Chemistry 3202
June 2017 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 a piece of evidence that supports the kinetic molecular theory.
2	28	ACC-1	L2	Identify how $E_{a(forward)}$, $E_{a(reverse)}$, and ΔH are related.
3	30	ACC-2	L1	Describe how a catalyst affects the rate of a chemical reaction.
4	30	ACC-2	L2	Identify factors that affect reaction rate.
5	32	ACC-3	L2	Identify the reaction intermediate(s) and the catalyst(s) in a given reaction mechanism.
6	32	ACC-3	L1	Identify the rate-determining step in a given reaction mechanism.
7	40	323-4 323-5	L2	Determine the cause of change imposed on an equilibrium system, given the equilibrium system and a concentration vs time graph.
8	42	323-4 323-5	L2	Use LCP and the solubility table to predict a change in an equilibrium system when a stress is imposed.
9	44	323-3	L1	Given an equilibrium system, identify what would cause the equilibrium constant (K_{eq}) to change.
10	44	323-3	L1	Recognize that solids and liquids are not included in the equilibrium expression.
11	44	323-3	L3	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	L2	Calculate (K_{eq}) from given equilibrium concentrations.

Item	Curriculum Guide Page	Outcome	Cognitive Level	Outcome Description
13	(Unit 2) 52	214-1	L1	Identify which pH best corresponds to a given acid/base operational definition.
14	54	320-1	L1	Identify an Arrhenius acid or base.
15	52	214-1	L2	Identify a strong/weak acid given solution characteristics.
16	56	214-17	L2	Identify an amphoteric substance.
17	58	214-17	L2	Use the table of acid strength to identify strongest acid or base.
18	60	320-2	L2	Predict whether reactants or products are favoured in an acid-base equilibrium.
19	62	320-4	L3	Determine the effect of changes on the self-ionization of water equilibrium.
20	66	320-4	L1	Identify the characteristics of a neutral solution.
21	62, 66	320-4	L2	Calculate $\left[H_3O^+\right]$, $\left[OH^-\right]$, pH or pOH of a strong acid or a strong base.
22	66	320-4	L1	Convert between any two of $\left[H_3O^+\right]$, $\left[OH^-\right]$, pH or pOH.
23	66	320-4	L2	Convert between any two of $\left[H_3O^+\right]$, $\left[OH^-\right]$, pH or pOH.
24	70	320-3	L2	Identify an expression as K_a or K_b for a given substance.
25	80	320-7	L3	Determine the colour of an indicator at different points on a titration curve.
26	82	214-5	L1	Identify polyprotic/polybasic species.
27	76	320-6	L1	Identify laboratory equipment used for titrations.
28	82	214-5	L2	Identify the reaction which occurs at the second equivalence point for a given acid and base.
29	(Unit 3) 94	324-3	L2	Calculate the specific heat capacity of a metal, given its mass and heat capacity.
30	100	324-2	L1	Identify changes that occur when substances undergo chemical changes and phase changes.
31	94	324-3	L1	Calculate the heat absorbed by a metal, given the mass, specific heat, and temperature change of the metal.

Item	Curriculum Guide Page	Outcome	Cognitive Level	Outcome Description
32	98	324-3	L2	Identify the enthalpy diagram for a given reaction.
33	100	324-3	L1	Identify an endothermic/exothermic phase change.
34	104	324-7	L2	Calculate the energy associated with a substance undergoing a phase change.
35	104	324-1	L3	Determine the identity of a reactant in a chemical reaction given the enthalpy of reaction, amount of energy absorbed/released, and the mass of reactant.
36	108	214-3	L1	Identify the changes in state on a heating or cooling curve.
37	110	117-9	L1	Compare physical, chemical, and nuclear changes.
38	108	214-3	L2	Given physical data for a substance, identify the changes it undergoes over a temperature change.
39	112	ACC-8	L2	Calculate the fuel value for a substance, given the mass and energy.
40	114	324-4	L2	Given thermochemical equations, calculate ΔH^0 for the reaction.
41	(Unit 4) 126	322-1	L1	Use Standard Reduction potentials table to identify strongest oxidizing/reducing agent.
42	126	322-1	L2	Determine whether a reaction is a redox reaction.
43	126	322-1	L1	Identify an oxidation or reduction half reaction.
44	126	322-3	L2	Determine the oxidation number of an atom in an ion or molecule.
45	132	322-4	L1	Describe the function of a salt bridge.
46	136	322-5 322-6	L2	Use the Standard Reduction Potentials table to predict cell voltage, E^o.
47	136	322-5 322-6	L1	Describe an electrolytic cell in terms of type of reaction and cell potential.
48	138	322-5 322-6	L3	Use given cell voltages to determine an unknown cell voltage.
49	144	322-8	L2	Calculate the number of moles of electrons transferred during electroplating, given the current and time.
50	134	322-4	L2	Identify electron and ion movement in an electrochemical cell.

PART II: Constructed Response—Total Value: 50%

Item	Curriculum Guide Page	Outcome	Cognitive Level	Value	Outcome Description
51a	(Unit 1) 28	ACC-1	L2	2	Draw and label a potential energy diagram for a given reaction.
51b(i)	32	ACC-3	L3	2	Determine an elementary step of a reaction mechanism given two elementary steps and the net equation for the overall reaction.
51b(ii)	32	ACC-3	L3	2	Identify and explain how to increase the rate of the overall reaction.
51c(i)	40	323-4 323-5	L2	2	Use LCP to describe possible changes that occur to an equilibrium system so that the amount of a species in the system will increase/decrease.
51c(ii)	40	323-4 323-5	L2	1	Use LCP to predict and explain the changes to an equilibrium caused by a change in temperature, pressure, volume or concentration.
51d	46	ACC-4	L2	4	Given the initial concentrations and equilibrium concentration of a species which is allowed to reach equilibrium, calculate the value of K_{eq}.
52a	(Unit 2) 60	320-2	L2	2	Predict the Brønsted-Lowry reaction that occurs when two solutions are combined.
52b	70	320-3	L2	4	Calculate the pH of a solution given the initial weak acid concentration and the K_a.
52c	80	116-2	L2	4	Calculate $\left[H_3O^+\right]$ and pH of a strong acid-strong base mixture where one reagent is in excess.
52d	76, 78	320-6	L3	4	Use titration data to determine the identity of a group II metal in one reactant. (Science Communication)
53a	(Unit 3) 96, 106	324-1 324-3	L3	4	Calculate the specific heat capacity of a metal, given the mass of the metal, a temperature vs time graph, and the volume of water in a simple calorimeter (into which the metal is dropped). (Science Communication)
53b	114	324-4	L2	4	Use Hess's Law to calculate the enthalpy of a reaction.

Item	Curriculum Guide Page	Outcome	Cognitive Level	Value	Outcome Description
53c	114	324-4	L2	2	Use standard molar enthalpies of formation, ΔH^0_f, to determine the molar enthalpy of a given reaction.
53d	118	324-4	L2	3	Use average bond energies to calculate the enthalpy of a given reaction.
54a	(Unit 4) 130	322-2	L2	3	Balance a redox reaction under acidic conditions.
54b	138	322-5 322-6	L3	3	Given a list of lab materials and chemicals, construct an electrochemical cell that produces a specified voltage. Write the two half reactions and identify the anode, cathode and cell voltages used to produce the cell.
54c	144	322-8	L2	4	Calculate the time required electroplate a certain mass of metal onto the cathode of an electrolytic cell, given the current. (Science Communication)