

# **PiXL Independence:**

## **GCSE Chemistry – Student Booklet**

### **KS4**

#### **Chemical and allied industries**

#### **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 – Chemical and allied industries**

**INSTRUCTIONS**

**Score: /20**

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

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1. Crude oil is separated using:
    - a. Distillation.
    - b. Filtration.
    - c. Crystallisation.
    - d. Fractional distillation.
  
  2. The process of fractional distillation includes:
    - a. Evaporation then condensation.
    - b. Filtration then evaporation.
    - c. Evaporation then filtration.
    - d. Condensation then filtration.
  
  3. The formula for alkanes is:
    - a.  $C_nH_{2n+2}$
    - b.  $C_{2n}H_{2n+2}$
    - c.  $C_nH_2$
    - d.  $C_{2n}H_{2n}$
  
  4. Long chain hydrocarbons can be made more useful by:
    - a. Fracking.
    - b. Filtration.
    - c. Bonding.
    - d. Cracking.
  
  5. Metals can be removed from their ores by:
    - a. Oxidation with carbon.
    - b. Reduction with carbon.
    - c. Combustion with carbon.
    - d. Neutralisation with carbon.
  
  6. Reduction with carbon occurs when:
    - a. The metal has the same reactivity as carbon.
    - b. The metal is more reactive than carbon.
    - c. The metal is less reactive than carbon.
    - d. The metal is found native.

7. Electrolysis can occur in:
  - a. Molten or dissolved ionic compounds.
  - b. Molten or dissolved covalent compounds.
  - c. Solid ionic compounds.
  - d. Solid covalent compounds.
  
8. In electrolysis metal ions go to the negative electrode because:
  - a. They need to gain electrons.
  - b. They need to lose electrons.
  - c. They are a gas.
  - d. Opposites attract.
  
9. When low grade copper is found this method can be used to extract it:
  - a. Mining.
  - b. Phytomining.
  - c. Drilling.
  - d. Combustion.
  
10. Corrosion occurs when this gas reacts with the metal to form a barrier:
  - a. Carbon dioxide.
  - b. Hydrogen.
  - c. Oxygen.
  - d. Nitrogen.
  
11. Compared to metals, alloys are:
  - a. Shinier.
  - b. Cleaner.
  - c. Stronger.
  - d. Easier to use.
  
12. The properties of alloys are due to:
  - a. The layers being distorted.
  - b. The layers being able to slide over each other.
  - c. A Bond forming between the atoms.
  - d. The layers being uniform.
  
13. The Haber process is used to produce this product for agricultural production.
  - a. Pesticide.
  - b. Food stuffs.
  - c. Medicine.
  - d. Fertiliser.
  
14. Percentage yield of a product is calculated using:
  - a.  $(\text{Actual yield/theoretical yield}) \times 100$ .
  - b.  $(\text{Theoretical yield/actual yield}) \times 100$ .
  - c. Actual yield/theoretical yield.
  - d. Theoretical yield/actual yield.

15. Atom economy is calculated using this equation:
- Mass of useful product/mass of all reactants.
  - Mass of product/mass of all reactants.
  - Mass of useful product/mass of all products.
  - Mass of products/mass of useful reactants.
16. An efficient process will have a:
- Low atom economy.
  - A fast rate of reaction.
  - High atom economy.
  - A slow rate of reaction.
17. The Haber process is used to produce:
- Nitrogen.
  - Potassium hydroxide.
  - Hydrochloric acid.
  - Ammonia
18. Glass is used for windows because:
- It is transparent.
  - It is light.
  - It is strong.
  - It is brittle.
19. The alloy stainless steel was created to:
- Produce cutlery.
  - Be strong.
  - Resist corrosion.
  - Be light.
20. Mitigation is:
- Using a barrier to protect the metal from oxygen and water.
  - Using a barrier to protect the metal from water.
  - Using a barrier to protect the metal from rust.
  - Using a barrier to protect the metal from carbon dioxide.

