Exam Study Sheet

(as of January 2020)

Exam Matrix

Unit	Multiple Choice	Short Answer	Total Marks	% Value of Exam
Atomic Structure	6	0	6	5.085
Bonding	17	18	35	29.661
Thermodynamics	14	21	35	29.661
Chemical Kinetics	13	29	42	35.593
Total	50	68	118	100

Unit Topics

Review (0 specific marks)

1. Know the following terms: molar mass.
2. Conduct mole conversions and stoichiometric calculations.

Strand I Structure and Properties

Unit 1 Atomic Structure

1. Know the following terms: aufbau principle, electronegativity, octet rule, orbital, quanta, sub-shell, uncertainty principle and valence.
2. Review the development of quantum atomic theory (quantum mechanical theory).
3. Identify, define and compare the different quantum numbers.
4. Determine quantum signature of electrons.
5. Identify the conclusions regarding quatum theory of various scientists (de Broglie, Heisenberg, Hund, Michelson, Pauli, Planck, Schrödinger, Sommerfeld and Zeeman).
6. Determine the electronic configurations for atoms/ions.
7. Determine how and when to promote electrons.

Unit 2 Bonding

1. Know the following terms: aggregate, bond angle, covalent bond, delocalized electron, dipole, hybridization, inductive dipole, ionic bond, lattice, Lewis diagram, London Dispersion Force (LDF), orbital, polar, pseudocovalent, quanta, sub-shell, VSEPR, solubility, unsymmetrical, valence and van der Waals.
2. Determine how and when to hybridize orbitals.
3. Determine hybridized states of atoms when they forms single, double or triple bonds (e.g. carbon).
4. Draw Lewis diagrams and calculate/use formal charge to determine probable/optimal configurations.
5. Determine/draw and name the shape of molecules.
6. Identify factors that determine the shape of molecules (e.g. number of lone pairs and bonding pairs, etc.).
7. Determine/draw bond polarity and molecular polarity.
8. Compare sigma and pi bonds.
9. Interpret and label bonding orbital diagrams.
10. Compare intermolecular forces and intramolecular forces.
11. Identify/explain properties of aggregate solids.
12. Use properties of solids to identify types of aggregate solids.
13. Compare the different intermolecular bonds present in molecular solids and their impact on the properties of these solids.

Strand II Energy Changes and Rates of Reactions

Unit 3 Thermodynamics

1. Know the following terms: activation energy (EA), burning/combustion, bombardment, dissolving, enthalpy, molar heat, nucleon and resting mass.
2. Compare exothermic and endothermic reactions/notation.
3. Calculate the heat released or absorbed by dissolving.
4. Conduct quantities of heat calculations using $Q=mc\Delta T$.
5. Identify the conditions of standard enthalpy.
6. Compare enthalpy of chemical reactions and changes of state (latent heat).
7. Define and use Hess's law to determine heats of reactions/formation (both methods).
8. Calculate enthalpy and molar enthalpy of reactions.
9. Analyze different potential energy curves to determine if a reaction is spontaneous, endothermic or exothermic.
10. Identify the different nuclear particles involved in nuclear reactions.
11. Determine the reactants or products of nuclear reactions and balance these equations.
12. Calculate the binding energy of nuclear reactions.

Unit 4 Chemical Kinetics

1. Know the following terms: endothermic, exothermic and polyatomic ion.
2. Interpret Maxwell-Boltzmann distributions and changes to the system.
3. Calculate average reaction rates and instantaneous reaction rates from graphs.
4. Calculate the rate of reactant consumption and product formation in reactions.
5. Identify postulates of collision theory.
6. Apply collision theory to explain reaction rates and factors affecting reaction rates.
7. Explain how surface area, nature of reactants, concentration, temperature and catalysts which affect the rate of a reaction.
8. Determine methods which can be used to speed up or slow down reactions.
9. Calculate rate effects, rate laws, rate constants and rate constant units from data (simple and complex rate laws).
10. Define activation energy and identify it in a potential energy graph.
11. Calculate activation energy from a potential energy graph or data.
12. Given a rate law, determine concentrations of reactants or rates.
13. Determine reaction orders.
14. Interpret a rate law and/or reaction orders to determine the impact on reaction rate.
15. Interpret reaction mechanisms.
16. Identify the intermediates, catalysts and rate determining steps from reaction mechanisms.
17. Explain reasons for the rate determining step.
18. Use the reaction mechanism to predict rate law.

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