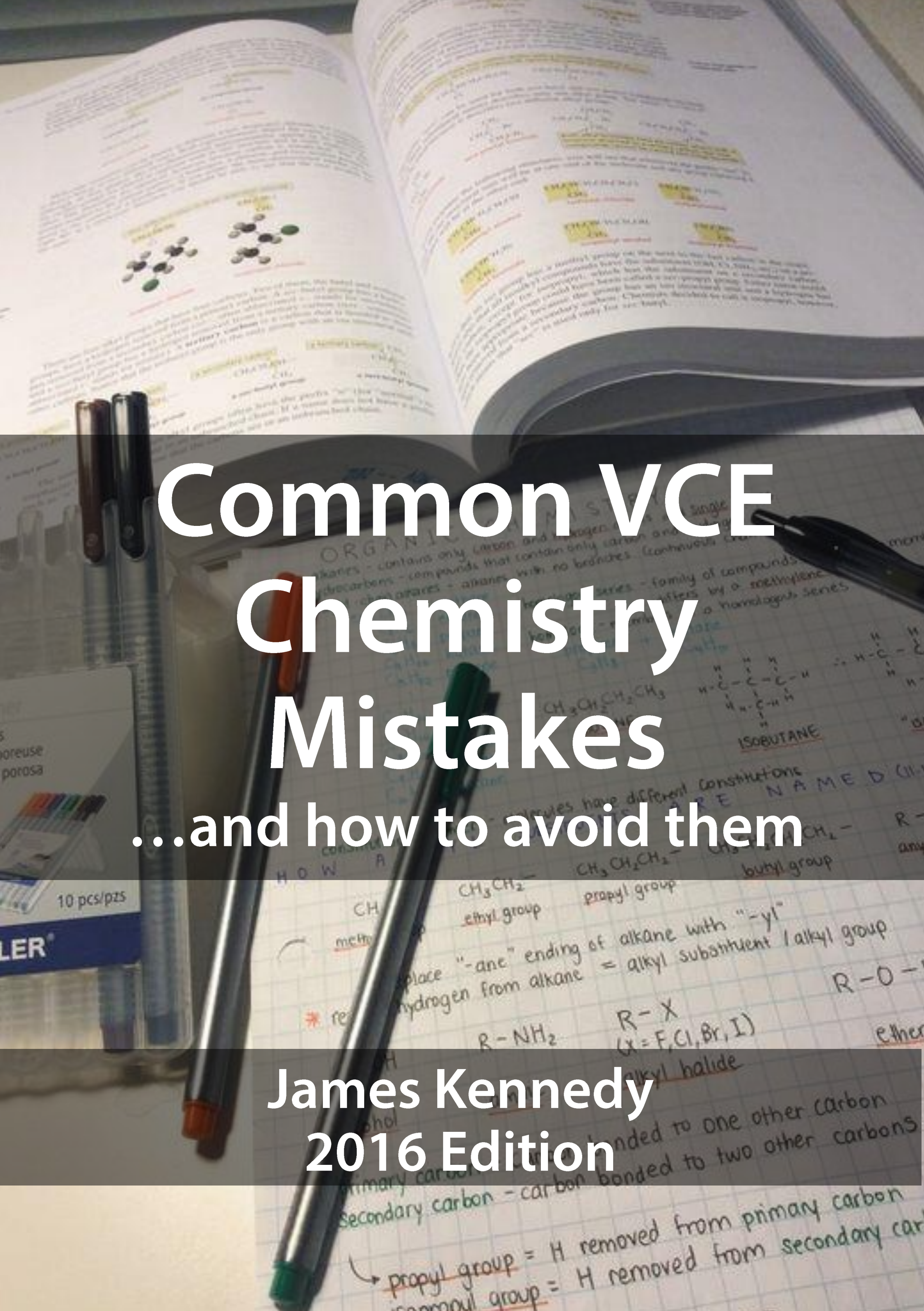
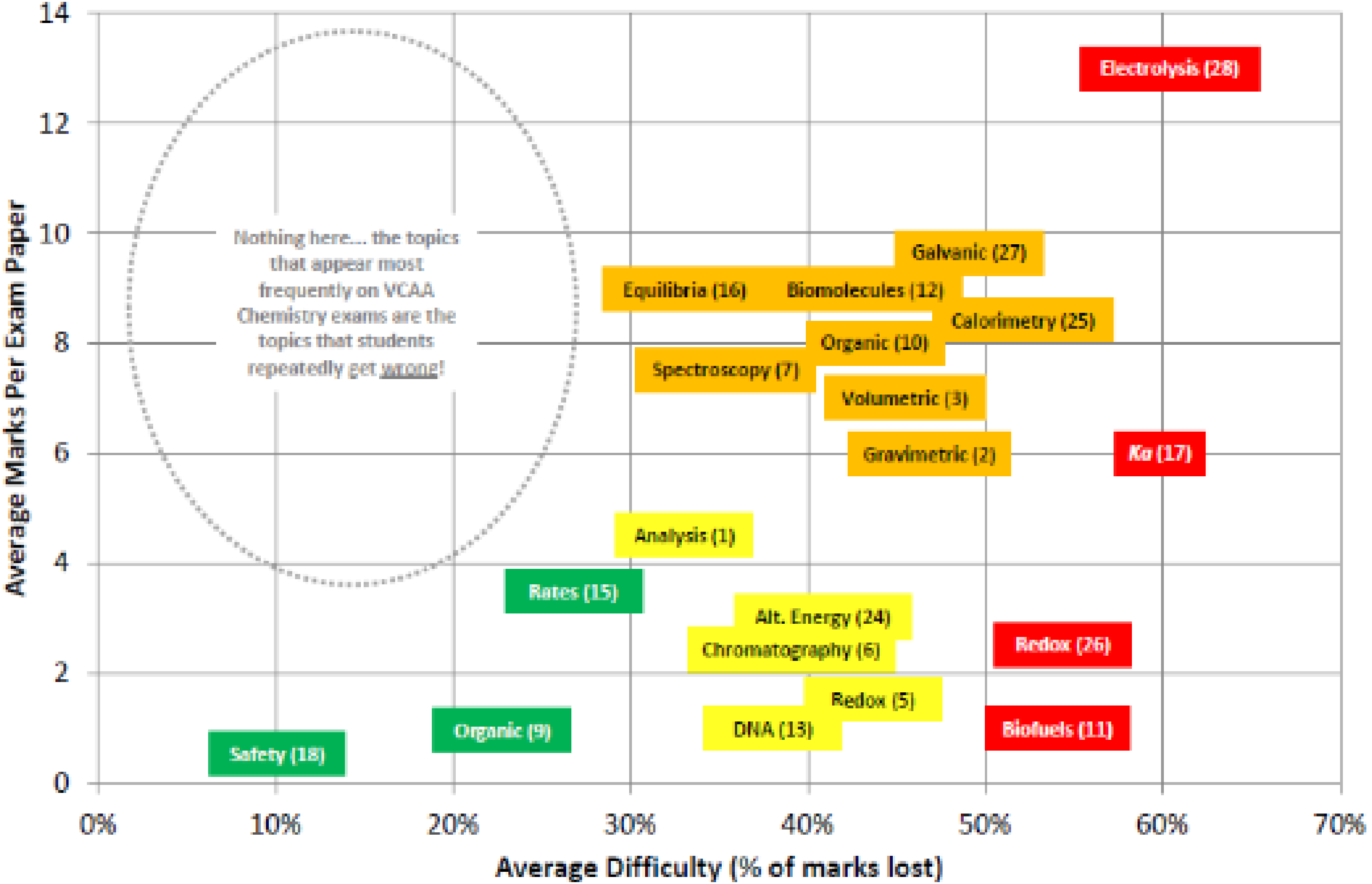


