

Errata Sheet for Organic Chemistry: A Guided Inquiry, 2e

Student Solutions Manual (SSM) changes are marked with a blue **SSM answers**
Errors that are confusing and should definitely be pointed out are shown in red
Errors shown in green were discovered after the 3rd printing. Many other errors were corrected for the 3rd printing. To determine the printing number of your book, look at the bottom left corner of the back of the title page. If it says 3456789 you have a 3rd printing.

ChemActivity 1

- CTQ 18 – the “degree” zeros lost their superscripting

ChemActivity 2

- CTQ 7 – second structure in each row are too close, stagger or separate
- **CTQ 13 – second structure in the third row is missing two lone pairs on oxygen (this structure is not meant to be the answer to CTQ 17)**

ChemActivity 3

- Exercise 8b – change wording to “Number of p orbitals left unhybridized on each non-hydrogen atom (i.e., the answer is ‘1’ for each sp² hybridized atom).”

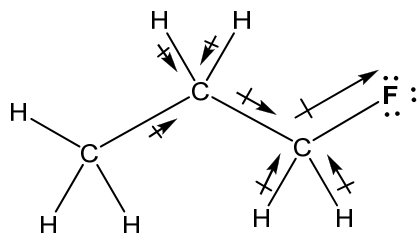
ChemActivity 4

- **In Memorization Task 4.1, Table 4.3 needs changes to the titles of the 4th and 6th boxes (sulfuric acid and hydronium ion). The new table should look like...**

Table 4.3: Generalized forms of the Six Strong Acids Used in this Book

| Hydroiodic Acid | Hydrobromic Acid | Hydrochloric Acid | Sulfonic Acids (when R = OH it is “sulfuric acid”) | Nitric Acid* | Oxonium Ions (when both R’s = H “hydronium ion”) |
|--------------------------------------|---------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| $\text{:}\ddot{\text{I}}\text{---H}$ | $\text{:}\ddot{\text{Br}}\text{---H}$ | $\text{:}\ddot{\text{Cl}}\text{---H}$ | $\begin{array}{c} \text{:O:} \\ \parallel \\ \text{R---S---O:} \\ \parallel \\ \text{:O:} \end{array}$ | $\begin{array}{c} \text{:O:} \\ \parallel \\ \ominus\text{:O:---N---O:} \\ \parallel \\ \text{H} \\ \oplus \end{array}$ | $\begin{array}{c} \oplus \\ \text{R---O---H} \\ \\ \text{R} \end{array}$ |

- CTQ 44 – replace parenthetical “(that is an acid)” with “(in the conjugate acid column)” and parenthetical “(that is an base)” with “(in the conjugate base column)”
- CTQ 46b – insert the word “EXOTHERMIC” after the bold “all” since the statement does not make sense for endothermic reactions.
- CTQ 48 – change question to “Construct an explanation that uses electronegativities to explain why the pK_a of water is lower (16) than the pK_a of ammonia (35). This gets students to the key issue better than the current question.
- **Model 13 on p. 48 – the two, right-most C-H polarity arrows are pointing the wrong direction. The corrected picture should look like...**



- **SSM answers to Exercise 1 – change “less” to “more”**
- **SSM answers to Exercise 3, 5th and 6th examples – The EN difference between H and Al is 0.6 (not 0.9); and the EN difference between C and Li is 1.5 (not 2.0)**
- Exercise 26 – add atom labels since skeletal structures are not covered until 6B
- Make pKa's in Table 4.6 a Memorization Task and emphasize these must be memorized for next quiz.
- Exercise 26, one CH₂ is still missing from one of the structures

