**Revised April 2013**

Comments on 1999 Multiple Choice

- **Hard Questions**

Of the 75 multiple-choice questions on the MC AP test, there will be a *few* that are either at the periphery of your knowledge, subtly disguised, or perhaps just really difficult. These used to be (prior to 2011) the ones that you left blank **BUT now there is no penalty for wrong answers, so you should have ZERO blanks – you must guess on all questions that you cannot answer.** The following questions from the 1999 test are in that, 'hard question' category.

Question	Explanation/Comment	Answer
3	A reaction with a negative ΔG is one that is spontaneous. If the reaction is spontaneous it will 'give out' work, i.e., it **will do work** on the surroundings. A reaction with a positive ΔG needs to have **work done on it** in order to make it happen. TOPICS 9 & 13. Should be able to confidently eliminate A & C, and possibly D & E.	**B**
19	In a combustion engine, fuel and air are mixed in the cylinder and the spark plug provides the energy to overcome the activation energy. TOPICS 9 and 15. The chemistry here is easy but it is disguised in the wording. Any reaction, even those that are spontaneous like the combustion of fuel, require a small amount of energy to overcome the activation energy to start them. Exothermic combustion reactions go on to provide the necessary energy to continue themselves. Should be able to confidently eliminate A & D.	**C**
21	Flame tests can be used to identify the presence of certain metal ions. Samples of the salt to be tested are dipped in concentrated HCl and held in a burner flame. Na^+ (yellow), Cu^{2+} (blue/green), K^+ (lilac), Ca^{2+} (brick red), Ba^{2+} (yellow/green) & Sr^{2+} (crimson) are common. Colors result as electrons are promoted to higher energy levels then fall back to lower levels releasing energy in the visible part of the spectrum. Mg metal combusts in O_2 with a bright, white light, BUT this is NOT a flame test, rather a combustion reaction that releases energy as light. TOPIC 3.	**B**
27	A spectrophotometer uses color intensity to **quantitatively** determine the concentration of a solution. TOPIC 4, Beer's Law. Only 16% of candidates got this correct (hardest question on the test).	**A**

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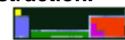
Question	Explanation/Comment	Answer
31	As temperature increases the volume water slightly increases. This leads to changes in density (mass per unit volume) and molarity (moles per unit volume) Only 21% of candidates got this question correct (2nd lowest scoring question on the test).	**C**
32	A carbon atom that makes a single bond has undergone sp^3 hybridization, one that makes a double bond sp^2 hybridization and one that makes a triple bond sp hybridization. Propene has both single (C-C) & double (C=C) bonds. TOPICS 8 & 11.	**D**
46	$Cu^{2+} + 4NH_3 \rightarrow [Cu(NH_3)_4]^{2+}$ Pale blue Cu^{2+} forms dark blue complex. TOPIC 10	**C**
52	Gases solubility increases with high pressure and low temperature TOPIC 6, Henry's law.	**B**

- **Question Analysis**

TOPIC	Question Numbers	# of questions	Comments
1 Matter & Measurement	-	0	
2 Atoms, Ions & Nomenclature	48, 51	2	
3 Electronic Configuration	6, 7	2	
4 Stoichiometry	20, 26, 27*, 33, 42, 47, 55, 59, 69*, 70*, 72, 73	12	
5 Aqueous Solution	30, 56, 65, 71	4	
6 Gases	23, 44, 53, 60, 64, 74	6	
7 Periodicity	1, 5, 37, 50	4	
8 Bonding	13, 14, 15, 16, 32*, 40, 68	7	
9 Thermochemistry	2, 22, 28, 61, 66	5	
10 Transition Metal Basics	8*	1	
11 Organic Basics	29	1	
12 Equation Writing	18*, 46*	2	
13 Equilibrium	25, 39, 41, 54, 67	5	
14 Acids & Bases	9, 10, 11, 12, 24, 38, 45, 62	8	
15 Kinetics	4, 19, 36, 63	4	
16 Electrochemistry	34, 35, 57	3	
17 Colligative Properties	31, 58, 75	3	
Miscellaneous (peripheral knowledge)	3, 17*, 21*, 43, 49*, 52	6	3 Energy & Work 17 General Knowledge 21 Flame Tests 43 Density/Molality/Molarity 49 Lab Procedure 52 Solubility of Gases
		75	