Common VCE Chemistry Mistakes

…and how to avoid them

James Kennedy

2016 Edition



Nothing here… the topics that appear most frequently on VCAA Chemistry exams are the topics that students repeatedly get wrong!

Foreword

This book is a collection of common mistakes in VCE Chemistry and how to avoid them.

It comes from years of marking student SACs and exam papers, and from reading Examination Reports from the VCAA as well.

It's free of charge, very informative, and very concise.

MISTAKE #1: Not planning your study time

Make a revision timetable. Need help? Read this:

https://jameskennedymonash.wordpress.com/2014/10/24/how-to-make-an-exam-revision-timetable/

Let's go!

Contents

Chapter 1

What is chemical analysis?

There are only two terms to learn in this chapter:

- Qualitative
- Quantitative

That's it.

Now, let's focus on chapter two.

Chapter 2

Gravimetric Analysis

MISTAKE #1: Trying to make a complete equation for the entire gravimetric analysis process.

There's no need. Just make a PARTIAL EQUATION that is only balanced for the ATOMS OF INTEREST. In gravimetric analysis, all of the atoms of interest (e.g. S, if they're looking for sulfur) will be present in the final precipitate.

Try VCE Chemistry Unit 3 Examination Section B Question 4 for more practice. Get the paper from VCAA's website. The partial equation you need in this question is simply:

P_2O_5(in fertiliser) → 2 $MgNH_4PO_4.6H_2O$

Notice the 2 in front of the precipitate? That balances the partial equation above with respect to the atom of interest only (that's P in this case). Use the resulting molar ratio (1:2) to answer the question.

MISTAKE #2: Students neglect one key type of gravimetric analysis because it's not in the Heinemann textbook!

Do Chemistry Dimensions 2 Worksheet 2.1 questions 5-11 for practice on this particular type of gravimetric analysis. Don't have that worksheet? Ask for it!

Chapter 3

Volumetric Analysis

MISTAKE #1: Forgetting which acids are strong, and which acids are weak.

HCl, HNO_3 and H_2SO_4 are all considered strong acids.

Sulfuric acid, H_2SO_4, is an interesting case. It's diprotic, meaning there are two successive ionisations. The first ionisation happens completely and requires a single arrow. The second ionisation happens *almost* completely and requires a double arrow. The $[H^+]$ in sulfuric acid will therefore be *almost* double the $[H_2SO_4]$, but not exactly so.

Weak acids include all carboxylic acids (R-COOH) and all the weak acids given as examples in the back of the data booklet.

MISTAKE #2: Strong acids need more base to neutralise them than weak acids if all other things are kept the same.

Totally not true. Strong acids and weak acids need the same amount of base to be neutralised (assuming they have the same concentration and volume). Amount of base required to neutralise an acid depends on something called TOTAL ACIDITY. This is essentially how many moles of H^+ *would* be present if they were all to dissociate. Strength of an acid thus makes no difference to the titre volume required to neutralise it. Strength of an acid does alter the shape of its pH curve, though.

