Chem Made Easy

Presents

Common Chemical Bonding Questions…

And How To Answer Them In Ways That Examiners Want

So That You Can…

Score Full Marks!

This guide contains massive amounts of tips, secrets and answering techniques you need to know to ace your chemistry O level examinations.
Read it, understand it, apply it and score DISTINCTIONS!
Here's to your success!

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Praise for Jeremy Neo and Chem.Made.Easy

When I joined the Chemistry tuition 7 months before O Levels, I was either failing chemistry in school with E8s, D7s or scoring near passes. Finding Chem.Made.Easy as a tuition option was entirely by chance, but I'm glad I did because the learning environment was great in our small groups. I found myself **actually looking forward to Chemistry tuition** after a few sessions **despite having an initial hatred** for chemistry ever since secondary school started. Though my understanding of Chemistry was very poor in the beginning, Jeremy was patient in teaching me and I eventually got a grasp of things and managed to score an A1 for Chemistry at O levels, surpassing my best subject, Physics. I highly recommend any student to take a chance on the centre, it worked for me and it's not too late to start, even 7 months before O levels.

Mavis Lim | Tanjong Katong Girls' School | F9 to A1

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Chem.Made.Easy is certainly one of the best tuition I've received so far. It **triggered my epic love for Chemistry**. I loathed the subject and was constantly flunking it. After I joined Chem.Made.Easy, an inspiring teacher with an undying love for teaching who took "further chemistry" provided me with the opportunity to fall in love with it. Learning ain't difficult, falling in love with it is. Thank you Jeremy <3

Darrell Lim | Pei Hwa Secondary School | D7 to A2

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Before I joined enrolled into this class, my prior understanding of chemistry was very basic. I had no interest in chemistry at all as it came off as a boring subject to me. However, after attending Jeremy's classes, I found his **teaching method and materials really useful**. What impressed me was his ability of coming up with **simple analogies** for us so that we would be able to relate to it and **grasp the concepts more easily**! It certainly helped me clear many of the doubts that I had. Additionally, he provided us with lots of past school practice papers which certainly helped me to familiarise myself with the possible questions that could come

out for the O levels. Enrolling into this class is certainly something that I won't regret, because **chemistry is no longer a boring subject to me**. In fact, I'm **going to take chemistry in JC because of my newfound interest** in it! Jeremy is a really committed teacher who's always willing to help his students at any time, putting in a lot of effort into improving himself so that he will be able to help us maximise our own potential. Thank you, teacher Jeremy!

Victoria Chong | Tanjong Katong Girls' School | C6 to A1

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Chem Made Easy is just the right place for those struggling or wanting to ace their O levels! Under Mr Jeremy Neo's teaching, I had found myself to **understand pure chemistry concepts easier** and in fact **started to develop an interest in chemistry**! (I hated chem in sec 3 HAHA). I strongly recommend anyone seeing this now to take up his classes, classes are small and easy to pay attention in (He is very funny too HAHA). 10/10 simply amazing :D From C6 to A2 for Chem, who would want to miss out on such an opportunity

Loh Yang Xian | Compassvale Secondary School | C6 to A2

Introduction

"*I believe that learning occurs when a student is engaged, interested and motivated. I hope to impart everything I know about the 'O' Level Chemistry syllabus to my students, so that they too can score a Distinction*."
Jeremy Neo | Founder of Chem.Made.Easy
http://www.jeremyneo.com/

This "Common Chemical Bonding Questions" revision guide is specially designed to help students who are struggling with Chemistry answering techniques and are looking for foolproof ways answer the questions and do well in exams.

If you are constantly losing marks because you did not answer the question using the "right" keywords/phrases, or you are not sure how to phrase certain concepts, then this book is the book for you!

In this book, there are fairly common explanation questions and suggested answers you can use to score full marks. Phrases that will cost you marks have been bolded so you need to pay extra attention to them.

Should you have any questions regarding the material in this revision guide, feel free to drop us a **call at 63853846** or an **SMS/Whatsapp at 8612 0234** and we will get back to you within the shortest possible time!

And so… without wasting any more time, let us begin!

