



Why Students Lose Marks When Making Observations

This Factsheet considers some typical problems when answering A Level questions on “Making and Recording Observations”. By the end of this Factsheet you should be confident about:

1. what examiners want,
2. the type of question you are likely to be asked,
3. avoiding common mistakes and misunderstandings.

Some General Points

1. **Never say “nothing”**; there will usually be something visible in the reactions examiners ask about.
2. When describing an observation (what you *see*) always **state the colour** of the substance being formed and whether the substance is a **solid / precipitate, liquid, gas or solution**. In the case of a gas the appropriate observation will be **bubbles / fizzing / effervescence** not “a gas is given off” – the latter is an interpretation, not an observation.
3. The **smell of a gas** can also be included as an observation.
4. **Whether the reaction test-tube gets hot or cold** is another possible observation. In the case of an exothermic reaction this may result in a volatile solid or volatile liquid vaporising to produce a visible **coloured gas**.
5. **Do not name the substances responsible for the observations** unless the question asks you to do so or it helps you give the correct observations.
6. Make sure you **know the colours** of substances before and after they are dissolved in water.
7. It is best (but usually not essential) to **write answers in sentences**. However there is no need to re-write the question.
8. Do not call **a colourless solution a “clear” solution** since all solutions are clear, i.e. transparent.
9. If the question asks for a colour **change**, remember to give **both the initial and final colours**.
10. **Do not give right and wrong answers!** A wrong answer will cancel out the credit for right answer.
11. Remember, there is **no such thing** as a “white solution” or a “black solution”.

A. Examples involving only observations.

What do you observe when:

(a) silver nitrate solution is added to sodium chloride solution?

Required answer:

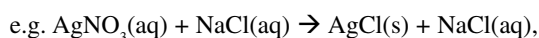
“A **white precipitate / solid / suspension (is formed)**.” 2 marks

Do not write out the question e.g. “When silver nitrate solution is added to sodium chloride solution a white precipitate is formed.”

This uses up valuable time which is important if all questions are to be attempted.

Do not say what substance is formed. e.g. “Silver chloride”. This will gain no marks for an observation since it is an explanation / interpretation, not an observation. The answer, “a white precipitate of silver chloride forms”, **will** get full marks but you have wasted your time adding “of silver chloride”.

However it is quite acceptable to have “working”,



as long as after this “working” you write: “a white precipitate (forms)”.

(b) a piece of calcium is added to cold water?

Required answer: The calcium (*sinks* and) reacts producing a **white suspension** and **fizzing / effervescence / bubbles** of a **colourless** gas. 2 or 3 marks.

It is probable that the examiner is only interested in the highlighted points of the answer but do not simply say “hydrogen gas is produced” – naming a product is not an observation.

(c) magnesium is heated strongly in steam?

Required answer: A **bright white light / flame** and a **white solid** remains. 2 marks

Note. Hydrogen gas is also formed but this is colourless and so cannot be seen since it cannot create bubbles.

(d) chlorine water is added to sodium iodide solution?

Required answer: A **brown solution** forms. (or a **black precipitate** forms.) 1 mark

Consider the following answers:

“It goes brown.” No marks since the word “solution” is not included.

“A brown / black solution forms.” No marks since the correct answer, “brown solution” is cancelled out by the incorrect answer “black solution”.

Note. This reaction has $\Delta H \approx 0$ so the iodine produced will not vaporise and no purple vapour is seen.

Compare the following questions where an exothermic reaction occurs.

(e) concentrated sulphuric acid is added to sodium iodide?

Since there are many possible observations there are usually a set of alternative observations for the marks to be awarded.

First mark: (Faint) *white fumes*. (first reaction is : $\text{H}_2\text{SO}_4 + \text{NaI} \rightarrow \text{NaHSO}_4 + \text{HI}(\text{g})$)

Second mark. *Pungent smell*, (SO_2) / **yellow solid (S)** / **bad eggs smell (H_2S)**.

The HI from the first reaction is a good reducing agent and so reduces the concentrated sulphuric acid in steps.

Third mark. *Black solid / purple gas or vapour*.

The concentrated H_2SO_4 oxidises the HI to iodine. This initially appears as a black solid but, since the test-tube gets hot, a purple vapour is also seen.

(f) when dilute sulphuric acid is added to magnesium chloride solution?

Required answer

A *colourless solution* forms / *no reaction* occurs but don't say "nothing"!

B. Examples requiring observations and extra information

(a) Describe what is seen when the bromine water is added to samples of KCl(aq) and KI(aq) and explain your observations.

KCl(aq). The orange bromine solution *becomes a paler orange*.

The *bromine solution is simply diluted*. No reaction occurs because *bromine is a poorer oxidant than chlorine / chloride ion is a poorer reductant than the bromide ion*.

KI(aq). A *brown solution / black precipitate* forms. The *orange colour (Br_2) disappears*.

Bromine is a better oxidant than iodine and so oxidises the iodide ion to iodine. (or an answer in terms of the iodide ion being a better reductant than bromide.)

(b) Name a reagent that may be used to distinguish between propanone and propanal. State what would be seen when your chosen reagent is added to separate samples of both compounds under appropriate conditions.

There are several possible answers ; give **only one** answer. Two possible answers are.

Reagent. *Tollen's reagent*.

Propanal: *a silver mirror*. Propanone: *colourless solution / no reaction*.

Reagent. *Fehling's solution*.

Propanal: *a brick red precipitate*. Propanone: *remains blue / no reaction*.

(c) What is the colour change that occurs when propene is passed into a solution of bromine in an inert organic solvent? Write an equation for the reaction that occurs and name the product(s).

Required answer

The *orange bromine solution is turned colourless / decolourised*.

(Since colour *change* is required, both the initial and final colours are wanted.)

Equation:



Practice questions

- The presence of either bromide or chloride ions in aqueous solution can be detected by the addition of aqueous silver nitrate. State what you would observe if
(i) bromide ions were present, (ii) iodide ions were present.

Explain how aqueous ammonia would help you distinguish between the products obtained.

- Describe the reaction that occurs when sodium is added to water. Name the products
- Propan-1-ol and propan-2-ol may be oxidised to different carbonyls by hot acidified solution of potassium dichromate solution. (i) State the colour change that occurs in each case. (ii) How could the products of this oxidation be distinguished? Name a suitable reagent and state the observations.
- What is observed when concentrated sulphuric acid is added to potassium bromide solid? Name the reduction product.

(Faint) *white fumes, red liquid / orange vapour and pungent smell*.

Answer 4.

(ii) See answer to B (b).

(i) *Orange solution to green solution* for both.

Answer 3.

The *sodium floats* and forms a *silvery ball / melts*. The sodium *shoots about* the water's surface producing a *colourless solution*.

Answer 2.

insoluble.

Add excess concentrated ammonia. The *cream precipitate dissolves* giving a *colourless solution*. The *yellow precipitate is*

(i) *Cream precipitate*. (ii) *Yellow precipitate*.

Answer 1.

Answers

Acknowledgements: This Factsheet was researched and written by Bob Adam. Curriculum Press, Bank House, 105 King Street, Wellington, Shropshire, TF1 1NU. ChemistryFactsheets may be copied free of charge by teaching staff or students, provided that their school is a registered subscriber. No part of these Factsheets may be reproduced, stored in a retrieval system, or transmitted, in any other form or by any other means, without the prior permission of the publisher. ISSN 1351-5136