**PiXL Independence – Level 2**  
**5 questions, 5 sentences, 5 words**  
**GCSE Chemistry – Chemical and allied industries**

**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:**

<b>QUESTION:</b>	Describe and explain the separation of crude oil by fractional distillation.			
<b>Sources:</b>	Website – <a href="http://www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/rocks/fuelsrev3.shtml">http://www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/rocks/fuelsrev3.shtml</a> <a href="http://www.gcsescience.com/e7-fractional-distillation.htm">http://www.gcsescience.com/e7-fractional-distillation.htm</a>			
<ol style="list-style-type: none"> <li>1. Crude oil is separated into fractions based on their boiling points.</li> <li>2. The crude oil is first evaporated and then condensed at different boiling points.</li> <li>3. The long chain hydrocarbons have high boiling points.</li> <li>4. The short chain hydrocarbons are more volatile, flammable and less viscous.</li> <li>5. The small hydrocarbons are used for fuels.</li> </ol>				
evaporation	condensation	fractions	Boiling points	chain

**QUESTION 1:** Explain how electrolysis is used to extract metals from their ores.

**Sources:**

**Website –**

1. [http://www.bbc.co.uk/schools/gcsebitesize/science/add\\_aqa\\_pre\\_2011/ions/electrolysisrev1.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa_pre_2011/ions/electrolysisrev1.shtml)
2. <http://www.gcsescience.com/ex3.htm>

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**QUESTION 2:** Explain how carbon can be used to extract metals from their ores.

**Sources:**

**Website –**

1. [http://www.bbc.co.uk/schools/gcsebitesize/science/add\\_ocr\\_pre\\_2011/chemicals/extractionmetalsrev1.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_pre_2011/chemicals/extractionmetalsrev1.shtml)
2. <http://www.animatedscience.co.uk/vle/science/KS4/absorb/chemistry/HTML/units/LR702.html>

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**QUESTION 3:**

**Evaluate alternative biological methods of metal extraction (bacterial and phytoextraction).**

**Sources:**

**Website –**

1. <https://www.youtube.com/watch?v=6mVoiaTRdmk>
2. <http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/metalsanduses/extractingmetalsrev5.shtml>

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**QUESTION 4:**

**Describe the composition of some important alloys in relation to their properties and uses.**

**Sources:**

**Website –**

1. [http://www.bbc.co.uk/schools/gcsebitesize/science/ocr\\_gateway\\_pre\\_2011/rocks\\_metals/4\\_metals\\_alloys2.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway_pre_2011/rocks_metals/4_metals_alloys2.shtml)
2. <http://www.explainthatstuff.com/alloys.html>

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**QUESTION 5:**

Describe the process where a plastic is recycled for a different use, and explain why this is viable.

**Sources:**

**Website –**

1. [https://getrevising.co.uk/resources/recycling\\_of\\_plastics](https://getrevising.co.uk/resources/recycling_of_plastics)
2. [http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel/problems\\_in\\_environment/recyclingrev1.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel/problems_in_environment/recyclingrev1.shtml)

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**PiXL Independence – Level 3**  
**Science in the News**  
**GCSE Chemistry – Chemical and allied industries**

**INSTRUCTIONS**

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**Fake news**

Sensationalized 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](http://www.tiny.cc/fakenews2)

At home, the Brexit vote also suffered from the circulation of misleading news stories [www.tiny.cc/fakenews3](http://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 recycling the answer to the Earth's problems?**

Discussion piece: <https://climate.nasa.gov/evidence/>

Science article: <https://climate.nasa.gov/evidence/>

Real article: <https://www.scientificamerican.com/article/science-behind-climate-change/>

**Task 1:**

You need to produce a 1 page essay on the science behind climate change.

<b>Essay section</b>	<b>Activity</b>
<b>Introduction</b>	Define the term climate change.
<b>Describe</b>	Describe the process global warming.
<b>Explore</b>	Look into the impacts of global warming.
<b>Evaluate</b>	Evaluate the evidence provided to support the theory of global warming. Discuss both the advantages and disadvantages and give an overall opinion.