Try this trio of quizzes:
https://jameskennedymonash.wordpress.com/2015/11/02/test-yourself-here-on-the-hardest-vce-chemistry-questions-ever-asked/

The relevant VCAA past paper question is number 15 in Quiz 3 above.

Watch this video for a brief explanation:
https://www.youtube.com/watch?v=pt2fSq46Pcw

MISTAKE #3: I can do pH = -log[acid] for any acid

Nope! The actual acid formulae are these:

$\text{pH} = -\log[H^+]$ (always true)

$[H^+] = [\text{acid}]$ for strong, monoprotic acids

$[H^+] \approx 2\times[\text{acid}]$ for strong, diprotic acids such as $H_2SO_4(aq)$

$[H^+] = \sqrt{K_a \times [\text{acid}]}$ for weak acids such as CH_3COOH

Try these questions:

1. What's the pH of 0.10 M HCl(aq)?

2. What's the pH of 0.10 M HOCl(aq)?

MISTAKE #4: What's ppm?

Parts per million. It's the same as milligrams per litre, or mg/L.

Chapter 4

Acid/Base Titrations

MISTAKE #1: Not knowing how to read Table 11 in the Chemistry Data Booklet

The "pH range" heading in Table 11 of the Data Booklet should really say "pH range of end point".

Remember the definition of an end point?

End point - The point during a titration when the indicator changes colour.

Equivalence point - A point during a titration when the solutions have been mixed in the mole ratio shown by the reaction equation.

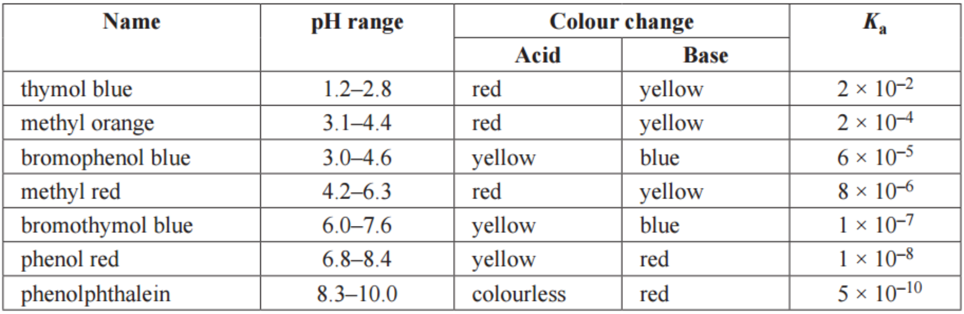
Download the Annotated VCAA Chemistry Data Booklet (2015 Edition) here: https://jameskennedymonash.files.wordpress.com/2015/05/vcaa-annotated-data-booklet-2015-edition-v2.pdf

When the pH of the solution is LESS THAN the lowest number in the "pH range", the indicator will be the colour on the LEFT.

When the pH of the solution is MORE THAN the highest number in the "pH range", the indicator will be the colour on the RIGHT.

For example, methyl red:

... is RED when pH <4.2
... is YELLOW when pH >6.3
... and between those values, it'll be ORANGE!



Name	**pH range**	**Colour change**		K_a
		Acid	**Base**	
thymol blue	1.2–2.8	red	yellow	2×10^{-2}
methyl orange	3.1–4.4	red	yellow	2×10^{-4}
bromophenol blue	3.0–4.6	yellow	blue	6×10^{-5}
methyl red	4.2–6.3	red	yellow	8×10^{-6}
bromothymol blue	6.0–7.6	yellow	blue	1×10^{-7}
phenol red	6.8–8.4	yellow	red	1×10^{-8}
phenolphthalein	8.3–10.0	colourless	red	5×10^{-10}

MISTAKE #2: Always doing titration calculations the long way

For one-mark questions, there's a quicker way!

First, write a balanced chemical equation for the titration. You'll need the molar ratio in this equation for the next step.

Next, use the quick titration formula:

$$\frac{c_1 v_1}{\text{ratio}_1} = \frac{c_2 v_2}{\text{ratio}_2}$$

c = concentration
v = volume
r = molar coefficient for each reactant

1 (left side) represents what's in the conical flask
2 (right side) represents what's in the burette.

Example question:

15.74 mL of 0.256 M $Na_2CO_3(aq)$ is required to neutralise a 20.00 mL aliquot of $HCl(aq)$. What's the concentration of the $HCl(aq)$?

MISTAKE #3: Unclear labelling of back titration quantities

There are three molar quantities in a back titration (where 'XX' is a regent to be added in excess)

n(XX added initially)
n(XX reacted with sample)
n(XX in excess)

Use the labels above because that's what VCAA uses in their Examination Reports!

The formula you'll need for a back titration is:

n(XX reacted with sample) = n(XX added initially) - n(XX in excess)

MISTAKE #4: Forgetting how to do a back titration AFTER an aliquot was taken.

Let’s say, for example, that an aliquot is taken *after* the excess reagent was measured out. For example, an experiment might be done like this:

1. Add known quantity of excess reagent to sample
2. ***Take an aliquot*** – Steps 1 and 2 sometimes swap
3. Then back-titrate that aliquot (not the whole sample!) against another reagent

Notice how they took an aliquot THEN did the back titration?

The formula you'll need in those cases is:

n(XX reacted with sample) = n(XX added initially) - {n(XX in excess) ÷ ALIQUOT FACTOR}

Try short answer back titration questions in the Lisachem Unit 3 AOS 1 booklet.

