NEET 2025

CLASS 11

BASIC CONCEPTS OF CHEMISTRY

Lecture 3

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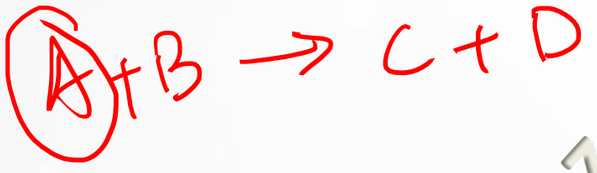
Contents

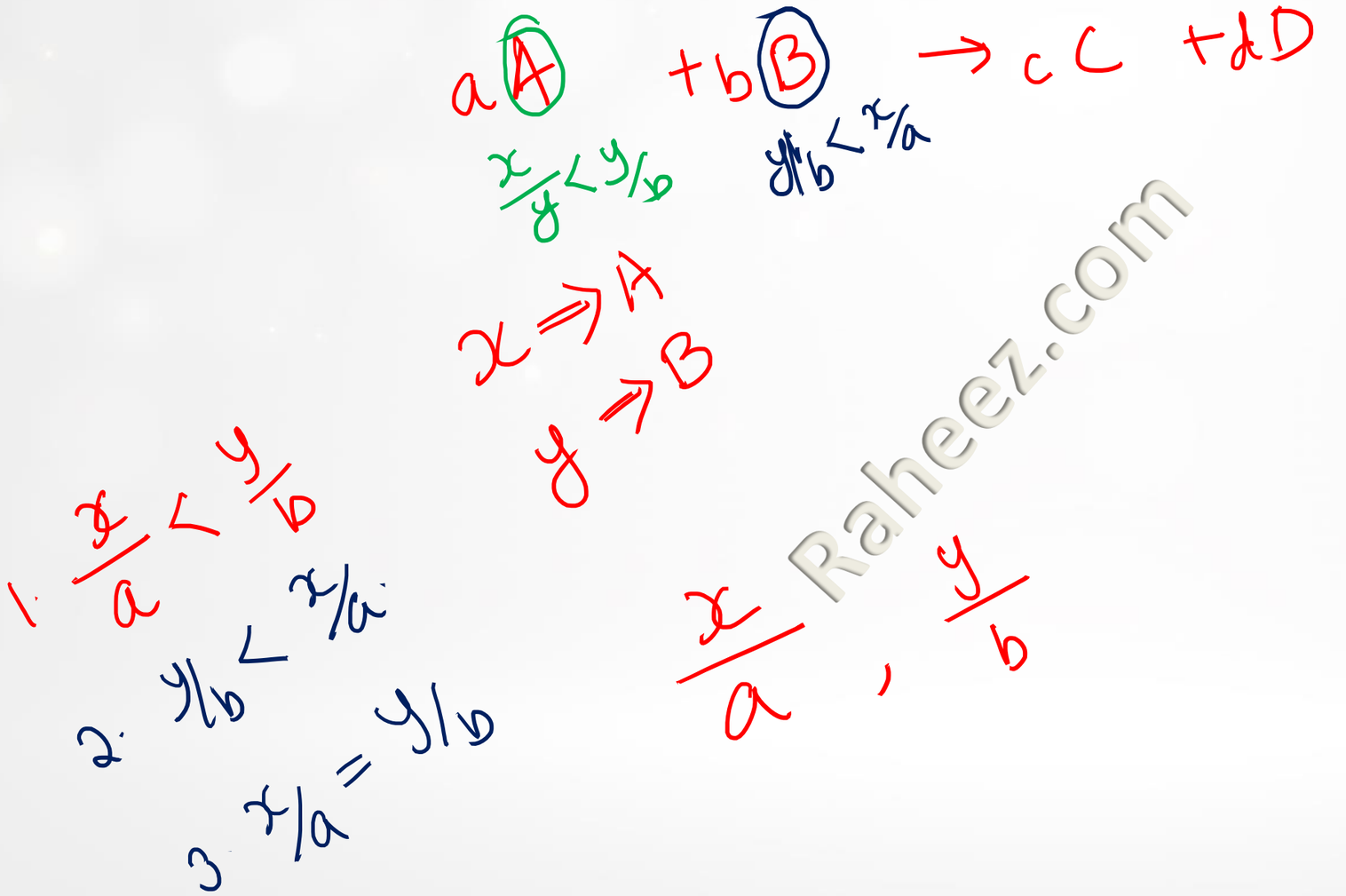
- The Limiting Reagent
- Empirical Formula
- Molecular Formula
- Examples

The Limiting Reagent

❖That reactant which is consumed first in a chemical reaction is called the limiting reagent



How To Find A Limiting Reagent?