## Can nature help us the produce copper?

Discussion article:

[https://www.copper.org/publications/newsletters/innovations/2004/05/producing\\_copper\\_natures\\_way\\_bioleaching.html](https://www.copper.org/publications/newsletters/innovations/2004/05/producing_copper_natures_way_bioleaching.html)

Real piece: <http://www.gcsescience.com/ex23.htm>

Discussion piece: <http://countrysidenetwork.com/daily/growing/soil-compost/phytoremediation-plants-used-to-clean-contaminated-soil/>

Real piece:

<http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/metalsanduses/extractingmetalsrev5.shtml>

### Task 2:

You need to produce a 1 page essay on alternative methods of copper extraction.

<b>Essay section</b>	<b>Activity</b>
<b>Introduction</b>	What are bioleaching and phytomining?
<b>Describe</b>	Describe the two separate processes.
<b>Explore</b>	Compare the different processes.
<b>Evaluate</b>	Evaluate whether these methods are the answer to the world's copper shortage. Give both sides of the argument and then your overall opinion.

# PiXL Independence – Level 4

## Scientific Posters

### GCSE Chemistry – Chemical and allied industries

#### INSTRUCTIONS

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##### 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](http://www.tiny.cc/posterskills) (that's Poster Skills not Posters Kill!) More detailed guidance is available at : [www.tiny.cc/posterskills2](http://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/postereq](http://www.tinyurl.com/postereq)

## Metal Extraction

### Background

The world needs metal but the world's supply is limited. New methods are being developed to extract the metals from low grade ores.

### Source articles

[http://www.bbc.co.uk/schools/gcsebitesize/science/aqa\\_pre\\_2011/rocks/metalsrev1.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/rocks/metalsrev1.shtml)

<http://www.gcsescience.com/ex23.htm>

[http://www.bbc.co.uk/schools/gcsebitesize/science/ocr\\_gateway\\_pre\\_2011/rocks\\_metals/4\\_metals\\_alloys1.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway_pre_2011/rocks_metals/4_metals_alloys1.shtml)

<http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/metalsanduses/extractingmetalsrev5.shtml>

**Use other sources as necessary.**

### Task:

Produce a scientific poster on metal extraction metals.

<b>Recall</b>	State the different methods of extracting copper.
<b>Describe</b>	Describe the methods for each extraction type.
<b>Compare</b>	Compare the similarities and differences between the various extraction methods.
<b>Evaluate</b>	Evaluate which method we will use in the future, give reasons for and against all methods and then produce an opinion. The advantages and disadvantages.

**PiXL Independence – Level 5**  
**Video summaries**  
**GCSE Chemistry – Chemical and allied industries**

**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 how we recycle. The second video discusses why we need to evaluate the processes we use.

**Source article:**

**Video 1 – How recycling works**

**Youtube clip:** <https://www.youtube.com/watch?v=b7GMpJx2jDQ>

**Video 2 – The importance of evaluation in recycling waste**

**Youtube clip:** <https://www.youtube.com/watch?v=IRaHe-iHeMQ>

**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 we recycle.
- 2 Discuss if recycling waste is beneficial.

**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

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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).

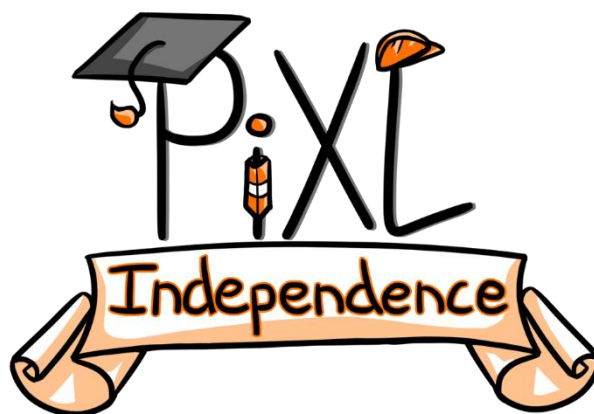
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**Summary (after the video)**  
What are your main points of learning from this video.  
This is your chance to make sense of your notes.  
Make clear connections to the things you need to know



<b>Objectives:</b>	<b>Title:</b>
	<b>Date:</b>
<b>Summary:</b>	

<b>Objectives:</b>	<b>Title:</b>
	<b>Date:</b>
<b>Summary:</b>	



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