

Chemguide – answers

ALDEHYDES AND KETONES: OXIDATION

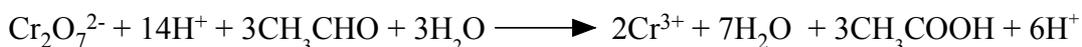
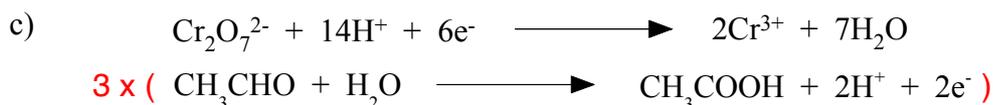
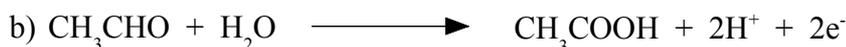
1. a)

Oxidising agent	Observations with	
	an aldehyde	a ketone
Potassium dichromate(VI) solution acidified with dilute sulphuric acid	Orange solution turns green (perhaps after warming)	No change
Tollens' reagent (containing the $[\text{Ag}(\text{NH}_3)_2]^+$ ion). Warm gently.	Colourless solution produces a grey precipitate or silver mirror on the test tube	No change
Fehling's solution or Benedict's solution. Warm gently.	Blue solution produces a dark red precipitate.	No change

b) Aldehydes are oxidised by replacing the hydrogen atom attached to the C=O bond by an -OH group (or an O⁻ ion if the reaction is done in alkaline solution). Ketones don't have a hydrogen atom attached to the C=O bond.

c) It is too powerful an oxidising agent, and has the ability to break carbon-carbon bonds. You would get much the same result with both aldehydes and ketones.

2. a) ethanoic acid (CH₃COOH)



You multiply the ethanal equation by 3 to transfer 6 electrons. This isn't the final answer because there are water molecules and hydrogen ions on both sides of the equation. That needs simplifying.



3. a) ethanoate ions (CH₃COO⁻).



This is a bit more awkward to do than the equivalent equation in acid solution. Refer to <http://www.chemguide.co.uk/inorganic/redox/equations2.html> if you need more help.

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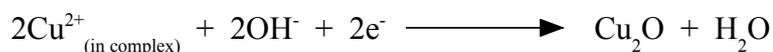


(It doesn't matter whether you include the square brackets around the ion or not. I notice that I have used both forms on the Chemguide page!)

d) You need to multiply the second equation by 2 so that you are transferring 2 electrons. If you then add the two equations together, you will find that there isn't anything that occurs on both sides, so that is the final version.



4. Fehling's solution and Benedict's solution both contain copper(II) complexes in an alkaline solution. The copper(II) complex can be simplified to $\text{Cu}^{2+}_{(\text{in complex})}$, and the electron-half-equation given as



(This is just the same as the ethanal equation from Q3(b), but with an extra CH_2 group.)

b) You can just add the two equations together, because both involve 2 electrons.