Chapter 5

Analysing Oxidants and Reductants

MISTAKE #1: Forgetting to multiply by 2 when finding [OH$^-$] of a dibasic substance

Remember that barium hydroxide ($Ba(OH)_2$) is dibasic, i.e. it reacts with two water molecules and accepts two protons to produce two $OH^-(aq)$ ions.

You therefore need to double the concentration of $Ba(OH)_2(aq)$ to find [OH$^-$].

For example:

If $[Ba(OH)_2] = 0.100$ M
then $[OH^-] = 0.200$ M
and $[H^+] = \frac{10^{-14}}{0.200} = 5 \times 10^{-14}$ M

therefore $pH = -\log\left(5 \times 10^{-14}\right) = 13.3$

MISTAKE #2: KOHES always works for balancing half-equations

KOHES only works for cells with acidic electrolytes. For cells with alkaline electrolytes, which sometimes appear in VCAA papers despite not being in the study design (see page 46 here), you'll need to use KOHES(OH).

Here's KOHES(OH) explained:

1. Do KOHES as normal

2. Add the same number of $OH^-(aq)$ ions to each side of the half-equation to balance out the $H^+(aq)$

3. Cancel and simplify. Remember that:
$H^+(aq) + OH^-(aq)$ makes $H_2O(l)$.

4. Remember also to cancel out any remaining $H_2O(l)$.

MISTAKE #3: I can balance an unbalanced redox equation by putting numbers in the equation

Don't be fooled by this one! The ONLY way to balance an unbalanced redox equation successfully is to do the following:

1. Separate it into two half equations

2. Balance them using KOHES or KOHES(OH) as appropriate

3. Multiply them and recombine

4. Cancel and simplify

5. Done!

That's a lot of work but it's the only way to do it successfully. If you try to 'cheat' by just writing numbers (molar coefficients) in front of the reactants and products, you'll find that the charges don't add up, and you'll get zero marks for the question.

MISTAKE #4: I can break up polyatomic ions to make balancing half-equations easier

Nope! You're only allowed to separate aqueous species in a half equation or an ionic equation. Because the Mn and O are actually bonded together in a polyatomic ion, you'll need to write this:

$MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) + 4H_2O(l)$

2/2 marks

$Mn^{7+}(aq) + 5e^- \rightarrow Mn^{2+}(aq)$

0/2 marks

If in doubt, keep it intact and it'll cancel out by the end if it's a spectator ion.

MISTAKE #5: "Becomes colourless"

VCAA hates the word "colourless". Don't use it.

Say "the purple potassium permanganate decolourised (as $MnO_4^-(aq)$) ions are reduced to $Mn^{2+}(aq)$" instead.

Chapter 6

Chromatography

MISTAKE #1: Students forget that in column chromatography, the peak area on a chromatogram corresponds to the amount of component being eluted.

This was mentioned in the VCAA Examination Report from 2015. Read it here:

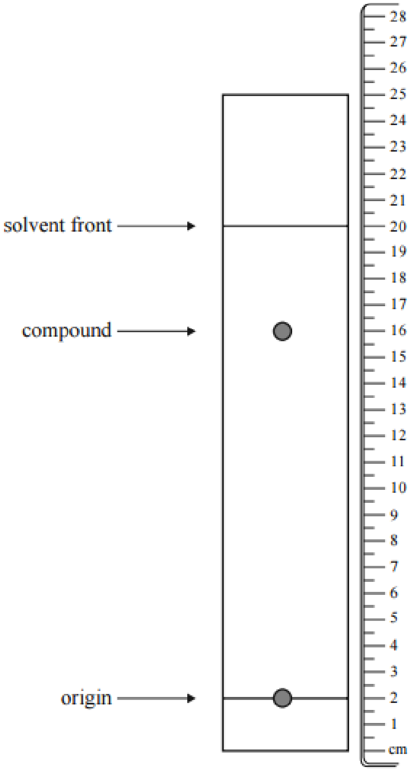
http://www.vcaa.vic.edu.au/Documents/exams/chemistry/2015/chemistry_examrep15.pdf

MISTAKE #2: Measuring Rf from the wrong place

This is a relatively easy topic so VCAA almost always tries to trick students who make simple mistakes.

Measure Rf from the ORIGIN to the SPOT on the chromatogram. Don't measure from the bottom of the paper...

What's the Rf of the spot in the diagram below?



Chapter 7

Spectroscopy

MISTAKE #1: How many split peaks?

Use words for this one.

singlet
doublet
triplet
quartet
pentet
sextet
septet
octet

Don't say “there are 3 splits” ... this is really ambiguous

MISTAKE #2: Which technique is best?

AAS - metals, very sensitive

UV/vis - coloured solutions (including coloured metal ions in solution e.g. $CuCl_2(aq)$, which is blue

^1H-NMR - organic molecules - shows hydrogen environments and give some insight into how they are arranged

IR - organic molecules - shows types of covalent bonds present

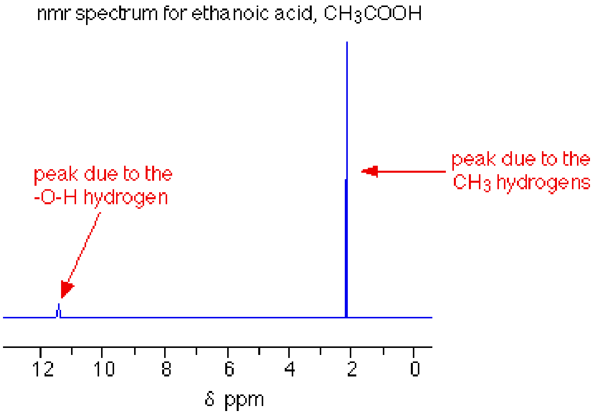
Learn this! A summary is given in Chapter 7.1.

