

CHEMISTRY 30
DIPLOMA EXAMINATION
SCHOOL REPORT
JUNE 2011

Case Study #3

Table 1
Chemistry 30
Percentage of Students Who Achieved Standards on Their Final Course Mark

Standard	Final Course Mark Representing Standard (%)	Percentage of Students Who Achieved Standard
Acceptable Standard	50	88.9
Standard of Excellence	80	32.3
Number of Students Included in Report	10118	81

Table 2
Chemistry 30
Percentage Distribution of A, B, C, and F, Averages, and Standard Deviations of Scores

Scores	School-Awarded Mark		Diploma Examination Mark		Final Course Mark	
	Prov.	School	Prov.	School	Prov.	School
A (80 - 100%)	41.9	27.2	29.2	25.9	32.3	23.5
B (65 - 79%)	34.3	24.7	23.7	14.8	30.1	23.5
C (50 - 64%)	18.9	25.9	21.2	24.7	26.5	24.7
F (0 - 49%)	4.9	22.2	26.0	34.6	11.1	28.4
Average Percent Score	74.0	63.0	64.3	57.4	69.5	60.5
Standard Deviation	14.1	19.7	20.8	23.5	16.5	21.1

Please refer to "Guidelines for Interpreting the Diploma Examination Detailed Reports" for suggestions about how to use this report.

$$Z = \frac{63.0 - 74.0}{19.7} = -0.76$$

$$Z = \frac{57.4 - 64.3}{23.5} = -0.33$$

$$Z = \frac{60.5 - 69.5}{21.1} = -0.55$$

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Table 3
Chemistry 30
Percentage of Students Who Achieved Standards on Their Final Course Mark, by Gender

Gender	Students		Students Who Achieved the Acceptable Standard		Students Who Achieved the Standard of Excellence	
	Number	Percent of Total	Number	Percent of Gender	Number	Percent of Gender
Province						
Male	4825	47.7	4284	88.8	1686	34.9
Female	5293	52.3	4707	88.9	1578	29.8
School						
Male	37	45.7	22	59.5	8	21.6
Female	44	54.3	36	81.8	11	25.0

Table 4
Chemistry 30
Percentage Distribution of A, B, C, and F, Averages, and Standard Deviations of Scores, by Gender

Scores	School-Awarded Mark				Diploma Examination Mark				Final Course Mark			
	Province Male	Province Female	School Male	School Female	Province Male	Province Female	School Male	School Female	Province Male	Province Female	School Male	School Female
A (80 - 100%)	42.7	41.2	24.3	29.5	32.3	26.3	24.3	27.3	34.9	29.8	21.6	25.0
B (65 - 79%)	32.7	35.7	18.9	29.5	23.4	23.9	10.8	18.2	28.7	31.3	16.2	29.5
C (50 - 64%)	19.2	18.7	24.3	27.3	19.8	22.4	18.9	29.5	25.1	27.8	21.6	27.3
F (0 - 49%)	5.4	4.4	32.4	13.6	24.5	27.4	45.9	25.0	11.2	11.1	40.5	18.2
Average Percent	73.9	74.0	58.3	67.0	65.7	63.1	52.5	61.5	70.1	68.9	55.7	64.6
Standard Deviation	14.4	13.7	22.1	16.8	20.9	20.6	25.4	21.2	16.7	16.2	23.3	18.3

$$Z = -1.08$$

$$Z = -0.51$$

$$Z = -0.63 \quad Z = -0.08$$

$$Z = -0.86$$

$$Z = -0.17$$

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Table 5
Chemistry 30
Average Raw Scores and Standard Deviations, by Item Format

Item Format	Total Marks Possible	Average Raw Score	Standard Deviation
		Prov. School	Prov. School
Multiple Choice	44	29.7	9.0
		26.8	10.2
Numerical Response	16	9.2	3.9
		7.9	4.2

$$Z = \frac{26.8 - 29.7}{9.0} = -0.32$$

$$Z = \frac{7.9 - 9.2}{3.9} = -0.33$$

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Table 6
Chemistry 30
Raw Score Results, by Reporting Category

Reporting Category	Total Marks Possible	Average Raw Score Prov.	School	Standard Deviation Prov.	School
Thermochemical Changes (A1/A2)	12	7.6	6.5	2.8	3.2
Electrochemical Changes (B1/B2)	20	13.2	12.0	4.4	5.0
Chemical Changes of Organic Compounds (C1/C2)	9	6.2	6.0	2.1	2.3
Chemical Equilibrium Focusing on Acid-Base Systems (D1/D2)	19	12.0	10.3	4.6	4.8

$$z = -0.46$$

$$z = -0.27$$

$$z = -0.10$$

$$z = \frac{10.3 - 12.0}{4.6}$$

$$= -0.37$$

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Table 7 - 1
Chemistry 30
Results, Blueprint Classifications, and Item Descriptions, by Item

