

# **PiXL Independence:**

## **GCSE Chemistry – Student Booklet**

### **KS4**

#### **Energy changes**

#### **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 – Energy changes**

**INSTRUCTIONS**

Score:     /20

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

1. An exothermic reaction:
  - a. Gives out heat energy to its surroundings.
  - b. Takes in heat energy from its surroundings.
  - c. Needs bonds to form and then break.
  - d. Is an example of a physical reaction.
  
2. An endothermic reaction:
  - a. Gives out heat energy to its surroundings.
  - b. Takes in heat energy from its surroundings.
  - c. Needs bonds to form and then break.
  - d. Is an example of a physical reaction.
  
3. Endothermic and exothermic reactions are examples of:
  - a. Opposite physical reactions.
  - b. The same physical reactions.
  - c. Opposite chemical reactions.
  - d. The same chemical reactions.
  
4. An exothermic reaction:
  - a. Needs more energy to make the new bonds than break the old bonds.
  - b. Needs the same amount of energy for bond breaking and making.
  - c. Has no excess energy.
  - d. Needs less energy to make the new bonds than break the old bonds.
  
5. An endothermic reaction:
  - a. Needs more energy to make the new bonds than break the old bonds.
  - b. Needs the same amount of energy for bond breaking and making.
  - c. Has no energy requirements.
  - d. Needs less energy to make the new bonds than break the old bonds.
  
6. Activation energy is:
  - a. The minimum amount of energy required to start a reaction.
  - b. The energy needed to activate atoms to move.
  - c. The maximum amount of energy required to start a reaction.
  - d. The energy needed to ensure the reaction goes to completion.

7. Crude oil is made from:
  - a. Hydrogen, carbon and oxygen.
  - b. Hydrogen and oxygen.
  - c. Hydrogen and carbon.
  - d. Oxygen and carbon.
  
8. Crude oil can be used to make:
  - a. Plastics.
  - b. Water.
  - c. Hydrogen fuel.
  - d. Wood.
  
9. Crude oil is a:
  - a. Renewable fuel.
  - b. Infinite resource.
  - c. Non-renewable fuel.
  - d. Unusable.
  
10. Crude oil is essential to life because:
  - a. It is used as tarmac on roads.
  - b. We use it in thermometers.
  - c. Fossils would not have formed helping us identify life forms.
  - d. We can use it to remove petrol in cars.
  
11. A fuel cell:
  - a. Produces no potential difference just a current.
  - b. Produces a potential difference infinitely.
  - c. Produces potential difference until one reactant is used up.
  - d. Produces a current.
  
12. An advantage of using a hydrogen fuel cell is:
  - a. Only hydrogen is produced as a waste product.
  - b. Only water is produced as a waste product.
  - c. There are no products.
  - d. Hydrogen is an odourless gas.
  
13. A disadvantage of using hydrogen as a fuel cell is:
  - a. It is hard to see.
  - b. The gas is light.
  - c. It is very flammable.
  - d. It uses oxygen from the air.
  
14. In a fuel cell the oxygen reacting with the hydrogen is:
  - a. Endothermic.
  - b. A physical reaction.
  - c. Irreversible.
  - d. Exothermic.

15. A hydrocarbon contains which of the following?
  - a. Hydrogen, carbon and oxygen.
  - b. Hydrogen and carbon.
  - c. Oxygen and carbon.
  - d. Hydrogen and oxygen.
  
16. Petrol can be made using:
  - a. Crude oil.
  - b. Coal.
  - c. Natural gas.
  - d. Wood.
  
17. A disadvantage of using petrol cars is:
  - a. Carbon dioxide is produced which causes global warming.
  - b. Carbon monoxide is produced which causes global warming.
  - c. Carbon dioxide is produced which causes acid rain.
  - d. Carbon monoxide is produced which causes acid rain.
  
18. An advantage of using petrol cars is:
  - a. Water is produced as a by-product.
  - b. A large amount of energy is produced.
  - c. It is easy to obtain.
  - d. It is non-renewable.
  
19. An example of an exothermic reaction is:
  - a. Combustion.
  - b. Reduction.
  - c. Physical reactions.
  - d. Sodium chloride and water.
  
20. In an endothermic reaction the temperature of the surroundings:
  - a. Raises.
  - b. Stays the same.
  - c. Falls then raises.
  - d. Falls.

