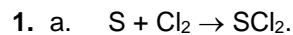


The chemistry of chemical weapons: answers

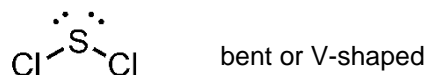
Education in Chemistry

November 2019

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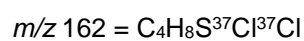
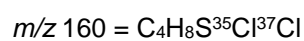
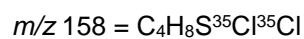
b.



c. i. Molecular formula of mustard gas $C_4H_8SCl_2$

Chlorine has two isotopes; 75% $Cl-35$ and 25% $Cl-37$

Explanation of peak



Explanation of abundance

$$3 \times 3 = 9$$

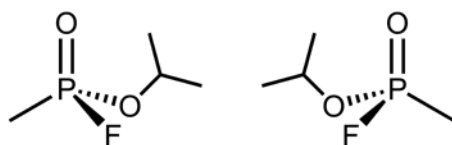
$$(3 \times 1) \times 2 = 6$$

$$(1 \times 1) = 1$$

ii. $m/z\ 109/111\ [ClCH_2CH_2SCH_2]^+$



2. a.



b. $10,000\ l = 10\ m^3$

Air breathed in per minute = $10\ m^3 / (24 \times 60) = 6.94 \times 10^{-3}\ m^3\ min^{-1}$

Sarin inhaled per minute = $6.94 \times 10^{-3}\ m^3\ min^{-1} \times 100\ mg\ m^{-3} = 0.694\ mg\ min^{-1}$

Time taken to inhale 0.5 mg = $0.5\ mg / 0.694\ mg\ min^{-1} = 0.72\ min = \underline{43\ s}$

c.

