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VCE Chemistry ½
Moles & Molar Mass [2.1]
Homework

Admin Info & Homework Outline:

Student Name	
Questions You Need Help For	
Compulsory Questions	Pg 2 - Pg 12
Supplementary Questions	Pg 13 - Pg 24

Section A: Compulsory Questions (50 Marks)

Sub-Section [2.1.1]: Apply Avogadro's Number to Mole Calculations using $n = N/N_a$

Question 1 (4 marks)

For the following, find the required value.

a. If a sample contained 2 moles of H_2 gas, how many particles of H_2 does it contain? (1 mark)

b. Given that 9.03×10^{24} molecules of water existed, how many moles of water are in the sample? (1 mark)

c. How many particles exist in 4.5 moles of CH_4? (1 mark)

d. How many moles are in 1.89×10^{24} molecules of neon gas? (1 mark)

Question 2 (3 marks)

Find the number of particles in the following.

a. In 3 moles of H_2, find the particles of hydrogen. (1 mark)

b. In 5 moles of NaCl, find the particles of sodium. (1 mark)

c. In 3.06×10^{25} particles of nitrogen in nitrogen gas, find the moles of nitrogen gas. (1 mark)

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Question 3 (6 marks)

Consider the compound of methane, CH_4.

a. If there are 3.01×10^{24} molecules of methane, how many moles of methane are present? (1 mark)

_____

b. How many carbon atoms are there in this amount of methane? (1 mark)

_____

_____

c. How many hydrogen atoms are there in this amount of methane? (1 mark)

_____

_____

d. Given that we have 3.311×10^{24} atoms of hydrogen in a sample of methane, calculate the moles of methane we have in total. (3 marks)

_____

_____

_____

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Sub-Section [2.1.2]: Apply Molar Mass to Mole Calculations using $n = m/M$

Question 4 (4 marks)

For the following substances, find their molar mass.

a. NH_3. (1 mark)

b. $ZnSO_4$. (1 mark)

c. KI. (1 mark)

d. $AgNO_3$. (1 mark)

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Question 5 (4 marks)

For the following samples, calculate the amount required.

a. Given that there is 2.4 g of H_2O, calculate the moles present. (1 mark)

b. Given that there is 8.1 g of HCl, calculate the moles of hydrogen chloride. (1 mark)

c. Given that there are 2.00 moles of LiF, calculate the mass present. (1 mark)

d. Given that there are 4.50 moles of $NaNO_3$, calculate the mass present. (1 mark)

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Question 6 (6 marks)

a. Explain what molar mass is. (2 marks)

_____

_____

b. Given that a sample contains 5.90 moles and weighs 250.75 grams, what is its molar mass? (2 marks)

_____

_____

c. Based on this information, we also know that the compound contains 2 atoms, with one of them being lithium. What is the other atom? (2 marks)

_____

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Sub-Section [2.1.3]: Apply Unit Conversions to Calculation Questions

Question 7 (4 marks)

For the following, convert the current units to the units required.

a. 1.30 kg to mg. (1 mark)

_____

b. 2 days to minutes. (1 mark)

_____

c. 5000 micrograms to grams. (1 mark)

_____

d. 100 decimetres to millimetres. (1 mark)

_____

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Question 8 (4 marks)

Find the missing value for the following questions.

a. Given that a sample of $NaNO_3$ weighed $5.00\ kg$, what is the number of moles present? (1 mark)

b. Given that another sample of $AlCl_3$ weighed $1260\ mg$, what is the number of atoms of chlorine present? (3 marks)

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Question 9 (5 marks)

Consider the compound, sodium sulphate.

a. What is its molar mass? (1 mark)

_____

b. Given that, a sample contains 5.432×10^{-3} kilograms, what is the number of moles present? (2 marks)

_____

_____

_____

c. Now, based on your answer, find the mass of sodium in the sample, expressed in micrograms. (2 marks)

_____

_____

_____

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Sub-Section: Final Boss

Question 10 (10 marks)

Consider an experiment where the aim is to experimentally determine Avogadro's number using a sample of potassium phosphate.

a. What is the molar mass of potassium phosphate? (1 mark)

b. Calculate the amount of moles of potassium phosphate present, given that the sample weighed out to be $39\ mg$. (3 marks)

c. On the other hand, we know that the amount of potassium in the sample was equivalent to $1.966 \times 10^{-5}\ kg$. What is the amount of potassium atoms? For this question, you can use the known value of N_A. (2 marks)

d. Given the information above, now find the experimental value of Avogadro's number. (2 marks)

e. Briefly explain why Avogadro's number has the units it does. (2 marks)

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Section B: Supplementary Questions (61 Marks)

Sub-Section [2.1.1]: Apply Avogadro's Number to Mole Calculations using $n = N/N_a$

Question 11 (4 marks)

For the following questions, calculate the amount required.