Item #	% Correct Prov. Sch.	Knowledge	Skills	STS	Item Description
1	76.5 64.6	A1.3k			Determine the enthalpy associated with the decomposition of a compound into its elements, and classify the enthalpy change as a reactant or a product.
NR1	78.1 63.3	A1.1k			Calculate the mass of water in a calorimetric experiment where the input energy is given.
2	70.2 63.3	A1.7k			Determine the enthalpy relationships among the overall reaction, and various equations related to the reaction steps.
3	72.7 60.8	A2.4k	A1.3s		Identify the potential energy diagram and the energy changes associated with a catalyzed biological reaction.
NR2	46.6 26.6	A1.1k			Compare hydrocarbon combustion and cellular respiration.
4	36.9 40.5	A1.1k			Compare the effects of varying calorimeter materials on the responding variable in a calorimetric experiment.
NR3	67.7 68.4		A1.2s		Select the calorimetric data that needs to be measured to determine the value of an energy associated with a chemical reaction.
5	76.1 60.8	A1.6k			Calculate the enthalpy associated with a reaction, given the balanced chemical equation.
6	73.4 57.0	A1.5k			Classify a reaction as exothermic or endothermic and calculate the mass of product associated with a given enthalpy change.
7	62.8 58.2	A2.2k			Relate the energy transfer to the bonds being broken when a hydrocarbon is broken down into free radicals.

Note: The reporting categories **Knowledge (k)**, **Skills (s)**, and **Science, technology and society (sts)** refer to curricular outcomes only. Items in each reporting category cover a range of cognitive levels.

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Table 7 - 2
Chemistry 30
Results, Blueprint Classifications, and Item Descriptions, by Item

Item #	% Correct Prov. Sch.	Knowledge	Skills	STS	Item Description
NR4	67.3 63.3	A2.3k	A2.3s		Analyze a potential energy diagram for an equilibrium reaction to determine enthalpies and energies associated with both forward and reverse reactions.
NR5	27.4 20.3	A1.4k			Determine the number of moles of each reactant and each product from an unbalanced equation and a given enthalpy change.
8	75.9 70.9	B1.7k			Balance an incomplete half-reaction involved in an industrial process.
9	61.2 55.7	B1.7k			Determine the electrons transferred, given an unbalanced, incomplete half-reaction.
NR6	84.6 72.2	B1.7k			Determine the oxidation numbers of a metal in various of its compounds.
10	58.8 63.3	B1.2k		STS	In the context of B1.1sts, identify the step that is a redox reaction, and the electron transfer involved, in the two-step synthesis of a compound from simpler substances.
NR7	56.4 45.6	B2.5k			Determine the electrical potential of a given half-reaction if the reference half-reaction were changed.
11	67.3 60.8	B1.5k			Given observations related to redox reactions involving hypothetical species, identify the strongest reducing agent present and predict the spontaneity of a particular redox reaction.
12	71.3 67.1	B1.6k			Estimate the reduction potential of an oxidizing agent, given experimental observations of the reactions of the oxidizing agent with various metals.
13	57.5 55.7	B1.4k			Identify reducing agents and electron donors in a biological system.

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Table 7 - 3
Chemistry 30
Results, Blueprint Classifications, and Item Descriptions, by Item

Item #	% Correct Prov. Sch.	Knowledge	Skills	STS	Item Description
14	70.9 67.1	B1.1k			Select consequences of oxidation of a metal in a redox reaction.
15	77.4 70.9	B1.2k			Identify oxidizing and reducing agents in a commercial battery.
16	69.3 68.4	B1.8k	B1.2s		Calculate the concentration of one solution from redox titration data.
NR8	44.5 44.3	B1.7k			Balance redox reactions to determine reactant and product coefficients and electron transfers.
17	70.9 58.2	B2.2k			Select properties common to both electrolytic and voltaic cells.
18	60.0 49.4	B2.7k			Given diagrams of electrochemical cells, determine which cells are voltaic.
19	75.2 72.2	B2.1k			Given sets of half-reactions, identify those sets that yield a positive electrical potential.
NR9	74.2 72.2	B2.6k			Determine the cell potential for a given electrochemical cell.
20	79.6 74.7	B2.3k	B2.3s		Classify an electroplating cell, and identify the strongest oxidizing agent present in the cell.
21	73.4 49.4	B2.2k			Determine the direction of motion of various charged particles in an electroplating cell.