Example

For a reaction,

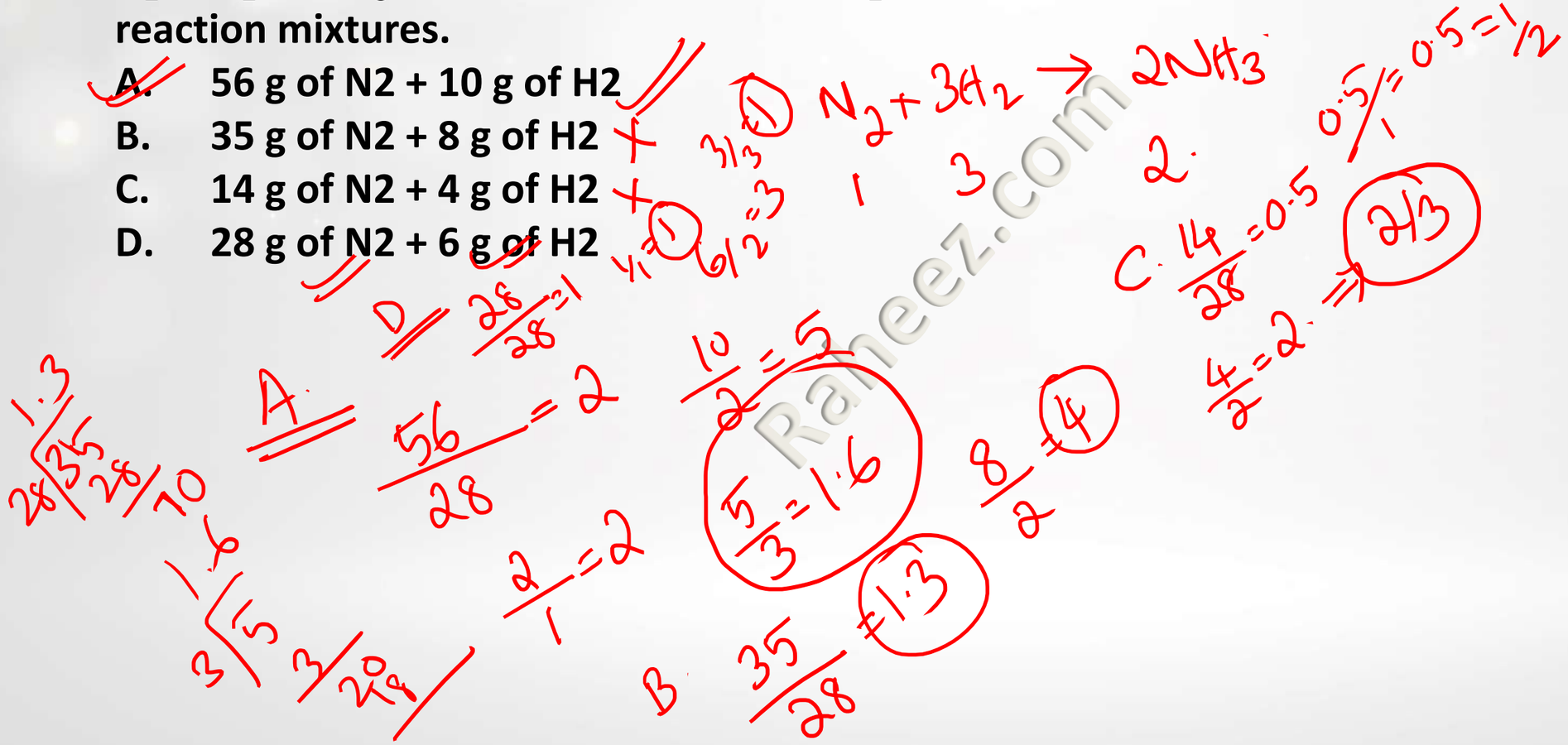
$N_2 + 3H_2 \rightarrow NH_3(g)$, identify dihydrogen H_2 as a limiting reagent in the following reaction mixtures.

