

PiXL Independence:

Chemistry – Student Booklet

KS5

Periodic Table

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

A Level Chemistry – Periodic Table

INSTRUCTIONS

Score: /20

- Read the question carefully.
 - Circle the correct letter.
 - Answer all questions
- Which of the following best describes the term 'periodicity'?
 - Repeating trends in physical and chemical properties.
 - Repeating its value at regular fixed intervals.
 - Arrangement of elements according to their atomic mass.
 - Study of the periodic table and its features.
 - What is the trend in ionisation energy across Period 3?
 - It increases.
 - It increases, but with a few exceptions.
 - It decreases.
 - It decreases, but with a few exceptions.
 - Which of the following statements, about the trend in ionisation energy across period 3, is FALSE?
 - In general, it gets harder to remove the outer electron.
 - The number of protons is increasing so there is a stronger nuclear attraction.
 - There is generally little extra shielding effect as the extra electrons are at the same energy level.
 - Atomic radii increases across the period.
 - Which of the following is TRUE?
 - Melting points are linked to the number of neutrons.
 - Melting point decreases across a period.
 - Melting point varies across a period.
 - Melting points increase across a period.
 - Which of the following statements, about factors affecting the melting point of a substance, is TRUE?
 - Metallic substances melting points increase across the period as the metallic bonds get stronger due to an increasing positive charge and increased number of delocalised electrons.
 - Silicon has a high melting point as it is macromolecular with strong covalent bonds between atoms.
 - Smaller non-metallic molecular substances have lower melting points as they have weak van der Waals forces between molecules.
 - a and b only
 - a, b and c

6. Explain why sulfur has a higher melting point than phosphorus and chlorine.
- It has delocalised electrons so forms a metallic bond.
 - It forms a macromolecule with strong covalent bonds.
 - Phosphorus and chlorine exist as individual atoms with very weak van der Waals forces.
 - It is a larger molecule (S_8) and therefore stronger van der Waals forces.
7. What happens to the reactivity down Group 2?
- It increases.
 - It increases, but with a few exceptions.
 - It decreases.
 - It decreases, but with a few exceptions.
8. What happens to the first ionisation energy down Group 2?
- It increases.
 - It increases, but with a few exceptions.
 - It decreases.
 - It decreases, but with a few exceptions.
9. Which of the following statements, about the elements as you go down Group 2, is FALSE?
- Each element has an extra electron shell which increases the electron shielding lowering the first ionisation energy.
 - The outer electrons are further away from the nucleus reducing the nuclear attraction.
 - Each element loses electrons when they react, forming anions.
 - Atomic radius increases reducing the nuclear attraction.
10. Which of the following statements explains the change in reactivity down Group 2?
- The decrease in first ionisation energy, increase in atomic radius and increase in electron shielding causes a decrease in reactivity.
 - The increase in first ionisation energy, increase in atomic radius and increase in electron shielding causes a decrease in reactivity.
 - The decrease in first ionisation energy, increase in atomic radius and increase in electron shielding causes an increase in reactivity.
 - The decrease in first ionisation energy, increase in atomic radius and decrease in electron shielding causes an increase in reactivity.
11. When Group 2 metals react with water which of the following is FALSE?
- They are oxidised.
 - They form X^{2+} ions.
 - They are reduced.
 - Their oxidation state changes from 0 to +2.
12. Which of the following equations correctly shows the reaction between magnesium and water?
- $2Mg_{(s)} + 2H_2O \longrightarrow 2MgOH_{(aq)} + H_{2(g)}$
 - $Mg_{(s)} + 2H_2O \longrightarrow Mg(OH)_{2(aq)} + H_{2(g)}$
 - $2Mg_{(s)} + 2H_2O \longrightarrow Mg(OH)_{2(aq)} + H_{2(g)}$
 - $Mg_{(s)} + H_2O \longrightarrow Mg(OH)_{2(aq)} + 2H_{2(g)}$

