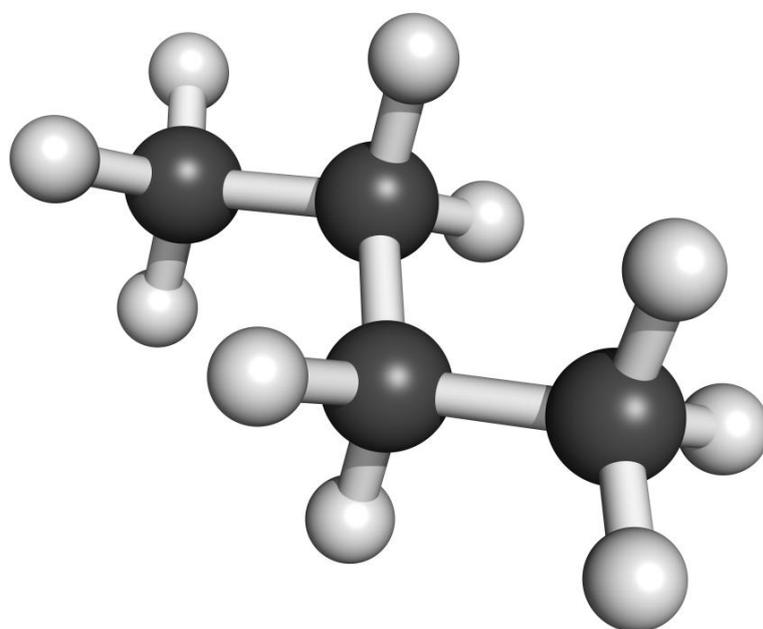


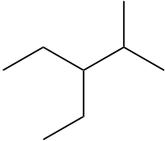
ALKANES



CHEMSHEETS.co.uk

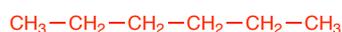


TASK 1 – Drawing and naming alkanes

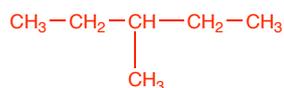
structure	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{CH}_2-\text{CH}-\text{CH}_2-\text{CH}_2-\text{CH}_3 \end{array}$	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{CH}-\text{C}-\text{CH}_3 \\ \quad \\ \text{CH}_3 \quad \text{CH}_3 \end{array}$	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_2 \\ \\ \text{CH}_3-\text{CH}_2-\text{CH}-\text{CH}_3 \end{array}$	
name	3-methylhexane	2,2,3-trimethylbutane	3-methylpentane	3-ethyl-2-methylpentane

TASK 2 – Isomers

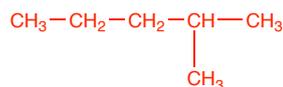
Draw the structural formula of and name all the alkanes with the molecular formula C_6H_{14}



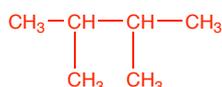
hexane



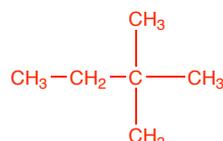
3-methylhexane



2-methylhexane

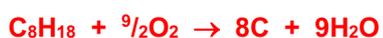
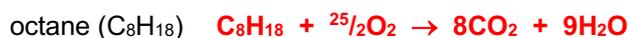


2,3-dimethylhexane



2,2-dimethylhexane

TASK 3 – Burning alkanes



e.g. $\text{CH}_4 \rightarrow \text{CH}_3\text{Cl}$	(1) $\text{CH}_4 + \text{Cl}\bullet \rightarrow \bullet\text{CH}_3 + \text{HCl}$ (2) $\bullet\text{CH}_3 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{Cl}\bullet$
e.g. $\text{CHBr}_2\text{-CH}_3 \rightarrow \text{CBr}_3\text{-CH}_3$	(1) $\text{CHBr}_2\text{-CH}_3 + \text{Br}\bullet \rightarrow \bullet\text{CBr}_2\text{-CH}_3 + \text{HBr}$ (2) $\bullet\text{CBr}_2\text{-CH}_3 + \text{Br}_2 \rightarrow \text{CBr}_3\text{-CH}_3 + \text{Br}\bullet$
e.g. $\text{CH}_3\text{Cl} \rightarrow \text{CH}_2\text{Cl}_2$	(1) $\text{CH}_3\text{Cl} + \text{Cl}\bullet \rightarrow \bullet\text{CH}_2\text{Cl} + \text{HCl}$ (2) $\bullet\text{CH}_2\text{Cl} + \text{Cl}_2 \rightarrow \text{CH}_2\text{Cl}_2 + \text{Cl}\bullet$
e.g. $\text{CHCl}_3 \rightarrow \text{CCl}_4$	(1) $\text{CHCl}_3 + \text{Cl}\bullet \rightarrow \bullet\text{CCl}_3 + \text{HCl}$ (2) $\bullet\text{CCl}_3 + \text{Cl}_2 \rightarrow \text{CCl}_4 + \text{Cl}\bullet$
e.g. $\text{CHF}_2\text{-CH}_3 \rightarrow \text{CF}_3\text{-CH}_3$	(1) $\text{CHF}_2\text{-CH}_3 + \text{F}\bullet \rightarrow \bullet\text{CF}_2\text{-CH}_3 + \text{HF}$ (2) $\bullet\text{CF}_2\text{-CH}_3 + \text{F}_2 \rightarrow \text{CF}_3\text{-CH}_3 + \text{F}\bullet$
e.g. $\text{CHF}_2\text{-CH}_3 \rightarrow \text{CHF}_2\text{-CH}_2\text{F}$	(1) $\text{CHF}_2\text{-CH}_3 + \text{F}\bullet \rightarrow \text{CHF}_2\text{-}\overset{\bullet}{\text{C}}\text{H}_2 + \text{HF}$ (2) $\text{CHF}_2\text{-}\overset{\bullet}{\text{C}}\text{H}_2 + \text{F}_2 \rightarrow \text{CHF}_2\text{-CH}_2\text{F} + \text{F}\bullet$
e.g. $\text{CH}_3\text{-CH}_2\text{-CF}_3 \rightarrow \text{CH}_3\text{-CHBr-CF}_3$	(1) $\text{CH}_3\text{-CH}_2\text{-CF}_3 + \text{Br}\bullet \rightarrow \text{CH}_3\text{-}\overset{\bullet}{\text{C}}\text{H-CF}_3 + \text{HBr}$ (2) $\text{CH}_3\text{-}\overset{\bullet}{\text{C}}\text{H-CF}_3 + \text{Br}_2 \rightarrow \text{CH}_3\text{-CHBr-CF}_3 + \text{Br}\bullet$

