



Pusat
Asasi UiTM

Syarahan Profesor

PROF. TS. DR. MOHD AZLAN MOHD ISHAK

FAKULTI SAINS GUNAAN

30 OGOS 2022 (SELASA)
10.00AM-1.00PM
KUMPULAN : S01 - S10

SECARA LANGSUNG
DI YOUTUBE RASMI PUSAT ASASI UiTM

Professorial Lecture UiTM
Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Fakulti Sains Gunaan



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak
Tajuk Fakulti Sains Gunaan
Jangka masa : 3 jam 6 minit

Transkrip:

- 5:24 : Okay, thank you very much and thank you to Chemistry Unit Centre of Foundation, Asasi UiTM. Actually I'm not from Asasi but 30 years back, in 1988. So I'm your super super super senior. Okay, thanks to Chemistry Unit for inviting me to share a little bit. Actually sub-subtopic regarding the chemistry chapter under the foundation, chemistry. So can I share my slide? Actually this slide was given to me by Iza.
- 6:17 : So slow. Can everyone see this slide? Not yet, Prof. You mentioned you're presenting to everyone. I also cannot see my slide, but I can see this slide, Prof. How about the students? Can? It did not appear on the Google Meet, but I can click.
- 7:46 : So can I start now? Yes...Yes, Prof...Yes, Prof. Okay, under the topic of concentration expression, concentration. What do we know about concentration actually? Concentration. But here he asked us by end of this topic students should be able to calculate the concentration of solution involving molarity, percent by mass, percent by volume, molality and mole fraction. Okay, in chemistry, we can see here there are more than one unit of concentration. But in common sense, daily usage of concentration.
- 8:34 : Normally we just use, in Malay we say as kepekatan, is it?..So kepekatan is actually, in English, the most people using is molarity, molar. Actually molarity is come from scientific word. Molarity is from scientific word. Okay, we can see molarity, molar. Okay, from the word molar.
- 9:02 : But nobody knows until they learn chemistry. So as a chemistry student, we should know there is more than one unit of concentration beside molarity. Okay, another unit which is come from percent by mass, percent by volume. So when we talk about percent by mass, per, percent. So it consists of two units. Again, similar to molarity, it also consists of two units.



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- 9:39 : Okay, I will explain after this what are the two units. Okay, percent by volume, of course involves two units. Except for this one, is volume over volume. This one, mass, weight over weight and then the other one is molality. This is very, very seldom we use. It looks similar to molarity, but slightly different, of course, in terms of the spelling. Okay, molality, molarity but here, still involve two units, but per unit, compared to this one, is referring to volume.
- 10:18 : This one, per here, is referring to mass. Okay, the last one, we should know the term mole fraction. This is the most common one. Okay, so we hope that by completing this subtopic regarding concentration, students should be able, and of course, should know the first one, the term of the different type of concentration, and also know how to calculate. Basically, when it involves these different type of units, mostly we have to calculate. Of course, why? Because we need to prepare solution, okay? So we need to prepare solution.
- 11:02 : Sometimes we have people asking us, please prepare this molality of concentration. Please prepare this by volume or please prepare this by weight, okay? Sometimes we heard the concentration unit comes into solution such as ppm, part per million, part per billion, okay? Million and billion, and so forth. So the ability to calculate this different type of molality will give us many applications in our daily life, okay? For example, in our daily life, do we aware that when we drive a car, in a car, normally, as for safety reason most of the car or automobile nowadays they will be fitted with airbags.
- 12:00 : Do you know airbags? Do you know how the airbags functioning? It's actually chemical inside there, and the bag is flipped into very small, tiny size, and the reaction behind the airbag is actually chemical reaction between, I think some of the reactant. When being heated, okay, when the car being heated the electric will automatically ignite this chemical reaction to occur in a very, very fast way so that the chemical will explode. So when it's explode, it will turn on the bag, okay, airbag.



Program

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- 12:48 : That's why we need to really calculate the precise amount of the reactant when it react, okay? Some of the application nowadays involve this ability to prepare most of the reactant involved in most of the pharmaceutical area, air green chemistry, ecological, or even in certain chemical product, okay? Before we go further, let us look at the concentration expression, okay? There are three main important keyword, okay? Normally, when we involve some idea or some, what we need to learn and then new things always bear in mind we need to know the keyword first, okay? Of course, we read sometime from the article, okay? It explain how to, it explain everything, but always bear in mind while reading the manuscript...or while reading the text, always our hand, always have a pen, and then some papers, okay? Please jot down, okay? We never learn because this is not literature, because we learn science. Science, actually, we see, we say, and we think. Sometimes we write, sometimes we verse simultaneously.
- 14:24 : So, always make sure that these things happen simultaneously so as to be much easier to remember, okay? In this concentration, the three main keywords are...the first one is, which one? Can anybody help me? There are three words here, capital letter here, solution, solute, solvent, which comes first?...Can anyone help me? Please, please...Are you here? Which comes first? Which comes first? Is it solvent first? Solven first.
- 15:28 : Some say solvent, some say solute. Some of you say solute, some of you say solvent. Does anyone say solution? Solution. Is it right, solution? Can you imagine this morning you try to prepare let's say, tea or coffee. What is the first do you prepare in your glass or mug? What the first thing you put in your mug? Water, okay. Some of you put water first. Some of you put coffee first. Right? Yes.



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- 16:11 : So, the first thing first, either solute or solvent is considered correct. This thing first needs to be prepared. So, when you mix these two, so the product is solution. Okay, the product is solution, provided the solute is totally dissolved. So, and then we can call solution. Let's say if you put too much sugar or too much coffee, you try to stir it so many times, you will leave behind some of the sugar undissolved. That's why it's still called a solute. It's not solution.
- 16:58 : Even though you prepare the solution, it's not 100% solution. Partial, okay. That's why when we learn concentration, we need to know how much solute, how much solvent needs to be prepared, needs to be added to form a good solution which is we call homogeneous mixture of solution. Have you ever heard homogeneous? Anyone? Have you ever heard homogeneous? Yes. What is it? What is homogeneous actually? So, have you ever heard heterogeneous? So, against homogeneous is heterogeneous. Meaning that if we put solute in not a proportion amount with solvent that will left behind heterogeneous mixture of solution.
- 18:13 : That's not considered as homogeneous mixture of solution. That's why when we learn concentration in chemistry, we need to involve another parameter which is called stoichiometry. You know stoichiometry? Yes. What does it mean, stoichiometry? We are not learning physics, we are learning mathematics, but now we are learning chemistry. Portion of chemistry is concentration. It looks simple, actually very simple.
- 18:47 : If you don't know, it becomes difficult. So, that's why we need to learn from the fundamental. So, we need firstly to know what is the keyword and know which comes first, which comes later, and the importance of the keywords. Okay. So, in concentration in chemistry, when we try to produce solution, we need to know exact amount of solute to act with exact amount of solvent. The exact amount of these two entities, when it reacts together, in a common sense, we stir together.



Program

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- 19:31 : In chemistry, we say we react together. And this, just enough amount of these two entities, which is called stoichiometry. Okay, stoichiometry and then we can produce homogeneous mixture of solution. Okay. So, in order to produce solution with certain concentration, that involves ratio.
- 19:59 : Okay, ratio. Why we say ratio? Just now, can you imagine? If we put certain amount with excess of solute or with less amount of solvent. Okay. So, when we mix these two, people will ask, these two things, when we mix together, there is certain ratio. Dalam Bahasa Melayu, kita kata berapa banyak sudu nak bubuh kan? Berapa banyak air nak tambah? So, ada nisbah dia. So, in common sense, we always talk about the ratio.
- 20:34 : Same as in chemistry. When talking about chemistry, when we try to prepare solution we need to have certain ratio. Okay. Certain ratio of solute. Okay. Even though we have certain amount of solvent, I'm not sure whether this sentence is quite appropriate... ..of solute to the volume of solution. Actually, to the volume of solvent. Solution concentration ratio of amount of solute to the volume of solvent.
- 21:11 : Okay. We need to have certain amount of solvent. Normally, people doesn't care about how much solvent is this. They have. Because they just put certain amount of solute. They measure solute. They never measure solvent. When they didn't measure the solvent, that's why it comes another parameter which is called limiting reactant, excess reactant. Because these two is considered as reactant.
- 21:38 : Solute and solvent is considered as reactant. This is final part. Okay. These two are reactant. When solute dissolve in solvent, these two reactant, can you imagine this three keyword, when you put all together in a chemical reaction? Reactant A plus reactant B produce product.



Program

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- 22:00 : So, you can imagine solute plus solvent produce solution. Okay. So, there is certain amount being added within these two reactant to produce solution. Okay. So, when we talk about ratio, when we talk about ratio, it's actually the ratio between solute and solvent only. Okay. We have to calculate the ratio between solute and solvent. Okay. It's simple when we talk about when we try to prepare tea or coffee or Milo.
- 22:38 : Okay. We just measure in term of Sudu Teh or Sudu Besar. 3 Sudu or 4 Sudu. It becomes simple. It also becomes simple in chemistry. When we talk about concentration, when we try to prepare, we need to know how much amount of solute. So, when talk about solute in chemistry, when involve so many type of compound. Solute is a common name. So, in specific name, it can be compound.
- 23:10 : Okay. So, we need to measure how much compound need to dissolve in certain solvent. So, we have this relationship. Okay. So, concentration in chemistry representing by M, capital M, molar. Okay. Or we talk about molarity. So, it gives us the ratio between solute and solvent. Okay.
- 23:37 : And this molarity comes when we mix these two, solute and solvent, in a certain ratio. But because this involve chemistry, we no longer use Sudu or Chamcha. So, we need to use another unit. So, this unit which is called mole. Do you know mole? Okay. One mole. Okay. Regardless of how many, how much you take, but we need to normalize it back into moles.
- 24:15 : Because we want to standardize the concentration in molarity. So, the molarity says it has to have the unit of solute in mole, (divided by amount of solvent that you use, and this solvent, we use in liters. Even though you use only 10 milliliter, we need to normalize it back to liter. It becomes simple. Let's say 10 mil, you convert to milliliter, you just divide by 1000 milliliter.



Program

Program Kepimpinan Perpustakaan Siri 7

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Transkrip:

- 24:46 : You become 0.001 liter. So, this is the conventional unit of molarity. So, by now, we should understand that in order to produce a certain concentration of solution, we need to have certain amount of solute in mole unit. How much solvent? When we write back into the sentence, it becomes mole per liter. Either we write as mole L of 4-3-1, or we write mole stroke liter. It's almost the same.
- 25:28 : This is representing molarity. Okay. This is the concentration of solute. So, we are representing the unit, mole per liter, as by this symbol, X is gamma. Two symbols approaching this X . So, there are many applications of solution chemistry and mobile solution chemistry, as I mentioned just now in pharmaceutical, in producing airbags for automobile, and so many things. Because they need to measure exact amount of reactant to be reacted in order to produce what target product they're preferring. Okay. You can find more in Google.
- 26:21 : Of course, you can Google. Okay. You can read some articles. You just start application of solution chemistry thousands or millions of applications you can see from Google...Okay...This is representing before and after. Okay. When you put certain amount of solute, and you add solvent. Finally, all solute dissolves in solvent to produce solution. Of course, the volume from the initial becomes increased. That's why, M times V , okay, from the initial is equivalent to M times V_2 . When we put unit for the M_1V_1 , we can have the mole actually.
- 27:13 : M , unit for M is mole per liter, V times liter. So, liter will cancel per liter for the initial. Same as liter will cancel liter from the concentration for the final. We actually have the same mole of what? Same mole of what? Can anyone help me?. Solute. Hmm? Same mole of what? Solute, yes. So, can you imagine? Okay. We didn't add more solute. We just add solvent. So, eventually, the volume increased.



