



# Chem!stry

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## Mole Calculations Assignment Nine – Multiple Choice Questions

1. A hydrocarbon was found to contain 80.0 % carbon and 20.0 % hydrogen by mass. What is the empirical (simplest) formula of the hydrocarbon?

A CH<sub>2</sub>            B CH<sub>3</sub>            C CH<sub>4</sub>            D CH<sub>5</sub>

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2. What is the number of moles of hydrogen atoms in 3.20 g of methane?

A 0.02            B 0.2            C 0.4            D 0.8

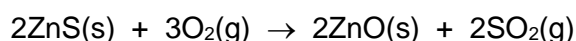
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3. 6.0 g of anhydrous magnesium sulfate combines with 6.3 g of water to form hydrated magnesium sulfate. What is the formula of the hydrated magnesium sulfate?

A MgSO<sub>4</sub>·3H<sub>2</sub>O                            B MgSO<sub>4</sub>·5H<sub>2</sub>O  
C MgSO<sub>4</sub>·7H<sub>2</sub>O                            D MgSO<sub>4</sub>·9H<sub>2</sub>O

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4. What volume of sulfur dioxide (at room temperature and pressure) is produced by heating 4.85 g of zinc sulfide, ZnS?



A 1.2 dm<sup>3</sup>            B 2.4 dm<sup>3</sup>            C 3.6 dm<sup>3</sup>            D 4.8 dm<sup>3</sup>

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5. An oxide of titanium (symbol, Ti) contains 60% by mass of titanium. What is the empirical (simplest) formula for this oxide?

A TiO            B TiO<sub>2</sub>            C Ti<sub>2</sub>O            D Ti<sub>2</sub>O<sub>3</sub>

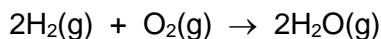
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6. A 240 g sample of hydrated sodium sulfide contains 162 g of water of crystallisation. What is the correct molecular formula of this compound?

A Na<sub>2</sub>S·3H<sub>2</sub>O                            B Na<sub>2</sub>S·5H<sub>2</sub>O  
C Na<sub>2</sub>S·7H<sub>2</sub>O                            D Na<sub>2</sub>S·9H<sub>2</sub>O

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7. The equation for the burning of hydrogen is:



One mole of hydrogen gas is mixed with one mole of oxygen gas and burnt. What will be present after the reaction?

- A** 1 mol of steam only.  
**B** 1 mol of steam and 0.5 mol of oxygen gas.  
**C** 1 mol of steam and 0.5 mol of hydrogen gas.  
**D** 2 mol of steam only.

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8. Sodium hydrogencarbonate decomposes on heating:



In an experiment, a 336 g sample of sodium hydrogencarbonate was heated. What volume of carbon dioxide, measured at room temperature and pressure, was evolved?

- A** 24 dm<sup>3</sup>      **B** 36 dm<sup>3</sup>      **C** 48 dm<sup>3</sup>      **D** 60 dm<sup>3</sup>

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9. A compound is found to have the following percentage composition by mass:

silicon = 87.5 %

hydrogen = 12.5%

What is the empirical (simplest) formula of this compound?

- A** SiH<sub>2</sub>      **B** SiH<sub>3</sub>      **C** SiH<sub>4</sub>      **D** Si<sub>2</sub>H<sub>6</sub>

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10. A sample of 50 cm<sup>3</sup> of carbon monoxide was burned in 50 cm<sup>3</sup> of oxygen. What was the composition of the gas remaining after the reaction? (Assume that all measurements were made at the same temperature and pressure).

- A** 50 cm<sup>3</sup> of carbon dioxide only.  
**B** 100 cm<sup>3</sup> of carbon dioxide only.  
**C** 50 cm<sup>3</sup> of carbon dioxide and 25 cm<sup>3</sup> of excess oxygen.  
**D** 50 cm<sup>3</sup> of carbon dioxide and 25 cm<sup>3</sup> of excess carbon monoxide.

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11. Sodium hydrogencarbonate decomposes on heating:



In an experiment, a 420 g sample of sodium hydrogencarbonate was heated. What volume of carbon dioxide, measured at room temperature and pressure, was evolved?

- A** 24 dm<sup>3</sup>      **B** 36 dm<sup>3</sup>      **C** 48 dm<sup>3</sup>      **D** 60 dm<sup>3</sup>