ChemActivtiy 5

- CTQ 22 – replace “do you expect to be lowest in potential energy” with “has a negative charge that is lowest in potential energy.”
- CTQ 28c – change resonance to electronegativity (since the three anions all have the same number of resonance structures...so the difference is not really explained by resonance, but rather electronegativity.)
- Page 57 and 61 – change “Information” heading to “Memorization Task” for consistency with other chapters.
- Page 61 Information section – insert “an” before argument
- Exercise 15 – second row, first column, left structure, middle CH₂ has a lone pair hiding under it
- Exercise 15 – top right structure is missing a CH₂
- **SSM answers to Exercise 2 – top answer of the third subquestion...there is a pi bond missing between carbons 1 and 2 (and an extra H on each of these carbons).** There is also an extra lone pair in both the question and the answers.
- Model 7 of CA5 says that the pKa for the vinyl carbanion is 43 (and in CTQ 23). Change these to 45 to match exercises for part C #27 and index.

Nomenclature Worksheet 1

- Exercise 1 – Change 2-methylpropene and propene to 2-methylpropane and propane, since alkenes are not covered until NW2. (Change SSM as well.)
- **SSM answers** to Exercise 2, second structure should be named 3-ethyl-4-isobutyl-2-methyldecane (since groups should be listed alphabetically)

ChemActivtiy 6

- Throughout CA 6, references are made to naming of alkenes, which is not covered until NW2...perhaps move NW2 so it is between CA 5 and CA 6. For example CTQ 32.
- CTQ 2 – change “butane” to “ethane”
- **CTQ 29 – change “NH” on rightmost structure to “O”**

- CTQ 32 – change “Model 10” to “Model 9”
- CTQ 33, 38, and italics at bottom of p. 82 – change Nomenclature Worksheet 1 to Nomenclature Worksheet 2
- Model 11 – the word “Priorities” has been bumped to the next line
- **CTQ 37 – change “conformers” to “conformers or identical”**
- **SSM answers to Exercise 5 – all structures (including #3) are Newman projections of the molecule in the box**
- **SSM answers** to Exercise 5 – structure #4 has stacked Me and i-Pr for some reason

ChemActivtiy 7

- **SSM answers** to Exercise 5 – structures 8 and 9 are conformers (not identical)

Nomenclature Worksheet 2

- CTQ 11 – the term “hydroxyl” should be changed to hydroxyl in both places.
- Model 5, Page 112 – pentyloxy should be pentoxy (?)
- **CTQ 21 should read 3-amino-2-methylpentane rather than 3-amino-2-methylpropane**

ChemActivtiy 8

- CTQ 22a – replace symbol with a proper double dagger
- **SSM answers** to Exercise 4c – switch dotted and solid lines
- Exercise 7 – remove methyl on C3 (adjust **SSM answers** as well)
- **SSM answers** to Exercise 10 – first structure in answer b is missing + charge

ChemActivtiy 9

- Model 1 – 2 in Br₂ should be subscript (Br₂)
- **Model 5 – underline the phrase “Markovnikov trans” so the next question makes sense.**
- Exercises restart numbering in Part B. Should be numbered 1-7, not 1-2, then 1-5.

ChemActivtiy 10

- CTQ 11 – change “always assume excess ⁿH₂” to “assume excess H₂ or D₂”
- Synth. Transf. 10.6 – PCC works with secondary alcohols also
- Model 5 on p. 143 change “either cis or trans” to “an alkene”
- Exercises 5 and 8 – delete NaOH from demercuration step with NaBH₄
- **SSM answers** to Exercise 8 – left side, 3rd target, replace Br₂ with HBr

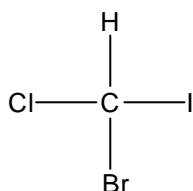
ChemActivtiy 11

- Synth. Transf. 11.6 on p. 157 should specify that the intermediate amide cannot be isolated, and that acid and water makes the reaction go all the way to the carboxylic acid. (This is how it is shown in the Appendix.)

ChemActivtiy 12

- CTQ 1-3 – change to the following...