Program

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Youtube Rasmi, Pusat Asasi UiTM

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Tajuk Fakulti Sains Gunaan
Jangka masa : 3 jam 6 minit

Transkrip:

- 28:06 : So, we produce solution. The amount of solute is still the same. Okay, the amount of solute is still the same. That's why always remember when we learn chemistry, we know chemistry. Let the chemistry guide us for life. Do you know? Do you understand? People say it's sweet and sour, right? We eat 10 sugar, right? We make 1 cup of coffee. We make cup of coffee. We drink 10 sugar. We make cup of coffee.
- 28:41 : And then, we add 1 liter of water. Can you imagine? Of course, it's dilute, right? But, if you drink only 1 cup, in a jug, you produce 1 jug of coffee with 10 sugar. But, if you drink 1 cup, it's okay. But, if you drink the whole solution meaning that you are taking into your body 10 spoon of sugar. Okay, that's why we need to understand that even though you have the beginning amount of solute, it doesn't matter. But, you need to control your solute in order to have certain concentration. Even though after you drink solution that contains 10 spoons of sugar you say that after that, no problem, I can drink 2 liter of water. Of course.
- 29:42 : But, in your body, you already receive 10 spoon of sugar. So, be aware of that. That's why we need to understand concentration. Before and after, when we calculate more before and after, for the solute, it's actually the same. Provided we consume all the solution. Okay. Another relationship between stoichiometry and concentration. Here, we give an example. When we talk about stoichiometry, it's actually a relationship between reactant and reactant. Sometimes, you also refer to stoichiometric relationship between reactant and product. Okay, that's why we need to have standard equation so as we can calculate to get the proportion to produce certain product that we need. For example, here, calcium bromide.



Program

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Youtube Rasmi, Pusat Asasi UiTM

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Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 30:46 : Okay. When it dissolves, it will dissociate into calcium ion and bromide ion. Okay, we try to balance this equation. So, calcium 1, 1 mole, 1 mole, 2 mole in terms of compound 2 mole in terms of ion. Okay, this is product, this is reactant. So, if we have 0.1 molar calcium bromide meaning that also have, because the mole is the same, we are comparing the mole. Remember, when we have two situation even though the solute before and after the same and the volume before and after different. We actually, we are calculating the mole of solute. Okay, mole are the same. That's why when we try to compare, okay, in front of each entity, in front of each compound or atom or ion, it gives you stoichiometric number, okay, integer number, presenting mole of the entity.
- 32:11 : Here we have 1 mole calcium bromide produce 1 mole calcium ion produce 2 mole bromide ion. Okay, this mole is actually the same as this one. We are talking about mole, okay. So, when we try to, we need to compare the same mole to help us here, calcium bromide, 0.1 molar. Of course, 0.1 molar, 0.1 mole per liter. Okay, this concentration. If we have the same concentration because the mole is the same so as for the bromide is times 2. Okay, it has 2 mole. Okay, when we compare the same amount of mole, so we have proportion of 2. We need 2 times 2. In BM, we call as perkadaran, kan? 1 mole, perkadaran 1. Kalau 2, perkadaran 2. Okay, that's why proportion is very important in stoichiometric in order for us to determine certain concentration for the unknown. Unknown meaning that when the patient asking us to calculate because they will give data on certain reactant but asking us to calculate another reactant.
- 33:33 : It doesn't matter as long as the data is completed so we can calculate and then we compare. And this comparison, which is called proportionate, we try to proportionate. Kita akan kadarkan dengan, what we have data given to us. Like this one, we have this as standard. So when the question ask us what is the concentration of bromide, okay, we don't have the data but we can compare. We can proportionate with concentration of bromide by talking about mole. Okay, always remember we are comparing the same mole. Okay, people might ask, this is different mole. Here is talking about the same mole but here is different mole.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

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Jangka masa : 3 jam 6 minit

Transkrip:

- 34:22 : Here is same bromide, of course different mole but all together in the same beaker. But when we talk about mole, of course we have different type of species but it appears in term of mole. When we talk about mole, can you imagine mole here in Malaysia, mole maybe in US is the same. That's why we need to have the standard unit. Okay, we need to agree that one mole for bromide is molarity mole bromine in a molar mass. So let in conventional, we may say satu kaki, 12 inci. So we need to accept 12 inci as the unit. We cannot accept satu kaki, 13 inci lah. How about people in US? They still stick to 12 inci because world accepted as one kaki, as five inches kan.
- 35:34 : Same as in chemistry, when we talk about mole, even though we are comparing this different type of species, it doesn't matter but when we try to calculate back in term of its weight, yes, then we have to times with the molar mass of that species. Same as this one, we are not talking about, we don't know what type of mole solid is that. We are just talking about amount of mole. If in this solution contains different type of mole of species, A, B, C, mole A, mole B, mole C. So the same as when we put solvent, it becomes certain solution of mole A, mole B, mole C. It doesn't matter. Even though here, it doesn't show to us there are more than one mole type of species. So we talk about chemical reaction, always bear in mind.
- 36:35 : Even though we have different type of species, sometimes species here, so many type of species here A, B and C produce product A, product B, product C. It doesn't matter. All you have to do is just balance the chemical reaction. Just balance the chemical reaction, which is called stoichiometric. Stoichiometric meaning that amount of reactant will react with quantized amount of reactant to produce a specific amount of product. So we can start to compare and can start to calculate amount of each reactant and also amount of each product to produce same amount of proportionate mole. Let us look at the concentration expression.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

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Jangka masa : 3 jam 6 minit

Transkrip:

- 37:49 : Can you remember the first slide I showed just now? There are so many types of unit. Now we start to go one by one, the concentration expression. The first one, beside molarity, the main concentration of unit being used in IUFAC, they use molarity, molal. We also need to know the type of concentration in a combustion. This occurs because of the solute, the solution, sometimes in a different form. When we talk about molarity, of course, it also sometimes comes in different form. But we try to standardize it to have unit that being mostly accepted. But yet in certain cases, we can also convert from the standard unit mole per liter, into various type of concentration. Because if you can see here, the main unit of ratio between solute and solution is still the same.
- 39:09 : Solute over solution, solute over solution, solute over solution. It is still the same. But the difference between these three is actually in front of it. When we talk about mass percent, we need to have mass of solute, mass of solution. When we put percent, we need to time 100. Actually, we don't have to have percent here because when we time 100, it is actually percent. When we talk mass percent, this ratio times 100. This ratio times 100. When we talk about percent volume, volume over volume. When we talk about volume, in front of it should be volume over volume. Of what?... Solute over solution. When we have to have percent, of course, we just time 100.
- 40:10 : It is simple like that. Next one is here, weight over weight. Solute comes in form of weight. Solution also in term of weight. Sometimes people asking, why are we making it so difficult? Why we want to have weight over weight? Whereas solution mostly in volume. Yes. Can we aware that? Do we aware that? Solution comes with the, in English, we call ketumpatan, density. You know density? Mass over volume. By having this unit, we can manipulate. That's why from the mole per liter, people start to manipulate. In term of weight over weight, weight over volume, volume over volume. So as they have different variation of concentration.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

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Jangka masa : 3 jam 6 minit

Transkrip:

- 41:12 : Not just because they want to have different concentration. Just because sometimes they have solute in a form of mass. They have solute, solution, sorry, solvent in term of solid. They have to dissolve. They have to calculate. They have to convert. So in final, they need to convert all the mole per liter into specific concentration. What they have done only solute or solvent. Okay, the third one is percent of mass per volume. This one slightly different from the both two. Okay. Mass over volume.
- 41:57 : Okay, so when we talk about mass. So the first one, of course, mass. Always fix the solid over volume. Always fix solid over solution. Okay. So it become mass of solid per volume of solution. Okay, per volume of solution. Okay, one example here. It give us 32% weight over volume. So we automatically should know that 32 weight is gram. Okay, see 32%. Percent meaning that the whole volume is 100. Normally the most simplest way we take 100. Very seldom people take 45 milliliter.
- 42:47 : Or sometimes when we take less than 100, we have to normalize back to 100. Just because to have it in form of percentage. So, for example, it give us 32% weight over volume of sugar solution. Okay, 32% weight per volume of sugar solution. So when we read this statement or when we read this concentration. Okay, this is type of concentration. Okay, 52% weight over volume. So, we translate it into 32 gram sugar, which is solute. Okay, see solute. Which one? Weight over volume. This one. So, 32 gram sugar. Per, this one per. Per.
- 43:39 : Percent is 100. So, per 100. If talking about volume, we need to put unit in volume. So, 32% weight over volume. Meaning that in 100 ml of solution, it contains only 32 gram sugar. Okay. Being dissolved in the solution. Okay. So, in other words, 32% is actually 32 gram sugar per 100 ml of solution. Okay. One of the most seldom unit being used here is molality. Looks similar to molarity. The difference is L and R. So here, talking of molality, it's actually mole of solute per 1 kg of solvent. Molarity, mole of solute per liter of solution. Okay.



Program

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Youtube Rasmi, Pusat Asasi UiTM

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Jangka masa : 3 jam 6 minit

Transkrip:

- 44:38 : Very simple. Just different between the unit of solvent. Liter, kilo. Okay, liter and kilo. So, molality, mole per kilo. Molarity, mole per liter. Okay. Okay, last one. We also need to know mole fraction. Okay, just now when we mix more than one solute in certain solvent and dissolve. Sometimes people ask us, what is mole fraction of A? You mix with B. Sometimes it's total fraction, mole fraction. So, the mole fraction is fraction of mole of one component in the total mole of the all component in the solution.
- 45:20 : Okay. When we talk about fraction, there is no unit. Not to say there is no unit, we already cancel. When we divide with certain, the same unit. Okay. When we estimate mole, total mole. Okay. Mole, mole, it will cancel. That's why there is no unit. Or we call as unitless. Okay, unitless. Of course, total mole, you just total up all mole involved to form that solution. Here one example. Okay. This question asking us to calculate the volume of 10.5% by mass.
- 46:03 : See. 10.5% by mass soda contains 78.5 grams of sugar. When we see the concentration, automatically, we need to know that this is unit of concentration of certain solution. Either by mass, by volume, whatever. Automatically, we need to know that this is concentration. Another one, when we give to us sugar, automatically, we know this, of course, solute. Okay. Amount of solute given to us with amount of concentration. Another unit given to us is density. Okay. Of course, sugar combined with solvent. This solvent, when we mix, it will have certain density. Because this is not purely water. It's not purely water. So to calculate this, take all the data given to us first.
- 47:10 : We have here 78.5 grams sugar, which is the solute. You can put solute if you want. Asking us to calculate the volume. Calculate the volume. Okay. Normally, if data given to us, normally, we know that we need to calculate first. The first thing first, try to calculate. Try to do some operation on the unit given to us. Okay. Provided we put in a proper way so that we can cancel the unit. That's the most important thing. In chemistry, there is one chapter that we call dimensional analysis. Dimensional analysis. You can see here. Although we look at one direct operation, but it's actually we can divide into two operations.



