Chemistry 3202
June 2013 Public Exam Outcome Report

This examination follows the specifications, conventions and standards set out in the:
Chemistry 3202 Provincial Exam Standards

Units 1 – From Kinetics to Equilibrium
2 – Acids and Bases
3 – Thermochemistry
4 – Electrochemistry

PART I: Selected Response—Total Value: 50%

Item	Curriculum Guide Page	Outcome	Cognitive Level	Outcome Description
1	(Unit 1) 28	ACC-1	L1	Identify $E_{a(forward)}$, $E_{a(reverse)}$, and ΔH from a PE diagram.
2	30	ACC-2	L1	Describe how the rate of reaction is affected relative to a change in the reactants.
3	28	ACC-1	L2	Identify a method of measuring the rate of a given reaction in a closed system.
4	32	ACC-3	L1	Identify the rate determining step.
5	32	ACC-3	L2	Identify a catalyst/reaction intermediate in a mechanism.
6	34	ACC-3	L1	Describe how a catalyst affects the rate of a chemical reaction.
7	38	323-3	L1	Identify a characteristic of a chemical equilibrium.
8	40	323-4 323-5	L2	Determine the change imposed on an equilibrium system from a graphical representation of the equilibrium system.

9	40	323-4 323-5	L3	Use LCP and the solubility table to predict the direction of equilibrium shift when a stress is imposed on an equilibrium system.
10	40-42	323-4 323-5	L2	Describe how a given equilibrium system is affected by a change in temperature.
11	44	323-3	L2	Identify the equilibrium constant expression for a chemical system.
12	46	ACC-4	L2	Calculate K_{eq} from given equilibrium concentrations.
13	(Unit 2) 54	214-1	L1	Describe an acid or a base using the appropriate theory.
14	54	320-1	L2	Identify an acid or a base using the appropriate theory.
15	52,58	214-1 214-17	L2	Use operational definitions to distinguish between weak and strong acids (or bases).
16	62	320-4	L1	Identify the auto-ionization of water.
17	56	214-17	L2	Identify a Brønsted-Lowry conjugate acid-base pair.
18	66	320-4	L2	Calculate the pH of a solution that has been diluted.
19	68	320-4	L1	Distinguish between the concentration and the strength of an acid.
20	66	320-4	L2	Convert between any two of $[H_3O^+]$, $[OH^-]$, pH, and pOH.

21	68	320-3	L2	Identify an expression as K_a or K_b for a given substance.
22	66	320-4	L3	Through calculations, identify an unknown strong acid.
23	74	ACC-5 ACC-6	L2	Identify an amphoteric species.
24	76	320-6	L1	Define/compare endpoint and equivalence point.
25	78	212-8	L1	Select the appropriate instrument to be used in a given titration process.
26	80	320-7	L2	Select an appropriate indicator given the formulas for the acid and the base in a titration.
27	84	214-5	L3	Given a titration curve of an unknown solution, identify the unknown acid.
28	82	214-5	L1	Distinguish between mono-, di-, and triprotic acids.
29	(Unit 3) 92	324-3	L1	Define the term specific heat capacity.
30	94	324-3	L2	Perform a calculation using $q = mc\Delta T$.
31	94	324-3	L3	Compare relationships between specific heat capacity and temperature change.
32	98	324-3	L2	Perform a calculation using $q = n\Delta H$ after interpreting a chemical reaction.
33	98	324-2	L1	Relate the sign of $\triangle H$ to endothermic and exothermic reactions.
34	100	324-3	L1	Identify energy changes that occur during phase and chemical changes.

35	104	324-1	L1	Identify the type of phase change.
36	104	324-1	L2	Calculate the mass of a substance that will release a certain amount of energy during a phase change.
37	114	324-4	L2	Use standard molar enthalpies of formation, ΔH^o_f, to determine the enthalpy change of a given reaction.
38	106	324-1	L2	Identify the heat transfer and temperature changes within a simple calorimeter as a reaction occurs.
39	108	214-3	L2	Identify changes in PE and KE in a given heating or cooling curve.
40	110	117-9	L1	Compare the magnitude of energy that is involved when physical, chemical and nuclear changes occur.
41	(Unit 4) 124	322-1	L1	Define the terms oxidation and reduction.
42	126	322-1	L1	Identify a half-reaction as an oxidation or as a reduction.
43	126	322-3	L2	Determine the oxidation number of an atom in an ion or molecule.
44	138	322-5 322-6	L3	Identify an unknown metal in a redox reaction with a known metal given the resulting cell voltage.
45	130	322-2	L2	Balance the charge in a half-reaction.
46	132	322-4	L1	Describe electron and ion movement in an electrochemical cell.

47	134	322-4	L2	Identify the species oxidized, the species reduced, the oxidizing agent and the reducing agent given the electrochemical cell notation.
48	142	322-8	L1	Identify a cell type.
49	138	322-5 322-6	L2	Use the Standard Reduction Potentials table to predict cell voltage, E^o.
50	136,150	322-5 322-6 322-7	L2	Use the Standard Reduction Potentials table to predict whether a redox reaction is spontaneous.

PART II: Constructed Response—Total Value: 50%

Item	Curriculum Guide Page	Outcome	Cognitive Level	Value	Outcome Description
51a	30	ACC-2	L2	2	Describe, using Kinetic Molecular Theory and Collision Theory, one method to increase the rate of a given chemical reaction.
51b	32	ACC-3	L2	4	Given a reaction mechanism, determine the equation for the overall reaction. Sketch and label the potential energy diagram associated with this reaction mechanism.
51c	38	323-3	L3	2	Given a graphical representation of a system that has reached equilibrium, write the equation for the equilibrium reaction.
51d	46	ACC-4	L2	3	Given the initial concentration and the equilibrium concentration of a species which is allowed to reach equilibrium, calculate the value of K_{eq}.
51e	40	323-4 323-5	L3	2	Predict the change that will occur when a compound is added to an established equilibrium and justify your answer.
52a	(Unit 2) 60	320-2	L2	2	Predict the Brønsted-Lowry reaction that occurs when two solutions are combined.
52b	72	320-3	L2	4	Identify an unknown acid from initial concentration and pH.
52c	80	116-2	L2	4	Calculate the resulting pH and acid concentration once a strong acid and a strong base are mixed together. (Scientific Communication)

52d	76	320-6	L3	2	Analyze the initial conditions and equivalence point of a titration curve.
52e(i)	80,84	320-7 214-5	L3	1	Given the number of protons transferred, and the indicator for the titration, sketch the titration curve.
52e(ii)	80,84	320-7 214-5	L3	1	Identify one possible acid and one possible base from a titration curve.
53a	108	214-3	L2	4	Calculate the total energy required to heat a substance through a phase change and temperature change. (Scientific Communication)
53b	116	214-6	L3	4	Using Hess's Law, predict a heat of reaction.
53c	112	ACC-8	L2	2	Calculate fuel value for a substance based on calorimeter data.
53d	118	324-4	L2	3	Use bond energies and enthalpy of reaction to calculate a missing bond energy.
54a	(Unit 4) 130	322-2	L2	3	Balance a redox reaction under acidic conditions.
54b	132,136	322-4 322-5 322-6	L2	4	Given a chemical cell, write the equation for the overall reaction and calculate the overall cell potential. (Scientific Communication)
54c	144	322-8	L3	3	Determine heat change using Faraday's Law and molar enthalpy of fusion.