A. 56 g of N2 + 10 g of H2

B. 35 g of N2 + 8 g of H2

C. 14 g of N2 + 4 g of H2

D. 28 g of N2 + 6 g of H2



Example

An amount of 5 moles of A, 6 moles of B and excess amount of C are mixed to produce a final product D, according to the reactions: $A + 2B \rightarrow I$, $I + C \rightarrow B + D$

What is the maximum moles of D, which can be produced assuming that the products formed can also be reused in the reactions?

A. 3 moles

B. 4.5 moles

C. 5 moles

D. 6 moles.

Example

An amount of 5 moles of A, 6 moles of B and excess amount of C are mixed to produce a final product D, according to the reactions: $A + 2B \rightarrow I$, $I + C \rightarrow B + D$
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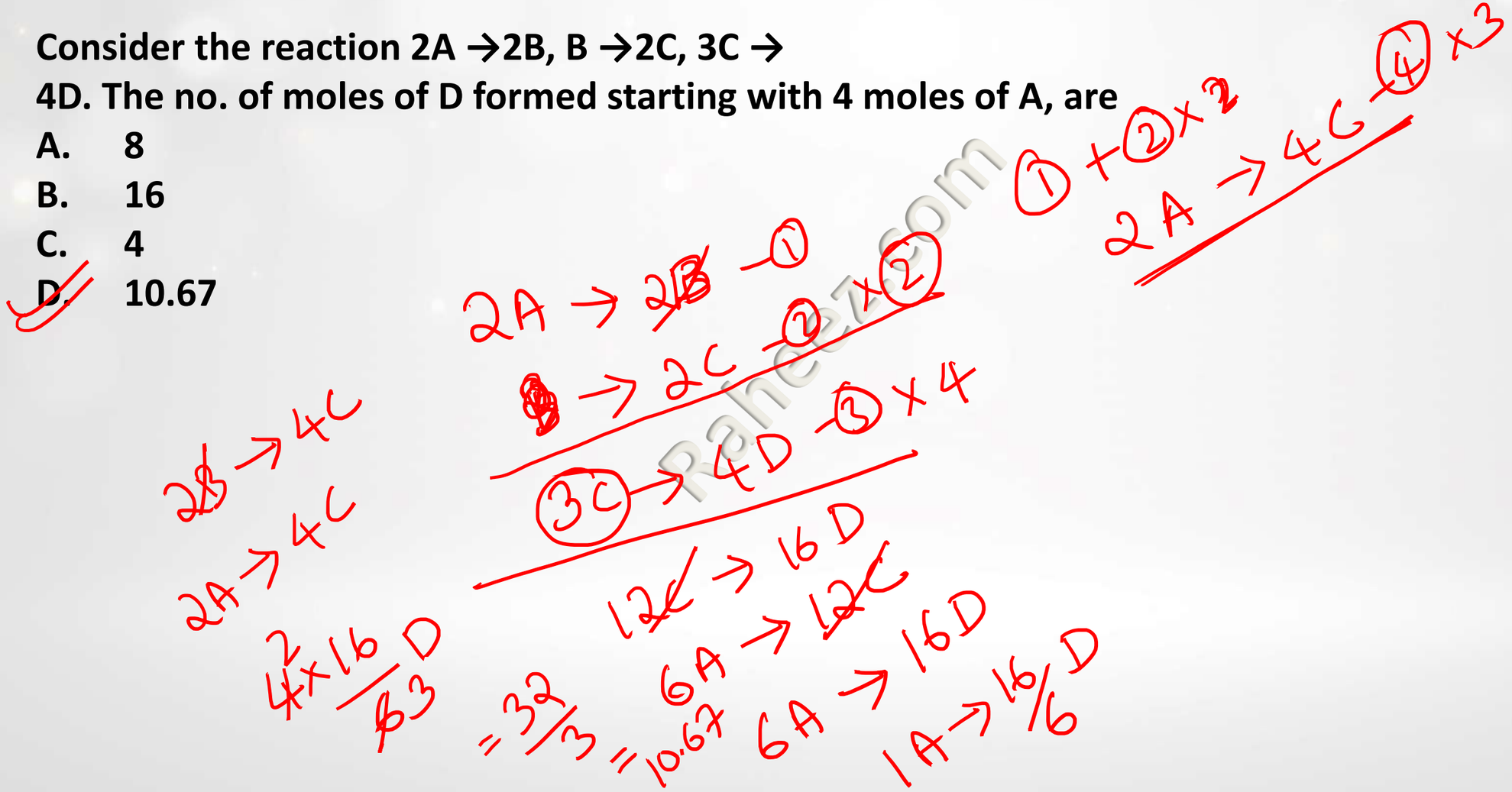
B. 4.5 moles
C. 5 moles
D. 6 moles.

