nucleus may be. All isotopes with a N:P less than one are radioactive, except for hydrogen, and all elements with a N:P greater than 1.537 are unstable. Therefore, the range of N:P ratios for stable (i.e. non-radioactive) isotopes is between 1.0 and 1.537. While not all isotopes with N:P between 1.0 and 1.537 are stable, those that are stable will have their N:P fall within that range.
8. True.
9. It is a non-charge-based force that develops between neutrons and protons and stabilizes the nucleus by "offsetting" the positive charges of the protons so that the nucleus stays together.
10. Because it has a N:P less than 1.0 and it isn't helium or hydrogen.
11. True.
12. Both of the N:P ratios are in the band of stability, so that doesn't help. Based upon the odd-even predictive tool, you would expect that the element with even number of protons and even number of neutrons would be the most stable, while one with even protons and odd neutrons would be less stable, so b. is likely radioactive.
13. Radiation.
14. Alpha and beta radiation.
15. An alpha particle, α particle or helium without any electrons.
16. 2 protons and 2 neutrons.
17. Alpha radiation, or alpha decay.
18. True.
19. No, it is not. The atomic masses are not equal, 210 on the parent side and 211 on the daughter side.
20.
$${}_{82}^{210}\text{Pb} \longrightarrow {}_{80}^{206}\text{Hg} + {}_2^4\text{He} + {}_0^0\gamma$$

Note to parents: it's OK if the student doesn't have the gamma radiation (the "0-0 funny-looking γ " part of the equation) indicated on the right side of this equation.
21. It is a type of radiation in which energy is carried out of the nucleus via waves of the electromagnetic spectrum.
22.
$${}_{83}^{214}\text{Bi} \longrightarrow {}_{84}^{214}\text{Po} + {}_{-1}^0\text{e}$$
23. Beta radiation occurs when a neutron changes into a proton and an electron is then released from the nucleus.
24. Yes.
25. True.
26. The atomic number changes.
27. False.