

## 2014 CHEM 311 Homework assignments

### HW 1 (Chapter 13):

**Tutorial Questions:** Free Particle Wave Equation, Linearity of the Schrödinger Equation

**Online Questions:** 13.3, 13.4, 13.6, 13.12, 13.17, 13.18

### HW 2 (Chapter 14)

**Online Questions:** 14.1, 14.4, 14.6, 14.9, 14.14

### HW 3 (Chapter 15)

**Tutorial Questions:** Particle in a Box, Finding Probabilities from the Wave Function, Vision and the Particle in a Box

**Online Questions:** 15.9, 15.12, 15.15, 15.20, 15.22, 15.34

### HW 4 (Chapter 16)

**Tutorial Questions:** Band Gaps

**Online Questions:** 15.17, 16.4, 16.8

### HW 5 (Chapter 17)

**Tutorial Questions:** Heisenberg's Uncertainty Principle

**Online Questions:** 17.10, 17.12, 17.23

**Book Questions:** P6.3, P6.4, P6.5, P6.7, P6.20

### HW 6 (Chapter 18)

**Tutorial Questions:** Applying the Harmonic Oscillator, Rules for Orbital Angular Momentum, Vibrating Hydrogen Molecule

**Online Questions:** 18.1, 18.5, 18.8, 18.9, 18.16, 18.23, 18.37

**Book Questions:** P7.2, P7.4, P7.7, P7.10

### HW 7 (Chapter 19)

**Tutorial Questions:** Electromagnetic Radiation, Basics of Molecular Spectroscopy

**Online Questions:** 19.1, 19.2, 19.7, 19.9, 19.14, 19.21, 19.23, 19.42

**Book Questions:** P8.29

### HW 8 (Chapter 20)

**Tutorial Questions:** Average Position of an electron in a Hydrogen Atom, Normalizing the Hydrogen Wave Function, s and p Orbitals of a Hydrogen Atom, Schrödinger Equation and Wave Functions

**Online Questions:** 20.1, 20.4, 20.9, 20.31

**Book Questions:** P9.2, P9.5

### HW 9 (Chapter 21)

**Tutorial Questions:** Quantum numbers and Electron Identification, Quantum Number Rules, Orbital Diagrams, Electronic Configurations of Atoms and Ions, Atomic Radii and Effective Nuclear Charge.

**Online Questions:** 21.1, 21.2, 21.10

**Book Question:** P10.5

### HW 10 (Chapter 22)

**Tutorial Questions:** Electron Configurations, Electron States, Selection Rules

**Online Questions:** 22.2, 22.3, 22.6, 22.16, 22.24, 22.38

**Book Question:** P11.13

### HW 11 (Chapter 23)

**Tutorial Questions:** Molecular Orbital Diagrams and Bond Order, Molecular Orbitals

**Online Questions:** 23.11, 23.12, 23.14, 23.21, 23.24

**Book question:** 12.6

**Additional question:** Draw the molecular orbital energy level diagram for the following molecules:  $O_2$ ,  $O_2^{2-}$ ,  $N_2$ ,  $N_2^+$ ,  $CO$ ,  $CO^-$ ,  $CO^+$ . Determine the electronic configuration, identify the HOMO and LUMO, compute the bond order and the total spin multiplicity.

### HW 12 (Chapter 24)

**Tutorial Questions:** Molecular Geometry, Molecular Shapes and Bond Angles, Bonding in the Benzene Molecule

**Online Questions:** 24.11, 24.15, 24.19, 24.24, 24.30

**Book questions:** 13.2, 13.9, 13.23

**Additional Questions:**

1) The ionization energy of Xe5p and O2p electrons are 12.1 eV and 13.6 eV, respectively. Calculate the energies and AO coefficients of the bonding and anti bonding orbitals of XeO. Use  $\beta = -1.2$  eV and  $S = 0$

HW 13 (Chapter 25 and 27)

**Tutorial Questions:** Wintergreen Mints: A Case of Triboluminescence

**Online Questions:** 25.1, 25.2, 25.4

**Online Questions:** 27.4, 27.13, 27.15, 27.21, 27.22

**Book Questions:** 16.9, 16.25