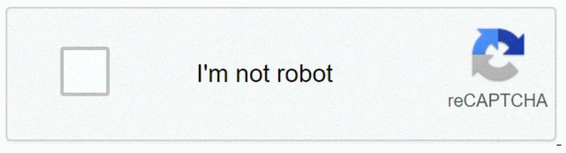

Continue

Mole calculation practice worksheet key

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Date:_____ Block:_____ Name:_____

Chemistry 11 - MOLE RATIOS (using the three step method)

Magnesium metal reacts with hydrochloric acid to produce magnesium chloride and hydrogen gas. The chemical equation is given as the following:

$Mg\ (s) + 2HCl\ (aq) \rightarrow MgCl_2 + H_2\ (g)$

If 4 moles of HCl is used, how many moles of $MgCl_2$ will be formed in the reaction?

Step (1): What is the mole ratio for HCl to $MgCl_2$?

2 mol HCl : 1 mol $MgCl_2$

Step (2): Write two conversion factors for this mole ratio.

$\frac{2\ mol\ HCl}{1\ mol\ MgCl_2}$ or $\frac{1\ mol\ MgCl_2}{2\ mol\ HCl}$

Step (3): Calculate the number of moles of $MgCl_2$ formed.

What you want = What you have X Conversion factor

Moles $MgCl_2$ = 4 mol HCl X $\frac{1\ mol\ MgCl_2}{2\ mol\ HCl}$

= 2 mol $MgCl_2$

_____2_____mol $MgCl_2$

Now try these example questions on a separate sheet of paper using the 3-step method!

1. $3Ca_3Si_2 + 2SbCl_3 \rightarrow 6Si + 2Sb + 3CaCl_2$

   a) If 0.65 moles of Ca_3Si_2 is used, how many moles of Sb will be formed in the reaction?

   Answer: 0.43 mol Sb

   b) If 1.47 moles of Si is formed in the reaction, how many moles of $SbCl_3$ was used at the start of the reaction?

   Answer: 0.49 mol $SbCl_3$

2. In a Chemistry 11 experiment, John mixes 0.010 moles of calcium chloride together with silver nitrate in a beaker. This results in the formation of silver chloride and calcium nitrate. How many moles of silver chloride are formed in the reaction?

   Answer: 0.020 mol AgCl

Mole calculation practice worksheet answer key.

Mole Calculations Worksheet

Part 1

1) Calculate the number of moles of potassium hydroxide that must be dissolved to make the following solutions:
   (i) 500cm³ of 1 mol/l
   (ii) 200cm3 of 0.5 mol/l
   (iii) 100cm3 of 0.1 mol/l
   (iv) 2 litres of 0.25 mol/l
   (v) 250cm3 of 2 mol/l

2) Calculate the concentration of each of the following solutions of hydrochloric acid:
   (i) 1 mol of HCl dissolved to make 100cm3 of solution
   (ii) 2 mol of HCl dissolved to make 1 litre of solution
   (iii) 0.1 mol of HCl dissolved to make 500cm3 of solution
   (iv) 0.5 mol of HCl dissolved to make 250cm3 of solution
   (v) 0.4 mol of HCl dissolved to make 200cm3 of solution

