

Amount of substance – AS 2022 Chemistry P2

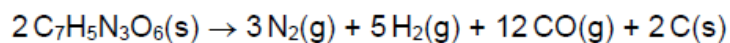
1. June/2022/Paper_7404/2/No.4

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This question is about gas volumes.

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TNT ($C_7H_5N_3O_6$) is an explosive because it can decompose very quickly and exothermically to form a large volume of gas. An equation for this decomposition is



Calculate the volume of gas, in m^3 , measured at $1250\text{ }^\circ\text{C}$ and $101\,000\text{ Pa}$, produced by the decomposition of 1.00 kg of TNT ($M_r = 227.0$).

The gas constant, $R = 8.31\text{ J mol}^{-1}\text{ K}^{-1}$

[5 marks]Volume of gas _____ m^3

0 4 . 2 Alkenes have the general formula C_nH_{2n}

When alkenes undergo complete combustion, 1.0 mol of C_nH_{2n} reacts with $\frac{3n}{2}$ mol of oxygen.

Calculate the volume of oxygen needed for the complete combustion of 200 cm³ of but-1-ene.

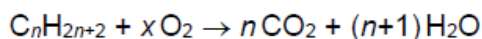
The volumes of all gases are measured at the same temperature and pressure.

[1 mark]

Volume of oxygen _____ cm³

0 4 . 3 Alkanes have the general formula C_nH_{2n+2}

Alkanes undergo complete combustion in a plentiful supply of oxygen.



Determine x in terms of n

[1 mark]

x _____

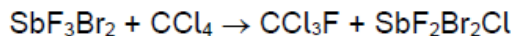
2. June/2022/Paper_7404/2/No.6

0 6

Trichlorofluoromethane (CCl_3F) was developed as a refrigerant. The production and use of CCl_3F is now restricted.

0 6 . 1

The equation for a process used to manufacture CCl_3F is



Calculate the percentage atom economy for the production of CCl_3F in this reaction. Give your answer to 3 significant figures.

[2 marks]

Percentage atom economy _____

An alternative synthesis of CCl_3F is the free-radical substitution reaction between fluoromethane (CH_3F) and chlorine.

0 6 . 2

An intermediate in this alternative synthesis is dichlorofluoromethane (CHCl_2F)

Give equations to represent the two propagation steps in the conversion of CHCl_2F into CCl_3F

[2 marks]

Propagation step 1

Propagation step 2

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Analysis of the products of this reaction shows the formation of a compound with the empirical formula CCl_2F

Give an equation to represent a termination step forming this compound.
Show the structural formula of the product in the equation.

[1 mark]
