



PiXL Independence:

GCSE Chemistry – Student Booklet

KS4

Rate and extent of chemical change

Contents:

- I. Level 1- Multiple Choice Quiz – 20 credits
- II. Level 2 - 5 questions, 5 sentences, 5 words – 10 credits each
- III. Level 3 - Science in The News – 100 credits
- IV. Level 4 - Scientific Poster – 100 credits
- V. Level 5 - Video summaries – 50 credits each

PiXL Independence – Level 1
Multiple Choice Questions
GCSE Chemistry – Rate and extent of chemical change

INSTRUCTIONS

Score: /20

- **Read the question carefully.**
- **Circle the correct letter.**
- **Answer all questions.**

-
1. The rate of a reaction can be measured by:
 - a. Measuring the mass of the reactants or the volume of the gas produced.
 - b. Measuring the mass of the products.
 - c. Measuring the volume of the reactants.
 - d. Measuring the volume of the reactants and the mass of the products.

 2. The factors affecting the rate of a reaction are:
 - a. Temperature, concentration, surface area and using a catalyst.
 - b. Temperature, volume used, surface area and concentration.
 - c. Concentration, mass, volume and surface area.
 - d. Surface area, temperature and using a catalyst.

 3. Increasing the temperature of the reaction:
 - a. Has no effect.
 - b. Increases the amount of product formed.
 - c. Increases the rate of the reaction.
 - d. Decreases the rate of the reaction.

 4. Increasing the volume of the reactant:
 - a. Has no effect.
 - b. Increases the amount of product formed.
 - c. Increases the rate of the reaction.
 - d. Decreases the rate of the reaction.

 5. Increasing the concentration of the reaction:
 - a. Has no effect.
 - b. Increases the amount of product formed.
 - c. Increases the rate of the reaction.
 - d. Decreases the rate of the reaction.

 6. Increasing the surface area of the reaction means:
 - a. Using a large lump rather than a powder.
 - b. Using a powder rather than a large lump.
 - c. Using small chips rather than powder.
 - d. That all particles come into contact with the reactant at the same time.

7. Increasing the surface area of the reaction:
 - a. Has no effect.
 - b. Increases the amount of product formed.
 - c. Increases the rate of the reaction.
 - d. Decreases the rate of the reaction.

8. Using a catalyst for a reaction:
 - a. Has no effect.
 - b. Increases the amount of the product formed.
 - c. Decreases the rate of the reaction.
 - d. Increases the rate of the reaction.

9. Using a catalyst:
 - a. Provides an alternative pathway with a higher activation energy requirement.
 - b. Provides an alternative pathway with less reactants.
 - c. Provides an alternative pathway with a lower activation energy requirement.
 - d. Provides an alternative pathway with more products.

10. Increasing the surface area gives:
 - a. A smaller surface area to volume ratio.
 - b. A larger volume for the particles to react with.
 - c. No real difference in the volume.
 - d. A larger surface area to volume ratio.

11. In order for a reaction to occur:
 - a. Particles must collide.
 - b. Particles must collide with the correct activation energy.
 - c. Particles need to have the correct activation energy.
 - d. Particle must collide with more than the activation energy.

12. The catalyst for the decomposition of hydrogen peroxide is:
 - a. Copper oxide.
 - b. Magnesium oxide.
 - c. Manganese oxide.
 - d. Kidney.

13. Increasing the temperature affects the rate of the reaction because:
 - a. Particles have more energy and collide more.
 - b. Particles have more energy and move faster.
 - c. Particles have more energy and have more successful collisions.
 - d. Particles have more energy and move quicker to escape the solution.

14. Increasing the pressure affects the rate of the reaction because:
 - a. The particles are closer together so collide more successfully.
 - b. The particles have more energy so collide more successfully.
 - c. The particles move more quickly so collide more successfully.
 - d. The particles collide more with the surface of the container.