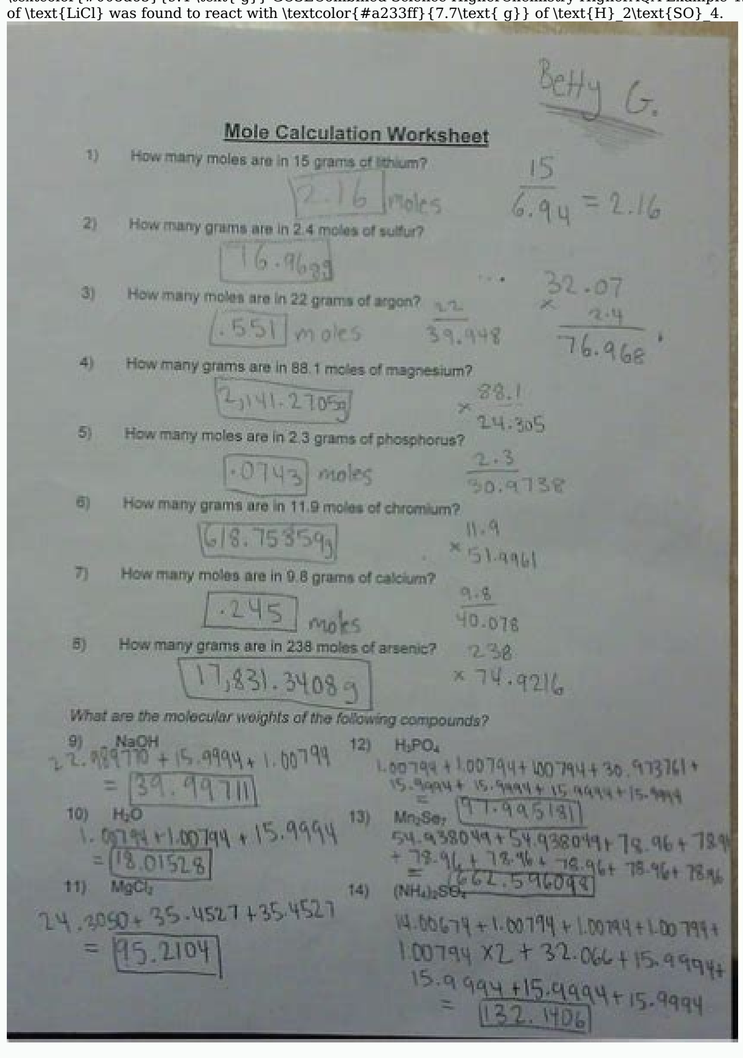
3) Calculate the volume of each of the following solutions of sodium hydroxide
   (i) 1 mol/l solution containing 2 mol of solute
   (ii) 0.5 mol/l solution containing 1 mol of solute
   (iii) 2 mol/l solution containing 0.1 mol of solute
   (iv) 0.1 mol/l solution containing 0.5 mol of solute
   (v) 0.4 mol/l solution containing 0.1 mol of solute

Part 2 – using both triangles

1) Calculate the number of grams of substance needed to make each of the following solutions
   (i) 50cm3 of NaOH (aq), concentration 2 mol/l
   (ii) 100cm3 of KOH (aq), concentration 0.5 mol/l
   (iii) 1 litre of Na2CO3 (aq), concentration 0.1 mol/l
   (iv) 25cm3 of lithium nitrate solution, concentration 0.2 mol/l
   (v) 250cm3 of ammonium sulphate solution, concentration 1 mol/l
   (vi) 200cm3 of calcium nitrate solution, concentration 0.25 mol/l

2) Calculate the concentration of each of the following solutions:
   (i) 5.65g of NaCl dissolved to make 1 litre of solution
   (ii) 2.5g of CaCO3 dissolved to make 100cm3 of solution
   (iii) 8g of NaOH dissolved to make 250cm3 of solution
   (iv) 2.02g of potassium nitrate dissolved to make 50cm3 of solution
   (v) 4g of copper (II) sulphate dissolved to make 100cm3 of solution

