

Instructions

-If a question has 2 steps round the first answer off to 4 decimal places, and always round the final answers off to 2 decimal places

-use a comma for decimal numbers

-when typing a unit with exponents, just type them as normal numbers, eg mol.dm-3 (no spaces)

$n = \frac{m}{M}$	Avogadro's constant: $N_A = 6.02 \times 10^{23}$ Molar gas volume at STP: $V_m = 22.4 \text{ dm}^3$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$	$c = \frac{m}{MV}$	$n = \frac{V}{V_m}$

Question 1

Multiple choice questions: Only write the letter of the correct option:

1.1 The number of moles in 22,4 dm³ of helium at STP is equal to ...

- A 0,5 mol of He atoms
- B 1 mol of He atoms
- C 1,5 mol of He atoms
- D 2 mol of He atoms

(2)

1.2 A molecule has an empirical formula of C_2H_7 . So, its true/molecular formula could be ...

- A C_3H_8
- B C_4H_9
- C C_6H_{21}
- D $CH_{3,5}$

1.3 What is the relative molar mass of $Al_2(CO_3)_3$?

- A. $186g.mol^{-1}$
- B. $114g.mol^{-1}$
- C. $234g.mol^{-1}$
- D. $138g.mol^{-1}$

Question 2

2.1 Calculate the number of moles in 46.6g aluminum metal.

(3)

Answer (2 deci)	Unit
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$n =$

{only type in final answer with the correct unit, correct to 2 decimal places}

2.2 Calculate the mass of 2.5 moles of calcium hydroxide $\text{Ca}(\text{OH})_2$ (3)

Answer (2
deci)

Unit

m = _____ {only type in final answer with the correct unit, correct to 2 decimal places}

Question 3

3.1 How many particles are there in 1 mole of any substance? (1)

= _____ x 10 particles {2 decimals}

3.2 Calculate the number of molecules in 10 moles of sodium hydroxide (NaOH .) (3)

n = _____ x 10 _____ {2 decimals}

3.3 Calculate the number of atoms in 18 g of Bromine gas. (5)

***Hint – this calculation requires 2 steps.**

Step one answer = _____ {leave as 4 decimal places}

Step two answer = _____ x 10 _____ {4 decimal places}

Step three answer = _____ x 10 _____ {2 decimal places}

Question 4

4.1 Calculate the concentration of a sodium nitrate solution if 6.25g of NaNO_3 is dissolved in water to make a 220cm^3 solution. (5)

***Hint – this calculation requires 2 steps, unless you use the shortcut formula of**

$$c = \frac{m}{MV}$$

If you complete the question in 2 steps:

Step one answer = _____ {leave as 4 decimal places}

Step two answer = _____ { 2 decimal places}

Or (Try this one 😊) $c = \frac{m}{MV}$

= _____ { 2 decimals}

Question 5

A component of protein called serine has an approximate molar mass of 105g mol^{-1} . If the percent composition is as follows, what is the

- a) empirical and
- b) molecular formula of serine?

C = 34.95 % H= 6.844 % O = 46.56 % N= 13.59%

Answer

Unit



a) C: n = _____ {4 decimals}

(7)

H: n = _____ {3 decimals}

O: n = _____ {2 decimals}

N: n = _____ {4 decimals}

Then when you simplify the above ratio, the empirical formula will be:

C H O N

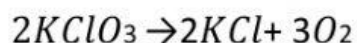
b) calculate the ratio to determine the molecular/true formula

ratio = x _____

Thus the molecular formula is C H O N

Question 6

***Hint – mole ratio question**



What mass of potassium chlorate ($KClO_3$) should be heated to produce 24g of O_2 ?

(5)

$2KClO_3$	$2KCl$	$3O_2$
Step 2 n = _____		Step 1 n = _____
Step 3 m = _____		

Question 7

Consider the balanced equation:



42.5g of NH_3 and 80g of O_2 are added together.

7.1 Show by means of calculation which reactant is used up first (limiting reagent).

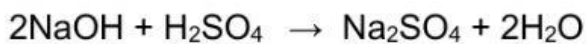
(6)

4NH_3	5O_2	4NO	$6\text{H}_2\text{O}$
Given: n = _____	n = _____		
Needed: n = _____ Limiting / excess	n = _____ Limiting / excess		

7.2 Calculate the mass of H_2O that forms in the reaction.

4NH_3	5O_2	4NO	$6\text{H}_2\text{O}$
			n = _____ m = _____

Question 8



280 g of impure sodium hydroxide is added to a hydrochloric acid solution. If 355 g of sodium sulphate forms at the end of the reaction, calculate the percentage purity of the sodium hydroxide sample. [6]

The format below is there to help you:

{The steps have also been numbered to assist}

2NaOH	H_2SO_4 →	Na_2SO_4
Step 2: n = _____ step 3: m = _____ step 4: % purity = _____%		Step 1: n = _____ (6)