1. (E) Make or borrow two models of the following, and confirm that the two models are **identical** based on the definition in Model 1.



green ball = chlorine atom
orange ball = bromine atom
purple ball = iodine atom
white ball = hydrogen

2. Modify one of your models by switching any two balls. (**Leave the other unchanged.**) Is the modified model **identical** to the unmodified model?
3. Which of the following words describe(s) the relationship between the modified model and the unmodified model? (Circle more than one choice, if appropriate.)
- identical**
 - configurational stereoisomers** (same atom connectivity, but not identical)
 - constitutional isomers** (same molecular formula, different atom connectivity)
 - mirror images** (look like reflections of one another in the mirror)
- CTQ 15, part f – there are 10 (not 14) stereoisomers.
 - CTQ 25 – two copies of a-f shown, delete one
 - Model 10 – there are two Model 10's (change latter to Model 11, etc., along with references to Models.
 - Model 10 – statement to left of boxed figure says that highest priority group should be at the top. This should say that the higher priority of the two TIED CARBONS should be at the top. An easier way to say this is that the top group (CHO in this case) should be higher priority than the bottom group (CH₂OH).
 - Page 168 – 2ⁿ rules does not take into consideration certain exceptions such as 1,4 disubstituted cyclohexane rings, or chiral molecules with no chiral centers.
 - **SSM answers** to Exercise 7 – answers h and p are missing an H⁺ (or an CH₃OH₂⁺, and H₃O⁺, respectively.
 - **SSM answers** to Exercise 13 – last structure, the answer should be 3 (not 4) since cis,cis; trans,trans; and cis,trans are the only possibilities.
 - Exercise 17 – configuration is not specified for the left most chiral center in the leftmost structure (**need to adjust SSM answers as well**)
 - **SSM answers** to Exercise 15f – The following pairs are redundant: RRSR and RSRR are the same molecule; SSRS and SRSS are the same; RRRS and SRRR are the same; and RSSS and SSSR are the same. One of each pair must be eliminated from the answer for a total of 10 unique stereoisomers.

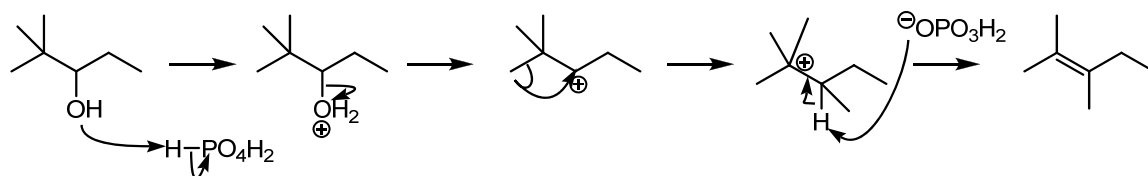
ChemActiviy 13

- CTQ 57 – the structure labeled DMF should be N,N-dimethylformamide, which is polar aprotic, so it needs to be moved to the middle row.
- Exercise 18 – modify the first statement to say “(1) Change to a nucleophile that is a stronger base.”

- **SSM answers** to Exercise 25 – last entry lacks a type of reaction. It should say S_N2 .

ChemActiviy 14

- Page 204 – gamma carbon should be bold
- CTQ 31 and elsewhere – ts symbol should be a proper double dagger.
- CTQ 32c – Change to “Strong base favors E2 when beta hydrogen present (except when the leaving group is primary).”
- CTQ 45 – last product, OH group should be an OCH_3
- **Synth. Transformations 14.3-14.4 are missing from index. (NOT FIXED)**
- **SSM answers** to Exercise 3 – answer is missing the energy diagram.
- **SSM answers** to Exercise 13b – carbocation was shown in the wrong place after rearrangement, and the H was shown on the wrong carbon. The correct answer is as follows.



- **SSM answers** to Exercise 20 (4th reaction) – to go with the statement “no good nucleophiles” the mechanism should show bisulfate acting as the base.
- **SSM answers** to Exercise 20 (last reaction) – E1 and S_N1 are reversed in the last sentence of the explanation.
- **SSM answers** to Exercise 22 – missing partial charge on Br in transition state drawing.
- **SSM answers** to Exercise 31 – answer should say “there must be a beta hydrogen anti to the leaving group.”

