Chem / Envsty L111: Homework 1 Solutions

Chapter 2 – Protecting the Ozone Layer

#8. a. Group 2A, or Alkaline Earth Metals. b. beryllium, Be; magnesium, Mg; calcium, Ca; strontium, Sr; Barium, Ba; radium, Ra. c. Be has 4 electrons, Mg has 12 electrons, Ca has 20 electrons, Sr has 38 electrons, Ba has 56 electrons, Ra has 88 electrons. D. They **ALL** have 2 valence electrons.

	element	# protons	#	#
			neutrons	electrons
а	¹⁸ 80	8	10	8
b	³⁵ 5	16	19	16
С	²³⁸ ₉₂ U	92	146	92
d	⁸² ₃₅ Br	35	47	35
е	¹⁹ ₁₀ Ne	10	9	10
f	$^{226}_{88}Ra$	88	138	88

#13. a. CCl₄ : N=8+8+8+8=40

A=4+7+7+7+7=32 S=N-A=40-32=8	•CI •CI •CI •CI •CI	*CI *CI-C-CI *CI *CI
b. H ₂ O ₂ : N=2+2+8+8=20		
A=1+1+6+6=14	H:O:O:H	н-о-о-н

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S=N-A=20-14=6

c. H ₂ S : N=2+2+8=12	••	••			
A=1+1+6=8	H: S :H	H-S-H			
S=N-A=12-8=4					
d. N ₂ : N=8+8=16					
A=5+5=10	*N***N*	\$N≡N\$			
S=N-A=16-10=6					
e. HCN : N=2+8+8=18					
A=1+4+5=10	H*C***N*	H−C≡N 			
S=N-A=18-10=8					
f. N ₂ O : N=8+8+8=24		•N≡N−0			
A=5+5+6=16	Ţ	Ť			
S=N-A=24-16=8	N:N:O	N=N=O			
g. CS ₂ : N=8+8+8=24					
A=4+6+6=16		•• 5−C−5			
S=N-A=24-16=8					

- #15. a. wave one has a longer wavelength than wave two
 - b. wave two has a higher frequency than wave one
 - c. both travel at the same speed

As a Set: #16, 17, 18 b

16b. 400 nm is in the visible region

17b.

$$\lambda = 400 nm \left(\frac{10^{-9}m}{1nm}\right) = 4.00 \times 10^{-7}m$$

$$v = \frac{c}{\lambda} = \frac{3.00 \times 10^8 m/s}{4.00 \times 10^{-7}m} = 7.50 \times 10^{14} / s$$

18b.
$$E = h\nu = (6.64 \times 10^{-34} J \cdot s) (7.50 \times 10^{14} / s)$$
$$E = 4.97 \times 10^{-19} J$$

#27. Note: All of these diagrams **should** show lone pair electrons as dots, but it's actually very hard to do that in Word. Assume that every halogen atom shown also has 6 lone pair electrons. Also note that you do **not** need to draw the Lewis structures in order to answer the questions, but I think it helps.



c. The CCl_2F_2 molecule (Freon-12) was an ideal substitute for more dangerous refrigerants. It has a boiling point in the right range, it is not poisonous, it does not burn, and the CCl_2F_2 molecule is so stable that it does not react with much of everything.

d. They all have different boiling points, which makes them more or less suitable for different applications.

#31. Allotropes have different number of oxygen atoms while isotopes are single atoms of oxygen with different numbers of neutrons.

#36. Radio waves.

#52. NO_3^- : Needed (N) = 8+8+8+8=32, Available (A) = 5+6+6+6+1=24

Shared (S) = N-A = 32-24=8 - so four bonds.



- #58a. CFC-12 90 + 12 = 102 so 1 − C, 0 − H, 2 − F, the rest are CI. Structure is CF₂Cl₂
 - b. CCl₄ has 1 − C, 0 − H, 0 − F so its code number is 100. 100 − 90 = 10, so it must be CFC-10
 - c. HCFC-22. 90 + 22 = 112, so 1 C, 1 H, 2 F with the rest being chlorines, formula must be CHF₂Cl, so yes it does work.
 - d. Halon-1301. 90 + 1301 = 1391, so this system won't work for the halons. The naming system for halons is simplified: the digits represent the number of carbon, fluorine, chlorine and bromine atoms, respectively, in the compound. No need to add anything. So, Halon 1301 means 1 C, 3 F, 0 H, 1 Br.