Basic Background

Before you embark on this list of Commonly Asked Questions and Suggested Answers, it is important that you familiarise yourself with the chemical properties of Ionic and Covalent (simple & giant) compounds!

If you haven't already done so, do take a quick look through your school's notes before coming back here!

Types of Chemical Bonding Questions (Explanations)

Type 1 - Ionic compound vs. Simple covalent compound

Explain, in terms of **structure and bonding**, why [sodium chloride] is a solid while [methane] is a gas at room temperature and pressure.

Suggested answer

Sodium chloride has a **giant crystal lattice structure.** A **large amount of heat energy** is needed to overcome the **strong electrostatic forces of attraction between oppositely charged ions**. The melting point is high therefore it is a solid at room temperature.

Methane has a **simple covalent molecule structure** with **weak intermolecular (Van Der Waals') forces of attraction between molecules.**
Little heat energy is needed to overcome these forces of attraction hence the melting and boiling point is low; therefore, it exists as a gas at room temperature.

Note:
Similar questions may appear - just by replacing [sodium chloride] with any other ionic compound or [methane] with any other simple covalent compound.

Other similar questions

1. Explain in terms of structure and bonding, why carbon dioxide and sulfur dioxide are gases at room temp and pressure.

[adapted from 2017 HIHS S3 MYE]

2. Explain, in terms of structure and bonding, why aluminum fluoride has a melting point of 1290^{o}C while phosphorus trifluoride has a melting point of -151^{o}C.

[adapted from 2017 SJI S3 EOY]

Type 2 - Ionic compound vs. ionic compound

Magnesium oxide and sodium chloride are **both ionic compounds**. Explain why magnesium oxide has a melting point of 2852°C while sodium chloride has a melting point of 801°C.

Suggested answer

The ions in magnesium oxide, Mg^{2+} and O^{2-}, have a **greater charge** than the ions in sodium chloride, Na^{+} and Cl^{-}. The **electrostatic forces of attraction between oppositely charged ions** in magnesium oxide are **stronger,** requiring more heat energy to overcome, therefore the melting point is higher.

Note:

The electrostatic force of attraction (ionic bond) is **affected by charge** of the ion. Generally, the larger the charge, the stronger the electrostatic force of attraction.

Other similar questions

1. Both Zinc oxide and sodium bromide have high melting points. However, zinc oxide has a higher melting point. Explain.

[Adapted from 2017 HIHS S3 MYE]

2. Predict and explain if aluminum fluoride has a higher or lower melting point than sodium fluoride.

[adapted from 2017 SJI S3 EOY]

Type 3 - Simple covalent molecule vs Simple covalent molecule

Explain why **methane is a gas** while **pentane is a liquid** at room temperature and pressure.

Suggested answer

Pentane is a **larger simple covalent molecule** than methane.

There are **stronger intermolecular/Van Der Waals' forces of attraction** between pentane molecules than methane molecules which require **more heat energy to overcome** hence the melting point of pentane is higher than methane.

Hence pentane is a liquid while methane is a gas.

Note:

The strength of intermolecular force of attraction is **affected by molecular size**. Generally, the larger the molecule, the stronger the intermolecular forces of attraction. This question may also be tested in Periodic Table (e.g. $Cl_2(g)$ vs. $I_2(s)$)

Other similar questions

1. SO_2 has a melting point of -72^{o}C while SO_3 has a melting point of 17^{o}C. Suggest a reason for this.

[adapted from 2016 Catholic High Prelim]

Type 4 - Simple covalent molecule vs. Giant covalent molecule [**Pure Chemistry only**]

Explain in terms of structure and bonding, why silicon oxide has a much higher melting point than carbon dioxide.

Suggested answer

Silicon dioxide exists as a **giant macromolecule** with **strong covalent bonds between silicon and oxygen atoms** which **extend throughout the tetrahedral structure**. A large amount of heat energy is needed to break these strong covalent bonds hence the melting point is high.

Carbon dioxide exists as a **simple covalent molecule** with **weak intermolecular/Van Der Waals' forces of attraction between molecules**. Small amount of heat energy is needed to overcome these forces of attraction hence melting point is low.