ChemActiviy 16

- CTQ 7 – Should say “from 5 to 4”
- CTQ 23 – last structure, the N_2H group should be an H_2N group.
- Synthetic Transformation 16.5 – Change OR” group on product to CH_2OR ”
- **Exercise 5 – move to Part B Exercises since it requires use of a $C=O$ electrophile (in reaction with an alkynyl anion).**
- Exercise 29 – change word “acceptable” to possible. Reword question to indicate that some possible answers may be better than others (i.e. smaller electrophile better)
- **SSM answers** to Exercise 13 – last step shows H_3O^+ /heat...change this to H^+ /heat.

Chem Activiy L1

- CTQ 17 – change “four” to “six”

- **CTQ 10 – for $H_2C=CH_2$ and $HC\equiv CH$ to $RHC=CH_2$ and $RC\equiv CH$ (since the symmetrical structures do not absorb)**
- p. 265 – IR table entry for C_{sp^3} should not say “strong”

ChemActivity L2

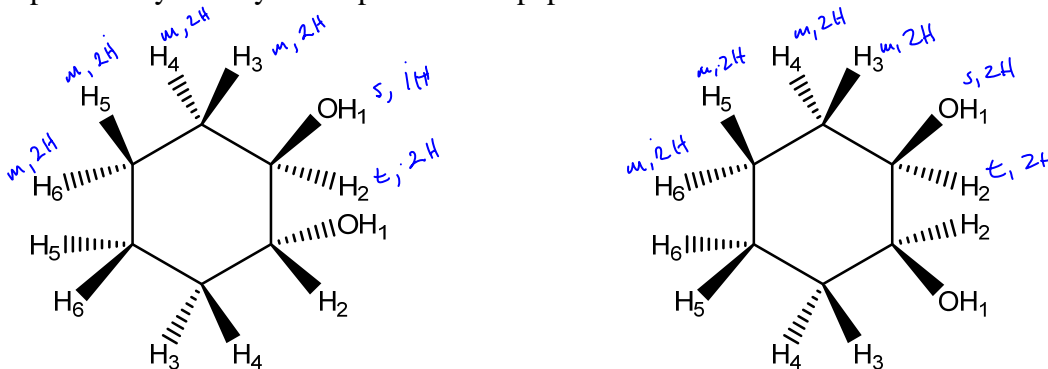
- page 270, Model 1 is missing a parenthesis after "(e.g, a 10-lb ball always..."

ChemActivity L3

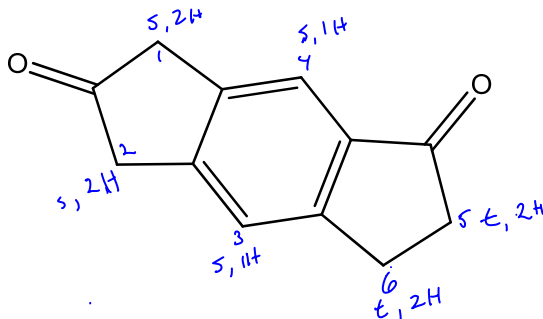
- Label figure in Model 4 as Figure L3.6, and figure in CTQ 18 as Figure L3.7 since in CTQ 20 a reference is made to L3.7.

ChemActivity L4

- **Model 1 – the triplet on the spectrum should be labeled “b” (currently both clusters are labeled “a”)**
- CTQ 4e is poorly worded and needs to be revised. The point of the question is to convey that peak height is not important, but peak area is important.
- CTQ 9a - ”product” should be produce
- **SSM answers** to Exercise 5 – both *cis* and *trans* dihydroxycyclohexane have NO plane of symmetry in the plane of the paper. The answers should be as follows...



- **SSM answers** to Exercise 5 – The middle structure in bottom row has no symmetry except the plane of the paper. The answers should be as follows...