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12. What is the mass of magnesium that completely reacts with 250 cm<sup>3</sup> of 1.0 mol/dm<sup>3</sup> sulfuric acid?  
A 6 g                      B 12 g                      C 48 g                      D 96 g  
(     )
13. A volume of ethane, C<sub>2</sub>H<sub>6</sub>, at r.t.p. has a mass of 20 g. What is the mass of an equal volume of propene, C<sub>3</sub>H<sub>6</sub>, at r.t.p.?  
A 20 g                      B 21 g                      C 28 g                      D 42 g  
(     )
14. What is the ratio of the volume of 4 g of hydrogen to the volume of 16 g of methane, both volumes at r.t.p.?  
A 1 to 1                      B 1 to 2                      C 1 to 8                      D 2 to 1  
(     )
15. What is the mass of aluminium in 204 g of aluminium oxide, Al<sub>2</sub>O<sub>3</sub>?  
A 26 g                      B 27 g                      C 54 g                      D 108 g  
(     )
16. Which quantity is the same for one mole of ethanol and one mole of ethane?  
A Mass    B Number of atoms  
C Number of molecules                      D Volume at r.t.p.  
(     )
17. A beaker contains 30 cm<sup>3</sup> of 0.03 mol/dm<sup>3</sup> sulfuric acid. Which volume of 0.03 mol/dm<sup>3</sup> sodium hydroxide must be added to exactly neutralise all of the acid?  
A 27 cm<sup>3</sup>                      B 30 cm<sup>3</sup>                      C 60 cm<sup>3</sup>                      D 90 cm<sup>3</sup>  
(     )
18. Which volume of 0.1 mol/dm<sup>3</sup> hydrochloric acid is required to react completely with 25 cm<sup>3</sup> of 0.2 mol/dm<sup>3</sup> aqueous sodium carbonate?  
A 100 cm<sup>3</sup>                      B 50 cm<sup>3</sup>                      C 25 cm<sup>3</sup>                      D 6.25 cm<sup>3</sup>  
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19. 20 cm<sup>3</sup> of an aqueous 1.0 mol/dm<sup>3</sup> solution of the hydroxide of metal **X** exactly neutralises 40 cm<sup>3</sup> of aqueous 0.25 mol/dm<sup>3</sup> sulfuric acid. What is the formula for the sulfate of **X**?  
A X<sub>2</sub>SO<sub>4</sub>                      B XSO<sub>4</sub>                      C X<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>                      D X(SO<sub>4</sub>)<sub>2</sub>  
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20. Silver nitrate (formula,  $\text{AgNO}_3$ ) is very soluble in water. The table shows the volumes of solution obtained by dissolving various masses of  $\text{AgNO}_3$  in different volumes of water at room temperature:

Mass of silver nitrate / g	1.0	2.0	3.0	4.0	5.0	6.0	7.0
Volume of water / $\text{cm}^3$	9.0	8.0	7.0	6.0	5.0	4.0	3.0
Volume of solution / $\text{cm}^3$	9.2	8.4	7.6	6.8	6.0	5.2	4.4

What mass of  $\text{AgNO}_3$ , dissolved in  $20 \text{ cm}^3$  of water, will give  $26 \text{ cm}^3$  of solution?

- A 6.0 g      B 16 g      C 20 g      D 30 g

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21.  $54 \text{ g}$  of water contains the same number of molecules as:

- A 34 g of ammonia      B 6 g of hydrogen  
C 14 g of nitrogen      D 4 g of helium

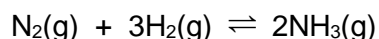
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22. What is the concentration of  $\text{Na}^+$  ions in a  $0.05 \text{ mol/dm}^3$  solution of sodium carbonate,  $\text{Na}_2\text{CO}_3$ ?

- A  $0.05 \text{ mol/dm}^3$       B  $0.10 \text{ mol/dm}^3$       C  $0.15 \text{ mol/dm}^3$       D  $0.20 \text{ mol/dm}^3$

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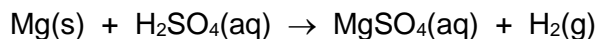
23.  $9 \text{ dm}^3$  of hydrogen reacted with excess nitrogen to form  $2 \text{ dm}^3$  of ammonia. What is the percentage yield of ammonia at room temperature and pressure?



- A 33%      B 66%      C 22%      D 54%

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24. When  $0.1 \text{ g}$  of magnesium is treated with an excess of sulfuric acid, what volume of gas at room temperature and pressure will be produced?



- A  $10 \text{ cm}^3$       B  $100 \text{ cm}^3$       C  $24 \text{ cm}^3$       D  $48 \text{ cm}^3$

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25. One volume of gaseous element  $\text{X}_2$  combines with 2 volumes of gaseous hydrogen to form 2 volumes of a gaseous hydride. The correct formula for the hydride of X is:

- A HX      B  $\text{H}_2\text{X}$       C  $\text{HX}_2$       D  $\text{XH}_3$

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26. Avogadro's Law states that any two samples of gases at the same temperature and pressure would contain the same number of gaseous molecules. A student determined that 1500 cm<sup>3</sup> of oxygen gas contained  $x$  number of oxygen molecules at room temperature and pressure. Which of the following inferences is **incorrect**?

	Gas	Volume / cm <sup>3</sup>	Number of molecules	Number of atoms
A	Hydrogen	1500	$x$	$2x$
B	Carbon Dioxide	4500	$3x$	$9x$
C	Ammonia	1500	$x$	$4x$
D	Argon	3000	$2x$	$4x$

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27. When 0.002 mol of a metal  $X$  was reacted with an excess of dilute acid, 48 cm<sup>3</sup> of hydrogen were produced (measured at room temperature and pressure). Which one of the following is the correct equation for the reaction?



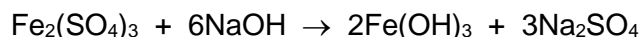
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28. When one mole of each of the following is completely burned in oxygen, which gives the largest mass of carbon dioxide?



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29. A solution containing one mole of sodium hydroxide is added to a solution containing one mole of iron(III) sulfate. The equation for the reaction is shown below.

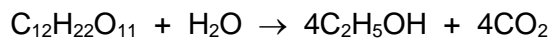


What is the number of moles of iron(III) hydroxide precipitated?



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30. When sugar ( $M_r = 342$ ) is fermented using yeast, the reaction below takes place.



What volume of carbon dioxide (measured at room temperature and pressure) would be produced by the complete fermentation of 1000 g of sugar?

A  $\frac{342 \times 4 \times 24}{1000} \text{ dm}^3$

B  $\frac{1000 \times 4 \times 24}{342} \text{ dm}^3$

C  $\frac{342 \times 24}{1000 \times 4} \text{ dm}^3$

D  $\frac{1000 \times 24}{342 \times 4} \text{ dm}^3$

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- Scan the QR code below for the answers to this assignment.



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