- What is the molarity of the solution formed when 0.50 g of aluminium fluoride is dissolved in 800.0 mL of water?

Marks 2

Answer:

What is $[F^-]$ in this solution?

Answer:

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.

Marks 3

- In an experiment, 5.0 g of magnesium was dissolved in excess hydrochloric acid to give magnesium ions and hydrogen gas. Write a balanced equation for the reaction that occurred.

What amount of hydrogen gas (in mol) is produced in the reaction?

Answer:

Marks 7

- A 0.060 M solution of aluminium nitrate and a 0.080 M solution of potassium phosphate are prepared by dissolving $Al(NO_3)_3$ and K_3PO_4 in water. Write the ionic equations for these two dissolutions reactions.

Dissolution of $Al(NO_3)_3$	
Dissolution of K_3PO_4	

If these solutions are combined, aluminium phosphate precipitates. Write the ionic equation for the precipitation reaction.

100.0 mL of the aluminium nitrate solution is added to 50.0 mL of the potassium phosphate solution. What amount (in mol) of aluminium phosphate precipitates?

Answer:

What is the final concentration of aluminium ions remaining in solution after the precipitation?

Answer:

- Explain why relative atomic masses are not always close to an integer. For example, copper has a reported value of 63.54.

2

- Analysis of a black-coloured mineral called pitchblende returned the following percentage composition by weight: 84.80% uranium and 15.20% oxygen.
  What is the empirical formula of this compound?

2

Answer:

Marks 3

- Balance the following equation:

$$NH_3(g) + O_2(g) \rightarrow NO(g) + H_2O(l)$$

Calculate the mass of NH_3 required to produce 140. g of water.

Answer:

- Calculate the number of aluminium atoms in a block of pure aluminium that measures 2.0 cm × 2.0 cm × 3.0 cm. The density of aluminium is 2.7 g cm^{-3}.

2

Answer:

Marks 4

- Lead ions react with bromide ions according to the following equation.

$$Pb^{2+}(aq) + 2Br^{-}(aq) \rightarrow PbBr_2(s)$$

If 0.040 M lead(II) nitrate solution (100.0 mL) is added to 0.020 M potassium bromide solution (300.0 mL), what amount (in mol) of lead(II) bromide precipitates?

Answer:

What is the final concentration of $NO_3^-(aq)$ ions remaining in solution after the reaction?

Answer:

- An unknown liquid contains H: 5.90 % and O: 94.1 % by mass and has a molar mass of 33.9 g mol^{-1}. What is its molecular formula?

Marks 2

Answer:

Marks 5

- A solution is prepared by dissolving lead(II) nitrate (33.12 g) in 1.00 L of water. Write the balanced ionic equation for this dissolution reaction.

When a 100.0 mL portion of this solution is mixed with a solution of potassium iodide (0.300 M, 150.0 mL), a bright yellow precipitate of lead(II) iodide forms. Write the balanced ionic equation for this precipitation reaction.

What mass of lead(II) iodide is formed?

Answer:

What is the final concentration of $I^-(aq)$ ions remaining in solution after the reaction is complete?

Answer:

- Three different oxides of lead are known. The oxide that is red in colour is found to consist of 90.67 % lead. What is its empirical formula?

2

Answer:

	Marks
• What mass of oxygen is required for the complete combustion of 5.8 g of butane, $C_4H_{10.}$ How many moles of CO_2 and H_2O are produced?	**4**

- A white powder used in paints, enamels and ceramics has the following mass percentage: 69.6% Ba; 6.09% C; 24.3% O. What is its empirical formula?

2

Answer:

Marks 6

- Lead(II) iodide precipitates when 0.080 M lead(II) nitrate solution (150.0 mL) is added to 0.080 M potassium iodide solution (50.0 mL). Write a balanced ionic equation for the reaction that occurs.

What amount (in mol) of lead(II) iodide precipitates?

Answer:

What amount (in mol) of $Pb^{2+}(aq)$ ions remain in solution after the reaction?

Answer:

What is the final concentration of $NO_3^-(aq)$ ions remaining in solution after the reaction?

Answer:

- What mass of calcium chloride is required to make 250 mL of a 0.1 M solution? **3**

Answer:

What amount of chloride ions (in mol) is present in 30.0 mL of this solution?