**PiXL Independence – Level 2**  
**5 questions, 5 sentences, 5 words**  
**GCSE Chemistry – Energy changes**

**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> | Explain the difference between endothermic and exothermic reactions.  |      |        |       |
| <b>Sources:</b>  | <b>Website –</b><br>1. <a href="http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa_pre_2011/chemreac/energychangesrev1.shtml">http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa_pre_2011/chemreac/energychangesrev1.shtml</a><br>2. <a href="https://www.youtube.com/watch?v=znsPa1BSaIM">https://www.youtube.com/watch?v=znsPa1BSaIM</a>  |      |        |       |
|                  | 1. Exothermic reactions give out heat as it takes more energy to break the bonds than make new bonds.<br>2. Endothermic reactions take in heat as it takes more energy to make new bonds than it does break old ones.<br>3. Surplus energy given out causes the temperature to rise.<br>4. Energy taken in from the surroundings causes the temperature to fall.<br>5. Exothermic reactions are ones such as combustion, endothermic reactions are ice packs. |      |        |       |
| endothermic      | exothermic  | heat | energy | bonds |

|                    |   |
|--------------------|---|
| <b>QUESTION 1:</b> | <b>Draw/Describe an energy profile for an exothermic reaction and identifying the various components.</b>   |
| <b>Sources:</b>    | <b>Website –</b><br>1. <a href="http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa/exothermic/exothermic_endothermicrev1.shtml">http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa/exothermic/exothermic_endothermicrev1.shtml</a><br>2. <a href="#">GCSE Science Revision Chemistry "Exothermic and Endothermic Reactions" - YouTube</a> |

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| <b>QUESTION 2:</b> | <b>Draw/Describe an energy profile for an endothermic reaction and identifying the various components.</b>   |
| <b>Sources:</b>    | <b>Website –</b><br>1. <a href="http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel_pre_2011/chemicalreactions/preparinggasesrev4.shtm">http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel_pre_2011/chemicalreactions/preparinggasesrev4.shtm</a><br>2. <a href="https://www.youtube.com/watch?v=LiAvDpl5aJA">https://www.youtube.com/watch?v=LiAvDpl5aJA</a> |

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**QUESTION  
3:**

**Describe the composition of crude oil and the dependence of humans on the commodity.**

**Sources:**

**Website –**

1. [http://www.bbc.co.uk/schools/gcsebitesize/science/ocr\\_gateway\\_pre\\_2011/carbon\\_chem/4\\_crude\\_oil1.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway_pre_2011/carbon_chem/4_crude_oil1.shtml)
2. <https://www.youtube.com/watch?v=JZdvsQzOKuk>

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**QUESTION  
4:**

**Evaluate the advantages and disadvantages of the hydrogen/oxygen fuel cell .**

**Sources:**

**Website –**

1. [http://www.bbc.co.uk/schools/gcsebitesize/science/triple\\_ocr\\_gateway/chemistry\\_out\\_there/energy\\_transfers/revison/1/](http://www.bbc.co.uk/schools/gcsebitesize/science/triple_ocr_gateway/chemistry_out_there/energy_transfers/revison/1/)
2. [http://www.altenergy.org/renewables/fuel\\_cells.html](http://www.altenergy.org/renewables/fuel_cells.html)

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**QUESTION  
5:**

**Describe how a hydrogen/oxygen fuel cell works.**

**Sources:**

**Website –**

1. [How Fuel Cells Work | HowStuffWorks](#)
2. [https://www.youtube.com/watch?v=Tk\\_ilzOUjTU](https://www.youtube.com/watch?v=Tk_ilzOUjTU)

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# PiXL Independence – Level 3

## Science in the News

### GCSE Chemistry – Energy changes

#### INSTRUCTIONS

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#### 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.

At home, the Brexit vote also suffered from the circulation of misleading news stories. 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 self-heating food the future?

News article: <https://www.theguardian.com/lifeandstyle/wordofmouth/2012/mar/23/have-you-tried-self-heating-food>

Discussion article: <http://www.straitstimes.com/lifestyle/food/instant-self-heating-hotpots-seizure-dos-and-donts-of-buying-food-products-online-or>

Real article: [The heat is on: heating food and drinks with chemical energy – Science in School](#)

#### Task 1:

You need to produce a 1 page essay on self-heating foods.

| Essay section | Activity  |
|---------------|---|
| Introduction  | Write the basic facts about exothermic and endothermic reactions.                                     |
| Describe      | Describe how exothermic reaction occurs.  |
| Explore       | Why people may choose to use self-heating food?   |
| Evaluate      | Is self-heating food safe? Discuss both the advantages and disadvantages and give an overall opinion. |

### Is crude oil all bad?

Discussion/News article: <http://www.endangered.org/oil-and-polar-bears-dont-mix/>

Real piece:

[http://www.bbc.co.uk/schools/gcsebitesize/science/ocr\\_gateway\\_pre\\_2011/carbon\\_chem/4\\_crude\\_oil1.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway_pre_2011/carbon_chem/4_crude_oil1.shtml)

Real article: <http://www.dummies.com/education/science/environmental-science/what-is-the-environmental-impact-of-petroleum-and-natural-gas/>

### Task 2:

You need to produce a 1 page essay on the background crude oil and the issues surrounding its use.

| <b>Essay section</b> | <b>Activity</b>  |
|----------------------|--|
| <b>Introduction</b>  | State what crude oil is made from and its components.  |
| <b>Describe</b>      | Describe how crude oil is made.  |
| <b>Explore</b>       | Explore the uses of crude oil and its links to humanity.   |
| <b>Evaluate</b>      | Evaluate whether crude oil is a good or a bad commodity, look at its environmental impacts vs its uses. Give both sides of the argument and then your overall opinion. |

