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VCE Chemistry ½

Moles & Stoichiometry Revision [2.4]

Test Solutions

21 Marks. 1 Minute Reading. 16 Minutes Writing

Results:

Quiz Questions	_____ /16
Extension	_____ /5

Section A: Quiz Questions (16 Marks)

Question 1 (4 marks)

Tick whether the following statements are **true** or **false**:

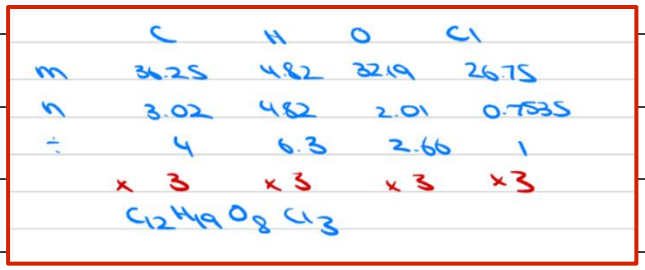
Statement	True	False
a. Moles refer to a unit of measurement used in chemistry, which helps chemists quantify the number of atoms, molecules, or particles present.	✓	
b. Avogadro's number is a constant that can only be used in chemistry to quantify atoms or molecules since it only applies to atoms and molecules.		✓
c. In a sample which contains 7.0 mol of water molecules, there will be a greater number of hydrogen moles, compared to the moles of oxygen.	✓	
d. Typically, the "m" symbol stands for molar mass whereas the "M" symbol stands for mass measured or obtained.		✓
e. The empirical formula of glucose is $C_6H_{12}O_6$, whereas the molecular formula of glucose is CH_2O.		✓
f. An isotope refers to a variation of a form of an atom, which has the same number of protons but a different number of neutrons.		✓
g. The mass-to-charge ratio in mass spectrometry is used to determine the mass of a component since the charge is typically assumed to be 1.	✓	
h. In stoichiometry, we can use the mass of one reactant to directly identify the mass of another reactant that will be used given that we have a balanced equation.		✓

Space for Personal Notes

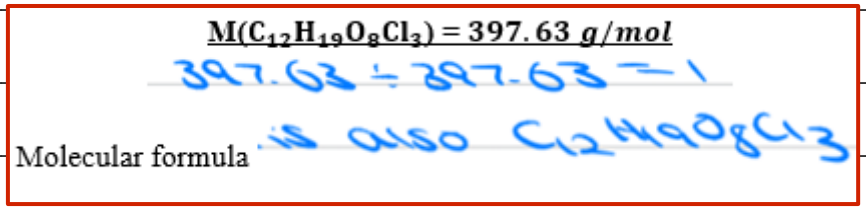
Question 2 (5 marks)

Sucralose is a synthetic sweetener that is a common ingredient in the world's food supply. It works in the body to produce a sweet sensation and is associated with hormone release. In the lab, a chemist is working with the sucralose molecule and identifies that it contains a percentage composition of 36.25% carbon, 4.82% hydrogen, 26.75% chlorine and 32.19% oxygen.

a. Identify the empirical formula of sucralose. (3 marks)



b. Given that sucralose has a molar mass of 397.63 g/mol, identify the molecular formula of sucralose. (2 marks)



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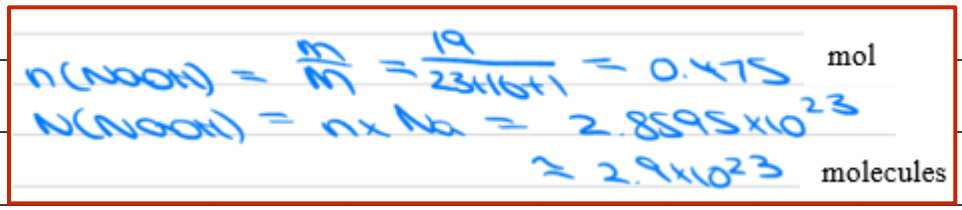
Question 3 (7 marks)

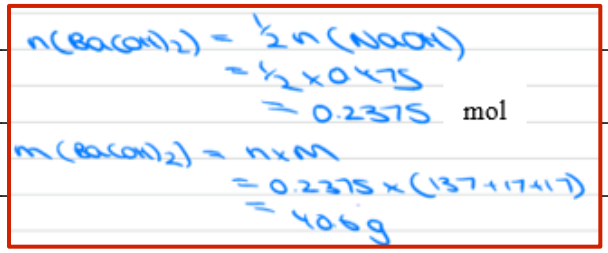
Kevin is working away in the lab with his peers when he comes across an interesting reaction. It involves the spontaneous interaction between pure sodium hydroxide and barium sulfate.

a. Write out the equation for the reaction between the two reactants. (1 mark)

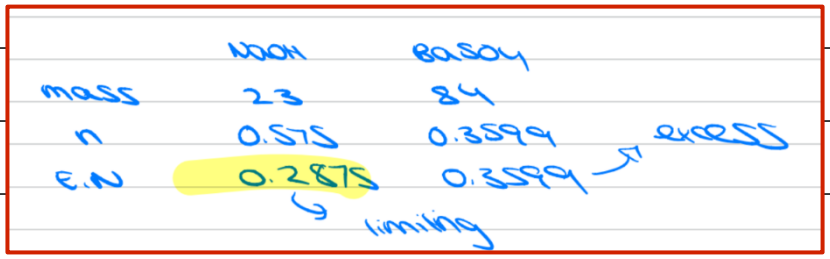
b. Kevin first reacts 19.0 grams of sodium hydroxide. How many molecules of sodium hydroxide would be present in this sample? (2 marks)



c. Given that Kevin reacts the 19.0 grams of sodium hydroxide in the presence of excess barium sulfate, how many grams of the barium-containing salt would be produced? (2 marks)



d. In another experiment, Kevin changes his measurements and instead reacts 23.0 grams of sodium hydroxide with 84.0 grams of barium sulfate. Identify the excess and limiting reagents in Kevin's new experiment. (2 marks)



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Section B: Extension (5 Marks)

Question 4 (5 marks)

Strontium chloride and sodium sulfate react in a way to produce a precipitate. The general reaction is provided without states below:

$$Na_2SO_4 + SrCl_2 \rightarrow 2NaCl + SrSO_4$$

a. Identify the precipitant that would form. (1 mark)

$SrSO_4$

b. Given that 12 grams of the said precipitant were formed, how many grams of sodium sulfate would have been reacted? (2 marks)

b) $n(SrSO_4) = \frac{12}{87.6+32.1+(16\times4)}$

$= \frac{12}{183.7} = 0.0653$ mol

$n(Na_2SO_4) = n(SrSO_4) = 0.0653$ mol

$m(Na_2SO_4) = 0.0653 \times (23\times2+32.1+(16\times4)$

$= 0.0653 \times 142.1$

$= 9.279$ g

c. If, in this reaction, the chemist adds 0.9 grams of strontium chloride into the reaction mixture to facilitate the reaction, how many atoms of chlorine are there in this? (2 marks)

$n(SrCl_2) = \frac{0.9}{87.6+71} = 0.00567$ mol

$N(SrCl_2) = n \times N_A$

$= 0.00567 \times 6.02 \times 10^{23}$

$= 3.41 \times 10^{22}$ atoms

$N(Cl) = 6.82 \times 10^{22}$ atoms

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