

Chem 115  
Practice Exam 3  
Answer Key

Part I. Multiple choice

page 2:

1. C
2. D
3. A
4. A
5. B
6. A

page 3:

7. A
8. C
9. B
10. B

page 4:

11. A
12. A
13. B
14. D
15. C
16. B

page 5:

17. E
18. A
19. A
20. A
21. A

Part II. Problems

1. worth 12 pts (part a) + 3 pts (part b) = 20 pts

a)  $\text{PCl}_3$  Lewis structure

P in center: 1 pt

single bonds between P and each Cl: 1 pt

each Cl has 3 lone pairs: 1 pt

correct total # of valence electrons: 2 pts

justification for # of valence  $e^-$  is  $(7 \times 3) + 5 = 26$ : 2 pts

$\text{HSiO}_2^-$  Lewis structure

Si in center: 1 pt

Si-H is single bond: 1 pt

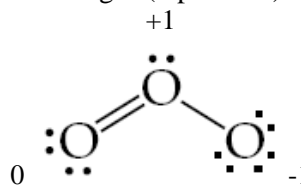
one Si-O single bond & one Si-O double bond: 1 pt

single-bonded O has 3 l.p.'s, double-bonded O has 2: 1 pt

two resonance structures: 2 pts

Si-O bond order is 1.5: 1 pt

b) ozone atoms formal charges (2 pts each)



2. worth 10 pts

most common ionic charges:  $\text{K}^+$  and  $\text{Ca}^{2+}$  (2 pts)

because potassium attains a noble gas electron configuration (stable) by losing one electron, while calcium does so by losing two electrons (2 pts)

ionization energy of potassium is lower (1 pt)

because

- same number of shells, so same  $r$  (separation between + charge center and outer shell of electrons): 1 pt
- $Z_{\text{eff}}$  for K is approx. +1 while  $Z_{\text{eff}}$  for Ca is approx. +2 (2 pts)
- greater force of attraction between most loosely bound electron and core for calcium, so requires more energy to remove the most loosely bound electron (2 pts)