

Use with textbook pages 289–293.

Isotopes

1. What is an isotope?

2. Atomic number + number of neutrons = _____

3. Number of protons + number of neutrons = _____

4. Mass number – atomic number = _____

Use the following standard atomic notation of an isotope to answer questions 5 to 7.



5. Label the mass number and the atomic number.

6. What is the name of this isotope? _____

7. Determine the number of subatomic particles for this isotope:

(a) number of protons = _____

(b) number of electrons = _____

(c) number of neutrons = _____

8. In each of the following cases, what element does the symbol X represent and how many neutrons are in the nucleus?

(a) ${}_{10}^{21}\text{X}$

Element = _____

Number of neutrons = _____

(b) ${}_{16}^{32}\text{X}$

Element = _____

Number of neutrons = _____

(c) ${}_{89}^{230}\text{X}$

Element = _____

Number of neutrons = _____

(d) ${}_{90}^{234}\text{X}$

Element = _____

Number of neutrons = _____

Name _____

Date _____

**Applying
Knowledge****Section 7.1**

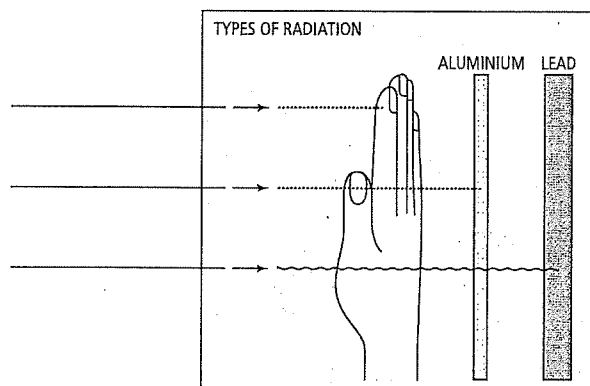
9. Complete the following table. The first row has been completed to help guide you.

Isotope	Standard atomic notation	Atomic number	Mass number	Number of protons	Number of neutrons
carbon-14	$^{14}_6\text{C}$	6	14	6	8
		27	52		
nickel-60					
			14	7	
thallium-201					
	$^{226}_{88}\text{Ra}$				
				82	126

Use with textbook pages 294–297.

Alpha, beta, and gamma radiation

1. Label the following diagram. Identify the penetrating power of the three forms of radioactive decay products: alpha particle, beta particle, and gamma ray.



2. Indicate whether the description is referring to an alpha particle, a beta particle, or a gamma ray. The description can refer to more than one of the forms of radiation.

(a) ${}^0_0\gamma$ _____

(b) ${}^0_{-1}\beta$ or ${}^0_{-1}e$ _____

(c) $\frac{4}{2}\alpha$ or ${}^4_2\text{He}$ _____

(d) has a charge of 0 _____

(e) has a charge of 1- _____

(f) has a charge of 2+ _____

(g) is a helium nucleus _____

(h) is a high-speed electron _____

(i) is emitted from the nucleus _____

(j) is emitted only during beta decay _____

(k) is emitted only during alpha decay _____

(l) can be stopped by aluminum foil _____

(m) is emitted only during gamma decay _____

(n) is affected by electric and magnetic fields _____

(o) is not affected by electric and magnetic fields _____

(p) is a high energy wave with short wavelengths _____

(q) is the highest energy form of electromagnetic radiation _____

(r) has low penetrating power (can be stopped by a single piece of paper) _____

(s) has the greatest penetrating power (can only be stopped by lead or concrete) _____

Use with textbook pages 286–299.

Radioactive decay and nuclear equations

Remember the following two rules when working with nuclear equations:

- I. The sum of the mass numbers does not change.
- II. The sum of the charges in the nucleus does not change.

Identify each nuclear equation as alpha decay, beta decay, or gamma decay, and then complete the nuclear equation.

1. $^{32}_{15}\text{P}$ -----> $^{32}_{16}\text{S}$ + _____
2. $^{218}_{84}\text{Po}$ -----> _____ + ^4_2He
3. _____ -----> $^{18}_5\text{Ar}$ + $^0_{-1}e$
4. $^{24}_{12}\text{Mg}^*$ -----> _____ + $^0_0\gamma$
5. $^{234}_{91}\text{Pa}$ -----> _____ + $^4_2\alpha$
6. $^{141}_{58}\text{Ce}$ -----> _____ + $^0_{-1}e$
7. $^{216}_{84}\text{Po}$ -----> _____ + $^0_{-1}\beta$
8. $^{20}_9\text{F}$ -----> $^{20}_{10}\text{Ne}$ + _____
9. $^{58}_{26}\text{Fe}^*$ -----> $^{58}_{26}\text{Fe}$ + _____
10. _____ -----> $^{221}_{87}\text{Fr}$ + $^4_2\alpha$
11. $^{149}_{64}\text{Gd}^*$ -----> _____ + $^0_0\gamma$
12. $^{226}_{86}\text{Ra}$ -----> $^{222}_{86}\text{Rn}$ + _____
13. _____ -----> $^{212}_{82}\text{Pb}$ + $^0_{-1}\beta$
14. $^{214}_{83}\text{Bi}$ -----> $^{210}_{81}\text{Tl}$ + _____
15. _____ -----> $^{254}_{98}\text{Cf}$ + $^0_0\gamma$