

- An unknown liquid contains H: 5.90 % and O: 94.1 % by mass and has a molar mass of 33.9 g mol^{-1} . What is its molecular formula?

Marks
2

The liquid contains 5.90% H and so 94.1% O.

	H	O
percentage	5.90	94.1
divide by atomic mass	$\frac{5.90}{1.008} = 5.85$	$\frac{94.1}{16.00} = 5.88$
divide by smallest value	1	1

The ratio of H : O is 1 : 1 and so the empirical formula is HO.

The molecular formula is $(\text{HO})_n$. The molar mass is:

$$\text{molar mass} = n \times (1.008 + 16.00) \text{ g mol}^{-1} = 17.008n \text{ g mol}^{-1}$$

As the molar mass is 33.9 g mol^{-1} , $n = 2$ and the molecular formula is $(\text{HO})_2$ or H_2O_2 . It is hydrogen peroxide.

Answer: **H_2O_2**