13. What happens to the reactivity with water down Group 2?
- It increases.
 - It increases, but with a few exceptions.
 - It decreases.
 - It decreases, but with a few exceptions.
14. The following statements refer to Group 2 salts. Which of the following statements is TRUE as you go down the group?
- Solubility of hydroxides increases and the solubility of sulfates decreases.
 - Solubility of hydroxides decreases and the solubility of sulfates increases.
 - Solubility of hydroxides increases and the solubility of sulfates increases.
 - Solubility of hydroxides decreases and the solubility of sulfates decreases.
15. What happens to the electronegativity down Group 7?
- It increases.
 - It increases, but with a few exceptions.
 - It decreases.
 - It decreases, but with a few exceptions.
16. What happens to the boiling point down Group 7?
- It increases.
 - It increases, but with a few exceptions.
 - It decreases.
 - It decreases, but with a few exceptions.
17. The following equations show displacement reactions between halogens and halides in solution. Which of the following is FALSE?
- $\text{Br}_{2(\text{aq})} + 2\text{I}^{-}_{(\text{aq})} \longrightarrow 2\text{Br}^{-}_{(\text{aq})} + \text{I}_{2(\text{aq})}$
 - $\text{Cl}_{2(\text{aq})} + 2\text{I}^{-}_{(\text{aq})} \longrightarrow 2\text{Cl}^{-}_{(\text{aq})} + \text{I}_{2(\text{aq})}$
 - $\text{Cl}_{2(\text{aq})} + 2\text{Br}^{-}_{(\text{aq})} \longrightarrow 2\text{Cl}^{-}_{(\text{aq})} + \text{Br}_{2(\text{aq})}$
 - $\text{I}_{2(\text{aq})} + 2\text{Cl}^{-}_{(\text{aq})} \longrightarrow 2\text{I}^{-}_{(\text{aq})} + \text{Cl}_{2(\text{aq})}$
18. Which of the following statements, about the elements as you go down Group 7, is FALSE?
- Each element has an extra electron shell which increases the electron shielding reducing the atoms ability to attract an additional electron.
 - The outer electrons are further away from the nucleus reducing the nuclear attraction.
 - Each element gains electrons when they react, forming anions.
 - Atomic radius decreases reducing the nuclear attraction.
19. The following definition applies to which of the terms listed below?
 'A redox reaction where the oxidation state of one element, e.g. chlorine, both increases and decreases.'
- Disproportional.
 - Disproportionate.
 - Disproportionation.
 - Disproportion.

20. Which of the following chemicals is used to test for halides?
- a. Silver nitrate.
 - b. Barium chloride.
 - c. Sodium hydroxide.
 - d. Hydrochloric acid.

PiXL Independence – Level 2
5 questions, 5 sentences, 5 words
A Level Chemistry – Periodic Table

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 the difference between a heterogeneous and homogeneous catalyst.			
Sources:	1. Website – https://www.chemguide.co.uk/physical/catalysis/introduction.html 2. Website – http://www.s-cool.co.uk/a-level/chemistry/atomic-structure/revise-it/the-structure-of-the-atom			
	1. Heterogeneous – catalyst is in a different phase to the reactants 2. Homogeneous – catalyst is in the same phase as the reactants. 3. Phase – boundary between the two components, this could be a different state e.g. solid and liquid, or the same state e.g. oil and water. 4. Heterogeneous – reactant(s) adsorbed onto catalyst at active sites, reaction, desorbed product. 5. Homogeneous – React with the reactant, often catalyses reactions between two anions via an intermediate.			
Phase	Adsorb	Active site	Desorb	Intermediate

QUESTION 1: Explain the term 'disproportionation', illustrated by chlorine .

- Sources:**
- Website –**
1. <http://chemguide.co.uk/atoms/properties/atomorbs.html>
 2. <https://www.chemguide.co.uk/inorganic/group7/otherreactions.html>

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QUESTION 2:

Describe the use of acidified silver nitrate solution and aqueous ammonia to identify and distinguish between halide ions.

Sources:

Website –

1. <https://www.chemguide.co.uk/inorganic/group7/testing.html>
2. http://alevelchem.com/aqa_a_level_chemistry/unit3.2/sub3205/04.htm

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QUESTION 3: Describe the characteristic properties of the transition metals.

Sources:

Website –

1. <https://www.chemguide.co.uk/inorganic/transition/features.html#top>
2. <http://www.s-cool.co.uk/a-level/chemistry/transition-metals>

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QUESTION 4:

Describe the factors which may cause a change in transition metal ion colour.

Sources:

Website –

1. <https://www.chemguide.co.uk/inorganic/complexions/colour.html>
2. <https://revisionworld.com/a2-level-level-revision/chemistry/periodic-table/transition-metals>

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QUESTION 5: Explain the trend in melting point across period 3 in terms of structure and bonding.

Sources:

Website –

1. <https://www.chemguide.co.uk/inorganic/period3/elementsphys.html>
2. <https://www.creative-chemistry.org.uk/alevel/core-inorganic/periodicity/trends8>

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PiXL Independence – Level 3

Science in the News

A Level Chemistry – Periodic Table

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.

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.

The Risks of Chlorine

News article: <http://www.bristolpost.co.uk/news/bristol-news/two-taken-hospital-chlorine-gas-655437>

Discussion article: <https://www.thecanary.co/discovery/2017/11/02/liam-fox-says-chlorinated-chicken-safe-forgets-mention-eu-banned/>

Real article: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1694065/>

Task

You need to produce a 1 page essay on the dangers associated with the use of chlorine.

Essay section	Activity
Introduction	State why chlorine is used in water treatment.
Describe	Describe the reaction between chlorine and water to form chloride and chlorate (I) ion.
Evaluate	Investigate the benefits to health and the potential risks to health posed by the use of chlorine.
Conclude & Reflect	Evaluate whether the benefits outweigh the risks.

PiXL Independence – Level 4

Scientific Posters

A Level Chemistry – Periodic Table

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.