8* could also be considered topic 3
17* could also be considered topic 8
18* could also be considered topic 7
21* could also be considered topic 3
27* could also be considered topic 10 or miscellaneous
32* could also be considered topic 11
43* could also be considered topic 1
46* could also be considered topic 10
49* could also be considered topic 5
69* could also be considered topic 5
70* could also be considered topic 5

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- **Scoring Analysis**

The grade boundaries below are based upon calculating a multiple-choice score by awarding one point for each correct answer, and subtracting 0.25 points for each wrong answer. Questions omitted (blanks) are ignored and do not contribute anything to your overall multiple-choice score. Prior to 2011, the advice was to leave blank any question that you were clueless about, blank; 'clueless' meaning it was not even possible for you to eliminate a single answer choice.

THIS WAS THE FORMAT USED IN THE 1999 EXAM, But from 2011 onwards, there is no penalty for an incorrect answer, i.e., you should ALWAYS guess and you will have ZERO blanks

Since these grade boundaries are calculated using the old format, and we currently have no data for the new format, here is how you should treat your 75 answers to give you an idea of where you currently stand in terms of an AP score.

1. Award one point for each correct answer.

2. Look at all of the questions that you got wrong, and assign them to one of two categories, EITHER

a. A question that under the old format you would have left blank, i.e. a question that you were totally clueless about and could not eliminate even ONE answer. (There should be VERY few of these, and in recent years EVEN UNDER THE OLD FORMAT, many Westminster AP chemistry students have had closer to ZERO 'blanks'), OR

b. A question that you could eliminate at least one answer, i.e. one that you WOULD have guessed at on the old format.

3. For each question in category 2b., subtract 0.25 points from the total in #1. Do nothing with the questions in category 2a.

In the first column of the chart below, find the range in which your total multiple-choice score falls. The %'s on that line indicate the proportion of candidates with your multiple-choice score, that ultimately achieved the final AP score shown in the vertical column. The shaded boxes show the two most likely AP scores within any range. It's worth noting that your position within a range is important. For example, if you are at the top of a range you are much more likely to have ultimately achieved the higher AP scores.

The numbers in parenthesis underneath each percentage indicate the approximate multiple-choice score range that may most closely correspond to that percentage and that AP score. It is important to note that this is not a scientific mathematical analysis, rather a guesstimate! In addition, it is important to understand that there is no guarantee that a particular multiple-choice score relates to a particular AP score.

1999 Multiple-choice score related to final AP score using the old format of penalizing wrong answers

	1	2	3	4	5
46.00-75.00 (117 possible scores in the range)	0.00%	0.00%	1.30% (46.00-46.25)	15.20% (46.50-50.75)	83.50% (51.00-75.00)
38.00-45.75 (32 possible scores in the range)	0.00%	0.50% (38.00)	23.30% (38.25-39.75)	55.60% (40.00-44.25)	20.60% (44.50-45.75)
26.00-37.75 (48 possible scores in the range)	0.20% (26.00)	15.00% (26.25-27.75)	64.60% (28.00-34.25)	19.00% (34.50-37.50)	1.20% (37.75)
15.00-25.75 (44 possible scores in the range)	14.60% (15.00-16.25)	60.40% (16.50-23.25)	24.70% (23.50-25.50)	0.30% (25.75)	0.00%
0.00-14.75 (60 possible scores in the range)	81.60% (0.00-12.75)	17.80% (13.00-14.50)	0.60% (14.75)	0.00%	0.00%