15. A dynamic equilibrium is:
- When there is a forward and a backward reaction in the same container.
 - When the rate of the forward and the backward reactions are equal.
 - When the products are removed to ensure the forward reaction is the quickest.
 - When the backward reaction is endothermic.
16. In a dynamic equilibrium, when the forward reaction is exothermic, increasing the temperature will:
- Increase the rate the products are made.
 - Decrease the rate that the products are made.
 - Have no effect.
 - Increase the amount of product made.
17. In a dynamic equilibrium, increasing the pressure will favour:
- The reaction with more products.
 - Neither side of the reaction.
 - The reaction with fewer products.
 - The quicker rate.
18. In making ammonia, the forward reaction is exothermic, so 450°C used because:
- It is a high temperature so the reaction will occur quicker.
 - It is compromise as the forward reaction prefers a low temperature.
 - It is a compromise as the forward reaction prefers a high temperature.
 - It is easy to maintain.
19. Using a higher pressure favours the forward reaction but only 200atm is used because:
- It is high enough for the reaction to occur.
 - It is a safe pressure to maintain.
 - It is too labour intensive at higher pressures.
 - It is 2x the natural atmospheric pressure.
20. A biological catalyst is known as:
- An enzyme.
 - A protein.
 - A type pf washing powder.
 - Mitochondria.

PiXL Independence – Level 2
5 questions, 5 sentences, 5 words
GCSE Chemistry – Rate and extent of chemical change

INSTRUCTIONS

- For each statement, use either the suggested website or your own text book to write a 5-point summary. In examinations, answers frequently require more than 1 key word for the mark, so aim to include a few key words.
- It is important to stick to 5 sentences. It is the process of selecting the most relevant information and summarizing it that will help you remember it.
- Write concisely and do not elaborate unnecessarily, it is harder to remember and revise facts from a big long paragraph.
- Finally, identify 5 key words that you may have difficulty remembering and include a brief definition. You might like to include a clip art style picture to help you remember it.

Example:

QUESTION:	Explain how to measure the rate of a reaction and to interpret the data.				
Sources:	Website – 1. http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_gateway/chemical_economics/reaction1rev1.shtml 2. http://www.s-cool.co.uk/a-level/chemistry/reaction-kinetics/revise-it/measuring-rates-of-reaction				
	<ol style="list-style-type: none"> 1. Measure how much product is formed over a specific period. 2. E.g. the mass of the substance or the volume of gas given off. 3. Plot the data on a graph, the steeper the gradient the quicker the reaction. 4. Both reactions should plateau at the same volume/mass. 5. However, the faster rate should stop first. 				
	plateau	time	volume	mass	steeper

QUESTION 1:	Explain the effect of increasing the concentration on the rate of the reaction.
Sources:	Website – 1. http://chemguide.co.uk/physical/basicrates/concentration.html 2. http://www.chem4kids.com/files/react_rates.html

Blank area for student response.

--	--	--	--	--

QUESTION 2:	Explain how increasing the temperature affects the reaction rate.
Sources:	Website – 1. http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel_pre_2011/chemicalreactions/preparinggasesrev4.shtml http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_gateway/chemical_economics/reaction2rev2.shtml 2. http://www.docbrown.info/page03/3_31rates3d.htm

--	--	--	--	--

--	--	--	--	--

QUESTION 3:	Describe the term 'dynamic equilibrium' and how we can change it to produce more product.
Sources:	Website – 1. http://www.bbc.co.uk/bitesize/higher/chemistry/reactions/equilibrium/revision/1/ 2. https://socratic.org/chemistry/phases-of-matter/dynamic-equilibrium-of-phase-changes

--	--	--	--	--

--	--	--	--	--

QUESTION 4:	Describe how catalysts can be used to speed up the rate of a reaction.
Sources:	Website – 1. http://chemguide.co.uk/physical/basicrates/catalyst.html 2. https://www.youtube.com/watch?v=pwLQGeKQuKU