Example

Consider the reaction 2A →2B, B →2C, 3C →
4D. The no. of moles of D formed starting with 4 moles of A, are

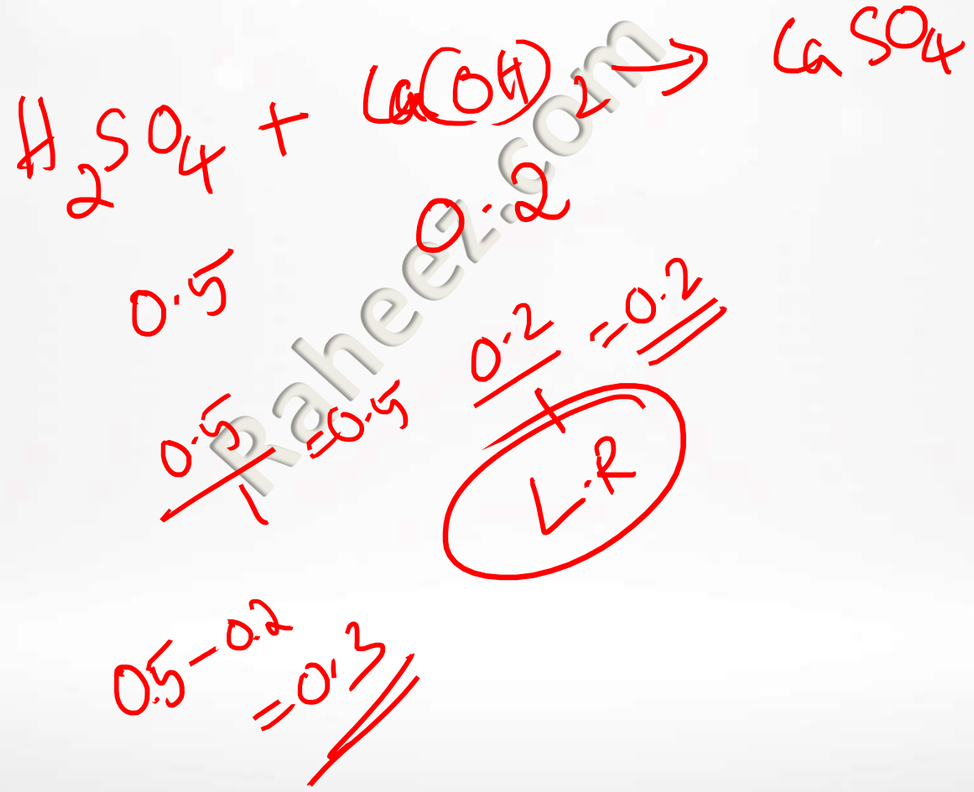
A. 8
B. 16
C. 4
D. 10.67



Example

0.5 mole of H2SO4 is mixed with 0.2 mole of Ca(OH)2. The maximum number of mole of CaSO4 formed is

