Chemistry 3202
June 2014 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   3 – Thermochemistry
2 – Acids and Bases   4 – Electrochemistry

PART I: Selected Response—Total Value: 50%

Item	Curriculum Guide Page	Outcome	Cognitive Level	Outcome Description
1	(Unit 1) 28	ACC-1	1	Identify $E_{a(forward)}$, $E_{a(reverse)}$, and ΔH from a PE diagram.
2	28	ACC-1	2	Identify how $E_{a(forward)}$, $E_{a(reverse)}$, and ΔH are related.
3	30	ACC-2	1	Describe how a catalyst affects the rate of a chemical reaction.
4	30	ACC-2	2	Identify factors that affect reaction rate.
5	30	ACC-2	2	Identify factors that affect reaction rate.
6	38	323-3	1	State the criteria that applies to a system at equilibrium.
7	40	323-4 323-5	2	Determine the change imposed on an equilibrium system from a graphical representation.
8	42	323-4 323-5	2	Use LCP and the solubility table to predict a change in an equilibrium system when a stress is imposed.
9	40	323-4 323-5	2	Use LCP to predict an equilibrium shift when a stress is imposed on the equilibrium system.
10	44	323-3	1	Recognize that solids and liquids are not included in the equilibrium expression.
11	44	323-3	3	Use initial concentrations of species present and K_{eq} to determine the changes that will occur in order for an equilibrium system to establish.

12	44	323-3	2	Calculate the equilibrium concentration of a chemical species given other concentrations and K_{eq}.
13	(Unit 2) 52	214-1	1	Use an operational acid/base definition to determine the pH of a substance.
14	52	214-1	1	Identify an operational definition of an acid or base.
15	52	214-17	2	Identify a strong/weak acid given solution characteristics.
16	56	214-17	2	Identify an amphoteric substance.
17	54	320-1	1	Identify an Arrhenius acid or base.
18	62	320-4	3	Determine the effect of changes on the self-ionization of water equilibrium.
19	58	214-17	1	Use the table of acid strength to identify strongest acid or base.
20	66	320-4	2	Convert between any two of $[H_3O^+]$, $[OH^-]$, pH, and pOH.
21	62&66	320-4	2	Calculate $[H_3O^+]$, $[OH^-]$, pH, or pOH given the concentration of a strong monoprotic acid or a strong base.
22	82	214-17	1	Identify a Bronsted-Lowry acid or base.
23	70	320-3	2	Identify an expression as K_a or K_b for a given substance.
24	76	320-6	1	Identify laboratory equipment used for titrations.
25	80	320-7	3	Determine the colour of an indicator at different points on a titration curve.
26	84	214-5	2	Interpret from a titration curve the strength of the acid and base.
27	74	ACC-5	2	Determine the effect on pH when acid and bases are combined.
28	82	214-5	2	Identify the reaction which occurs at the second equivalence point for a given acid and base.
29	(Unit 3) 92	308-2	1	Define temperature.
30	94	324-3	1	Identify the features of open, closed and isolated systems.
31	94	324-3	1	Perform calculations involving specific heat capacity.
32	94	324-3	2	Perform calculations involving specific heat capacity.
33	94	324-3	2	Perform calculations involving specific heat capacity.

34	98	324-3	2	Identify the enthalpy diagram for a given reaction.
35	104	324-1	3	Determine the identity of a reactant using q = nΔH for a given reaction.
36	104	324-1	2	Calculate the energy associated with a substance undergoing a phase change.
37	92/100	308-2 324-3	1	Identify the energy changes that occur when substances undergo chemical changes and phase changes.
38	108	214-3	2	Identify the order of changes a substance undergoes during a temperature change.
39	110	117-9	1	Compare the magnitude of the energy that is involved when physical, chemical and nuclear changes occur.
40	114	324-4	2	Using Hess's law, predict the heat of a reaction.
41	(Unit 4) 124	322-1	1	Describe a process that occurs with oxidation and reduction.
42	126	322-1	2	Identify the oxidizing agent and the reducing agent in a redox equation.
43	124	322-1	2	Identify electron transfer in redox equations.
44	126	322-3	2	Determine the oxidation number of an atom in an ion or molecule.
45	134	322-4	1	Use electrochemical cell notation to represent an electrochemical cell.
46	136	322-5 322-6	2	Identify a spontaneous reaction as one that produces a positive cell potential.
47	136	322-5 322-6	1	Describe an electrolytic cell in terms of type of reaction and cell potential.
48	138	322-5 322-6	3	Complete a table of redox half-reactions from experimental results.
49	144	322-8	2	Perform calculations related to Q = It and Q = nF.
50	150	322-7	1	Identify a cell type.

PART II: Constructed Response—Total Value: 50%

Item	Curriculum Guide Page	Outcome	Cognitive Level	Value	Outcome Description
51a	28	ACC-1	2	3	Draw and label a potential energy diagram for a given reaction.
51b	38	323-4 323-5	2	2	Predict the change that will occur when a compound is added to an established equilibrium and justify your answer.
51c	32	ACC-3	3	4	i) Determine an elementary step of a reaction mechanism given 2 elementary steps and net equation for the overall reaction. ii) Identify how to increase rate of overall reaction.
51d	46	ACC-4	2	4	Given the initial concentrations and equilibrium concentration of a species which is allowed to reach equilibrium, calculate the value of K_{eq}.
52a(i)	60	320-2	2	2	Predict the Bronsted-Lowry reaction that occurs when two solutions are combined.
52a(ii)	60	320-2	2	1	Predict whether reactants or products are favoured.
52b	66	320-4	2	3	Perform dilution and pH calculations to determine the final volume.
52c	70	320-3	2	4	Calculate pH given the initial concentration of a weak base.
52d	76/78	320-6	3	4	Use titration data to determine the identity of a group II metal in one reactant. (science communication mark)
53a	98	214-3	2	5	i) Draw a heating/cooling curve from given data. ii) Calculate the total energy required to heat a substance through temperature changes and phase change.
53b	112	ACC-8	2	2	Calculate fuel value of a substance given calorimeter data.
53c	114	324-4	2	2	Use standard molar enthalpies of formation to calculate heat of reaction for a chemical change.
53d	118	324-4	3	4	Use bond energies and enthalpy of reaction to calculate a missing bond energy.

54a	130	322-2	2	3	Balance a redox reaction under acidic conditions.
54b	132/136	322-4 322-5 322-6	2	4	i) Identify and label the parts of an electrochemical cell. ii) Determine the overall cell potential. (science communication mark)
54c	94/144	322-8	3	3	Using Faraday's law, determine the time to make a metal given its specific heat capacity and heat absorption during a temperature change.