



AP[®] Chemistry 2005 Scoring Commentary Form B

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2005 SCORING COMMENTARY (Form B)

Question 1

Sample: 1A

Score: 10

This response earned all 10 points: 1 point for part (a), 2 points for part (b), 2 points for part (c), 1 point for part (d)(i), 3 points for part (d)(ii), and 1 point for part (d)(iii).

Sample: 1B

Score: 8

Only 1 out of 3 points was earned in part (d)(ii). The point was earned for calculating the initial number of moles of OCl. The point was earned in part (d)(iii) because the incorrect value calculated in part (d)(ii) is used correctly.

Sample: 1C

Score: 6

Neither point was earned in part (c). In part (d)(ii) the first point was earned for calculating the initial number of moles of HOCl, and the second point was earned for calculating the final number of moles of HOCl. The third point was not earned because the calculation for $[H_3O^+]$ is incorrect. The point was not earned in part (d)(iii) because the calculation is not done correctly.

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Question 2

Sample: 2A

Score: 9

This response earned all 9 points: 1 point for part (a), 2 points for part (b), 1 point for part (c), 2 points for part (d), 2 points for part (e), and 1 point for part (f).

Sample: 2B

Score: 7

The point was not earned in part (a) because the equation is incorrect. The point was not earned in part (f) because the response does not indicate that the partial pressure of water vapor is involved.

Sample: 2C

Score: 4

The point was not earned in part (a) because the equation is missing H^+ 's and e^- 's to make it balance. Only 1 out of 2 points was earned in part (d) because the response does not recognize that two moles of electrons are transferred for each mole of H_2 involved. Neither point was earned in part (e) because the response assumes that the conditions are standard temperature and pressure. The point was not earned in part (f) because the response does not indicate that the partial pressure of water vapor is involved.

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Question 3

Sample: 3A

Score: 9

This response earned all 9 points: 1 point for part (a), 2 points for part (b), 1 point for part (c), 2 points for part (d), 2 points for part (e), and 1 point for part (f).

Sample: 3B

Score: 7

This response earned only 1 out of 2 points in part (b). The number of molecules of Y calculated is not the number of molecules of Y produced in the first 20 minutes but the number that would be produced from the X remaining in the flask after 20 minutes. The point was earned for using the correct stoichiometry of two moles of Y per mole of X. Only 1 out of 2 points was earned in part (e) because the math involving the natural logs is done incorrectly. Both points are earned in part (f) because the incorrect value calculated in part (e) is used correctly.

Sample: 3C

Score: 5

Only 1 out of 2 points was earned in part (b) because the number of moles of Y produced is calculated, not the number of molecules. Only 1 out of 2 points was earned in part (e) because the integrated rate law is not used. The point was earned for the correct units. Neither point was earned in part (f) because the integrated rate law is not used.

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Question 4

Sample: 4A

Score: 15

This response earned all 15 points. In each part, 1 point was earned for the correct reactant(s), and 2 points were earned for the correct product(s).

Sample: 4B

Score: 12

Only 1 out of 3 points was earned in part (d) because ethanoic acid is incorrectly shown as extensively ionized. One product point was earned for H_2O . The reactant point and only 1 out of 2 product points were earned in part (e) because KOH should be shown as extensively ionized.

Sample: 4C

Score: 10

Only 1 out of 3 points was earned in part (d). Barium hydroxide should be shown as extensively ionized, and Ba^{2+} , a spectator ion, should not be included. One product point was earned for H_2O . The reactant point and only 1 out of 2 product points were earned in part (e) because KOH should be shown as extensively ionized. Only 1 out of 3 points was earned in part (g) because NaF and HCl should be shown as extensively ionized. One product point was earned for HF .

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Question 5

Sample: 5A

Score: 8

In part (a) a point was earned for using the correct amount of 10 M H₂SO₄, and another point was earned for diluting to the mark; however, two other possible points were not earned because a pipet is not used and water is not put into the volumetric flask before the acid is added. The rest of the response is correct: 3 points were earned for part (b), 1 point for part (c)(i), 1 point for part (c)(ii), and 1 point for part (c)(iii).

Sample: 5B

Score: 7

Only 3 out of 4 points were earned in part (a) because water is not put into the volumetric flask before the acid is added. The point was not earned in part (c)(i) because the calculated percent yield would be greater than the actual percent yield, not less. The point was not earned in part (c)(ii) because the increase is not due to the weight of the precipitate increasing as it cools.

Sample: 5C

Score: 6

Only 1 out of 4 points was earned in part (a): the correct amount of H₂SO₄ is used, but incorrect equipment is used, acid is not added to water, and the container is not filled to the mark. The point was not earned in part (c)(ii).

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Question 6

Sample: 6A

Score: 8

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

Sample: 6B

Score: 6

The point was not earned in part (d) because changing the volume would not affect the kinetic energy: the v in the cited equation is velocity, not volume. Only 1 out of 2 points was earned in part (e)(i) because the response only indicates that the pressure increases, not that it doubles.

Sample: 6C

Score: 4

The point was not earned in part (b). The point was not earned in part (d) because changing the volume would not affect the kinetic energy. Only 1 out of 2 points was earned in part (e)(i) because the response only indicates that the pressure increases, not that it doubles. The point was not earned in part (e)(ii) because the speed does not change.

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Question 7

Sample: 7A

Score: 8

This response earned all 8 points: 2 points for part (a), 2 points for part (b), 1 point for part (c), 2 points for part (d), and 1 point for part (e).

Sample: 7B

Score: 6

The point was not earned in part (c) because the response does not give the balanced chemical equation. The point was not earned in part (e) because the response does not compare the lower energy required in the breaking of old bonds to the greater energy released by the formation of new bonds. Also, the response does not indicate what bonds are formed.

Sample: 7C

Score: 4

The point was not earned in part (c) because the response uses H_2O instead of O_2 as the source of oxygen in the formation reaction. Neither point was earned in part (d) because ΔS is negative, not positive. The point was not earned in part (e) because there is no mention of bond energies.

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Question 8

Sample: 8A

Score: 8

This response earned all 8 points: 1 point for part (a), 2 points for part (b), 2 points for part (c), 2 points for part (d), and 1 point for part (e).

Sample: 8B

Score: 6

Neither point was earned in part (b) because the bonds are not of equal length. This was a common error.

Sample: 8C

Score: 4

Neither point was earned in part (b) because the bonds are not of equal length. Neither point was earned in part (c) because the bond energy in CSe_2 is less than the bond energy in CS_2 .