Program

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- 48:05 : For those who are not familiar with straightforward operation, you can do stepwise operation. First thing, you have to do the operation between these two first. And then try to do in a proportionate way. Try to do it in a proportionate way. And you can get the answer in a sequence order. If you can see here, given to us. 100 gram solution. Okay. In 100 gram solution. This is talking about percentage. So 100 gram solution, percent 100. If by mass, gram .Okay. So we just translate this concentration first. 100 gram solution.
- 48:53 : In 100 gram solution, it contains 10.5 gram sugar. Okay. See, we just interpret the concentration given to us. So either or, either or. We can say as 10.5 gram sugar contained in 100 gram of solution. That's why when we construct proportionate sentence, we can put either way. Okay, we can put either way. Another data given to us is the density. We can also write the density here. 1.04 gram per mil into here. In other words, 1 mil solution is contain about 1.04 gram. That's how we translate. From here, we translate to here. From here, we translate to here. Why? Because we want to use this for next calculation.
- 49:59 : Make it become easier. Normally, people translating from data given into here because they want to put in one short operation. This is called one step operation. Okay, provided the unit is correct. Okay, to solve this problem. 78.5 gram sugar times 100 gram. Okay, this percentage. Over 10.5 gram sugar. You can use either or. Times 1 mil over this density. Make sure that you can cancel the unit. Eventually, giving you the correct unit. If you want to have volume, you have to have volume here. In here, we didn't see the cross. Left behind is mil. Yes, correct. Okay. To those familiar with this one step process, you can go by this type of process.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak
Tajuk Fakulti Sains Gunaan
Jangka masa : 3 jam 6 minit

Transkrip:

- 51:20 : But normally, to those people who are not familiar with this, you can go stepwise. There are only two steps in order to produce this answer. You can discuss it later after this. Okay, another example. Calculate the molarity. And molality. Molality. Mola. Mola. Remember, molarity mole per liter. Molality mole per kilogram. It doesn't matter. If you can get the molarity, you can automatically convert to molality. Because we have the density. So, not much of a problem. So, this question is asking us to calculate the molarity and molality of solution prepared by mixing 17.2 grams of ethylene glycol. This is solute. Okay.
- 52:14 : Please calculate molarity and molality of solution. Always bear in mind. Solute. Solvent. Solution. Okay. You are asking to calculate the molarity. Let us focus on molarity first. You were given 17.2 grams of ethylene glycol. With 0.5 kilograms of water. This is solvent. Always bear in mind. Density of water is always one. So, if the question given to us is 0.5 kilograms, meaning that it is the same as 0.5 liters. So, you can calculate the molarity the same as you can calculate the molality. Either or. To make 515 milliliters of solution.
- 53:07 : And then, another question. Determine the mole fraction. Okay. First thing first. We convert into standard unit. Not to say that milliliters is not standard. But, when we talk about molarity, the unit is mole per liter. So, we need to convert milliliter into liter first. Next, try to calculate how much the solute in the solvent. This already give the solvent. This already give the solute. So, just calculate to know how much mole this ethylene glycol being used. So, this amount of solute times with mole of water. Sorry, sorry. Mole of ethylene glycol.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 53:57 : We want to know the amount of mole of being used. We need to divide by molar mass of ethylene glycol. You can calculate. Carbon times 2 hydrogen and oxygen. And finally, you can get 0.277 mole of ethylene glycol being used. Combine with 0.55 liter of water to produce this type of concentration. Okay. So, much easier for us. Calculate either or. You can have the first one with molality. Molality just now. Because we already calculate liter. We produce molarity first. In exam, normally, if you calculate molality, it doesn't matter. As long as the question asking molality first or molarity, it doesn't matter.
- 54:47 : You can calculate either or first. You can put molality first. Because given to you, it's already kilogram. And yet, you convert to liter. It's still the same. And then, you have the molarity. Molar. 0.5 kilogram of solution. Solution. Okay. This is solution. Okay. Another thing is the difference between molarity and molality. This is liter of solution. Solution. Solution. See. This molality. Liter of solvent. See. The difference between molarity and molality.
- 55:47 : So, mole divided with solvent. Mole divided with solution. Mole per liter solution. Mole per kilogram solvent. So, the unit becomes slightly different. That's why molarity is not the same as molality. Even though the same amount of solute being dissolved in the same amount of solvent. Because we are referring to different type of unit. Next, asking us to do is the mole fraction. So, get mole of water. And then, you have to have mole of total. Total up. You can get total mole of solute plus solution. So, fraction. You just divide by the total.
- 56:32 : Mole, you can get this amount. Of course, very, very small. Okay. 0.2. Talking about 0.2 divided by 28. Okay. So far, so good. There is one question. Okay. If you can calculate, write this first. And we can calculate this later. Question 1, asking us to calculate the mass of solute and mass of solvent from each prepared solution. There are 3 questions from question 1. 1 to 5 gram of 1% weight over weight sodium nitrate. Okay. You can write down first. Write the answer.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 57:12 : You need to see the process how you get the answer. Okay. Second one is 1 gram of 0.15 molar. Okay. So, be careful. Just now, molar is talking about mole solute over kilogram solvent. It's not solution. The last one is 1 to 5 ml of 0.1 molar sodium nitrate. Given to us also, density of solution. Second question is calculate the amount of water in gram. Need to be added to 5 gram of urea. Urea is the solute. Water is the solvent. In preparation of 60.2% biomass solution. Okay.
- 58:11 : You want us to stop first or we continue? Do you want to take a break for a while? Okay. Take 5. Try to do the question first. While waiting for 5 minutes. Try to do the question given to you. Under the checkpoint 17. Question 1 and question 2. The answer is there. Okay. If you want to continue, you can. Take a break. Semua student berapa, Dr. Faizal? Maaf, Prof. Kelas ini daripada S01 hingga S010. Satu kelas lebih kurang dalam 25 orang. Oh, combine. Combine kelas..Ya, combine 10 kelas. Oh, 10 kelas
- 1:00:12 : Cumanya, satu kelas wakil 9 orang saja yang masuk dalam Google Meet. Oh. Bakinya tengok dari YouTube Pusat Asasi. Maksudnya, keseluruhan Pusat Asasi ini? Untuk sains dalam 2,000 lebih, saya rasa tak silap saya. 2,000 lebih. Maksudnya, ini sains hayat? Ya, betul. Sains hayat. Ramai. 2,000 lebih. Ramai. Kami ada grup sampai S58 kalau tak silap say. Ada 58 kelas. Betul dia. Ya So, bagaimana penyimpanan untuk setiap pelajar untuk menguruskan semua pelajar? Semi penyimpanan kita agak rendah sikit, 12 saja.
- 1:01:00 : Oh.Tapi, biasanya pelajar, lab. Ya, kami menguruskan tiga-tiga. Pelajar, lab, tutorial. Betul dia. Ya. Memang heavy. Lebih. Boleh lagi. Pelajar baru masuk minggu ketiga ni, Prof. Jadi, agak macam baik lagi lah. Baru minggu tiga ni. Kebanyakan pelajaran sekarang, 100%? Bukan, kan? Ya, face-to-face dah 100%. Face-to-face, kan? Jadi, ada masalah mengenai isu COVID-19? Terkawal lah. Ada tu ada, tapi terkawal. Ada, kan? Ya, ada. Sebenarnya, nota tu betul-betul Aisyah bagi. Dah hari tu, saya dua hari demam. Saya buka semalam.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak
Tajuk Fakulti Sains Gunaan
Jangka masa : 3 jam 6 minit

Transkrip:

- 1:02:00 : Tak semalam baru saya buka. Bukan apa, sebab pergi ambil booster yang kedua. Sebab pergi dalam masjid jater. Saya just isi fill up lah. Bila fill up. Jadi, dia buat appointment 26 pagi. Ambil lah. Ambil-ambil, siang okey lagi. 10 malam, habis satu badan sakit. Yang sebelum ni okey lah. Second first dose pun macam tu juga sebenarnya. Saya boleh kata semualah sakit. Bulan 4 hari tu pun saya dah kena COVID-19 dah sekali. Sama saja. Dia macam, alhamdulillah kita boleh dapat vaksin. Dia jadi badan ada-belah ada imun. Tapi dia tetap ada juga apa ni dia punya tanda-tanda tu. Sakit badan, sakit sendi.
- 1:02:45 : Jadi, saya datang sajalah. Oh, dia kata biasanya yang ambil booster ni selalunya nak pergi overseas. Encik nak pergi luar negara ke? Oh, pula dia kata macam. Dia pula dah stop ambil cucuk pasien masa nak pergi haji hari tu. Oh. Jadi, bila ada yang baru ni. Dia prepare based on booking. Dalam hari tu saya tengok dalam 6 orang je yang masuk booking. Orang macam tak sangatlah nak ambil. Ya, saya tanya di situ. Kebanyakan orang positif dan negatif. 90% negatif. Dia kata setakat dapat complete 212, it's okay. Booster pertama tu just because dia ada urusan lain. Nak pergi luar negara ke.
- 1:04:20 : Kalau takda, dia pula tak ambil. Oh, okay. Mostly macam tu. Sebab hari tu kan KJ macam dia cakap kan kena ada 3 juga kan? Ya, ya. Itu kau orang ambil kan? Kali ketiga, kali keempat orang tak nak ambil dah kot. Tak nak ambil dah. Macam-macam. Okay student. Boleh sambung? Boleh kita sambung? Can we continue? Okay, let us look at the first question. Try check with your answer. Okay. The first percent sodium nitrate. Okay, X. Solution given to as 1%. We just put here X. And then we arrange to get back mass of solvent. Okay.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak
Tajuk Fakulti Sains Gunaan
Jangka masa : 3 jam 6 minit

Transkrip:

- 1:05:18 : Same goes for the B. Okay. And we should get 298.9 grams solvent. Solvent. C1 is the mass. Evenly asking us to calculate mass. Okay. Given to as small. Molarity and volume. So, normally data given to us. Okay, normally they asking us to do something. Okay. Provide something. And then we start to operate. Okay, mass solution, mass solvent. Question number 2. Percent mass.
- 1:06:13 : Okay, percent mass. From the same relationship. Okay. Put back all the data. Rearrange the data. You should get mass of water. Okay, another question from check point 18. Okay. The density of 2.45 molar. Okay, mole per liter. Aqueous solution of methanol. Is 0.976 gram per liter. Okay. Calculate the molality. Molality. Okay. Of the solution. Okay. This is concentration of the methanol solution. And then. Concentration of methanol.
- 1:07:04 : This gram per mil is actually representing concentration of. Methanol in terms of weight over volume. This total solution. Okay. 2.45 molar is the total solution. Okay. Given to us also. Concentration of. The solute. Which is methanol. Always bear in mind. When we talk about solute. Normally people will. Remember solute is solid. Okay. In chemistry. It doesn't mean. Solid. It can also be liquid. Okay. As long as...These two liquid. Is miscible. They use this term miscible. Melarut. Between the both. Phase. Water is. Solution. Solute is solution. Okay.
- 1:07:53 : So these two phase. Is miscible. So it can dissolve. That's why methanol here is liquid. Solution panel is liquid. It's no longer. Solid. That's why. Diverse. Concentration. Here we use is. Weight over volume. Volume over volume. Or. Weight over weight. Given also here is. Molar mass of. The solution. Which is the methanol. From the data. We can calculate. Calculate first the data given to us here. You can get the gram of methanol.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 1:08:37 : Okay. 2.45 mole per liter. Okay. This is gram and you can get in term of gram. So by having a density. So. Finally we can get the. Mass of the solution. The mass solvent. Always remember this. Molarity. Okay. Molarity. Solution. Molar. Solvent. So the question asking us to calculate the Molarity.
- 1:09:17 : Molar. Okay. So to get all the unit properly put in the each of this operation so mass of solvent. Okay. You can get mass of solvent. Convert it into kilogram. So by having this unit. For solvent. You can get the. Molarity. Mole per Kilogram of solvent. Mass molarity. Okay. It's not difficult to remember. Always bear in mind. When they give two units.
- 1:09:51 : With different meaning, Molarity, Molality. Always. Try to think of. What's the difference between these two units. Always write it down. Molarity mole per litre. Okay. Mole of solute per solution. Molality, mole per kilogram. Mole of solute per kilogram of solvent. So, if you have this in your mind. You can easily remember and of course given to you. Any type of unit, you can convert it into what unit the question asks you to do.
- 1:10:30 : Okay. We go to the solutions stoichiometric. Just now, what we learn is in general term of unit of concentration up to preparation of certain solution or solvent. With different type of or various type of concentration unit. So now, we try to look into the solution stoichiometric. Okay. Stoichiometric. Involving solution.
- 1:10:58 : Okay. Learning objective of this topic is to solve problem related to solution stoichiometric. Okay. Example of relation that involves solution stoichiometric. There are four. Okay. Or we can say that situation, we have four situation or relation in different form. The first one is under gas formation reaction and the other one is gravimetric analysis. You can see the gravimetric and gravity metric is unit.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 1:11:41 : We need to measure the weight also gravimetric analysis is referring to weight amount of product being used, produce. Sometime even we produce weight, but the question asking us to measure the reactant. Or sometime we measure the reactant without knowing how much produce the product. So we need to measure the product. Another situation. This solution stoichiometric being used is on the acid base titration. Acid base titration involving a solution.
- 1:12:18- : In a stoichiometric amount of reactant. Okay. When certain amount of reactant. Normally they use oxidation. Oxidation matter, mixed with reduction matter to produce product. So, neutralization produce product. So the fourth example of reaction is redox titration. The same as acid base. Because acid base is combination acid with base and then finally you can get the neutral product. Even though redox does not consider directly of acid base. The way of reaction between the two reactant normally is similar as acid base titration. Okay.
- 1:13:04 : So there are four phenomena. We can say phenomena or we can say any type of reaction involving solution stoichiometry. The first one, we look into the gas formation reaction. When there are no gaseous reactant, the formation of an insoluble or slightly soluble gas provide a driving forces for a type of reaction that we call a gas formation reaction. Okay. For example, when excess of sulfuric acid react with X gram of zinc 500 milliliter of hydrogen gas is evolved at STP. Standard temperature and pressure. Always remember, when we dealing with gas, normally scientists have to measure the amount of mole.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 1:13:58 : Okay. Because talking about solid and liquid, they will use molar mass of the element to convert it into mole. But we talk about gas, it's hard to measure the weight or volume. Unless, they need to measure at a certain standard temperature, and pressure with a standard amount of stoichiometric and then they can measure. Regardless any type of gas provided, we put the standard condition. Okay. So meaning that when we try to measure gas, it has to be measured at standard temperature and pressure. This is stoichiometric stage.
- 1:14:43 : Okay. Here, we talk about reaction. Okay, we talk about reaction and this reaction must be stoichiometric. Always bear in mind we need to have chemical reaction. Okay. Chemical reaction. Normally, we need to translate. Okay. Or we need to translate from the sentence into chemical reaction. This is how chemists work. Okay. Sulphuric acid make sure the formula is correct, not to say HSO_4 .
- 1:15:18 : Okay. Sulphuric acid, make sure the compound is correct. H_2SO_4 react with zinc. Zinc is solid. Okay. Ion combination. So, produce zinc sulphate. For example. This equation is given to us much easier. So in future, sometimes it just give to us the question only. So student need to work out the chemical reaction. Okay here. They ask us to calculate the excess of sulphuric acid. Because, in liquid normally this is in excess amount. The question asking us to calculate the excess of sulphuric acid because sulphuric acid in a aqueous liquid form. Normally this is in excess amount. In chemistry, when the two reactant reacting. They sometime involve another form that we call as excess. The other one is limiting excess amount. Limiting amount.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 1:17:09 : The excess amount of course normally liquid. Limiting amount normally is this solid. But we need to calculate to prove it. Whether it is excess of limiting reactant. Okay, back to this question. It ask us to calculate. Okay. Excess of sulphuric acid with X gram of zinc. This is used in excess but we don't know how much zinc is used to produce zinc sulphate and make sure that this equation is Stoichiometric. In other words, the amount of mole of the reactant react to produce product is equivalent in term of mole of each of the reactant and product.
- 1:17:57 : In here we can calculate. Hydrogen 2 here, 2 here, Zinc 1, 1 mole. Sulphate ion. Here sulphate ion. So that's why, in front of each reactant and product it all have the same amount of mole. Okay. Bear in mind just now, can you remember the two diagram before and after. We are calculating actually mole. Okay. So that's why, when we have different type of species we also have to calculate, or we also have to compare, or we also have to proportionate them in term of mole. Regardless of the formula, regardless of the compound on the reactant, or product. Always remember that. So, hold in our mind that we can compare either whether the amount of reactant. Sorry. Regardless of reactant is different type. Okay. Product is different type, it doesn't matter as long as in front of each species is integer representing mole of each product and reactant.
- 1:19:12 : Back to this question. Here we have 500 ml of hydrogen gas given to us. The product amount 500 ml of hydrogen gas and STP. So, an STP is actually we need to determine the mole of the gas. Okay. Mole of hydrogen, one mole STP is 22.4 litre. Okay. One mole of any gas at STP. They measure its amount 22.4 litre.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 1:19:50 : We need to. This is a standard you need for STP any gas. So, we can use this for Hydrogen. So with times, amount of hydrogen produced is actually 500 ml or. 0.5 litre of hydrogen produced is actually 0.0223 gram mole of hydrogen only. Okay. Okay. Now question is, why are we so concerned to convert millilitre to mole? Can anyone help me. Why are we so concerned to convert millilitre to litre, and finally to mole. Can anyone help me. Because we want to find mass. Yeah. We have to do this because we want to proportionate. We want to proportionate. Now, we only have Hydrogen.
- 1:21:01 : As I said earlier, we can compare, we can proportionate any of these species in this chemical equation by having its mole only. So, anyhow. Any clue we need to calculate, we need to convert any data given to us into mole. Okay. So here, because this is gas, we need to convert it gas and then finally get the mole. Once we have the mole, since this is stoichiometric relation, if we talk about stoichiometric relation and then we can proportionate.
- 1:21:41 : That's why here we proportionate here to get mass of zinc. Okay, and then we can use the same mole. See. We can use the same mole because in front of zinc is one mole. In front of hydrogen is also one mole. So, by having same mole, of course zinc is the same mole but talking about how much X in weight and then you have to calculate. You have to times weight mole, mass of zinc. Okay. The difference is weight but the same is mole. So, we can use the same mole because this equation, this equation is already stoichiometric. So this term, all this term, you need to remember what does it mean. That's stoichiometric.
- 1:22:31 : It's actually relationship between exact amount of reactant to produce exact amount of product. Okay. When we have this stoichiometric relationship, whatever more produce, we can start to proportionate. Okay. The difference is we can convert it into what type of weight of the species is. That's it. Another question. Four gram of solid copper metal react with 10 ml of concentration matrix acid. Imagine that all these sentences were converted into this chemical equation. Assuming that this chemical equation is already stoichiometric. I always tell my student. .



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 1:26:04 : Alright, there are two possible approaches when solving this type of question. The first is based on stoichiometry, while the second is based on the experimental result. In this question, however, we first need to determine the limiting reactant. As I mentioned earlier, we begin by calculating the information that can be obtained from the data provided. We are given the volume and the concentration of the nitric acid. The volume is 0.01 dm^3 (or 10 mL), and the concentration is 12 mol dm^{-3} . Whenever both the volume and the concentration are given, we can calculate the number of moles of the substance using the appropriate formula. The number of moles calculated here represents the actual amount of nitric acid used in the experiment. This value is obtained from the experimental data provided in the question. Next, we compare this experimental amount with the theoretical mole ratio obtained from the balanced chemical equation. From the equation, we know that 3 moles of copper react with 8 moles of nitric acid to produce 3 moles of copper(II) nitrate. These values, 3 moles and 8 moles, are the theoretical mole ratios because they come directly from the balanced chemical equation. At this stage, no experiment has actually been carried out; the balanced equation only tells us the theoretical relationship between the reactants and products. By comparing the experimental number of moles with the theoretical mole ratio, we can determine which reactant is the limiting reactant before proceeding with the rest of the stoichiometric calculations.
- 1:26:04 : As I mentioned earlier, we begin by calculating the information that can be obtained from the data given in the question. Here, we are provided with the volume and the concentration of the nitric acid. The volume is 0.01 dm^3 (10 mL), and the concentration is 12 mol dm^{-3} . Whenever the volume and concentration are given, we can calculate the number of moles of the substance using the formula: Number of moles = Concentration $\times$ Volume. The value obtained represents the actual number of moles of nitric acid used in the experiment. This is considered the experimental amount because it is calculated from the data provided in the question.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

: Next, we compare this experimental amount with the theoretical mole ratio from the balanced chemical equation. According to the balanced equation, 3 moles of copper react with 8 moles of nitric acid to produce 3 moles of copper(II) nitrate. These values – 3 moles, 8 moles, and 3 moles – are the theoretical mole ratios because they are taken directly from the balanced chemical equation. At this stage, no reaction has actually taken place. We have only been given the balanced chemical equation, which represents the theoretical relationship between the reactants and products. Therefore, by comparing the experimental number of moles with the theoretical mole ratios, we can determine the limiting reactant before proceeding with the remaining stoichiometric calculations.

