# Polytechnic Tutoring Center

## Midterm II REVIEW – CM 1004, Spring 2020

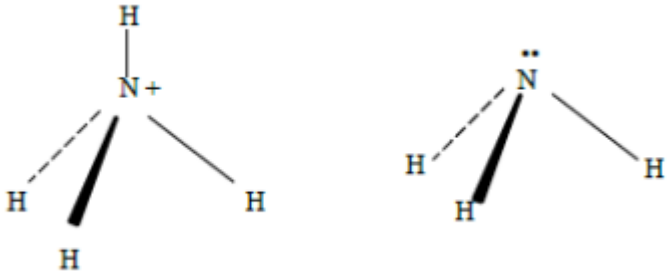
*Disclaimer: This mock exam is only for practice. It was made by tutors in the Polytechnic Tutoring Center and is not representative of the actual exam given by the Academic Department.*

### Answer Key

Multiple choice

1. C, exothermic reactions release heat
2. A, rearrange each equation to cancel out terms to the final reaction
3. E, 2 in s orbital, 4 in d orbital. All unpaired is paramagnetic
4. C, products minus reactants
5. B, $q=ms\Delta t$
6. C, count 8 down the row past Kr
7. B, full f orbital, partially filled d
8. C, lowest on table most to left
9. B, although halogens have the highest electronegativity, He take the most to ionize
10. D, not all atoms follow octet rule, but all lewis structures obey formal charges
11. B, Fluorine loves electrons
12. C, single bonds in C are sp3, double are sp2, triple are sp
13. C, water has lone pairs while carbon dioxide does not
14. A, Xe has two bonds with F and 3 lone pairs
15. E, definition of Trigonal Bipyramidal
16. A, ring hydrocarbons are denser and can pack better than the other structures

LONG ANSWERS:




1. Bond angles: 107.7

NH4+ is tetrahedral, NH3 is trigonal pyramidal molecular geometry and tetrahedral electron geometry.

2.

| | Ion-Ion | Dipole-Dipole | London | Hydrogen Bonding | Ion-Dipole |
|---|---|---|---|---|---|
| $I_2$ | | | X | | |
| $SO_2$ | | X | X | | |
| $CH_3CH_2OH$ | | X | X | X | |
| $CH_3OCH_3$ | | X | X | | |
| KBr (aq) | X | X | X | | X |

3. Use q = mst to find heat gained by the water. Solve for the final temperature of the plate using t=q/ms, plugging in values for the plate. 109.74 C

4. Looking on the periodic table the elements are:
    a. magnesium
    b. nitrogen
    c. Bromine
    d. Beryllium
    e. Neon
    f. phosphorus

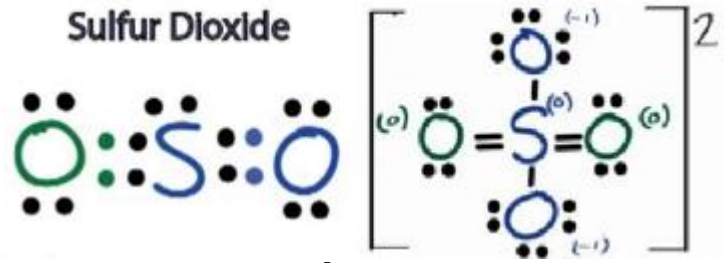
    Knowing this it becomes simple to arrange them by the rules of electronegativity, atomic radius and ionization energy:

    b) C is lowest (also accept D as lowest), A would be highest

    c) C highest, B lowest

    d) Mg = [Ne] 3s2
    N = [He] 2s2 2p2
    Br = [Ar] 4s2 3d10 4p5
    B = [He] 2s2
    Ne = [Ne]
    P = [Ne] 3s2 3p3

5. Bond lengths: $SO_4^{2-} > SO_2$




Resonance for $SO_2$, $SO_4^{2-}$