

## Chapter 12 HW Answers

### Review Questions:

8. Atomic Number = number of protons  
Mass Number = number of particles in core (neutrons + protons)
9. Mass Number = number of particles in core (neutrons + protons)  
Atomic mass = the average mass of one atom
10. Most elements are **metallic**.
18. Atomic spectra are unique for each element, like fingerprints are unique for each person.
20. An electron **far** from the nucleus has more potential energy than an electron close to the nucleus.
26. The electrons in the highest energy orbit, the valence electrons, are most responsible for the properties of an atom.

### Exercises:

8. Carbon, which has 6 protons
9. Approximate atomic mass = 98 amu; it would actually be a little more massive than this because of the extra neutrons. This is Technetium (Tc).
10. It will have 26 electrons. If the atom is electrically neutral, it will have the same number of electrons as protons.
16. Carbon (C) = 12.01 amu  
Carbon dioxide (CO<sub>2</sub>) = 12.01 + 16.00 + 16.00 = 44.01 amu
17. Hydrogen (H) = 1 amu  
Water (H<sub>2</sub>O) = 1.008 + 1.008 + 16.00 = 18.016 amu
21. Electrons are on the outside of every atom and they repel each other; this prevents objects from passing through each other.
30. The energies of the photons emitted by an atom correspond to the electron jumps between allowed energy levels within that particular atom.
31. The atomic spectrum will be different for the two different lamps.
32. The hydrogen atom, and every other type of atom, each have an infinite number of discrete energy levels available when excited. The electron in the hydrogen atom can make several jumps to multiple energy levels and produce multiple lines of color.

33. **Blue** light is the result of the greater energy transition.

35. The spectrum would be continuous rather than having individual lines. Every line of color would be present.

Additional:

1. **Water** is not an element.

2. Answer **b.** number of protons

3. Most of the elements are formed **in stars.**

4. Answer **c.** an isotope

5.

Atom	Protons	Neutrons	
${}^4_2\text{He}$	2	2	Regular
${}^{55}_{26}\text{Fe}$	26	29	Isotope
${}^{13}_6\text{C}$	6	7	Isotope
${}^{235}_{92}\text{U}$	92	143	Isotope
${}^2_1\text{H}$	1	1	Regular
${}^{17}_8\text{O}$	8	9	Isotope

6. **Six** lines can be produced from four energy levels.

- 1)  $2 \rightarrow 1$
- 2)  $3 \rightarrow 1$
- 3)  $4 \rightarrow 1$
- 4)  $3 \rightarrow 2$
- 5)  $4 \rightarrow 2$
- 6)  $4 \rightarrow 3$

7. The energies would be equal because both would result in the same net energy change.

$4 \rightarrow 3$  then  $3 \rightarrow 1$  (frequency 1 then frequency 2)

$4 \rightarrow 1$  (frequency 3)

**frequency 1 + frequency 2 = frequency 3**

8. **No**, atoms cannot absorb or emit  $1 \frac{1}{2}$  photons. Atoms can only emit or absorb whole photons.

9. Each blue line has a specific frequency and energy which is determined by the allowed energies of each particular element. A blue line from one element will have a different frequency and energy as compared to the blue line from a second element.