MISTAKE #3: I trust the Data Book's chemical shift values are always correct

They're not! There's even a warning on page 5 of the Data Book that says "These can differ slightly in different solvents". That's absolutely right.

Be prepared for the chemical shifts in ^{1}H-NMR questions to be IN OR SLIGHTLY ABOVE the range given in the data booklet. ^{1}H environments located NEAR AN ELECTRONEGATIVE ATOM such as oxygen will have a chemical shift higher than predicted.

Check the chemical shift of the --CH_3 group in ethanoic acid below. It's about 1.0 point higher than the range in the Data Book because it's located near two electronegative oxygen atoms.



MISTAKE #4: Not doing enough practice questions

Get Chemical Detectives for iOS now and practice spectroscopy questions on ‘Easy’ mode.

https://itunes.apple.com/au/app/chemical-detectives/id741760895?mt=8

Chapter 8

Mass Spectroscopy

There's just one major error to be aware of here:

MISTAKE #1: Forgetting the + symbol on all ions and fragment ions present in a mass spectrogram. For example: What causes the peak at m/z=15?

CORRECT answer: $-CH_3^+$
INCORRECT answer: $-CH_3$

Always remember the + symbol!

Chapters 9 & 10

Compounds of Carbon and Organic Reaction Pathways

Memorise all reactions, reaction types, catalysts and conditions required in chapters 9-10.

They'll be worth about 8 marks in the exam.

MISTAKE #1: Writing "H_2SO_4" as the catalyst in esterification reactions

VCAA cares about this one. They want you to write "concentrated H_2SO_4", which will earn you a mark. Simply writing "H_2SO_4" gets *zero* marks.

MISTAKE #2: Esters are named longest chain first

Totally wrong. Esters contain two carbon chains separated by a –COO– ester group. The chain attached to *one oxygen* is named first, and the chain attached to *two oxygens* is named second.

Chapter 11

Biochemical Fuels

MISTAKE #1: What's biogas? We didn't learn that!

$CH_4(g)$ formed by bacterial fermentation of biomass in the absence of oxygen.

Important point:

$O_2(g)$ must be absent from the reaction to prevent the preferential respiration reaction occurring, producing $CO_2(g)$ and $H_2O(l)$ instead of biogas.

MISTAKE #2: What's bioethanol again?

Bioethanol is formed from the fermentation of glucose in the absence of oxygen.

MISTAKE #3: Biodiesel is a fatty acid methyl ester

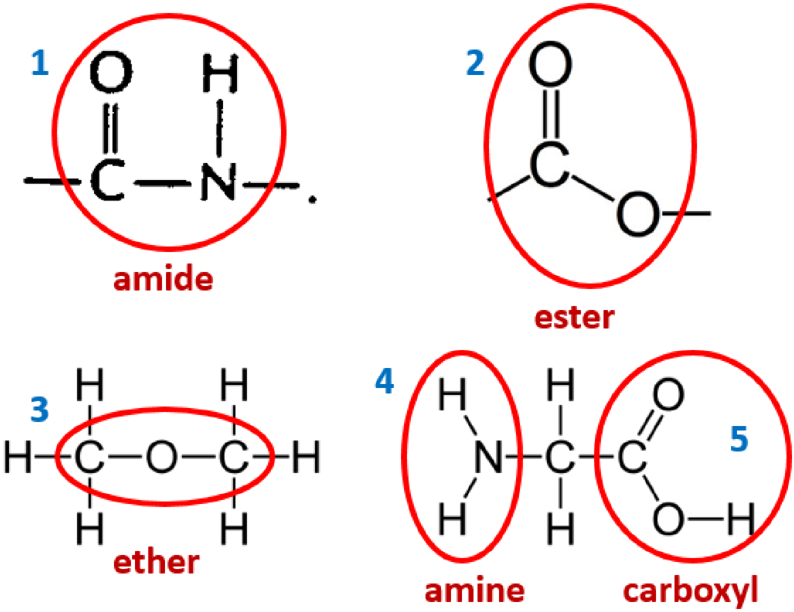
They can be fatty acid methyl esters or fatty acid ethyl esters. See the top of page 171 for proof.

Chapter 12

Pathways to Biomolecules

MISTAKE #1: Confusing ether/ester and amide/amine

Many students make this mistake. Learn the names of the functional groups below.



Note the carboxyl group on the right. The functional group is **not** called a ‘carboxylic acid’!

MISTAKE #2: All fatty acids are solid at 25°C

Actually, the saturated fatty acids are solid, and the unsaturated ones are liquid at 25°C.