GCSEAQACombined Science HigherChemistry Higher What is a Mole? The value of a mole is fixed, it does not change with the substance being discussed, i.e. one mole of iron, one mole of electrons, and one methane molecules both contain 6.022 \times 10^{23} particles. This number is known as the Avogadro constant and is typically give the symbols L or NA. For any given substance, the mass of one mole (6.022 \times 10^{23} particles) of a substance will be equal to the relative mass of said substance. This means that one mole of carbon, with a relative atomic mass of 12 weighs exactly 12\text{ g}. One mole of methane molecules, with a relative formula mass of 16 weighs exactly 16\text{ g}. This is particularly useful for chemists, as it means we can easily convert between the moles of substances and its mass in grams. GCSECombined Science HigherChemistry HigherAQA Calculating the Number of Moles Calculating how many moles of a substance we have is fairly straight forward.
The mass in grams of a substance and the number of moles present are related by a simple formula: \text{Moles of Substance}=\frac{\text{Mass of Substance in grams}}{\text{Relative Mass of Substance (M}_r\text{)}} It is very common for chemists to talk about the number of moles involved in a reaction, instead of the masses or volumes taking place. This is because the ratios of moles involved in reactions will always remain constant. For example, in the reaction: \text{Mg(OH)}_2 + 2 \text{HCl} \rarr \text{MgCL}_2 + \text{H}_2\text{O} The ratio of moles of magnesium hydroxide (Mg(OH)2) to moles of hydrochloric acid (HCl) will always be 1:2. Therefore, if we are told that 0.5 mol of magnesium hydroxide is used in a reaction, we can deduce that 1 mol of hydrochloric acid must have been used. This rule applies across the arrow as well. forge of empires continent map guide 2020 list 2019 printable From the equation we know that the ratio of the moles magnesium hydroxide reacted to moles of magnesium chloride formed is 1:1. If we know the number of moles of a substbstance then we can also calculate its mass. The above formula can be rearranged to give: \text{Mass of Substance} = \text{Moles of Substance} \times \text{Relative Mass of Substance} By combining this with the ratios rule above, we can use the number of moles at the start of a reaction to predict the mass of any individual products formed. GCSECombined Science HigherChemistry HigherAQA Using Moles to Balance Equations One of the useful things about moles is that we can use them to help us balance an equation. If we know how many grams of two substances react, and their molecular masses, we can calculate the ratio of moles in the reaction. Often, this ratio will not be simple whole numbers.
However the numbers used in balancing equations must be whole numbers. As such, once we have calculated the ratio of moles in a reaction, we then either round up or down or multiply or divide the ratio to find the simplest whole number ratio. GCSECombined Science HigherChemistry HigherAQA Example 1: Calculating the Number of Moles A student weighs out a \textcolor{#00bfa8}{3.24\text{ g}} sample of iron (III) oxide \left(\text{M}_r = \textcolor{#f21cc2}{160}\right) for a reaction. Calculate the number of moles present in the sample: [1 mark] \text{Number of} \text{Moles Iron (III)} \begin{aligned} \text{Oxide} &= \frac{\text{Mass of Iron (III) Oxide}}{\text{M}_r\text{ Iron(III) Oxide}}\\&= \frac{\textcolor{#00bfa8}{3.24}}{\textcolor{#f21cc2}{160}}\\ &= \textcolor{#008d65}{0.02 \text{ mol}}\end{aligned} GCSECombined Science HigherChemistry HigherAQA Example 2: Calculating Mass from Moles A student is given a sample of propane \left(\text{M}_r = \textcolor{#00bfa8}{44}\right). The sample is known to contain \textcolor{#f21cc2}{2.5 \text{ moles}}. Calculate the mass of the sample: [1 mark] \text{Mass of Propane}=\text{Moles of Propane} \times \text{M}_r\text{ of Propane}\\ = \textcolor{#00bfa8}{2.5} \times \textcolor{#f21cc2}{44}\\ = \textcolor{#008d65}{110 \text{ g}} GCSECombined Science HigherChemistry HigherAQA Example 3: Calculating Masses from Equations A reaction is carried out between potassium hydroxide \left(\text{KOH, M}_r =\textcolor{#00bfa8}{56}\right) and sulfuric acid \left(\text{H}_2\text{SO}_4\text{, M}_r =\textcolor{#f21cc2}{98}\right). Below is the balanced equation for this reaction: 2\text{KOH} + \text{H}_2\text{SO}_4 \rarr \text{K}_2\text{SO}_4 + 2\text{H}_2\text{O} \textcolor{#327399}{5.98\text{ g}} of potassium hydroxide were used in the reaction. Predict the mass of potassium sulfate (\text{K}_2\text{SO}_4\text{, M}_r =\textcolor{#a233ff}{174}) produced: [3 marks] This is more involved than the above calculations. The thing to do with questions like these is to break them down into steps. Step 1: Calculate the moles of \text{KOH} used: \text{Moles KOH Used} = \frac{\text{Mass KOH Used}}{\text{M}_r \text{ KOH}}\\ =\frac{\textcolor{#00bfa8}{5.98}}{\textcolor{#10a6f3}{56}}\\ =\textcolor{#008d65}{0.107 \text{ mol}} Step 2: Calculate the moles of \text{K}_2\text{SO}_4 produced: From the equation we know that 2 moles of \text{KOH} form 1 mole of \text{K}_2\text{SO}_4. Therefore, we can state that the ratio between \text{KOH} and \text{K}_2\text{SO}_4 is \text{2:1}. To get the number of moles of \text{K}_2\text{SO}_4 we need to divide the number of moles of \text{KOH} by 2: \text{Moles of K}_2\text{SO}_4 = \frac{\text{Moles of KOH}}{2}\\ =\frac{0.107}{2}\\ =\textcolor{#008d65}{0.054 \text{ mol}} Step 3: Use the moles of \text{K}_2\text{SO}_4 to calculate the mass produced: \text{Mass of K}_2\text{SO}_4 = \text{Moles of K}_2\text{SO}_4 \times \text{M}_r \text{ K}_2\text{SO}_4\\ = 0.054 \times \textcolor{#a233ff}{174}\\ = \textcolor{#008d65}{9.4 \text{ g}} GCSECombined Science HigherChemistry HigherAQA Example 4: Using Moles to Balance Equations In a reaction between lithium chloride (\text{LiCl}, \text{M}_r =\textcolor{#00bfa8}{42.5}) and sulfuric acid (\text{H}_2\text{SO}_4, \text{M}_r =\textcolor{#f21cc2}{98}), \textcolor{#327399}{7.8\text{ g}} of \text{LiCl} was found to react with \textcolor{#a233ff}{7.7\text{ g}} of \text{H}_2\text{SO}_4.