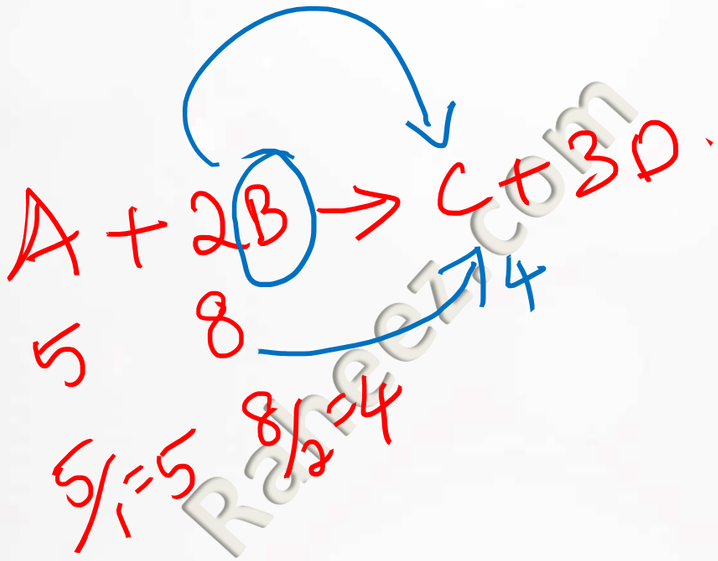
A.0.2
B.0.5
C.0.4
D.1.5



Example

For the reaction A + 2B → C + 3D, 5 moles of A and 8 mole s of B will produce

A. 5 moles of C
B. 4 moles of C
C. 8 moles of C
D. None of these



Empirical Formula

- **The Formula that shows the simplest ratio of atoms of various elements present in a molecule of a compound, is called Empirical Formula**

Substance	Molecular Formula	Empirical Formula
Benzene	C_6H_6	CH
Acetylene	C_2H_2	CH
Glucose	$C_6H_{12}O_6$	CH_2O
Water	H_2O	H_2O

Steps to Find Empirical Formula

- **Step 1:If given the % composition, assume a 100g sample then convert % to grams.**
- **Step 2: Use the atomic masses to convert grams to moles.**
- **Step 3: Divide the moles of each element by the SMALLEST mole fraction.**
- **Step 4: The results from step 3 should be a whole number, if not, make it so by multiplying by suitable integer**

Steps to Find Empirical Formula

→ Convert % into mass

→ Find out number of moles

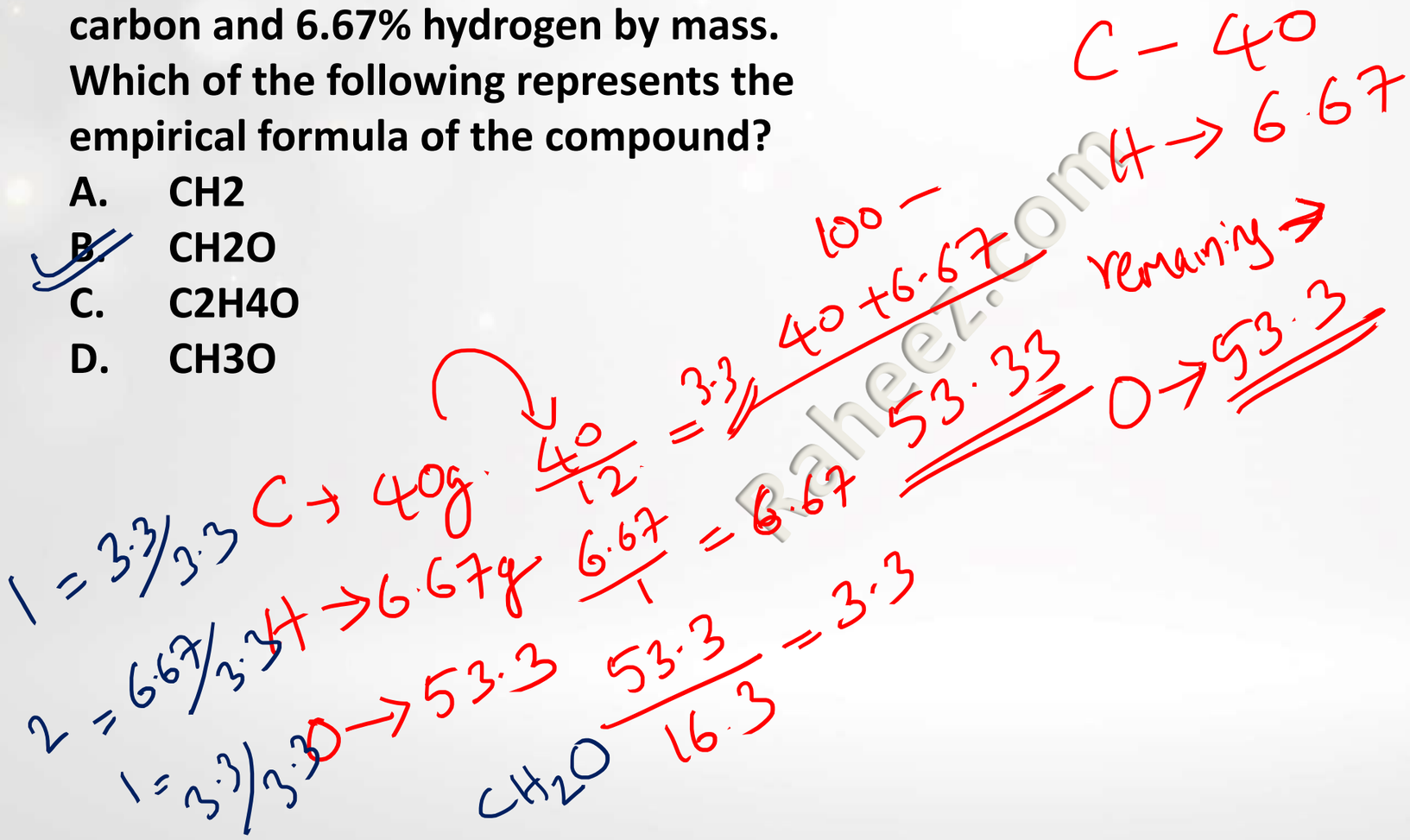
→ Divide each no of moles by smallest number.