--	--	--	--	--

--	--	--	--	--

QUESTION 5:	Describe how increasing the surface area increases the rate of the reaction.
Sources:	Website – 1. http://chemguide.co.uk/physical/basicrates/surfacearea.html 2. https://www.youtube.com/watch?v=FJtwkum_QAY

--	--	--	--	--

--	--	--	--	--

PiXL Independence – Level 3

Science in the News

GCSE Chemistry – Rate and extent of chemical change

INSTRUCTIONS

Fake news

Sensationalised news stories have been around for some time, but with the mass growth of social media, the problem seems to have grown in recent years. At the very least, the US Presidential election has certainly highlighted the impact that misleading information can have. www.tiny.cc/fakenews2

At home, the Brexit vote also suffered from the circulation of misleading news stories www.tiny.cc/fakenews3

Therefore, the ability to identify real information, track it back to the source article and make your own judgement is a very important skill. This activity will help you develop that skill.

Is nuclear power at risk from natural disasters?

News article: <http://www.mirror.co.uk/news/world-news/japan-rocked-62-magnitude-earthquake-11300042>

News article: <http://www.telegraph.co.uk/news/worldnews/asia/japan/8377506/Japan-earthquake-nuclear-disaster-feared-after-power-plant-explosion.html>

Real article: <http://www.dw.com/en/the-science-behind-how-a-nuclear-meltdown-occurs/a-14907961>

Task 1:

You need to produce a 1 page essay on how temperature and pressure can affect nuclear plants after a natural disaster.

Essay section	Activity
Introduction	Write how temperature and pressure are controlled in a nuclear plant.
Describe	Describe how temperature and pressure affect the rate of the reaction.
Explore	How and why we control temperature and pressure for nuclear reactions?
Evaluate	Is nuclear power safe from natural disaster, taking into account the above? Discuss both the advantages and disadvantages and give an overall opinion.

The Haber process



Discussion/News article: <http://www.the-compost-gardener.com/haber-process.html>

Real piece: <http://chemguide.co.uk/physical/equilibria/haber.html>

Real clip: <https://www.youtube.com/watch?v=NWhZ77Qm5y4>

Task 2:

You need to produce a 1 page essay on the background to the Haber process, how it works and the way we manipulate it.

Essay section	Activity
Introduction	What is the Haber process? State the conditions we use for it.
Describe	Describe how the Haber process developed.
Explore	Explore the way industry exploits dynamic equilibrium to ensure economic gains.
Evaluate	Evaluate whether the Haber process has been good or bad for society. Give both sides of the argument and then your overall opinion.

PiXL Independence – Level 4

Scientific Posters

GCSE Chemistry – Rate and extent of chemical change

INSTRUCTIONS

Scientific Posters

Scientists communicate research findings in three main ways. Primarily, they write journal articles much like an experiment write up. These are very concise, appraise the current literature on the problem and present findings. Scientists then share findings at conferences through talks and scientific posters. During a science degree, you would practice all three of these skills.

Scientific posters are a fine balance between being graphically interesting and attracting attention and sharing just the right amount of text to convey a detailed scientific message. They are more detailed than a talk and less detailed than a paper.

Use this information to help structure your poster – www.tiny.cc/posterskills (that's Poster Skills not Posters Kill!) More detailed guidance is available at : www.tiny.cc/posterskills2

Creating your poster

It is easiest to create a poster in PowerPoint; however, you need to add custom text boxes rather than using the standard templates.



Posters need to be eye catching, but readable from a distance. If you use PowerPoint, start with a 4:3 slide (for easier printing, it can then be printed on A3) and use a 14-16 pt font. The first box could be larger to draw people in. You can use a background image, but pick a simple one that is of high quality. Select text box fill and select change the transparency to maintain the contrast and partially show the picture.

You can experiment with different layouts and you should include images. Avoid a chaotic layout, posters are read from top left column downwards.

Remember to include the authors and references.