Here's proof:

0 C=C	lauric acid	43.2 °C (s)
0 C=C	myristic acid	55.4 °C (s)
0 C=C	palmitic acid	62.9 °C (s)
1 C=C	**palmitoleic acid**	**-0.1 °C (l)**

0 C=C	stearic acid	69.3 °C (s)
1 C=C	**oleic acid**	**13 °C (l)**
2 C=C	**linoleic acid**	**-5 °C (l)**
3 C=C	**linolenic acid**	**-16.5 °C (l)**
0 C=C	arachidic acid	75.5 °C (s)
4 C=C	**arachidonic acid**	**-49 °C (l)**

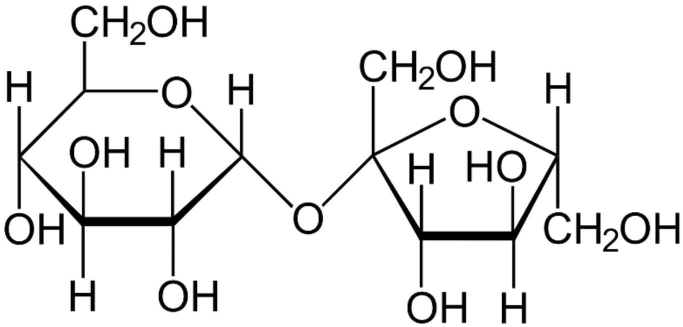
Only saturated fatty acids are solid at room temp.

MISTAKE #3: Glycosidic bonds and ether bonds are the same

They're not the same!

Glycosidic bonds are covalent bonds between sugars and other groups of atoms

Ether bonds are –C-O-C– covalent groups



The –C-O-C– group between carbohydrates is both a glycosidic bond and an ether bond. But bonds in other molecules exist that are one but not the other.

MISTAKE #4: Not knowing how to find the degree of unsaturation of a fatty acid

There's an easy formula for this.

$C + \frac{1}{2} - \frac{H}{2}$ is the number of C=C bonds in a fatty acid

C and H represent the numbers in the backbone of the fatty acid (or fatty acid residue)

For example:

$C_{17}H_{29}COOH$ has this many C=C bonds:

$$C + \frac{1}{2} - \frac{H}{2} = \mathbf{17} + \frac{1}{2} - \frac{\mathbf{29}}{2} = \boxed{3}$$

MISTAKE #5: What's iodine number?

It's the number of grams of iodine (I_2) that react with 100 g of sample.

See Heinemann Chemistry 2 page 126 question 23 for more information on iodine number.

MISTAKE #6: Proteins get denatured

"Denatured" gets zero marks in year 12 because VCAA knows you learned this back in year 10!

For a mark here in year 12, you need to refer to:

- the types of bonds broken
- the 3-D shape of the active site changing
- the fact that the enzyme can no longer bind with the substrate

Practice now. Try this question:

Explain why the enzyme functions less effectively at 60 °C than at 35 °C.

MISTAKE #7: Just not being specific enough when describing secondary structure of proteins

Secondary structure of proteins is:

"folding, coiling and pleating of a protein chain caused by hydrogen bonds between C=O and N-H of nearby amide groups"

Remember that all secondary structure is due to hydrogen bonding.

See page 193 of the Heinemann textbook for more.

MISTAKE #8: Is asparagine basic?

No! It looks basic because it contains an $-NH_2$ group. But this is actually part of a larger $-CONH_2$ group, which is called a primary amide.

Primary amides are neutral, not basic.

Asparagine's side-chain is therefore neutral (polar) and it forms hydrogen bonds with other polar amino acid side chains.

MISTAKE #9: Learning chapter 12.6

Don't. It was taken off the course in 2013.

Chapter 13

DNA

MISTAKE #1: Not being specific enough about the secondary structure of DNA when you're asked to describe it

Secondary structure of DNA is:

"hydrogen bonds between complementary base pairs: on opposing DNA strands: adenine forms two hydrogen bonds with thymine; while guanine forms three hydrogen bonds with cytosine"

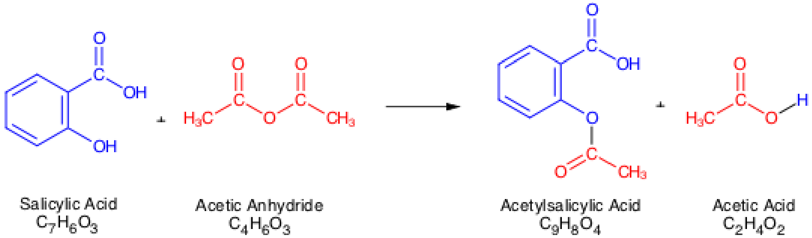
MISTAKE #2: Learning pages 209 through to 219

Don't. These were taken off the course in 2013.

Chapter 14

Aspirin

Memorise the structural formula equation for the formation of aspirin – but it seldom comes up, and is worth only one mark when it does.



Remember the **concentrated H_2SO_4 catalyst** (no marks are awarded if the word ‘concentrated’ is omitted)

Remember that in the formation of aspirin, salicylic acid acts as the ‘alcohol’. Acetic anhydride acts as the ‘acid’.

Chapter 15

Fast and Slow Chemistry

MISTAKE #1: Increasing temperature increases the rate of reaction because the particles collide more frequently

Wrong. There are actually two ways in which temperature increases the rate of reaction:

1. A greater proportion of the reactant particles have $E_K > E_A$
2. Reactant particles collide more frequently

Both of the above factors contribute to a higher rate of successful collisions – but the first one contributes to a much greater extent than the second

MISTAKE #2: What's the state of that fuel?

They're all in the back of the data booklet. There's no excuse for getting states of fuels incorrect!

MISTAKE #3: Some students still don't believe that there are only FOUR factors that can increase the rate of a chemical reaction

Surface area
Concentration
Temperature
Catalysts

…and nothing else!

MISTAKE #4: What's a thermochemical equation?