→ Make them whole number.

Example

An organic compound contains 40% carbon and 6.67% hydrogen by mass. Which of the following represents the empirical formula of the compound?

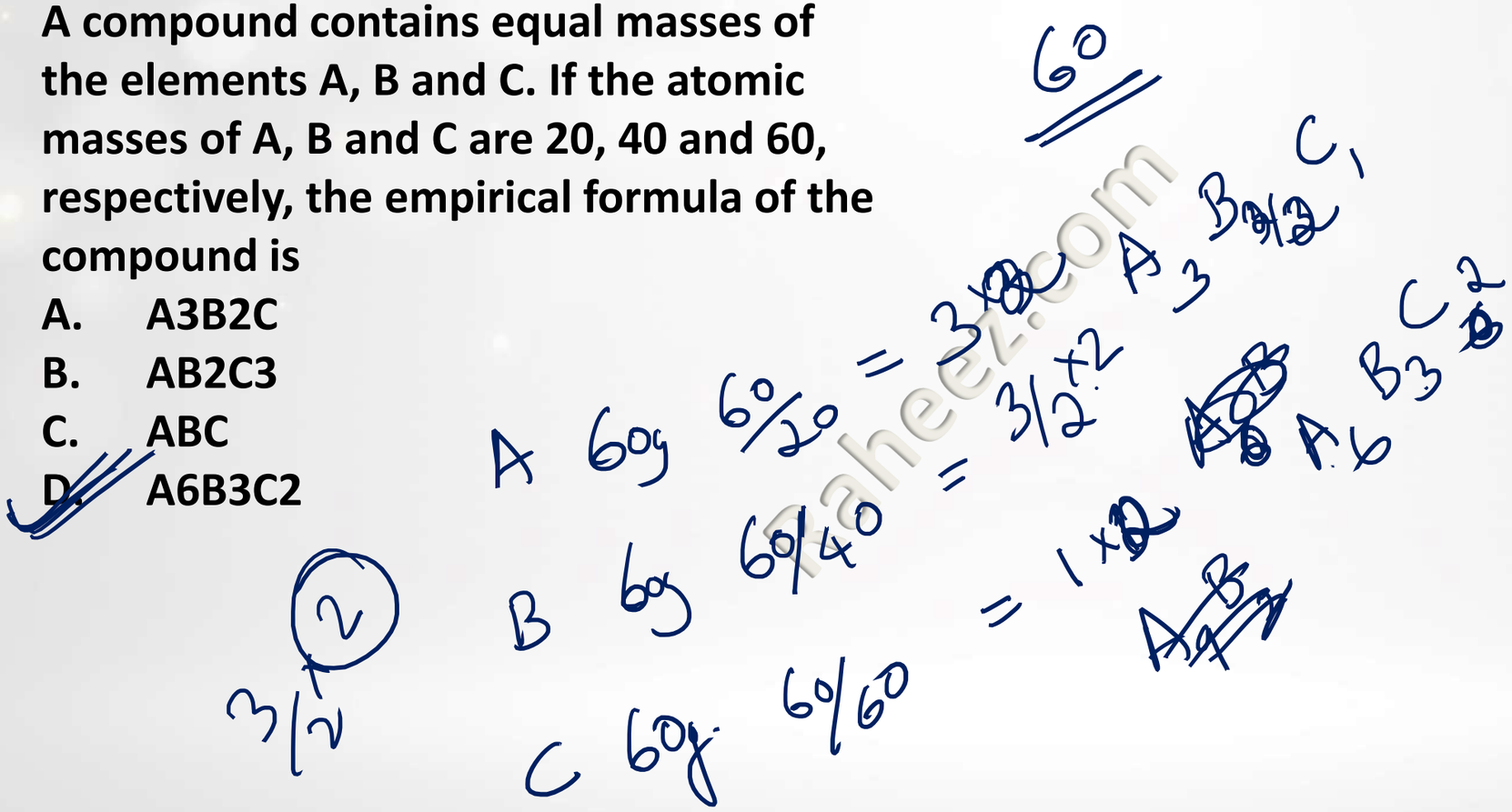
A. CH2
B. CH2O
C. C2H4O
D. CH3O



Example

A compound contains equal masses of the elements A, B and C. If the atomic masses of A, B and C are 20, 40 and 60, respectively, the empirical formula of the compound is

A. A3B2C
B. AB2C3
C. ABC
D. A6B3C2