Finally, look at the examples given on the University of Texas website which also offers an evaluation of each www.tinyurl.com/postereg

The effects of four factors on the rate of a reaction.

Background

How can we use the four factors to ensure economic viability for chemical reactions? We constantly use the ideas and principles to help industry make money. Here we will look into the ways we can manipulate the reactions.

Source articles

<https://www.thoughtco.com/factors-that-effect-chemical-reaction-rate-609200>

<http://www.adichemistry.com/physical/kinetics/factors/factors-affecting-rate-reaction.html>

http://www.chem4kids.com/files/react_rates.html

<http://www.compoundchem.com/2016/02/17/rate-of-reaction/>

Use other sources as necessary.

Task:

Produce a scientific poster on the factors affecting the rate of reactions.

Recall	Write the four factors that increase the rate of the reaction.
Describe	Describe how each of these affects the rate of a reaction.
Compare	Compare the energy profiles of reactions with and without a catalyst.
Evaluate	Why we use these factors to increase the rate of a reaction and why we may sometimes need to compromise in order to make the reaction sustainable.

PiXL Independence – Level 5
Video summaries
GCSE Chemistry – Rate and extent of chemical change

Cornell Notes

At A level and University, you will make large amounts of notes, but those notes are only of use if you record them in a sensible way. One system for recording notes is known as the Cornell notes system. This method encourages you to select relevant information, rather than trying to write a transcript of everything said. More importantly, it forces you to spend a few minutes reviewing what you have written, which has been scientifically proven to aid learning and memory retention.

The ideal is to write everything on one page, but some students may prefer to type and others will to handwrite their notes. Whichever option you use, remember the aim is to summarise and condense the content with a focus on the objectives that you are trying to learn and understand.

There are three main sections to the Cornell notes

- 1 **Cue/ Objectives** – This can be done before or after the lecture. You may have been provided with the objectives or you may need to decide what they were or you may want to make the link to your learning if this is an additional task or lecture you are viewing, such as this video.
- 2 **Notes** – In this space you record concisely, simply the things you are LESS likely remember - **The NEW knowledge**.
- 3 **Summary** – The most important step that is carried out after the lecture or video. This helps to reinforce learning.

Background

The following short talks present two topics that link to your learning. The first looks at Fritz Haber and his life's work. The second video discusses Le Chatelier's Principle.

Source article:

Video 1 – Fritz Haber: Great minds

You tube clip: <https://www.youtube.com/watch?v=tdEE5uvFhOM>

Video 2 – Le Chatelier's principle

Ted talks clip: <https://www.youtube.com/watch?v=4-fEvpVNTIE>

Task:

**You need to produce a set of Cornell notes for the video given above.
Use the following objective to guide your note taking, this links to your learning.**

- 1 Discuss how Fritz Haber developed the Haber process.
- 2 Discuss how Le Chatelier's principle is linked to the Haber process.

Objectives What are the main learning outcomes that have been shared with you? This will help guide you to taking the RIGHT notes during the video.	Title
	Date
	Sketch down note and key words Do not write in full sentences whilst you listen, put quick sketches, single words, mind maps, short hand etc. To help train you for university, try not to pause the video because you could not pause a live lecture (However, a lecture may give more natural pauses for you to catch up).

Summary (after the video)

What are your main points of learning from this video.
This is your chance to make sense of your notes.
Make clear connections to the things you need to know

Objectives:	Title:
	Date:
Summary:	



Commissioned by The PiXL Club Ltd.

This resource is strictly for the use of member schools for as long as they remain members of The PiXL Club. It may not be copied, sold, or transferred to a third party or used by the school after membership ceases. Until such time it may be freely used within the member school.

All opinions and contributions are those of the authors. The contents of this resource are not connected with, or endorsed by, any other company, organisation or institution.

PiXL Club Ltd endeavour to trace and contact copyright owners. If there are any inadvertent omissions or errors in the acknowledgements or usage, this is unintended and PiXL will remedy these on written notification.