Chemistry 101

TEST 3 STUDY GUIDE

Topic	*Text Ref.*
CHAPTER 6	
• Understand the concept of energy and its units of measurement.	6.2
• Know the definition of internal energy and its relationship to heat and work	6.3
• Determine change in internal energy (ΔE) based on heat flow between system and surroundings	6.3
• Assign proper sign for heat, work and ΔE based on information provided	6.3
• Calculate ΔE from values of heat and work given	6.3
• Calculate heat absorbed or released by a system from mass, specific heat and ΔT	6.4
• Distinguish between heat capacity, molar heat capacity and specific heat and their relationship to amount of heat.	6.4
• Solve problems involving heat transfer between two objects or substances	6.4
• Calculate pressure-volume work from given data	6.4
• Know the characteristics of a bomb calorimeter	6.5
• Calculate ΔE for experiments using bomb calorimeter	6.5
• Differentiate between enthalpy (ΔH) and ΔE	6.6
• Use thermochemical equations to calculate the amount of heat in a reaction.	6.6
• Calculate ΔH for experiments using coffee-cup calorimeter	6.7
• Use Hess's Law to calculate heat of reaction for a reaction composed of several steps.	6.8
• Calculate enthalpy of reaction from standard enthalpies of formation.	6.9
CHAPTER 7	
• Know the wave nature of light and what its wavelength and amplitude represent	7.2
• Know the relationship between frequency and wavelength of a wave and calculate one based on the other	7.2
• Rank radiation in the electromagnetic spectrum (Fig. 7.5) based on frequency, wavelength or energy	7.2
• Know what wave interference is and distinguish between constructive and destructive interference	7.2
• Know what diffraction of waves is caused by and how it appears in two slits.	7.2
• Understand the quantized nature of light (photons) and calculate its energy from wavelength or frequency	7.2
• Describe photoelectric effect and explain how Einstein's photon theory explains it	7.2
• Determine if photoelectrons are produced given threshold frequency and wavelength of light	7.2
• Distinguish between atomic emission spectrum and white light spectrum	7.3
• Use Bohr's model to explain how atomic emission spectrum is produced	7.3
• Use Rydberg's equation to calculate the wavelength of light given by transition of electrons between energy levels	7.3
• Describe observations that led to proposal by de Broglie that matter has wave properties	7.4
• Calculate de Broglie wavelength for objects from given data	7.4
• Explain how Heisenberg uncertainty principle affects the determination of position and velocity of electrons	7.4
• Identify contribution of each scientist to the development of the quantum theory	Notes
• Know what electron orbitals are, and the 3 quantum numbers describing them	7.5
• Know what each quantum number represents and their allowed values	7.5
• Assign proper quantum numbers for each orbital in the first 6 energy levels	7.5

Topic	*Text Reference*
CHAPTER 8	
• Know the values of the electron spin quantum number and the Pauli exclusion principle	8.3
• Assign the four quantum numbers for an electron in an atom	8.3
• Use concept of shielding to determine effective nuclear charge for atoms	8.3
• Use the Aufbau principle to write electron configuration for any atom in the first 3 periods	8.3
• Use Hund's rule to write orbital diagrams for valence electrons in the p, d, and f orbitals	8.3
• Use the periodic table to rank energy of various orbitals in an atom	8.4
• Write condensed electron configurations for any atom in the periodic table.	8.4
• Know the exceptions in electron configuration of the transition elements	Notes
• Predict and explain the trends for the atomic radii of all atoms	8.6
• Determine the paramagnetic and diamagnetic properties of atoms based on their orbital diagrams and number of unpaired electrons	8.7
• Predict and explain the trends in the ionic radii of cations and anions	8.7
• Predict and explain the trends for the ionization energy of atoms (including the exceptions)	8.7
• Define electron affinity for an atom and know its general trends and exceptions	8.8
• Predict and explain the trends for the metallic character of atoms	8.8
• Relate the metallic character of an element to its properties	Notes

SUMMARY OF EQUATIONS

The equations listed below will be provided for your use on the test.

$h = 6.626 \times 10^{-34}$ Js $\qquad c = 3.00 \times 10^{8}$ m/s

$\Delta E = q + w \qquad w = P\,\Delta V$

$q = m \times C_s \times \Delta T \qquad q_{cal} = C_{cal} \times \Delta T$

$$\nu = \frac{c}{\lambda} \qquad \Delta E = h\nu$$

$$E = \frac{hc}{\lambda} \qquad \frac{1}{\lambda} = R\left(\frac{1}{m^2} - \frac{1}{n^2}\right) \qquad \text{where } R = 1.097 \times 10^{7}\ m^{-1}$$

$$\lambda = \frac{h}{mv} \qquad E = \alpha \frac{q_1 q_2}{r}$$