a. The moles of magnesium atoms in 1.204×10^{24} particles. (1 mark)

_____

_____

b. The particles of argon atoms in 19 moles. (1 mark)

_____

_____

c. The moles of francium atoms in 3.913×10^{24} particles. (1 mark)

_____

_____

d. The particles of copper atoms in 9.654 moles. (1 mark)

_____

_____

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Question 12 (4 marks)

Find the number of particles in the following.

a. In 2 moles of O_2, find the particles of oxygen atoms. (1 mark)

_____

_____

b. In 4 moles of $CaCl_2$, find the particles of calcium ions. (1 mark)

_____

_____

c. If we knew that a sample of CO_2 contained 1.20×10^{24} particles of oxygen, how many moles of CO_2 were there? (2 marks)

_____

_____

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Question 13 (6 marks)

Consider the compound of ammonia, NH_3.

a. If there are 6.02×10^{24} molecules of ammonia, how many moles of ammonia are present? (1 mark)

b. How many nitrogen atoms are there in this amount of ammonia? (1 mark)

c. How many hydrogen atoms are there in this amount of ammonia? (1 mark)

d. Given that we have 4.518×10^{24} atoms of hydrogen in a sample of ammonia, calculate the moles of ammonia we have in total. (3 marks)

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Question 14 (6 marks)

Consider the compound of $KMnO_4$, or commonly referred to as potassium permanganate.

a. Given that we have 6.41×10^{29} particles of oxygen, what number of particles of manganese and potassium do we have? (2 marks)

b. Hence, what number of moles of potassium permanganate do we have? (1 mark)

c. A student says that for 100 molecules of O_2 versus 100 molecules of Se_2, because Se is a much bigger molecule than O, their amount in moles will be different. Evaluate this statement. (3 marks)

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Sub-Section [2.1.2]: Apply Molar Mass to Mole Calculations using $n = m/M$

Question 15 (4 marks)

For the following substances, find their molar mass.

a. CO_2. (1 mark)

_____

b. KCl. (1 mark)

_____

c. $CaCO_3$. (1 mark)

_____

d. $C_6H_{12}O_6$. (1 mark)

_____

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Question 16 (4 marks)

For the following samples, calculate the amount required.

a. Given that there is 5.0 g of CO_2, calculate the moles present. (1 mark)

b. Given that there is 10.0 g of NaOH, calculate the moles of sodium hydroxide. (1 mark)

c. Given that there are 3.00 moles of $MgCl_2$, calculate the mass present. (1 mark)

d. Given that there are 2.50 moles of KNO_3, calculate the mass present. (1 mark)

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Question 17 (5 marks)

a. Given that a sample contains 12.50 moles and weighs 778.75 moles, what is its molar mass? (2 marks)

_____

b. Based on your understanding of molar mass, is it reasonable to assume that 10 g of $NaNO_3$ will be similar in amount to 10 g of $CsNO_3$? Explain. (3 marks)

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Question 18 (7 marks)

Consider an unknown chemical X_2O. We know that there are 7.89×10^{25} atoms of oxygen in this sample.

a. What is the number of individual atoms in our sample? (2 marks)

b. Find the moles of X_2O. (2 marks)

c. If the compound is 12345 grams, find its molar mass. (2 marks)

d. What is X's identity? (1 mark)

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Sub-Section [2.1.3]: Apply Unit Conversions to Calculation Questions

Question 19 (4 marks)

For the following, convert the current units to the units required.

a. Convert 5.50 kg to grams. (1 mark)

_____

b. Convert 3 hours to seconds. (1 mark)

_____

c. Convert 7500 milligrams to kilograms. (1 mark)

_____

d. Convert 25 micrometres to metres. (1 mark)

_____

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Question 20 (4 marks)

Find the missing value for the following scenarios.

a. Given that a sample of K_2SO_4 weighed 2.50 kg, what is the number of moles present? (1 mark)

b. Given that another sample of $CaCl_2$ weighed 980 mg, what is the number of atoms of chlorine present? (3 marks)

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Question 21 (5 marks)

Consider the compound of calcium bromide.

a. What is its molar mass? (1 mark)

b. Given that, a sample contains 9.7412×10^{-4} megagrams, what is the number of moles present? (2 marks)

c. Now, given that is the case, find the mass of bromine in the sample, expressed in milligrams. (2 marks)

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Question 22 (8 marks)

Consider a molecule of $K_2Cr_2O_7$, commonly referred to as potassium dichromate.

a. What is the molar mass of this molecule? (1 mark)

b. What type of intramolecular bonding holds this molecule together? (1 mark)

c. If there was 20.3 mg of potassium dichromate present, how many moles of it are present? (1 mark)

d. From your previous answer, calculate the number of molecules of potassium dichromate present. (2 marks)

e. Now, state how many kilograms of oxygen was present in the sample. (3 marks)

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