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Table 7 - 4
Chemistry 30
Results, Blueprint Classifications, and Item Descriptions, by Item

Item #	% Correct Prov. Sch.	Knowledge	Skills	STS	Item Description
NR10	34.8 38.0	B2.3k			Identify reactant and product species in an electrochemical cell.
NR11	54.6 41.8	B2.8k			Calculate the time required to produce a given mass of metal in an electrolytic cell.
NR12	57.1 58.2	C1.2k			Analyze the structural formula for a given organic compound to determine the numbers of specified atoms and bonds.
22	83.5 75.9	C1.4k			Determine a general structural formula for a biologically active substance.
NR13	54.7 51.9	C2.2k			Balance the equation representing the combustion of a carboxylic acid.
23	80.9 81.0	C2.1k			Classify an organic reaction, given the reactants and the products.
24	78.1 77.2	C1.4k			Determine a classification that will cover five organic compounds whose structural formulas are given.
25	70.4 63.3	C2.3k		STS	In the context of C2.1sts, classify a polymer, and identify the functional group in one of the monomers.
26	57.3 62.0	C2.2k			Predict the reaction between a given hydrocarbon and a halogen.
27	62.1 51.9	C1.7k			Analyze the relationships among boiling point, molar mass, and product location in an industrial process.

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Table 7 - 5
Chemistry 30
Results, Blueprint Classifications, and Item Descriptions, by Item

Item #	% Correct Prov. Sch.	Knowledge	Skills	STS	Item Description
28	79.2 82.3	C1.3k			Identify one isomer of a simple sugar, and select the definition of an isomer in this context.
29	61.0 49.4	D1.1k			Determine two properties of a system that is in equilibrium.
NR14	79.6 60.8	D1.4k	D1.3s		Create an equilibrium law expression, starting from an unbalanced equilibrium equation.
30	65.6 58.2	D1.1k	D1.2s		Analyze the colour changes associated with the shift in equilibrium when a stress is applied to the system.
31	46.5 31.6	D1.4k			Use reactant and product concentrations to evaluate whether a system is in equilibrium, and to determine any required or favoured products or reactants that need to be changed.
32	73.7 63.3	D2.3k	D2.3s		Calculate the equilibrium constant of a reaction from graphical data.
33	58.6 50.6	D1.7k			Select a conjugate acid-base pair from a given list of species.
34	70.2 65.8	D1.5k			Select amphiprotic species from a given list of species.
35	69.1 60.8	D1.2k			Given an equilibrium law expression, determine the balanced equilibrium equation and predict the equilibrium shift associated with a given stress to the system.
36	60.5 49.4	D1.3k			Analyze the effect on an equilibrium of the discharge of a pollutant from an industrial enterprise.

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Table 7 - 6
Chemistry 30
Results, Blueprint Classifications, and Item Descriptions, by Item

Item #	% Correct Prov. Sch.	Knowledge	Skills	STS	Item Description
37	71.4 58.2	D1.3k	D1.2s		Select the graph that represents the effects of a stress on an equilibrium system.
38	56.2 53.2	D2.3k	D2.3s		Given the initial concentrations and one equilibrium concentration, determine the remaining equilibrium concentrations in an equilibrium reaction.
39	57.2 50.6	D2.3k			Calculate the equilibrium concentration of an acid, given the initial concentration of acid and the equilibrium pH.
40	73.4 63.3	D1.6k			Compare the strengths of two weak acids, and compare the Kb values of their conjugate bases.
NR15	42.8 22.8	D2.2k			Calculate the pH of a solution of a weak acid, given values for Ka and the initial acid concentration.
41	64.4 60.8	D2.1k			When an indicator is added to a solution, identify the products of the indicator reaction and the colour of the indicator.
42	53.7 34.2	D2.2k			Calculate the Kb and POH values of a solution of a weak base.
43	68.0 68.4	D1.8k		STS	In the context of D1.1sts, determine the buffering equation and the effect of the buffering on the pH of lakes as a result of acid deposition.
NR16	52.8 45.6	D1.6k	D1.3s		Identify basic and amphiprotic species from a list of species.
44	71.8 79.7	D1.8k	D1.3s		Analyze a titration curve of pH as a function of acid added to identify buffering regions and to classify the base being titrated.

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