1:27:51 : We know that all of these values are theoretical amounts obtained from the balanced chemical equation. The mole ratios represent the theoretical relationship between the reactants and the chemical products. From the experimental data, we have the actual amount of nitric acid used. We then compare this experimental amount with the theoretical mole ratio from the equation. In this case, we compare the amount of nitric acid with the amount of NO gas produced because the question asks us to determine the product, which is nitric oxide gas. Based on the balanced chemical equation, 8 moles of nitric acid produce 2 moles of NO gas. This is the theoretical mole ratio. However, from the experimental data, we have 0.12 moles of nitric acid. This value represents the experimental amount obtained from the given information. To determine the amount of NO gas produced experimentally, we use the mole ratio from the balanced equation: 8 moles of HNO_3 produce 2 moles of NO. Therefore, if 0.12 moles of HNO_3 are used, the amount of NO produced can be calculated by multiplying the given amount of nitric acid by the ratio of NO to nitric acid: $(2 \text{ moles NO} / 8 \text{ moles HNO}_3) \times 0.12 \text{ moles HNO}_3$. By cancelling the appropriate units, we can obtain the actual amount of NO gas produced. This value is considered the experimental amount because it is calculated based on the actual quantity of reactant provided in the experiment. The theoretical amount comes from the balanced chemical equation, while the experimental amount is obtained by using the actual data given in the question. The comparison between these two values helps us understand the reaction and determine the expected amount of product formed.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 1:29:54 : When we use copper as the reactant, we follow the same calculation method. First, we calculate the number of moles of copper. After obtaining the moles of copper, we then use the stoichiometric ratio from the balanced chemical equation to determine the amount of NO gas produced. Previously, we calculated the amount of NO by comparing it with nitric acid. Now, we will perform the same calculation by comparing copper with NO gas. Therefore, we first calculate the number of moles of copper, and from this value, we can determine how much NO gas can be produced. According to the balanced chemical equation, 3 moles of copper produce 2 moles of NO gas. This represents the theoretical mole ratio between copper and nitric oxide. However, in this question, the amount of copper used is only the given experimental amount, which is 4 grams of copper. Therefore, we first convert the mass of copper into moles. Once we know the number of moles of copper used, we apply the stoichiometric ratio to calculate the amount of NO gas produced. This calculation represents the experimental prediction because it is based on the actual amount of copper provided in the question. By comparing the calculations using nitric acid and copper, we can determine the amount of NO gas produced and identify the limiting reactant in the reaction.
- 1:31:13 : Now, we can see that the amount of NO produced based on the nitric acid calculation is 0.03 moles of NO. This value is calculated using the stoichiometric relationship from the balanced chemical equation. However, this amount of NO is still considered a theoretical amount because the actual experiment has not been carried out yet. The same concept applies to copper, where the given amount is 4 grams of copper. We calculate how much NO gas would be produced if all 4 grams of copper reacted completely. By comparing copper with the product, which is NO gas, we apply the stoichiometric ratio from the balanced equation. Based on the calculation, 4 grams of copper would produce 0.04 moles of NO. Before determining whether copper or nitric acid is the limiting reactant, we need to compare the amount of NO that each reactant can produce. From the calculations, 0.12 moles of nitric acid produce 0.03 moles of NO, while 4 grams of copper produce 0.04 moles of NO.



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Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- : The limiting reactant is the reactant that produces the smaller amount of product. Since nitric acid produces only 0.03 moles of NO, which is less than the 0.04 moles of NO produced by copper, nitric acid is the limiting reactant. Therefore, nitric acid is the reactant that determines the maximum amount of NO gas that can be produced in this reaction.
- 1:32:44 : Copper is considered the excess reactant because it produces a larger amount of NO gas compared to nitric acid. Even though we have a sufficient amount of copper available, the reaction can only proceed based on the amount of nitric acid present. In other words, according to stoichiometry, the amount of product formed depends on the amount of the limiting reactant available. Therefore, even if we have an excess amount of copper, the reaction cannot produce more product than what is allowed by the available nitric acid. In a real reaction, it is important to identify the limiting reactant because the limiting reactant determines the actual amount of product produced. This is why we compare the two reactants, which are nitric acid and copper, by calculating how much NO gas each reactant can produce. From the comparison, nitric acid is identified as the limiting reactant because it produces a smaller amount of NO gas. Therefore, the amount of NO produced based on nitric acid, which is 0.03 moles of NO, represents the actual product amount that can be formed in the reaction. After obtaining the actual amount of NO produced, we can calculate the volume of NO gas by using the appropriate gas volume relationship under STP conditions. By converting the number of moles of NO gas into volume, we can determine the final volume of gas produced in the reaction.



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Transkrip:

1:34:11 : This is why identifying the limiting reactant is important. When two reactants are given and the question asks us to determine the amount of product formed, the first step is to calculate and identify which of the two reactants is the limiting reactant. The first method is to compare the theoretical amount of product produced by each reactant. The reactant that produces the smaller amount of product is the limiting reactant. Always remember that the limiting reactant is the reactant that determines how far the reaction can proceed and controls the maximum amount of product that can be formed. For example, if we have one kilogram of copper, but we only have 0.12 moles of nitric acid, the reaction can only proceed based on the amount of nitric acid available. The excess amount of copper cannot react further because there is not enough nitric acid to continue the reaction. Therefore, the limiting reactant acts as the main factor that controls the reaction and determines the actual amount of product produced. To summarize, if a question provides two different amounts of reactants and asks you to calculate the amount of product formed, the first step is always to identify the limiting reactant. Once the limiting reactant is determined, you can use it to calculate the actual amount of product produced in the reaction.

1:35:30 : The first step is always to identify which reactant is the limiting reactant in order to determine the actual amount of product that can be produced. Another application of stoichiometry is in gravimetric analysis. Previously, we discussed reactions involving the formation of gases, where stoichiometric calculations are used to determine the amount of gas produced. This is one example of applying stoichiometry to solve problems. This type of question may appear more complex because it provides two different amounts of reactants. In the previous example, only one reactant amount was given, which makes the calculation easier. However, when two reactants are provided, we must first identify the limiting reactant before calculating the amount of product formed. Stoichiometric calculations are also commonly used in gravimetric analysis. Gravimetric analysis involves reacting a substance with a reactant to form a precipitate. The reason we produce a precipitate is because it can be separated, collected, and measured.



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Program Kepimpinan Perpustakaan Siri 7

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Transkrip:

- : By forming a precipitate, we are able to determine its mass experimentally. After measuring the mass of the precipitate, we can use stoichiometric calculations to determine the amount of the original substance or analyte present in the sample. Therefore, in gravimetric analysis, the formation and measurement of a precipitate allow us to calculate the quantity of a substance involved in the chemical reaction.
- 1:36:40 : One example of this phenomenon is a sample analysis involving an alloy. Let us assume we have a 3-gram alloy sample. An alloy is a material that consists of a combination of two or more elements, usually metals, to form a new material with improved properties. For example, an alloy may contain lead and tin. The element lead (Pb) is sometimes pronounced differently depending on the region. In the United States, it is commonly pronounced as “led”, not “lead” as in the verb meaning to guide. In chemistry, lead refers to the metal element with the symbol Pb. Similarly, tin (Sn) is another metal that is commonly used in alloys. The pronunciation of tin can sometimes cause confusion, but it refers to the metallic element, not other meanings of the word. A common example related to lead is unleaded petrol. In the past, petrol contained lead compounds because they helped improve engine performance. However, scientists later discovered that lead could cause harmful effects, so alternatives were developed to replace lead additives in petrol. The process of removing lead from petrol required additional technology and chemical adjustments, which is why unleaded petrol was initially more expensive. In an alloy analysis, we can use chemical methods such as gravimetric analysis to determine the amount of a specific element present. By reacting the sample and producing a measurable product, such as a precipitate, we can calculate the composition of the alloy using stoichiometric calculations.



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Program Kepimpinan Perpustakaan Siri 7

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Transkrip:

- 1:38:21 : So back to this question. 3 gram sample alloy which consists of plumbum and stenum for dissolving nitric acid and then sulphuric acid was added to this solution, which precipitate 2.93 gram of plumbum sulphate. tak kisahlah, tiba-tiba ada nitric acid and then ada sulphuric acid, doesn't matter. What we looking for is the precipitate. Nak guna tiga jenis asid, whatever it is, doesn't matter. Okay, and then kata, this sulphuric acid was added to the solution which precipitated 2.93 gram of plumbum sulphate, assuming that all the lead was precipitated. Assumption is also important because we need to assume this, because we need to have the correct stoichiometric chemical reaction. Let's say, if we did assume this, maybe another type of product or by-product produced. So, it will. It will deter or it will ganggu lah. we will ganggu, ataupun kita kata, we need to have chemical reaction yang stoichiometric.
- 1:39:35 : That's why, by assuming this, so another product, we cancel. So, we much much easier to correct this chemical reaction to become stoichiometric and also plumbum because we cannot remember this. Sometimes, we give one piece of paper, predictable. All of the elements, not the compound. Sometimes, compound you need to calculate. Once you give a wrong compound equation, of course you calculating the wrong molecular weight of the compound, so bear in mind. So, this is a chemical equation given to us. Again, I said just now, please check the stoichiometric of the equation. Meaning that, the more reaction react between the reactant and the product are the same. In other words, in chemistry they use the term equivalent. You know, english ni lebih tepat sama, tapi tak setara. Equivalence setara kan? Malay selalu sebut sama, tapi tak serupa kan. So, in chemistry, they put higher level of same, they use the term equivalent. Equivalent mole, plumbum is one mole. This is ion, doesn't to do with mole. This is ion, charge ion. Sulfate, one unit. Sulfate. Sulfate. Okay. So, with the data given to us, calculate.



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Program Kepimpinan Perpustakaan Siri 7

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30 Ogos 2022 (Selasa), Jam 10.00 pagi

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Transkrip:

- 1:41:14 : First, what do we have. Weight of plumbum sulfate produced the precipitate. So divide with molecular weight of plumbum sulfate, we can get mole of plumbum sulfate here. This equation, under this example almost the same as the first example here. The simple one kan. Second one, the more complicated. See, same as this one. Only one given to us, much easier lah. Once we get the mole of the rectum, automatically we can calculate whatever need given us to calculate. One more plumbum sulfate, continue one more plumbum or we can interpret like this. Let say here lah, because the same mole, so much much easier lah. One more plumbum sulfate produce one more plumbum ion, one more sulfate ion or if we calculate in the real situation. Okay, given to us produce 2.93 gram which is equivalent to 0.00966 mole of plumbum sulfate. We can interpret this.
- 1:42:29 : If this amount of plumbum sulfate being used, we also produce 0.00966 mole of plumbum ion and also 0.00966 mole of sulfate ion. Okay, so it become much easier to calculate the percentage. Okay, percentage of stenum. Okay, get the amount of stenum, okay, stenum here is also one mole get the amount of stenum. Okay, and then here, okay for stenum is not given here. Plumbum only, plumbum. Kilogram plumbum. Okay. Because of total gram sample 3 gram. Okay, we just minus, total minus plumbum, you can get the stenum. So amount of stenum divided by the total weight of sample, you can get the percentage of stenum. This much straightforward problem, okay. Another one, see just now we have only one reactant just now, now we only have two reactant with one product.



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Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

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Transkrip:

- 1:43:51 : Of course, we are targeting the product because the product will be precipitated out. So they measure the product. Okay, let's say this question, 2 gram sample of limestone will dissolve in hydrochloric acid and all the calcium present in the sample was converted into calcium ion. Okay. Excess ammonium oxalate solution $\text{NH}_4\text{C}_2\text{O}_4$ was added to solution to precipitate the calcium ion as calcium oxalate. Yeah. Calcium oxalate CaC_2O_4 precipitate was filtered and weight to a constant mass of 2.45 gram of this calcium oxalate and the question is determine the percentage by mass of calcium in a calcium sample. This actually is another question here but is not appear here which is the reaction of sample limestone with hydrochloric acid. Okay, this reaction will produce calcium ion, so product of calcium ion.
- 1:45:07 : Then, this is the second equation shown here. Product of calcium ion produced by reacting limestone with hydrochloric acid. So this calcium will be reacted with oxalate, ammonium oxalate. So they will produce calcium. This reaction actually asking us to know how much calcium in the limestone actually, because calcium in the limestone need to dissolve the limestone. First so we can separate calcium with the rest of the ion in the limestone. Maybe some of them impurities. Okay, to get more pure calcium dissolve first with hydrochloric acid. Okay, so calcium become single ion and then capture this single calcium with another type of chemical. We need to study what type of chemical that suitable to capture the calcium and finally this capture will produce a good precipitate in gravimetric analysis. We need to know the characteristic of good precipitate which is they have good high molecular weight, good molecular weight, and also of course have high weight because of the molecular weight is bigger. Why? Because we are using gravimetric so we need to measure by weight.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

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Transkrip:

- 1:46:38 : If we produce very less weight, how are we going to measure? Okay, that's why the accuracy of the gravimetric is to have a good product of precipitate. Okay, that's why the selection of good chemical in order to capture our unknown is very very crucial. In this case they are using ammonium oxalate C, very very long equation and you can total up the mass, how much? So big. So of course when you capture calcium you also produce calcium oxalate quite big but after that, even though you have the total number, total mass of calcium oxalate, all you have to do is you just compare mole ratio between the calcium and the whole ion and then you can get the percentage of calcium. Okay, let the story behind of the reaction. Okay, go back to the equation.
- 1:47:47 : We already have the calcium oxalate. Okay, we want to see the mole fraction between the ion, so calcium combine with oxalate to produce calcium oxalate. Okay, so it clearly shown to us that one mole calcium, one mole oxalate ion, one mole calcium oxalate. So calculate what given to us, first mole of calcium oxalate precipitated, okay, 2.45 gram here. Okay, molar mass of calcium oxalate not given. So you have to calculate calcium oxalate, how much? 1 to 8.1, get the mole. This is the mole, okay. The experimental mole of calcium oxalate being produced. Okay, calcium oxalate being produced, therefore it is said 0.0193. 0.0193 calcium ion is reacted. Okay, cause all the same mole. Okay, because we are comparing the same proportionate number amount of mole on each reactant and product. So much easier for us to get the mole of calcium, see, same mole calcium is mole of oxalate.