# PiXL Independence – Level 4

## Scientific Posters

### GCSE Chemistry – Energy changes

#### 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.

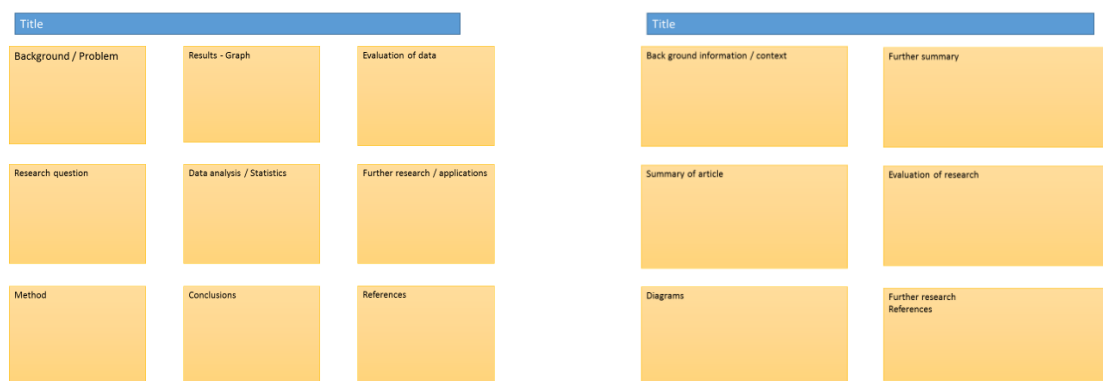
Scientific posters are a fine balance between being graphically interesting and attracting attention and sharing just the right amount of text to convey a detailed scientific message. They are more detailed than a talk and less detailed than a paper.

Use this information to help structure your poster – <https://www.wikihow.com/Make-a-Scientific-Poster>

More detailed guidance is available at: <https://guides.nyu.edu/posters>

##### 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 <https://ugs.utexas.edu/our/poster/samples>

## Exothermic and Endothermic Reactions

### Background

We are developing new ways of including these chemical reactions into our everyday lives to help with the stresses and time pressures of modern living. Are these going to revolutionise modern life like the refrigerator did?

### Source articles

<https://www.lifepersona.com/examples-of-exothermic-reactions>

<http://www.simplechemconcepts.com/chemistry-phenomenon-endothermic-exothermic-reactions-in-everyday-life/>

<https://www.khanacademy.org/test-prep/mcat/chemical-processes/thermochemistry/a/endothermic-vs-exothermic-reactions>

<https://www.youtube.com/watch?v=eJXL0IrbtqE>

Use other sources as necessary.

### Task:

Produce a scientific poster on exothermic and endothermic reactions.

|                 |   |
|-----------------|---|
| <b>Recall</b>   | Write the definitions of exothermic and endothermic reactions.                            |
| <b>Describe</b> | Describe the processes behind exothermic and endothermic reactions.                       |
| <b>Compare</b>  | Compare the energy profiles of exothermic and endothermic.                                |
| <b>Evaluate</b> | How can we use these reactions in modern life? Look into both positive and negative uses. |

# PiXL Independence – Level 5

## Video summaries

### GCSE Chemistry – Energy changes

#### 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 chemicals and energy. The second video discusses how we can use new ideas when looking at the products of crude oil.

#### Source article:

#### Video 1 – Energy and Chemistry

You tube clip: <https://www.youtube.com/watch?v=GqtUWyDR1fg>

#### Video 2 – Plastics and bacteria

Ted talks clip: [Miranda Wang & Jeanny Yao: Breaking down plastics using soil bacteria - YouTube](#)

**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 what the issue with plastics is and how can bacteria help.
- 2 Discuss what is energy and how it affects reactions.

|  |  |
|--|--|
| <b>Objectives</b><br>What are the main learning outcomes that have been shared with you?<br>This will help guide you to taking the RIGHT notes during the video. | Title  |
|  | Date   |
|  | Sketch down note and key words<br>Do not write in full sentences whilst you listen, put quick sketches, single words, mind maps, short hand etc.<br>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.

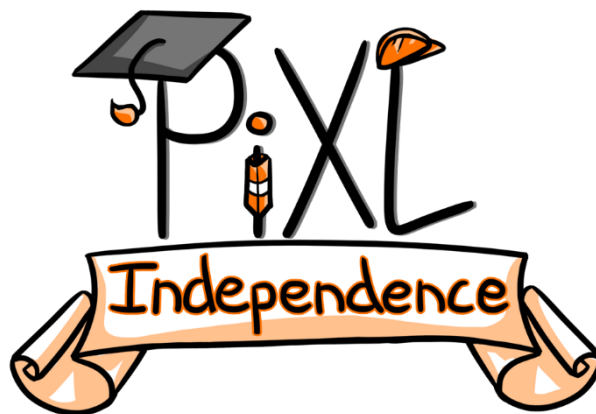
This is your chance to make sense of your notes.

Make clear connections to the things you need to know



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

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



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