ChemActivity 18

- CTQ 18 and 19 – should refer to Figure 18.3 rather than 13.3. Also, Figure 18.4 is labeled as 13.4.
- Exercise 15 – change “non-bonding” to “slightly bonding” (or delete all together)

ChemActivity 19

- CTQ 7 – use of the neutral base is confusing. Change B: to B:⁻
- CTQ 10 – Change “Note the formal charge is misleading in this case” to “and explain your reasoning.”
- CTQ 11 – Change “Explain” to “Construct an explanation for”
- CTQ 12 (and in Model 4)– FeCl₃ is shown, but AlCl₃ should be used instead.
- CTQ 13 – Change question to the following: “When FeCl₃ and Br₂ are used together, a small amount of Cl—Br is generated. Show a mechanism for how Cl—Br could lead to formation of bromobenzene, an unwanted side product in this reaction. (Note that the desired target in this reaction is chlorobenzene.)
- CTQ 14 – Change Fe to Al.
- page 344 – Synthetic Transformation 19.3 (and again in Exercise 2 on p. 363) the electrophile SO₃ appears as HSO₃⁺
- p. 345 (Model 4) – Change caption to “This notation indicates that an unspecified group is attached to an unspecified position on the ring.”
- Mem Task 19.11 on p. 358 – halogenation of aromatic amines does not require a catalyst (according to Solomons, Br₂/H₂O + aniline gives 2,4,6-tribromoaniline).
- **CTQ 63 – change reagents to Br₂ or product to CH₃ adduct**
- Synth. Transf. 19.7 should be changed to show that Zn(Hg)/HCl reduces both benzylic and non-benzylic carbonyls but not ordinary C=C bonds. [It turns out that C=C conjugated to a carbonyl are also reduced by Zn(Hg)HCl. Additionally, beta-diketones give different results with all these reagents, and so should be removed from the examples.] Note that H₂/Pd reduces benzylic carbonyls.
- **SSM answers** to Exercise 37 – The answers are correct but the answers to CA 22, Exercise 2 have an error. A more complete description of the complexity of such reductions is described below. In the next edition, there needs to be either expanded coverage of this complexity, or use of simpler examples.

Zn(Hg)/HCl will reduce any C=O group and C=C bonds conjugated to a C=O.

(Reduction of a benzylic C=O is easier than a non-benzylic C=O so careful control of temperature and time could allow selective reduction of the benzylic C=O.)

H₂/Pd can reduce almost any pi bond given a high enough temperature and pressure. Even the pi bonds of a benzene ring can be reduced at very high temperature and pressure. However, at normal temperature and pressure H₂/Pd will reduce ordinary C=C pi bonds and benzylic C=O bonds to CH₂, but have no effect on a non-benzylic C=O bond. (Note that at moderate temperatures and pressures H₂/Pd can be used to reduce a non-benzylic C=O bond to a C—OH bond; however, LiAlH₄ or NaBH₄ are normally used to reduce a carbonyl to an alcohol.)

- Model 14 – change R to Z on the rings at the top of the page

- The Big Picture – In the second paragraph, delete the sentence that starts “As the name implies” and replace it with... “As the name implies, in NAS a nucleophile replaces a leaving group. In other words, in EAS the ring functions as a nucleophile (and reacts with an electrophile), while in NAS the ring functions as an electrophile (and reacts with a nucleophile).” **(As written, nucleophile and electrophile are backwards!)**

ChemActivtiy 20 nv/ ;/ |vghg

- CTQ 12 – Show five resonance structures.
- **SSM answers** to Exercise 4: **answer is 8** (not 12)

ChemActivtiy 21

- **CTQ 12 – Delete “is aromatic and”** (otherwise makes no sense in this context since none of these r.s. are aromatic)
- CTQ 13 – Add “and explain your reasoning” to the end.

ChemActivtiy 22

- Synth Transf. 22.5 on p. 395 – show acid and base catalyzed amide hydrolysis.
- **SSM answers** to Exercise 2 needs to be modified (see underlined portion). “Zn(Hg)/HCl will reduce any C=O group and C=C bonds conjugated to a C=O.”
- **SSM answers** to Exercise 5, third target. A better answer would be to brominate...replace Br with OCH₃ using benzyne...brominate again...isolate para product...nitrate twice.