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Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

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Tajuk Fakulti Sains Gunaan
Jangka masa : 3 jam 6 minit

Transkrip:

- 1:49:09 : We are comparing same amount, so we can get. Convert back to weight of calcium, 40.1 gram molar mass of calcium per mole, we can get 0.60 gram of calcium, actually in the limestone. So, percent by mass of calcium in sample always remember sample, not per some of student, we per this with 2.45 gram. This common mistake done by student, normally they will per with 2.45, of course this calcium. Finally, precipitate out in this form of calcium oxalate, but the question asking us in the limestone sample, determine percentage by mass calcium in the limestone sample. Asking us calcium in the calcium oxalate, not confuse students, why not here. Determine percentage by mass calcium in the. calcium oxalate sample. Other student will calculate per with 2 gram of calcium. The question is straight forward so be careful. Be careful. So in conclusion, percent by mass of calcium in sample, sample of course referring to limestone. So per 2 gram of limestone, you can get 38.3 percent of calcium in the limestone. Okay, third phenomena. The use of solution stoichiometric is the acid base titration.
- 1:50:46 : Actually we can react acid and base without using the titration, but we need to measure accurately by using measuring cylinder, but it's quite difficult. So most of the scientist use titration to react in a stoichiometric amount of acid and base in order to neutralize the reaction. Example here, calculate the volume of 0.6 molar sodium hydroxide, solution needed to neutralize. When talking about acid and base, of course the reaction will produce neutral solution, 20 ml of 2.45 sulfuric acid solution. Okay, always remember, always bear in mind in any situation, gas, solution, gravimetric acid base phenomena. When talk about stoichiometric, you need to have chemical reaction in stoichiometric form and then you can calculate whatever. Asking us to calculate. Always bear in mind.



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Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

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Jangka masa : 3 jam 6 minit

Transkrip:

- 1:51:56 : Of course this here much easier because you were given already the chemical equation with the stoichiometric amount. Okay, please bear in mind always check first before you do operation on the calculation. Okay, to cut short of this, 2 moles of sodium hydroxide with 1 mole of sulfuric acid produce 1 mole of sodium thiosulfate with 2 mole of water when the compound contains sulfur, normally we pronounce as thio. Okay, sodium is very very useful. Okay, because we have 2 entity of reactant, you can use A, B. or A, B here or A, B here, any, any of this reactant or product doesn't matter. If you choose this one is 2, you have this one is 2, this is the general term. Okay, because we are comparing the mole, so M times B is mole, mole of what? mole of A. Okay. If A is sodium hydroxide, it becomes 2. If B is sulfuric acid, it becomes 1. Now in referring to between sodium hydroxide and sulfuric acid doesn't concern with product because this is titration.
- 1:53:26 : Titration only concern on the reactant, between the 2 reactant. Radiometric only concern on the product. So, put all the data given to you, make sure this referring to this radiometric reaction. A is referring to sulfuric acid 2.45 molar volume of sulfuric acid and the rest and rearrange, you can get volume of B. B is referring to the sodium hydroxide. Sodium hydroxide. Okay, calculate volume of sodium hydroxide needed for this one. Okay, another question. Calculate the mass of sodium hydroxide required to neutralize 57 ml of 0.5 molar sulfuric acid. Now the equation is not given to you. Okay, but the equation much much simpler. Okay, calculate the mass. I am just now asking you to calculate the volume. Now, you are asked to calculate the mass. Okay. So this is the equation. So calculate first. Information given to us ml, concentration, you can get mole. Always remember this is, this is molecular weight of sulfuric acid 57 ml mole per litre. Okay, 57.05, you just get mole first. Okay, you just get mole first from this volume and concentration, you can get mole first. Then, 1 mole sulfuric acid, you have 2 mole sodium hydroxide.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

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Transkrip:

- 1:55:21 : This statement is taken from the stoichiometric equation where 1 mole of sulfuric acid reacts with 2 moles of sodium hydroxide. So, if there are 0.015 moles of sulfuric acid, it will react with 0.03 moles of sodium hydroxide. This is already simplified using the stoichiometric ratio of 2:1. The question then asks us to convert the amount into mass. To do this, simply multiply the number of moles of sodium hydroxide by its molar mass, giving 1.48 g of sodium hydroxide. Does anyone know the physical form of sodium hydroxide when it is used to prepare a solution? Sodium hydroxide is a solid, and it is commonly available in the form of pellets, which are small cylindrical tablets. Sodium hydroxide is highly hygroscopic, meaning it absorbs moisture from the surrounding air. Therefore, after weighing the required amount, it must be prepared as quickly as possible because prolonged exposure to air causes it to absorb water, affecting the measured mass.
- 1:57:18 : You should measure only sodium hydroxide if you do the measuring very very slow sodium hydroxide will automatically absorb moisture from the surrounding that's why sodium hydroxide is very very hygroscopic, so you need to prepare much much faster when you dealing with sodium hydroxide. Okay, the last part which is redox titration there are 4 event when solution automatically being used the last part is redox titration. Okay, redox titration same like the acid base titration, but redox titration involve oxidation and reduction in the one reaction simultaneously, so either the titrate is the oxidation or at the bottom is reduction. Either all you just titrate. Okay, eventually the reaction will stop why because you reach the equivalent point this is the equivalent point. When you do titration of course amount of pectin react to produce product in the same amount, its equivalent amount so reaction will stop but actually in titration.



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Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

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Transkrip:

- 1:58:48 : We cannot find equivalent point because our naked eyes, we cannot see the equivalent point because during titration we can see only the reaction stop or the reaction completed by the help of indicator. You know indicator acid base titration. How do we know that the acid and base completed between the two without having the indicator? If you didn't put indicator, you titrate sulfuric acid and sodium hydroxide use one gallon of sodium hydroxide but you cannot see the completed of the reaction completion of the reaction. That's why in redox titration or acid base titration, you need to have indicator you put one or two drop of indicator. It helps you to see the reaction is completed however when you use indicator that reaction is completed.
- 1:59:57 : You are actually excess amount of, amount of titration being put into the base reaction to complete the reaction. So you are excess amount of titration, in other words you already exceeded equivalent point but in calculation, the exceedent of equivalent point in titration is very very small amount. About half, half drop, I think half drop very hard to get half drop. One drop, normally people use one drop, so when you put one drop you can see, you start from the beginning titration can you imagine you titrating acid and base. You put indicator, you start titrate and then you see once the acid or base touching the surface, the color appear and you start shaking the color dissolve to a certain extent last drop or maybe a few drops you can see the color start to become permanent and then you start slowly. Start slowly, swirl and when you put last drop you can see that the permanent color become permanent.



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Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

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Jangka masa : 3 jam 6 minit

Transkrip:

- 2:01:25 : That's why we call as end point. So in titration, there are three situation, end point, equivalent point, initial point, equivalent point and end point. You cannot see the equivalent point but theoretically here said that equivalent point is actually amount of reactant completely react with exact amount of mole of reactant to produce product. Equivalent point as I said just now you cannot see reaction without the help of indicator. So if you put indicator you are actually exceeded equivalent point just to help you to stop the reaction, just to say that the reaction is already equivalent but if you want to calculate the actual one, you don't have to do titration. Actually you can calculate theoretical just to give an idea what is all about the equivalent point is reached when reducing agent is completely.
- 2:02:44 : See, they use the term completely oxidized. Oxidizing agent if you are referring to acid base titration, we can use the term here that the equivalent point is reached. When acid is completely react with the base the difference between acid base and redox titration. So it is the same because they are using the same equivalent point so here, there are two common oxidizing agent. Agent manganese ion, how do we know that? Manganese have 7 plus, 7 plus here we need to calculate the oxidizing state of the manganese. Manganese plus 4 times negative 2 equivalent to negative 1. Over the whole ion so negative 8, 4 times negative 2 is negative 8. We bring forward after the equivalent minus with 1 minus we get 7 plus.
- 2:03:52 : So here manganese for oxidant. Here, oxidation state here is 7 plus, very very strong oxidizing agent here. Because it is single, we look at the ion so here oxidizing state of manganese is 2 plus 2, plus is ion, plus 2, is oxidation state 2 plus, plus 2. That is why chemistry is very very important. How you write, which one first, sometimes I'm asking my student to write M with proper writing. Most of the student will write M with bigger M, but still not a capital letter of M. You know what I mean, M kan, dia tulis M besar tapi M tu macam huruf kecil. So kadang kadang saja nak gurau dengan student especially during quiz even though the question is right, I give wrong answer to the student and most of the student start pening. Why sir? I don't know, are you properly written your equation M besar dengan M kecil, besar mana tu M you tulis, tetap huruf kecil faham tak?



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Youtube Rasmi, Pusat Asasi UiTM

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Tajuk Fakulti Sains Gunaan
Jangka masa : 3 jam 6 minit

Transkrip:

- 2:05:24 : So chemistry is very very critical. You put 2 plus or plus 2 is very very important because you need to differentiate between ion and oxidation state here is plus 7. Here is plus 2, 4 dichromate ion plus 6 here. Here is plus 3 reduce to 3. Reduce to 3 meaning that in order for this dichromate to turn into plus 3 it already receive another 3 electron. Only electron can be transferred give and take, only electron in a nucleus atom proton, neutron only reside in the nucleus. The electron only outside of the nucleus, so in any reaction only the outer electron will involve, so meaning that one species will receive another species will donate this only 2, there is no other than 2 receive and donate. So in this state, 7 plus 7 become plus 2 meaning that this manganese in the purple condition already receive 5 electron to reduce to plus 2 state here chromium receive 3 electron to go to green colour which is chromium 3 state one example as usual given to us.
- 2:07:06 : This equation will already break up just to show to us the ion state. It doesn't matter, as long as is same. Referring the same amount of mole reacting in the chemical reaction. As long as when we check the reactant reaction mole with the product mole are the same. We are not talking about the ion 3 plus here, 2 plus here in front of the formula 5 here 4 for the whole water. Yes we can get for the whole water 4 times 2 for hydrogen 8, 4 for oxygen. 4 for oxygen. I think most of student will familiar with all these things. Okay, let us look at the question 60 ml of 0.13 molar helium permanganate or potassium permanganate to oxidize 25 ml of ferrous sulfate. If this is you can check whether this is F2 or F3, normally this is F2.