It's a chemical equation with ΔH written on the end.

For example:

$$C_2H_4(g) + O_2(g) \rightarrow 2CO_2(g) + 2H_2O(g)\ \Delta H = -1387.4\ kJmol^{-1}$$

MISTAKE #5: Aqueous things combusting

VCAA hates this one. According to VCAA, nothing aqueous combusts. All fuels need to be (s), (l) or (g) as appropriate.

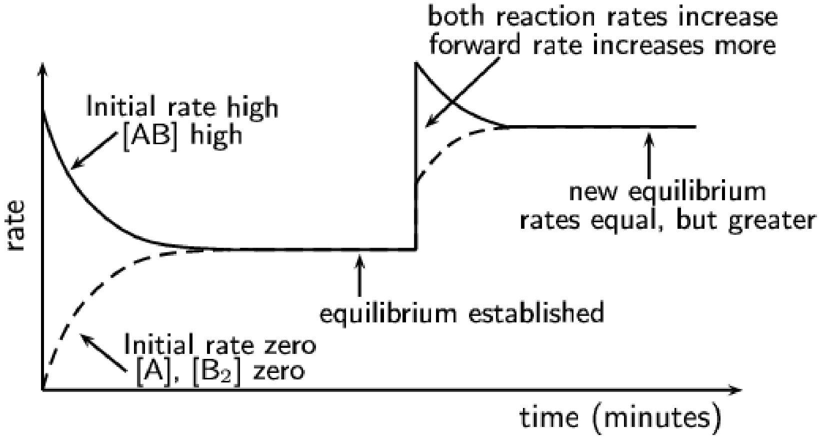
Chapter 16

Controlling Yield of Reactions

MISTAKE #1: In an endothermic equilibrium, increasing temperature decreases the rate of the backwards reaction

Totally wrong. Recall from chapter 15 that increasing temperature *always increases* the rate of reaction? In an equilibrium, increasing temperature increases reaction rate in *both directions unequally*.

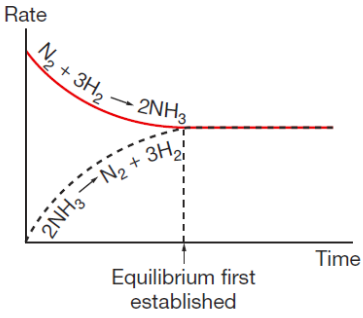
Endothermic reactions are sped up *more* by increases in temperature than exothermic ones.

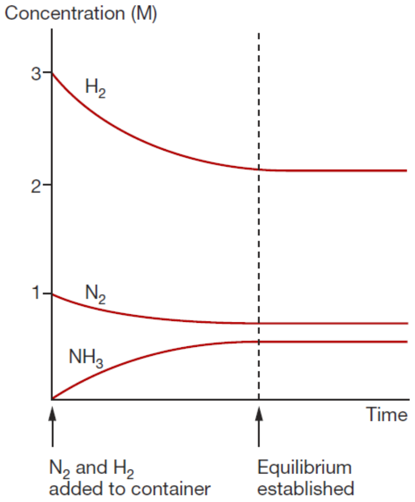


MISTAKE #2: What type of graph is that?

There are two types of equilibrium graph:

- **Rate-time graphs**
  Two lines – always.
  Equilibrium is when the two lines are superimposed
- **Concentration-time graphs**
  One line per reactant/product in the equation





MISTAKE #3: Not learning Q

Remember that Q, equilibrium quotient, is calculated using the same formula as K.

Q is an indication of the position of equilibrium.

Remember:

- If $Q > K$, reaction is proceeding left
- If $Q = K$, reaction is at equilibrium
- If $Q < K$, reaction is proceeding right

You need to learn how to use Q even though it isn't taught in the Heinemann textbook.

MISTAKE #4: Overshooting the initial value

When drawing concentration-time graphs for equilibria, make sure your values at t_2 don't overshoot the values at t_1. Le Chatelier's principle states that changes are only ever *partially* offset.

Chapter 17

Acid/Base Equilibria

MISTAKE #1: Including $[H_2O]$ in a K_a expression

K_a expressions exclude $[H_2O]$.

(In other words, they assume that $[H_2O] = 1$.)

MISTAKE #2: Stating that $[H_2O]$ is omitted from K_a expressions because $[H_2O]$ is negligible

No, it's not! K_a expressions assume the *change* in $[H_2O]$ to be negligible.

In other words, $[H_2O]$ is assumed to be constant.

MISTAKE #3: Where's the weakest weak acid?

Take a look at the K_a values in Table 12 of the Data Book. Ammonium ions, NH_4^+, are the weakest acids because they have the lowest K_a values of all.

MISTAKE #4: The pH of water is always 7

Nope. Water is only pH 7 at 25 °C. Hot water has a pH of around 6.5, and cold water has a pH of around 7.2.

MISTAKE #5: Neutral compounds are always pH 7

Wrong again. Neutral compounds have $[H^+] = [OH^-]$. Self-ionisation of pure water produces one mole of H^+ for every mole of OH^- so it is *always* neutral.

MISTAKE #6: Neglecting buffer solutions

This seldom comes up in exams, but when it does, students are almost always stumped.

Read about buffers on page 290 of Heinemann Chemistry. Learn:

- Definition of a buffer
- How to do calculations involving buffers
- How buffers work (memorise Figure 17.5)

Chapters 18-22

Chapter 18 is mostly common sense. Read it, but don't spend too much time on practicing this chapter. You're better off focussing on the more difficult chapters instead (Chapters 17 and 25-28).