Nomenclature Worksheet 4

- Exercise 1 – change “Model 3” to “Mem Task NW3.2”

ChemActivtiy 23

- CTQ 29 – 7th reaction should be changed from the hydrate of cyclohexanone to the hydrate of an aldehyde (since ketones don't form hydrates).
- Synth Transf 23.10 on p. 421 – add alkoxide and N- nucleophiles to top list in box
- CTQ 54 (and in Model 14 above) – the pi bond is missing in each of the 1,2-addition products
- Exercise 2 – Change label below structure to “aldehyde” (delete ketone and change one R to H) since ketone hydrates are not favorable.
- Exercise 8 – change ending to “ketone C=O, and conjugation to a pi bond (or benzene ring) shifts any C=O peak to lower frequency (to the right).”
- Exercise 14 – says “products shown in Model 2” but this is a remnant from 1st edition.
- Exercise 21b – remove H attached to the nitrogen in the product shown in the question (answers are correct).
- **SSM answers** to 20, use OEt as base instead of hydroxide
- **SSM answers** to 21a, first target. Use H₂OCH₃⁺ as acid instead of HCl
- Exercise 39 – replace SO₃ with anhydrous H₂SO₄ or H₂SO₄/SO₃

- Exercise 46, bottom left target – ketone will be oxidized to carboxylic acid (not shown in Synth. Transformations anywhere. Is this a problem?)

ChemActivity 24

- CTQ 1 – Hint is misleading since electronegativity does not explain why Cl is a poor pi donor. That is Cl and N both have EN = 3.0 (vs. 3.5 for oxygen). Change the hint in part a) to “Consider the fact that pi overlap is usually weak between atoms on different rows of the periodic table.”
- Mem Task 24.3 on p. 436 – check if Grignards work with Carbox acids as nucleophiles (or only as bases)
- Exercise 9 – Synthetic Transformation 24.4 does not require water, just hydroxide. (Also change this in the index.)
- **SSM answers** to Exercises 19-31 are numbered incorrectly in the SSM (start over at 1).
- **SSM answers** to Exercises 23 – acid catalyzed aminolysis should start with amine attack not protonation of carbonyl
- Exercise 25 – need a base in step A (answers may be correct)

ChemActivity 25

- Title – Says ChemActivity 25A, though there is no 25B.
- Synth. Transf. 25.1, y can also = H (or alkyl or OR)
- Synth. Transf. 25.2 (can esters undergo acid-catalyzed alpha halogenation??)
- Exercise 5, “alcoide” should be alkoxide
- **SSM answers** to Exercises 2 book uses I-CH₃, answers uses Cl-CH₃ (pg 143)
- **SSM answers** on page 145 - OD₂ is uses in second step, should be H₂O
- **SSM answers** Exercise 18 second to last step needs + charge on oxygen
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ChemActivity 26

- CTQ 34 – Add “solvent” to reactants in Synth. Transf. 26.3. (or specific solvent, not water)
- CTQ 47a - “that” is repeated
- Exercise 3 – figure is labeled with “V.E.” instead of P.E.
- Exercise 7 – in the figure it says “fou-member”
- **SSM answers** to Exercises 7, last structure is wrong. Should be
- **SSM answers** to Exercises 12 – last rxn not given in exercise
- **SSM answers** to Exercises 30b (pg 161) shows second structure as aromatic ring
- **SSM answers** to Exercises 34, last pair should have only two products, not four since only one alpha H on the hindered ester making a Claisen using this as a nucleophile unfavorable

Appendix 1

- Synth. Transformations 14.3 and 14.4 on p. 208 are missing from appendix.

- Synth Tranf. 10.6 – PCC works with a primary or secondary alcohol (though it is normally used with primary alcohols)