Type 5a - Conduction of electricity (giant covalent – pure chem only)

Explain why graphite conducts electricity but diamond does not.

Suggested Answer

Each carbon has 4 valence electrons. In graphite each carbon atom is covalently bonded to 3 other carbon atoms, leaving **1 valence electron, per carbon atom**, that is able to delocalise, move through the hexagonal layers, carry charge and conduct electricity.

In diamond, each carbon atom is covalently bonded to 4 other carbon atoms. As all valence electrons are used to form covalent bonds, there are no mobile electrons to carry charge and conduct electricity.

Note:

Examiners *may* apply this concept (valence electrons not used to form covalent bonds) to other structures.

E.g. phosphorus doped diamonds.

Each phosphorus atom has 5 valence electrons, only 4 are used to form covalent bonds...

Type 5b - Conduction of electricity (ionic vs covalent)

Explain why sodium chloride can only conduct electricity in aqueous and molten state, but not in the solid state.

Suggested Answer

In aqueous and molten state, sodium chloride has **free moving ions** that are able to carry charge and conduct electricity.

In the solid state, the ions are held in fixed positions by strong electrostatic forces of attraction, hence there are no free moving ions or mobile electrons to conduct electricity.

Note:

Students usually mix up the word ions with electrons. This is a HUGE mistake! There are NO free moving ELECTRONS!

Also, when a substance is unable to conduct electricity, it is because there are **no mobile charge carriers** - hence reference must be made to both ions and electrons.

Extra - Application Question

Tin (IV) chloride has a melting point of 114°C. Suggest the type of bonding and structure present and explain why.

Suggested Answer

As the melting point of tin (IV) chloride is low, little heat energy is required to overcome weak intermolecular forces of attraction. Hence tin(IV) chloride exists as a simple covalent molecule and has covalent bonds.

Note:

Many students tend to think that a metal and a non-metal must react to form an ionic compound. However, if you look at the property of tin (IV) chloride, the low melting point suggests the ABSENCE of strong electrostatic forces of attraction!

More praises for Jeremy Neo and Chem.Made.Easy

I was actually quite worried that your teaching methods wouldn't suit me and I wouldn't benefit much from you lessons, but you used different methods of teaching to help us understand, and **always made sure that we understood each topic before moving** on. The different types of notes that you gave me helped me understand different concepts which I greatly benefitted from. **I very much enjoyed the whole lesson. You made lessons fun and enjoyable and I seldom felt bored attending your lessons.**

Amas Lua | Victoria School | C5 to A1

My chemistry before coming to the lesson is almost always F9 or else e8, my friend recommended me here (because) she said the teaching is very good.
I really needed help in chemistry and school lessons are more boring and hard to understand. However, the **lessons here are very interactive and funny always able to get my attention and focus**. After joining the lesson my chemistry jumped from f9 during prelim 1 to a2 during prelim 2. I eventually scored an A1 for my O Level Science!

Creston Lam | Eastview Secondary School | F9 to A1

Hey Jeremy! I found your lessons extremely beneficial. Science used to be a subject I never thought I would score well in, seeing as I was constantly either failing or barely passing exams. Due to your patience and friendly demeanour, I gained a deeper understanding of the subject, eventually learning to like science. The lessons, which were well-paced and comprehensive, aided me in my revision for my O Levels, pulling my grades from a C6 to an A1. Initially skeptical that this tuition would not help me much, as I'd only started attending a few months prior to the national exam, I was pleasantly surprised at how big of an impact it had had on my final score. Super thankful to have found this place!! :D
Wishing you all the best and all the happiness in the world~ :)

Kristie Kuah | Paya Lebar Methodist Girls' School | C6 to A1

Final words from Jeremy...

I hope this revision guide has given you a tiny glimpse into the types of lessons I run, the materials I use and the values I believe in.

If you're still struggling in Chemistry and are looking for a simpler, more engaging way to understand and excel in Chemistry, I highly encourage you to contact me - so we can see how we can work together toward your A1!

Sincerely,
Jeremy Neo
Chem.Made.Easy | www.jeremyneo.com