Chapters 19-22 won't be in the examination.

Here's proof:

http://www.vcaa.vic.edu.au/Documents/bulletin/2012/2012julsup.pdf

Page 8 says:

"In Unit 4, students will investigate the production of one industrial chemical selected from ammonia, sulfuric acid or nitric acid. This will be assessed through School-assessed Coursework only"

Chapters 23-24

Mostly general knowledge.

Read through the chapters but don’t spend too much time practicing them.

Chapters 23 and 24 are generally worth 0 and 3 marks, respectively.

Chapter 25

Energy from Chemical Reactions

MISTAKE #1: Losing track of units (kJ and J)

Always label the units of E (kJ or J) above the E. This is the most common source of error in calorimetry calculations. Try this quick way to remember the required units of E: If there's ΔH in the equation, the units are kJ; otherwise, the units are J.

MISTAKE #2: Using the wrong mass in E=mcΔT

In E=mcΔT, all the variables refer to the mass of water being heated. A common error among students is to use the mass of limiting reactant instead of the mass of water. Generally, m in this equation is 100 g or a similar round number.

MISTAKE #3: Adding 273 to ΔT values

Never convert ΔT to kelvin. Temperature changes are the same in kelvin and Celsius… in short, NEVER add 273 when finding ΔT.

MISTAKE #4: Oh… They didn't calibrate the calorimeter. HELP!!

No calibration step? No problem! Use m × c instead. Because $E=mc\Delta T$ and $E=C_f\Delta T$, it therefore follows that $C_f = m \times c$.

For example:

If we' re heating 100.0 g of water without a Cf, we should use $C_f = 100 \times 4.18 = 418\ \text{J K}^{-1}$ instead.

MISTAKE #5: Using the wrong n

In $\Delta H = E/n$, n denotes the number of moles of *reaction*. When two solutions are being mixed, NEVER add up the numbers of moles of reactants: use the <u>number of moles of limiting reagent only</u>.

MISTAKE #6: Calculator errors

Calculate twice. Students most often make mistakes when converting hours or days into seconds. Many answers are therefore wrong by a factor of 60. Do your calculations twice: once while doing the question and again when you check over your answers at the end of the SAC or examination.

MISTAKE #7: Writing answers that are FAR outside the realistic range

Know a ballpark figure. Neutralisation and solubility reactions tend to have 2-digit ΔH values; combustion reactions tend to have a 3-digit ΔH and explosive reactions tend to have a 4-digit ΔH. If you get a 5-digit ΔH value, you've probably forgotten to convert your answer into kilojoules!

MISTAKE #8: Omitting '+' and '-' signs

Remember the '+' or '-' sign! The calculator doesn't know whether the answer should be positive or negative. Think about it yourself instead: endothermic reactions need a '+' sign and exothermic need a '-' sign. VCAA awards a whole mark for getting the '+' or '-' sign correct! It's possibly the easiest mark in the whole paper.

Chapters 26-28

Redox

This is the most difficult set of chapters in the whole course.

MISTAKE #1: The polarities switch during recharge

Nope. The polarities never switch. It's the labels of 'anode' and 'cathode' that switch because the electrons are flowing the other way through the external circuit. Polarity is permanent.

MISTAKE #2: Hydrogen fuel cells don't emit any greenhouse gases

Wrong. They emit H_2O, which is a powerful greenhouse gas. If you don't believe that the VCAA can be this pedantic, think again.

Read the 2015 Examiners Report here:

http://www.vcaa.vic.edu.au/Documents/exams/chemistry/2015/chemistry_examrep15.pdf

MISTAKE #3: Each mole of electrons forms 1 mol Ag, 2 mol Cu or 3 mol Al in a cell

Wrong again. If you look at the half-equations, you'll see that each mole of electrons actually forms 1 mol Ag, ½ mol Cu or ⅓ mol Al. That's why I teach "1, ½ and ⅓ moles" instead of the typical "1, 2, 3 moles" rule.

MISTAKE #4: Temperature increases the rate of reaction in electroplating

Wrong! Remember that Faraday's first law states that $m\ \alpha\ Q$. Because $Q = I \times t$, only those two things—current and time—can affect the mass deposited at the cathode.

MISTAKE #5: The cathode is always positive

No. The electrode where the half-reaction with the higher electrode potential (E^0 value) is always positive.

MISTAKE #6: Electrons always leave the anode and go towards the cathode

Wrong again. Electrons go RACO: to see what that means, download the posters above. This question appears in recent versions of Chemistry Checkpoints. Give it a try.

MISTAKE #7: Ions flow one way in the salt bridge

Nope. Anions always migrate to the anode; and cations always migrate to the cathode.

MISTAKE #8: The two reactants that are closest together on the electrochemical series react

Not always true. Use SOC SRA instead, which is explained in the posters above. Still struggling? Ask your teacher or tutor for help.

MISTAKE #9: Oxidants are all on the top of the electrochemical series

They're actually on the left, and all the reductants can be found on the right side of each half equation in the electrochemical series. There is no top/bottom divide on the electrochemical series: only a left/right divide of oxidants/reductants.

MISTAKE #10: Labelling reactants and products as (aq) when there's no water present in the cell

When water's present, the question will give you clues such as "concentration", "solution" or "(aq)".

When water's not present, the question will give you clues such as "concentrated", "molten", "(l)" or "liquid".