Homework 2 Key

1 ppm = 1000 ppb

1. a. 0.118 ppm
=118 ppb

$0.118 \text{ ppm} \times \frac{1000 \text{ ppb}}{1 \text{ ppm}} = 118 \text{ ppb}$

+1

b. 25 ppm
= 25000 ppb

You'll be able to smell ozone in both of these samples.

8. a. 2A

b. alkaline earth metals

c. Be 4 Ca 20 Ba 56 +1
Mg 12 Sr 38 Ra 88

d. 2

10. a 8 protons, 8 electrons, 10 neutrons

b 16 protons, 16 electrons, 19 neutrons +2

c 92 protons, 92 electrons, 146 neutrons

d 35 protons, 35 electrons, 47 neutrons

e 10 protons, 10 electrons, 9 ~~protons~~ neutrons

f 88 protons, 88 electrons, 138 ~~protons~~ neutrons

+3

13. C: 4 outer electrons
Cl: 7 outer electrons for each } 4 + 7 × 4 = 32 total electrons

b. H : 1 outer electron each
O : 6 outer electrons each
} $2\times1 + 2\times6 = 14$

c. H : 1 outer electron each
S : 6 outer electrons
} $2\times1 + 6 = 8$

d. N : ~~5~~ outer electrons each } ~~5~~ $\times 2 = 10$

e. H : 1 electron
C : 4 outer electrons
N : 5 outer electrons
} $1+4+5 = 10$

f. N : 5 outer electrons each } $5\times2+6=16$
O : 6 outer electrons

g. C : 4 outer electrons
S : 6 outer electrons each
} $4 + 2\times6 = 16$

15. a. Wave 1 has a longer wavelength than wave 2. +1

b. Wave 1 has a ~~lower~~ ~~(shorter)~~ frequency than wave 2.

20. a. ~~shortest/smallest~~ UV-C UV-B ~~longest/greatest~~ UV-A wavelength

b. UV-A UV-B UV-C energy +1

c. UV-~~A~~ UV-B UV-C damage

26. a. No There can only be carbon, fluorine + chlorine. +1

b. HCFCs have hydrogen, carbon, fluorine + chlorine but HFCs have no chlorine.

30. The slogan is saying that we need ozone in the stratosphere (up high) to protect us from the sun's UV light but ozone in the troposphere (nearby) is an air pollutant. +1

31. Allotropes of oxygen have different molecular structures (like O_2 and O_3). Isotopes of oxygen differ in the number of neutrons in the nucleus of the atom. (like $^{16}_{8}O$ and $^{18}_{8}O$). +2

34. The Lewis dot structures of ozone are (see problem 33 for example)

I predict that the bond lengths in ozone will be between 132 and 121 pm... like a 1.5 bond because we can't measure the two different resonance structures

36. lowest energy — Radio ← least damage

IR

visible

UV

highest energy ← most damage

+1

44. The Antartic is the coldest place on earth (as low as −90°C) and polar stratospheric clouds form. At the surface of these clouds (the ice crystals), "safe" molecules are converted to reactive species such as $HOCl + Cl_2$. When the sun comes out, the $HOCl + Cl_2$ are broken down, releasing Cl atoms. The Cl atoms then break down O_3. To form the O_3 hole, extreme cold + no wind + darkness is needed, followed by rapidly increasing amounts of sunlight. The conditions are not quite right in the Artic - the PSCs diffuse before the sun comes out.

+2