The equation of the reaction is given below: x\text{LiCl} + \text{H}_2\text{SO}_4 \rarr \text{Li}_2\text{SO}_4 + 2\text{HCl} Using the information given, deduce the value of x to balance the equation: [4 marks] This may seem like a daunting task at first. The best way to tackle a question like this, like above, is to split it up into steps. Step 1: Calculate the moles of \text{LiCl} that have reacted. \text{Moles LiCl} = \frac{\textcolor{#327399}{7.8}}{\textcolor{#00bfa8}{42.5}} =\textcolor{#008d65}{0.18 \text{ mol}} Step 2: Calculate the moles of \text{H}_2\text{SO}_4 that have reacted. \text{Moles H}_2{SO}_4 = \frac{\textcolor{#a233ff}{7.7}}{\textcolor{#f21cc2}{98}} =\textcolor{#008d65}{0.079 \text{ g}} Step 3: Divide the moles of \text{LiCl} by the moles of \text{H}_2\text{SO}_4 to find the ratio between them.
\frac{0.18}{0.079} = \textcolor{#008d65}{2.3} \text{Moles LiCl} = 2.3 \times \text{Moles H}_2\text{SO}_4 \text{Ratio}=1:2.3 Step 4: Round up or down to get determine the value of x 1:2.3 \approx 1:2 \textcolor{#008d65}{x = 2} Substituting for x in the equation above gives: \textcolor{#008d65}{2}\text{LiCl} + \text{H}_2\text{SO}_4 \rarr \text{Li}_2\text{SO}_4 + 2\text{HCl} GCSECombined Science HigherChemistry HigherAQA Calculations Using Moles Example Questions \begin{aligned}\text{Moles H}_3\text{PO}_4 &= \frac{\text{Mass H}_3\text{PO}_4}{\text{M}_r \text{ H}_3\text{PO}_4}\\ &= \frac{6.5}{98}\\ & = \underline{0.067 \text{ mol}}\end{aligned} Calculation should be broken down into steps (one mark per step): 1. pathfinder 2e hellknight hill pdf \text{Moles N}_2 = \frac{13.5}{28} = \underline{0.5 \text{ mol}} 2. \text{Moles H}_2 = 3 \times \text{ Moles N}_2 = \underline{1.5 \text{ mol}} 3. \text{Mass H}_2 = 1.5 \times 2 = \underline{2.9 \text{ g}} Calculation should be broken down into steps (one mark per step): Step 1: Calculate the moles of Fe \text{Moles of Fe} = \frac{11}{56} = \underline{0.196 \text{ mol}} Step 2: Calculate the moles of Cl2. \text{Moles of Cl}_2 = \frac{20.58}{70} = \underline{0.294\text{ mol}} Step 3: Calculate the ratio. \frac{0.294}{0.196} = \underline{1.5} \text{Ratio} = \underline{1:1.5} Step 4: Deduce the simplest whole number ratio. \text{Simplest Whole Number Ratio} = 1:1.5 \times 2 = \underline{2:3} \text{X} = \underline{3} Calculations Using Moles Worksheet and Example Questions You May Also Like... GCSE Chemistry revision cards are the perfect revision tool to help You improve your grade. vifavixudu.pdf The MME Chemistry cards cover all the major topics areas within the AQA GCSE Chemistry specification. The profit from every pack is reinvested into making free content on MME, which benefits millions of learners across the country. £9.50 View Product Sale! The Very Best GCSE Science Revision Cards for the AQA Exam Board. These science flashcards have been created by expert tutors alongside student feedback and experienced content developers to provide the very best revision cards. The profit from every pack is reinvested into making free content on MME, which benefits millions of learners across the country. £23.97 £16.99 View Product GCSE Combined Science Trilogy Predicted Papers and Mark Schemes. Great preparation for your exams. Get 1 step ahead with these papers! The profit from every set is reinvested into making free content on MME, which benefits millions of learners across the country. From: £14.99 View Product Sale! The Very Best GCSE Science Revision Cards for the AQA Exam Board £28.50 £24.99 View Product Online exams, practice questions and revision videos for every GCSE level 9-1 topic! No fees, no trial period, just totally free access to the UK’s best GCSE maths revision platform.
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