Program

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Jangka masa : 3 jam 6 minit

Transkrip:

- 2:08:17 : Once you calculate the oxidizing state. If you know this is ferrous Fe plus 2 for the oxidizing state. You need to properly pronounce it as ferrous sulfate. You cannot say it as ferric sulfate, later people will know that we don't know. They said they have studied but they don't know, it is dangerous if people know we don't know. So don't show people that we don't know. They said ferrous right, ferric sulfate. People said we don't know, so in this case you have to calculate. If you uncertain, you calculate oh Fe is plus 2 meaning that Fe is ferrous sulfate for 2 plus. Normally we pronounce as ferrous for Fe 3 plus we pronounce as ferric so they said calculate the concentration of ferrous sulfate in molarity, ferrous sulfate molarity.
- 2:09:20 : Another question, most of the second question is put at the end. Normally student will only focus on the first, inside the situation from this one. I think better put number 1, need to calculate 1 concentration of ferrous sulfate 2 net ionic equation right. First, once you completed, you take this is example so calculate first. What you have from the information. This is general information of mole regardless of reactant or product. As I said earlier you can proportionate between reactant and reactant product and product or reactant and product. You can proportionate within chemical compound or inter chemical compound, you just have to have the mole between the comparison MAV, MBBB put all the information provided to you. You can get molarity of the solution. Okay, check 122, normally check 122.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 2:10:43 : Student need to do question 1, iodine 5 meaning that iodine at the stage of plus 5 oxidation state. Iodine 5, ions react with acidified iodide ion as shown below. Okay, equation given to you. Iodine normally come from potassium iodate, it only shows the counter ion because potassium doesn't react but react is the counterpart of it which is iodine. Okay, iodine ion is iodide because this is equivalent to produce iodine with iodide. It's not easy to produce potassium iodide or iodide, you need to mix between these two and then you can get certain amount that you calculate. So here it says that iodine 5 react with acidified iodide. Okay, you need to have acid to produce iodine, so iodine is not easy to produce. Okay, you have to prepare two solution iodide with potassium iodide plus acid and then you have iodine. Okay, iodine produce here see. Okay, iodine release meaning that the iodine produce here is then reacted with thiosulphate. This is thiosulphate just mention just now, it's not thiosulphate sorry, sulphate. This one, yes this is thiosulphate. Okay, so once this iodine produce it will be titrated with thiosulphate amount of the produce will be titrated with thiosulphate to produce iodine S4 O6 so question is 60 ml of 0.2 iodine here.
- 2:12:38 : Reacted with excess acidified iodide ion. Okay, iodide ion. If all the iodide liberated reacted with X of 0.4 ml of thiosulphate ion. Calculate the value of X where the X is excess acidified iodide ion, if all the iodide liberated with X of thiosulphate ion, calculate the value of X. X here is referring to the excess amount of iodide. Excess amount of iodide, excess. Okay, so iodate form. Okay, use is 0.01, by having this information here okay, convert into litre we get 0.01 to mole, Okay, mole of iodine liberated meaning the excess being used in here 1 mole iodide is 3 mole iodine, 1 mole iodide is 3 mole iodine. The exact amount, the exact amount. It ask us here is to calculate the excess amount of iodine, but here it produce. Liberated any liberated iodine will be titrated with thiosulphate.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

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Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 2:14:10 : So any excess will be titrated. Mole of iodine liberated, 1 mol iodine produce 3 mol iodine. So if this amount of iodine. Okay, iodine. Actually only this amount of iodine. Okay, so this amount of iodine. So how much thiosulphate needed to be titrated. Okay, how much thiosulphate needed to be titrated? Okay, so 1 mole iodine will react with 2 mole thiosulphate. Okay, this one. So if 0.0360 mole iodine, it will use or it will consume 0.002 thiosulphate. Okay, X here is actually the thiosulphate used to react with the excess of iodine. The excess thiosulphate. Okay, with the thiosulphate. So volume of thiosulphate will convert back more into concentration given. We can get the ml of thiosulphate. Okay, 180 ml is quite a lot. Normally titration, normally is not as much as 50 ml, not more than 50 ml.
- 2:15:39 : This is some calculation example. Okay, so we completed chapter, sub chapter 110 and 1.9. Okay. Maybe we can take 5. Yeah, okay students. So we can take 5 minutes break before we continue with our second topic. Topic 2, sub topic 2.1. So we give a break 5 minutes.
- 2:30:08 : Okay so our last part. Under the topic of 2.0. We look into the electronic structure of atom. Little bit on electronic structure of atom. Predictable and periodicity. Maybe not all because this is just an introduction. So we will cover a few for today. The Bohr model of hydrogen atom. The purpose of this topic is to state the postulate of the Bohr atomic model of hydrogen and state the weaknesses in Bohr atomic model. Actually before Bohr model of hydrogen atom being introduced, the electronic structure of atom, electronic structure meaning that the electron configuration outside the atom, being stipulated by certain scientist. Started with J.J. Thomson, followed by Niels Bohr,



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 2:31:24 : Next by Sommerfeld, followed by Rutherford, and finally Erwin Schrödinger. Okay now we just look at the Bohr model. Actually Bohr model proposed the planetary model with the theory that electrons revolve around the nucleus. Bohr developed the hydrogen atom model, explaining how the structure of the atom changes when it undergoes energy transition. Then another statement from him. The major idea is the energy of the atom was quantized, definite amount. Quantized meaning that there is a definite amount of energy, and one of this energy is related to its electron position and last statement from him. Bohr suggested that electrons could only orbit, move in a certain size surrounding the nucleus in a specific orbit or shells. They called as shells with a fixed radius. This is the idea from Niels Bohr, talking about electrons surrounding the nucleus because electrons have specific energy when they surround the nucleus. And this energy was quantized. And this energy can be transitioned. Experiment done by Niels Bohr. He did when electric current is passed through a glass tube. This gas discharge contains hydrogen gas. So he applied electric to produce beam of light, blue light. He put lead to have very tiny light from hydrogen and then pass through the prism. The light is passed through the prism and split into four narrow bands of bright light, four different colors and each color has its own wavelength.
- 2:33:56 : You can see here, from violet, blue-violet, blue-green to red. Different wavelength, different energy produced by this light being separated. Actually hydrogen has only one electron, but with different transitions of energy due to different colors because the electron receives energy from the discharge to produce different energy by its color. So he described to us that an electron absorbs energy in the form of photons. He used the term photons, meaning that energy absorbed by the electron can be measured. The amount of energy supplied to the electron can be measured. He used the term photons. Most of the scientists at that time are from physics. That's why they used the term physics.



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Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 2:35:05 : He used the term photons. Meaning that energy absorbed by the electron can be measured. The amount of energy supplied to the electron can be measured. He used the term photons. Most of the scientists at that time are from physics. That's why they used the term physics. To get to this level, you need to have certain energy. To get to this level, this amount of energy is measured. Scientists measure the energy needed to move to a higher energy level. As long as the photon energy is equal to the energy difference between the initial and final energy level. In order to have from 2 to 3, there is a specific amount of energy. And the difference between the two energy levels moves the electron from the lower state to the higher energy state.
- 2:37:07 : The excited electron would be in a less stable position, so it would quickly emit a photon to relax back to a lower, more stable energy state level. Always bear in mind, once the energy is transmitted to a higher level, this level is not considered the ground level because once the electron receives a photon of energy, it stays in an unstable state. Eventually it will go back to the initial state. But when going back to the initial energy state level, it will produce its own photon. And this photon is the same amount being produced as the amount absorbed by the electron to move to another energy level. Because of this transition state, it returns to the ground state by releasing back the energy in the form of a photon, which is the energy previously absorbed by the electron.
- 2:38:31 : And also the excited state, in this position, is referring back to the ground state, which is the stable state. By referring to the wavelength, that is why the equation of energy is $E = h \times \nu$ (nu). Each of this has its own wavelength, measured in nanometres, as can be seen here. The ground state is always back to 2, back to the ground state. As portrayed in this photo, you can see different colours being depicted just to show the different energy levels of each excited state, starting with 3, 4, 5, 6, and so on. You can also see from the initial state that the electron is excited to the next level because this is the transition state. It will then go back to the ground state, and a photon will be emitted. This emitted photon is captured by the gauge in this experiment by having this film, showing that the electron has been excited to a certain energy level.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak
Tajuk Fakulti Sains Gunaan
Jangka masa : 3 jam 6 minit

Transkrip:

- 2:40:07 : Regarding Bohr's model of hydrogen atom. Bohr only explained hydrogen atom. Of course simple hydrogen atom. It only has one electron. So even though. Bohr's model is very important. It is a starting point of explaining. How electron is being distributed. Around the nucleus. So he postulated. He gave. A fact based on his experiment. It is not a possibility. Postulate is strong more than. Probability maybe. Postulate is based on. His observation on a specific. Chronicle of experiment. So it is true. Because it is referring to hydrogen atom. So let us look at the postulate. From Bohr's model. The hydrogen atom has only certain energy level. The electron in hydrogen atom revolve. Around the nucleus in a fixed circular orbit. A fixed circular orbit. This is the first orbit. This one orbit. So this electron orbiting the nucleus. Depends.
- 2:41:37 : If the atom has only one electron. It has one orbit. Continuously orbiting the nucleus. If the element have more than one electron. You can imagine how many orbits. Surrounding the nucleus. Without any one of the electron colliding each other. Can you imagine that? The atom has only certain energy level. This is what being postulated by Bohr. They don't support this postulate. Only for hydrogen atom. This energy level is quantized. Quantized meaning that. This energy is a specific amount. For the electron to stay. To stay surrounding the nucleus. And then orbit. With a certain amount of energy. Have you heard of ISS? This is ISS right? Surrounding the earth station. The station is big. Like an airport. The atom has only certain energy level. This is what being postulated by Bohr. Because hydrogen only have one electron. And this electron revolve. Surrounding the electron in circular orbit. Up to now, other scientists.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak
Tajuk Fakulti Sains Gunaan
Jangka masa : 3 jam 6 minit

Transkrip:

- 2:43:16 : Can you imagine it can stay at that orbit? Because energy at that level. Scientists already calculated to stay at that level. From gravity. Being pulled by gravity. To stay at that level. They have to have that energy. To stay stable at that level. In other words, to orbit. They have to have a certain amount of energy. This energy is also the same as. Electron orbiting the nucleus. This energy is called quantized energy. Or quantum right? Quantum in Malay. And called stationary. Stationary means stable. Every orbit is stable. Stationary. There are two. S-T-A-T-I-O-N-A-R-Y. That's how it's written. When I study chromatography. There are two phases. Mobile phases. And stationary phases. S-T-A-T-I-O-N-A-R-Y. That's how it's written. Always be careful. English is a scientific term. English is also a scientific term. So this energy level. Which electron resides.
- 2:44:57 : In order to orbit. Certain nucleus. It has terms like stationary. Quantized energy. And it's labeled as N. And starting with 1, 2, etc. The bigger the nucleus is. Of course nucleus consists of proton and neutron. And in neutral atom. Proton always equal to electron. The bigger the element is. Which is the number of proton increase. Of course equivalent is electron number. So you can imagine. If the element has let's say 30 electrons. And these 30 electrons must be put outside the nucleus. At the same time. Simultaneously orbiting the nucleus. Without colliding each other. So meaning that. It has to be put into various. Stationary energy level. And this energy level is called orbit. So the higher the energy level. The further the orbit from the nucleus. This is ground state. 1, 2, 3, 4. This is ground state. This is ground state. So outer. Or further the orbit. From the nucleus. The higher the energy level. You need more energy here. More energy here and more energy here. The bigger the energy. The further the orbit from the nucleus. It's written on the 2D.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 2:46:57 : Even though into a line. When you put into a circle. Just to representing orbit. It become like this. The bigger. The higher the energy. The higher the excitability. This is the first postulate from Bohr. This postulate is like a fact. The second thing is that. The atom does not change energy. When the electron move within an orbit. If it rotates within an orbit. It has the same energy. The same goes to the. Let's say calcium. Or helium. Both 2 will reside in the same orbit. Let's say. Other than 2 electrons. Only certain electron will reside in an orbit. The next electron will reside in the next orbit. The atom does not change energy. While the electron move within an orbit. The third postulate from him. The energy of the atom changes when the electron move to another orbit. The energy of the atom changes. When the electron move to another orbit. Only by absorbing or emitting photon. Because just now Bohr said that.
- 2:48:31 : In every orbit. The energy reside in that orbit. If the electron want to move. From one orbit to another orbit. It has to be excited. In other words. Energy must be absorbed. From here to here. It absorbs the energy. Excited. And then because this level is not. Ground level state. It becomes unstable. Automatically. It goes back to the ground state. So by proceed to the ground state. Automatically. It will emit a photon. The same amount that being absorbed earlier. The energy of the atom changes. When the electron move to another orbit. Or this level. Minus amount of this ground level. You can get this amount.
- 2:49:24 : So we do know. How much this amount of energy. Which is constant amount of energy. So we know how to supply energy. In order to excite. Or transmit this electron to another level. So we supply. Certain amount of energy. For example here. Supply certain amount of electricity. And produce heat. And this heat. Up to certain stage. Will produce light. And this light is actually representing. Electron. That emitted. After it being excited to a higher level. This formula given. From him. E is energy. Constant energy. As I said earlier. Is h times μ . Difference between energy atom. At the final. Minus the initial. The general formula is $h \mu$.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak
Tajuk Fakulti Sains Gunaan
Jangka masa : 3 jam 6 minit

Transkrip:

- 2:50:29 : Can you remember. This three postulate. Produced by Bohr. Just to explain. How electron. Is distributed in an atom. There are only three. Postulate from him. Much easier to remember. Satu. Energy level. Okay. Second. Does not change energy. In certain orbit. Third one. If want to move. You have to supply. Or you absorb. And photon. Okay. That's how. Bohr. Describe. Electron in an atom. Okay. Let us look at the electron transition. Bohr said that. Electrons in the first orbit. Let's say N1. Of course N1. Because. Bohr. Already explaining. On the. Hydrogen atom.
- 2:51:25 : Electrons in the first orbit. Which is N1. It closest to the nucleus. Okay. Closest to the nucleus. And at each time. It is. Is in its lowest energy level. Which is called the. Ground state. Here. Bohr tried to explain. How transition occurred. Actually. Okay. This is the first electron. Residing in the inner part of the orbit. And this orbit. Have its own energy level. Okay. This is quantized. Energy. And. If this electron. Stable at this state. We can call this as ground state. Electron as this orbit is. At ground state. Okay. Next. When each. Atom. Hydrogen atom. Absorbs energy.
- 2:52:12 : Absorbs energy to a certain amount. The electron. Have the capability. To jump to a higher level. Which is at excited level. This is dotted line. Why. Why he put dotted line. Because. Actually. Hydrogen only have one. Electron. There is no. Orbit outside. But. If. This electron. Being. Transmitted. To another level. This electron will. Move to higher level. And start orbiting. The nucleus. At higher level. But. Because of this higher level. Is not actually exist. Because it is transition state. This electron eventually. Return to ground state. So at this state. Which is called. Excited state. The first. Receives energy. Okay. Being. Out to the. Another level.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 2:53:13 : Once they are orbiting the. Nucleus. At higher level state. It has own energy. Because this energy being absorbed. From the outside. Okay. Absorbed. So at a certain stage. Because this not stable state. It will goes back to the. Ground state. Okay. Return to ground state. So at excited state. Electron is unstable. Why unstable. Because this not. Actually. Its own orbit. Okay. Unstable. Electron returns to ground state. By emitting energy. That is photons. In the form of. Electromagnetic radiation.
- 2:53:49 : Electromagnetic radiation. Energy being released. This is how. Scientist prove. The existence of electron. At that time. Only Bohr. Can prove that. There is. Electron. Emitting. Or surrounding. And. Unfortunately. Bohr. Can only. Explain for. Hydrogen atom. Sahaja. Okay. We take out. The weakness of. Atomic model. Could only. Explain the. Spectrum. Of. Hydrogen. What is called. Spectrum. This is spectrum. Light being. Produced. After being. Emitted. After being. Excited. To a certain. Energy level. They produce. Certain. Color. And this color. We call. Spectrum. It's only certain. Spectrum. Hydrogen or. Ions that only. Contain. One. Electron.
- 2:54:56 : So he tried to prove with another type of atom. Yeah. Helium. Next to it is helium. Helium has two electrons. So if he removes one electron from helium, helium becomes He^+ . So he can easily explain the characteristic of the helium. He^+ resembles hydrogen. So helium also has an electron, and this electron orbits and produces the same amount of energy if a certain amount of photon is absorbed by the electron and goes back to the ground state.
- 2:55:31 : And also, he can only explain for the electron removed. Two out of three. He showed characteristic energy same as H^+ and also atomic energy. Other than that, Bohr failed to explain all spectrum produced by each of the electrons when they are supplied with certain photons of energy.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 2:55:58 : And then could not predict the energy level, and spectra of most atom, and having more than one electron. Other than lithium, Bohr cannot explain how this energy level produced and most of the ion being. Produced in order to have more spectrum. And then, he got the the more the modern quantum mechanisms. Mechanisms. Bohr concept of discrete energy, distance and energy involved.
- 2:56:26 : During the transition orbits of. Uh. Today orbits introduced. This is orbit proposed by Bohr. Okay, because he only postulate one to three electron. So, the simple orbit surrounding the nucleus like this. So after Bohr model. So another scientist come up with. Uh. New model such as, Photophore. They can produce layer of electron residing on each of a satisfactory. Uh. Condition without colliding in each of the electron. So they propose another type of orbit. Uh. To exclude Bohr model orbit. So that's why they use modern quantum mechanic.
- 2:57:21 : The concept. Okay. So they reject the Bohr's concept. Okay. But they reject the circular orbit of the nucleus. But. Uh. A Bohr model is also important to the latest development. Starting from Bohr, most of the terms being used up to now. Such as, excited state, round state, photon. Okay. Okay.
- 2:57:49 : That is modern stationary state. Round state still being used. Although being rejected halfway because he can only explain only species with one neutron. He tried to explain with more than one neutron by using helium and lithium ion, but it failed. Okay. Checkpoint number one. State the postulate of Bohr model of hydrogen atom. Sedangkan dari tiga postulate. Remember, postulate is not. Possibility, ataupun, Apapun. Kemungkinan. This is done, but with a limited observation.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 2:58:40 : Lastly, it will become a theory. Whatever the theory is, it will result the same. It can't be denied. About electron chlorine and so on. They only cover certain limitation. So the answer is hydrogen atom has only certain energy level, always remember we talking about Bohr model. They always referring to hydrogen atom, so when you want to write statement always use hydrogen atom. Dia kata apa, hydrogen atom has only certain energy level betul. Hydrogen atom does not change energy level betul, within an orbit. Hydrogen atom changes membrane zone energy betul, tapi when applied to another type of element that more than one hydrogen dia fail, so that postulate can only be accepted for hydrogen atom sahaja.
- 2:59:46 : The important things of hydrogen Bohr model up to now. So when it comes to Schrodinger, Schrodinger dah boleh buat susunan, dia panggil configuration electronic. Electronic configuration. Why this electronic configuration is very important because bila elemen tu it has more electron, many electron, it need to be put into a very specific orbit. So when it put into specific orbit, eventually scientist can see in each element, in each element, they show the certain characteristic. Dia kata bagai outer electron. They not focus on the inner electron. Pelik kan, in the beginning, Bohr try to susun electron tapi dia hanya dapat susun electron yang satu je je. Sampai dua, tiga pun dia try susun, tak boleh. Bukan dia nak menyusun maksudnya, dia kena prove by experiment. Tapi bila experiment beri a lot of colours, dua, tiga, empat, lima, sepuluh colours, macam-macam different colours, dia fail to explain. When he fail to explain, meaning that he fails to put electron in proper way outside the nucleus in a certain orbit.



Program

Program Kepimpinan Perpustakaan Siri 7

Youtube Rasmi, Pusat Asasi UiTM

30 Ogos 2022 (Selasa), Jam 10.00 pagi

Nama Prof. Ts. Dr. Mohd Azlan Mohd Ishak

Tajuk Fakulti Sains Gunaan

Jangka masa : 3 jam 6 minit

Transkrip:

- 3:01:04 : So, after that, scientist start to do their own model. The final model presented by Erwin Schrodinger ni dia dah dapat call sebagai electronic configuration by the help of quantum mechanics. That's why most of the scientists in this area come from physics. That's why we call quantum chemistry, from physics. So, Schrodinger dah bantu kita menyusun electron semua. Even though electron berubah ratus-ratus. So, they found out that any element, when they follow his rule to structure the electron in a certain atom, they found out that each atom ni dia ada outer electron. And this outer electron lah yang involved dalam kebanyakan reaction. And only this outer electron lah being excited, move back, produce plus ataupun minus, lebihan dan sebagainya. Dia akan membentuk ikatan ionic, covalent, whatever. And this is very, very important. And based on that, scientist kenal pasti the chemical properties of each element.
- 3:02:20 : And then they form into each compound. And then finally barulah tersusunnya periodic table. And this periodic table, nama pun periodic kan. Sebab apa dia panggil periodic table? Maksud apa? Dia berkala kan, bukan kala jengking tu. Periodic. Orang perempuan tahu sebab orang perempuan dia ada period. Period dia datang secara berkala. Dia tak datang tiap-tiap hari. Kalau tiap-tiap hari sakit lah dia. Atau pun sebab tu orang dah kahwin dia tahu kalau dia 2 tahun kahwin tak dapat anak, dia pergi jumpa doktor. Doktor akan check nombor 1 dia punya period. Kalau period dia irregular, tak tetap, sekejap 30 hari, sekejap 20 hari, sekejap 15 hari. Maksudnya dia tak tetap. Nama pun periodic kan. Tak tetap, maknanya dia tak subur. Kalau tak subur susah lah dapat anak.
- 3:03:14 : So that periodic table pun macam tu lah. General berkala. Each element disusun dalam kumpulan masing-masing. And each group, it has its own punya properties. And this properties adalah berdasarkan outer electron that has been hearing in a proper way dengan bantuan saya dipakailah sampai whatever. Maksudnya properties. And then they start to electronic structure. And then dia akan susun dalam periodic table. Dia akan tengok di mana kedudukan elemen tu berada. Saya rasa setakat itu saja kot.