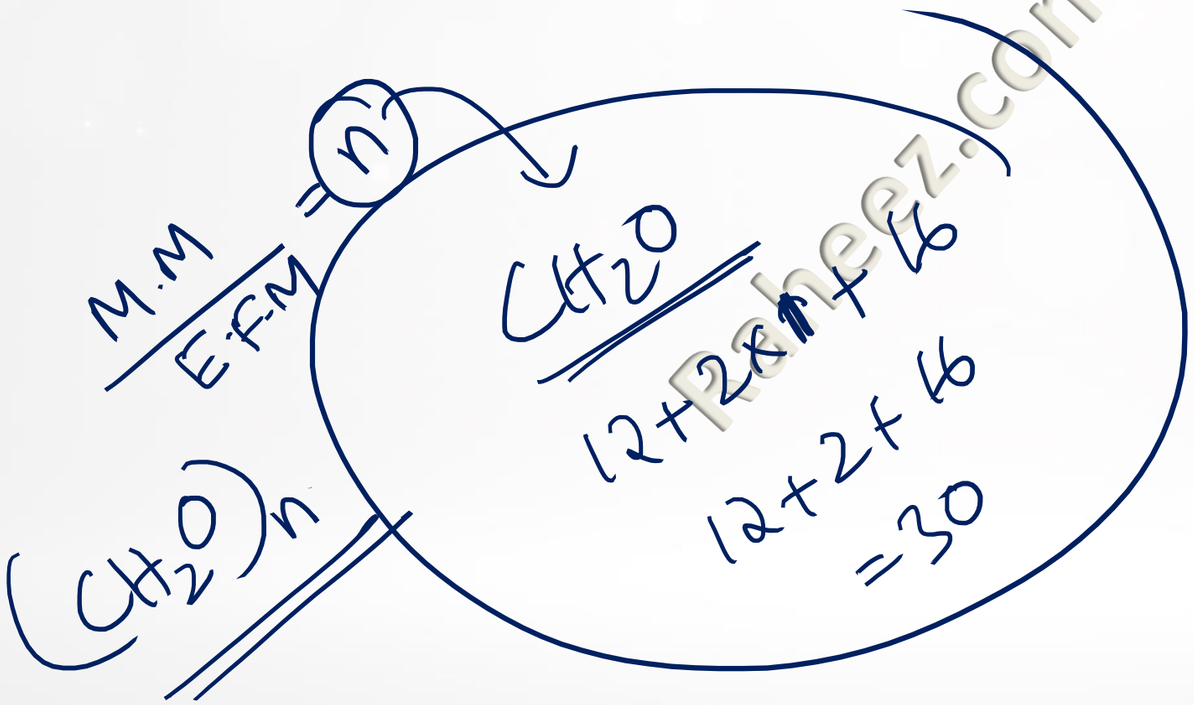
Molecular Formula

- A chemical formula that gives the total number of atoms of each element in each molecule of a substance.

Compound	Molecular Formula
Glucose	$C_6H_{12}O_6$
Butane	C_4H_{10}
Octane	C_8H_{18}

Steps to Find Molecular Formula

1. Find the empirical formula.
2. Find the empirical formula mass.
3. Divide the molecular mass by the empirical mass.
4. Multiply each subscript by the answer from step 3.



