Chapter 11: Properties of Matter; 11th edition
Review questions pg. 210

1. What causes dust particles and tiny grains of soot to move with Brownian motion?
Ans. The dust particles and tiny grains of soot move when atoms that are vibrating with kinetic energy collide with them.

2. Who first explained Brownian motion and made a convincing case for the existence of atoms?
Ans. Albert Einstein.

18. What does the atomic number tell you about the element?
Ans. The atomic number tells you the number of protons in the nucleus of the atom and determine which element it is.

20. What is an isotope?
Ans. An isotope of an element has the same number of protons and other isotopes of that element, but has a different number of neutrons.

Extra: Why do we say that materials in our world are mostly space?
Ans. The atoms that make up the world around us are mostly space. Ask in class for further information.

Extra: How does the mass and electric charge of a proton compare with the mass and charge of an electron?
Ans. The proton is much more massive than an electron. It requires more that 1800 electrons to equal the mass of just one proton. Their charges however, are exactly the same amount; 1.6×10^{-19} Coulombs. The proton has the positive type of charge and the electron has the negative type.

Extra: The nucleus of a neutral iron atom contains 26 protons. How many electrons does a neutral iron atom contain?
Ans. 26 electrons.

Extra: How does the mass and charge of a proton compare with those of a neutron?
Ans. Their masses are almost identical. The proton has a $+1.6 \times 10^{-19}$ Coulomb charge while the neutron has no charge.

Extra: What does the atomic mass number tell you about the element?
Ans. The atomic mass number tells you the total number of protons and neutrons in the nucleus of the atom.

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16. The atomic masses of two isotopes of cobalt are 59 and 60.
a) What is the number of protons and neutrons in each?
Ans. They both have the same number of protons. From the periodic table of the elements on page 219 we see that they will have 27 protons. They will have 32 and 33 neutrons respectively.
b) How many electrons will they each have when they are electrically neutral?
Ans. They will have 27 electrons when they are electrically neutral.

17. A particular atom contains 29 electrons, 34 neutrons and 29 protons. What is the atomic number of this element, and what is its name?
Ans. It is atomic number 29 and from the table of elements on page 219, we see that it is copper.

18. If two protons and two neutrons are removed from the nucleus of an oxygen atom, what nucleus remains? Refer to the periodic table of the elements on pg. 219.
Ans. Oxygen-16 has 8 protons and 8 neutrons. If your remove 2 protons and 2 neutrons from its nucleus, it will only have 6 protons and 6 neutrons. That element is Carbon-12. The reaction can be written as follows:

$$^{16}_{8}O \rightarrow ^{4}_{2}He + ^{12}_{6}C$$

20. What happens if you add two protons to the nucleus of mercury? Refer to the table of elements on pg. 219.
Ans. Mercury (Hg) is atomic number 80. That means that it has 80 protons in its nucleus. If we add 2 more protons, we will have atomic number 82, which is lead (Pb).

21. To become a negative ion, does an atom gain or loss an electron?
Ans. It gains an electron.

22. To become a positive ion, does an atom gain or loss an electron?
Ans. The atom losses an electron.

Extra: What element results if one of the neutrons in a nitrogen nucleus changes into a proton by beta decay?
Ans. $^{14}_{7}N \rightarrow ^{0}_{-1}\beta + ^{14}_{8}O$ We would get an isotope of oxygen. However, N-14 does not really do this.