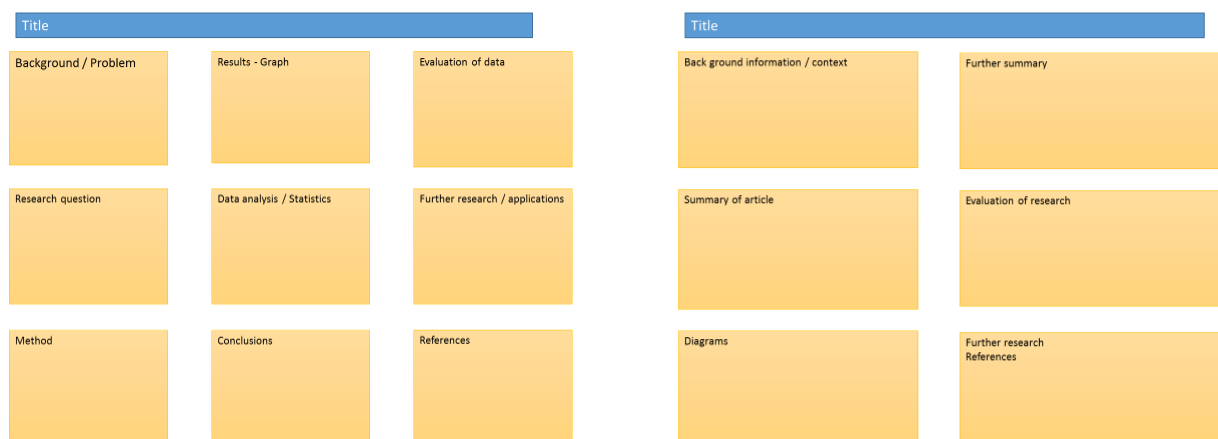
Scientific posters are a fine balance between being graphically interesting and attracting attention and sharing just the right amount of text to convey a detailed scientific message. They are more detailed than a talk and less detailed than a paper.

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>

What is a ligand?

Background

Transition metals have a complex chemistry, forming coloured ions, having variable oxidation states with the ability to act as catalysts.

Source articles:

- <https://www.chemguide.co.uk/inorganic/complexions/whatis.html>
- <https://revisionworld.com/a2-level-level-revision/chemistry/periodic-table/transition-metals>
- <http://www.s-cool.co.uk/a-level/chemistry/transition-metals/revise-it/complex-ions>
- http://www.knockhardy.org.uk/sci_htm_files/15tmet1.pdf
- <http://www.compoundchem.com/2014/03/05/colours-of-transition-metal-ions-in-aqueous-solution/>
- <https://www.youtube.com/watch?v=011Bj5USaI8>
- <https://www.chemguide.co.uk/inorganic/complexions/whatis.html>

Use other sources as necessary.

Task

Produce a scientific poster on Ligands.

State	Define the terms ligand, complex and co-ordination number.
Describe	Describe the following types of ligand and give examples: monodentate, bidentate and multidentate.
Explain	Explain ligand substitution.
Evaluate	Evaluate the impact of inhaling carbon monoxide on haemoglobin, in terms of ligand substitution.

PiXL Independence – Level 5

Video summaries

A Level Chemistry – Periodic Table

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 series of videos link to your learning. The first is a summary of essential learning on electrochemistry produced by the excellent 'Crash Course'. The second discusses the importance of large-scale batteries that are able to store renewable energy.

Source article:

Video 1 – Periodicity

<https://www.youtube.com/watch?v=VOcY9zGsSFs>

Video 2 – Periodic table trends

Khan academy: <https://www.youtube.com/watch?v=HBI8xjMchZc>

Task:

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

1. Discuss periodicity and trends across period 3.
2. Discuss the reasons for the trends in the periodic table.

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

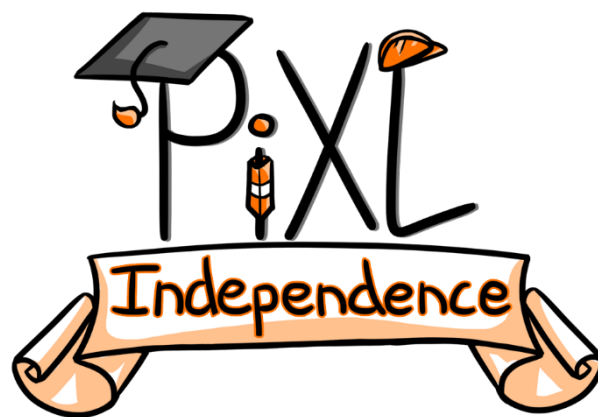
Sketch down note and key words
Do not write in full sentences whilst you listen, put quick sketches, single words, mind maps, short hand etc.
To help train you for university, try not to pause the video because you could not pause a live lecture (However, a lecture may give more natural pauses for you 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

	Title Date
Objectives	
Summary	

	Title Date
Objectives	
Summary	



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