



AP[®] Chemistry 2002 Scoring Commentary Form B

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AP[®] CHEMISTRY
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Question 1

Sample 1A (Score 9)

This response earned a total of 9 points — 3 points for part (a), 1 point for part (b), 2 points for part (c), and 3 points for part (d).

This is a very good response that would have earned full credit except for a math error in part (c).

Sample 1B (Score 7)

This response earned a total of 7 points — 2 points for part (a), 1 point for part (b), 1 point for part (c), and 3 points for part (d).

This good response earns full credit for both parts (b) and (d), which are clear and correct. Only 2 of the 3 points available in part (a) are earned. In this part, the use of 0.016 leads to an incorrect value for K_a . Also, 1 out of 3 points is earned in part (c) because of two errors: one in calculating $[C_3H_5O_3^-]$ and one in determining $[H^+]$.

Question 2

Sample 2A (Score 10)

This response earned a total of 10 points — 3 points for part (a), 2 points for part (b), 2 points for part (c), and 3 points for part (d).

This is an excellent paper that earns a perfect score of 10 points. Steps are clearly shown so that the methods used are unambiguous.

Sample 2B (Score 8)

This response earned a total of 8 points — 3 points for part (a), 2 points for part (b), 1 point for part (c), and 2 points for part (d).

This is a very good response that earns 8 of the possible 10 points. Parts (a) and (b) are done clearly and correctly. Part (c) earns only 1 point because the masses used in the calculation are based on one mole of each substance rather than the actual number of moles present in the flask. In part (d), the response earns only 2 of the possible 3 points because argon is not included in the calculation of the mole fraction of all species in the flask.

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Question 3

Sample 3A (Score 8)

This response earned a total of 8 points — 1 point for part (a), 1 point for part (b), 2 points for part (c)(i), 2 points for part (c)(ii), 2 points for part (d)(i), and 0 points for part (d)(ii).

This response is very good, earning 8 out of 10 points. Parts (b) and (c) clearly earn full credit. In part (a), the response does not indicate whether the carbon is oxidized or reduced and so does not earn a point, and in part (d)(ii), no credit is earned because the reaction is spontaneous from left to right, not right to left.

Sample 3B (Score 6)

This response earned a total of 6 points — 2 points for part (a), 0 points for part (b), 2 points for part (c)(i), 2 points for part (c)(ii), 0 points for part (d)(i), and 0 points for part (d)(ii).

Earning 6 out of 10 points, this response shows some typical errors. The point available in part (b) is not earned because concentrations are used instead of pressures, and N_2 does not appear in the numerator of the expression. In part (d)(i), neither Q nor ΔG is calculated, and in part (d)(ii), the reaction is spontaneous from left to right, not right to left.

Question 4

Sample 4A (Score 13)

This response earned a total of 13 points — 2 points for part (a), 2 points for part (b), 3 points for part (c), 3 points for part (e), and 3 points for part (h).

This response is very good, earning 13 of the available 15 points. Reactions (c), (e), and (h) earn full credit, which is 1 point for correct reactants and 2 points for correct products. In reaction (a), 2 of the 3 available points are earned because the products are correct but the formula for 1-propanol is incorrect. In reaction (b), the formula for the reactant chromate is incorrect, but 2 product points are earned for a consistent formula of a precipitate.

Sample 4B (Score 11)

This response earned a total of 11 points — 3 points for part (a), 1 point for part (c), 3 points for part (e), 2 points for part (g), and 2 points for part (h).

In this response, reactions (a) and (e) each earn the full 3 points. Reaction (c) earns 1 product point for Fe^{2+} . In reaction (g), Cl_2 is incorrectly included as a product, so only 1 product point is earned. Just one of the two products is correct in reaction (h).

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Question 5

Sample 5A (Score 10)

This response is particularly clear, and earns a perfect score of 10 points — 2 points for part (a), 2 points for part (b), 2 points for part (c), 2 points for part (d), and 2 points for part (e).

Sample 5B (Score 8)

This response earned a total of 8 points — 0 points for part (a), 2 points for part (b), 2 points for part (c), 2 points for part (d), and 2 points for part (e).

This is a very good response that shows a common error. In part (a), the response identifies NaCl as the salt that can be distinguished by its appearance alone. In fact, three of the other salts (AgCl, NH₄Cl, and BaCl₂) are also white in pure form.

Question 6

Sample 6A (Score 8)

This excellent response is clear and organized, earning all 8 points — 2 points for part (a), 2 points for part (b), 2 points for part (c), 1 point for part (d), and 1 point for part (e).

Sample 6B (Score 6)

This response earned a total of 6 points — 2 points for part (a), 2 points for part (b), 1 point for part (c), 1 point for part (d), and 0 points for part (e).

This response is good, and earns all but 2 points. In part (c), the structural formulas are shown, but the response does not address the reasons for the spatial arrangement. The explanation for the difference in acid strengths in part (e) is incorrect.

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Question 7

Sample 7A (Score 8)

Full 8-point credit is earned in this excellent response, which clearly documents the reasoning behind the answers — 2 points for part (a), 2 points for part (b), 2 points for part (c), and 2 points for part (d).

Sample 7B (Score 6)

This response earned a total of 6 points — 1 point for part (a), 2 points for part (b), 2 points for part (c), and 1 point for part (d).

In this good response, parts (b) and (c) earn full credit. In part (a), however, the response does not specify the correct initial concentration of M^{2+} (Zn^{2+}) in solution; in part (d), the response correctly indicates that the voltage would be zero, but falls short in not mentioning ion transfer in the salt bridge.

Question 8

Sample 8A (Score 8)

This response earns all 8 points — 2 points for part (a), 2 points for part (b), 2 points for part (c), 1 point for part (d)(i), and 1 point for part (d)(ii).

Sample 8B (Score 6)

This response earned a total of 6 points — 2 points for part (a), 2 points for part (b), 1 point for part (c), 1 point for part (d)(i), and 0 points for part (d)(ii).

In this very good response, the graph in part (c) does not start at a pH of 1, thus only one of the two available points is earned. The response in part (d)(ii) does not earn the point.