Example

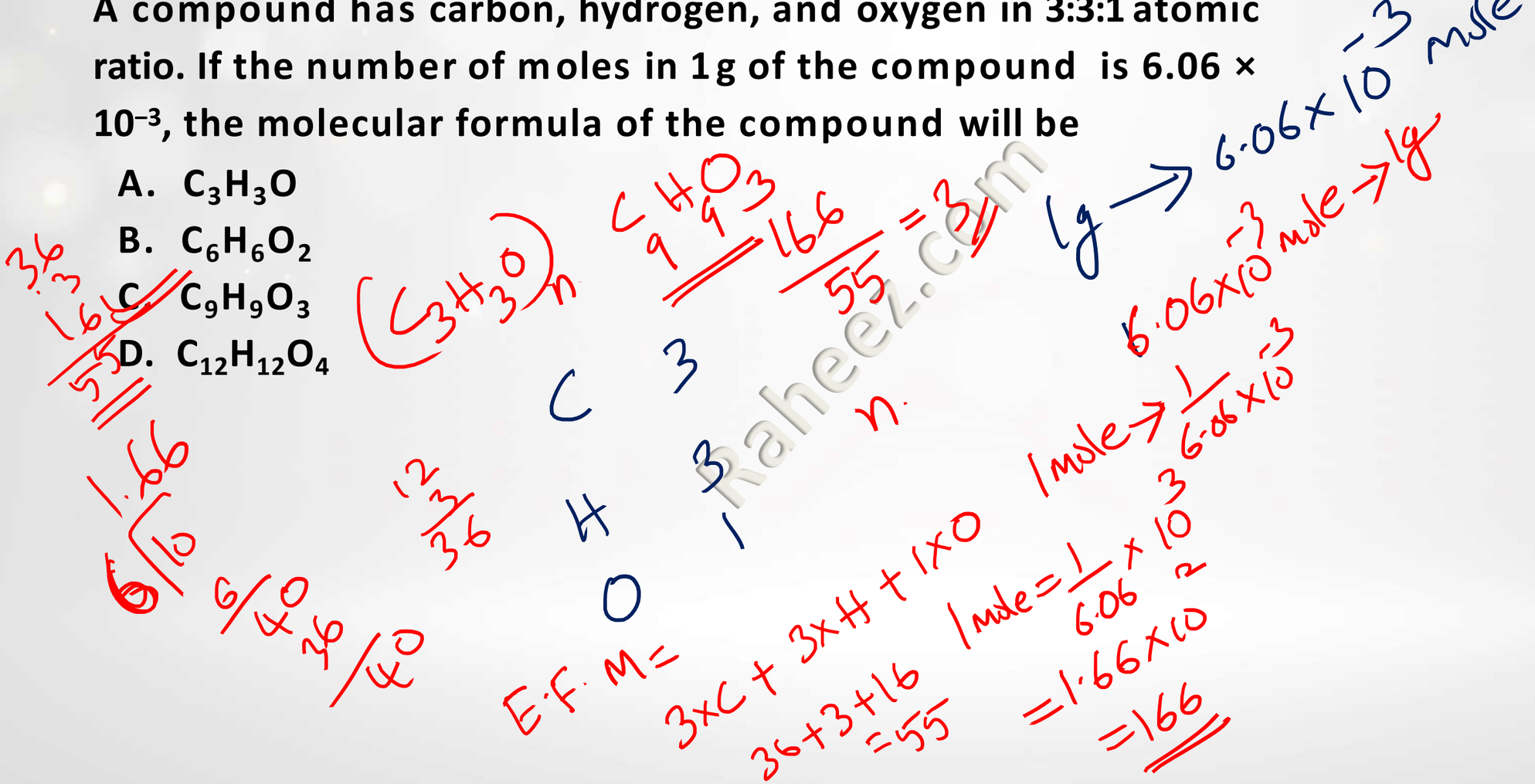
A compound has carbon, hydrogen, and oxygen in 3:3:1 atomic ratio. If the number of moles in 1g of the compound is 6.06×10^{-3}, the molecular formula of the compound will be

A. C_3H_3O

B. $C_6H_6O_2$

C. $C_9H_9O_3$

D. $C_{12}H_{12}O_4$



Example

A compound having the empirical formula, C_3H_4O, has a molecular weight of 170 ± 5. The molecular formula of the compound is

A. C_3H_4O
B. $C_6H_8O_2$
C. $C_6H_{12}O_3$
D. $C_9H_{12}O_3$