Answer:

	Marks
• The complete combustion of butane, C_4H_{10}, in air gives water and carbon dioxide as the products. Write a balanced equation for this reaction.	4
What mass of oxygen is required for the complete combustion of 454 g of butane and what masses of carbon dioxide and water are produced?	

- During physical activity, lactic acid forms in the muscle tissue and is responsible for muscle soreness. Elemental analysis shows that it contains by mass 40.0% C, 6.71% H and 53.3% O. Determine the empirical formula of lactic acid.

4

Answer:

Given that lactic acid has a molar mass of 90.08 g mol^{-1}, determine its molecular formula.

Answer:

- If 50 mL of a 0.10 M solution of $AgNO_3$ is mixed with 50 mL of a 0.40 M solution of Na_2CO_3, what mass of Ag_2CO_3 will precipitate from the reaction?

Marks 4

Answer:

What is the final concentration of CO_3^{2-} ions in the solution after the above reaction?

Answer:

- Give balanced ionic equations for the reactions that occur in each of the following cases.

3

Sodium metal is added to excess water.

Solutions of cobalt(II) nitrate and sodium phosphate are mixed.

Solid calcium carbonate is dissolved in dilute nitric acid.

	Marks
• Balance the following nuclear reactions by identifying the missing nuclear particle.	**2**

$$^{234}_{90}\text{Th} \rightarrow \square + {}^{0}_{-1}\text{e}$$

$$^{234}_{92}\text{U} \rightarrow \square + {}^{4}_{2}\text{He}$$

• A nugget contains 2.6×10^{24} atoms of gold. What amount of gold (in mol) is in this nugget and what is its mass (in kg)?	**2**

Amount:	Mass:

Marks 7

- The complete combustion of propane, C_3H_8, in air gives water and carbon dioxide as the products? Write a balanced equation for this reaction.

What mass of oxygen is required for the complete combustion of 454 g of propane and what masses of CO_2 and H_2O are produced?

Explain the "law of conservation of mass". Show whether or not the above combustion conforms to this law.

Marks 3

- The reaction of methane and water is one way to prepare hydrogen for use as a fuel.

$$CH_4(g) + H_2O(g) \rightarrow CO(g) + 3H_2(g)$$

Which compound is the limiting reactant if you begin with 995 g of methane and 2510 g of water?

Answer:

What mass of the excess reactant remains when the reaction is completed?

Answer:

Marks

- An unknown compound contains carbon and hydrogen only. If 0.0956 g of the compound is burned in oxygen, 0.300 g of CO_2 and 0.123 g of H_2O are isolated. What is the unknown compound's empirical formula?

4

Answer:

If its molar mass is found to be 70.1 g mol^{-1}, what is its molecular formula?

Answer:

- What amount (in mol) of chloride ion is contained in 100 mL of 0.25 M magnesium chloride solution?

1

Answer:

- If 25.0 mL of 1.50 M hydrochloric acid is diluted to 500 mL, what is the molar concentration of the diluted acid?

1

Answer:

- Write a balanced **ionic** equation for the reaction of solid sodium hydrogencarbonate, $NaHCO_3$, and dilute sulfuric acid, H_2SO_4.

2

Marks

- The element boron forms a series of hydrides, which includes B_2H_6, B_4H_{10}, B_5H_9, B_6H_{10} and $B_{10}H_{14}$. Which one of these hydrides consists of 85.63% boron by mass? **2**

Answer:

- Complete the following table. **2**

Formula	Name
K_2SO_4	
	copper(II) chloride
SF_4	
	potassium chromate

Marks

- Solid sodium hydroxide reacts with carbon dioxide to produce sodium carbonate and water. Calculate the mass of sodium hydroxide required to prepare 53.0 g of sodium carbonate.

3

Answer:

- Analysis of an unknown compound returned the following percentage composition by weight:

  nitrogen: 26.2%; chlorine: 66.4% hydrogen 7.5%

  What is the empirical formula of this compound?

3

Answer:

- The relative atomic mass of magnesium is reported as 24.3. Show how this figure is calculated given the natural abundances of the following isotopes of magnesium: ^{24}Mg (79.0 %); ^{25}Mg (10.0 %); ^{26}Mg (11.0 %). **Marks 2**

- With examples, briefly explain what allotropes are. **2**

- Complete the following table. **2**

Formula	Name
Na_2CO_3	
	iron(III) oxide
PCl_3	
	ammonia