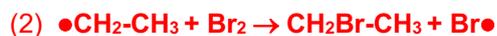
TERMINATION	(2 radicals \rightarrow molecule) If two free radicals collide, they will form a molecule and stop the chain reaction. Any two free radicals involved in the mechanism could collide in this way.
e.g. $\text{CH}_3\text{-CH}_3$ in $\text{CH}_4 \rightarrow \text{CH}_3\text{Cl}$	$2 \bullet\text{CH}_3 \rightarrow \text{CH}_3\text{-CH}_3$
e.g. $\text{CCl}_3\text{-CCl}_3$ in $\text{CH}_4 \rightarrow \text{CCl}_4$	$2 \bullet\text{CCl}_3 \rightarrow \text{CCl}_3\text{-CCl}_3$
e.g. $\text{CH}_2\text{Cl-CCl}_3$ in $\text{CH}_4 \rightarrow \text{CCl}_4$	$\bullet\text{CH}_2\text{Cl} + \bullet\text{CCl}_3 \rightarrow \text{CH}_2\text{Cl-CCl}_3$
e.g. $\text{CF}_3\text{-CH}_2\text{F}$ in $\text{CH}_4 \rightarrow \text{CF}_4$	$\bullet\text{CF}_3 + \bullet\text{CH}_2\text{F} \rightarrow \text{CF}_3\text{-CH}_2\text{F}$
e.g. butane in $\text{CH}_3\text{-CH}_3 \rightarrow \text{CH}_3\text{-CH}_2\text{F}$	$2 \bullet\text{CH}_2\text{-CH}_3 \rightarrow \text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$
e.g. $\text{CBr}_3\text{-CBr}_3$ in $\text{CH}_4 \rightarrow \text{CBr}_4$	$2 \bullet\text{CBr}_3 \rightarrow \text{CBr}_3\text{-CBr}_3$
e.g. 1,3-dibromobutane in $\text{CH}_3\text{-CH}_3 \rightarrow \text{CBr}_3\text{-CBr}_3$	$\bullet\text{CH}_2\text{-CH}_2\text{Br} + \bullet\text{CHBr-CH}_3 \rightarrow \text{CH}_2\text{Br-CH}_2\text{-CHBr-CH}_3$

TASK 4 – Free radical substitution problems

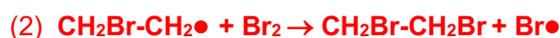
1) For the conversion of ethane to 1,1-dibromoethane.

a) Give the overall equation. $\text{CH}_3\text{-CH}_3 + 2\text{Br}_2 \rightarrow \text{CH}_2\text{Br-CH}_2\text{Br} + 2\text{HBr}$

b) Give the pair of propagation steps to form bromoethane from ethane.



c) Give the pair of propagation steps to form 1,1-dibromoethane from bromoethane.

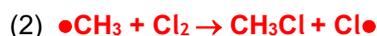


d) Give the termination step that forms butane. $2 \bullet\text{CH}_2\text{-CH}_3 \rightarrow \text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$

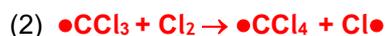
2) For the conversion of methane to tetrachloromethane.

a) Give the overall equation. $\text{CH}_4 + 4\text{Cl}_2 \rightarrow \text{CCl}_4 + 4\text{HCl}$

b) Give the pair of propagation steps to form chloromethane from methane.



c) Give the pair of propagation steps to form tetrachloromethane from trichloromethane.



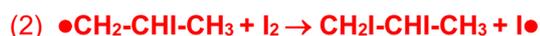
d) Give the termination step that forms a substance with the empirical formula CCl_3 .



3) For the conversion of 2-iodopropane to 1,2-diiodopropane.

a) Give the overall equation. $\text{CH}_3\text{-CHI-CH}_3 + \text{I}_2 \rightarrow \text{CH}_2\text{I-CHI-CH}_3 + \text{HI}$

b) Give the pair of propagation steps to form 1,2-diiodopropane from 2-iodopropane.



c) Give the termination step that forms a substance with empirical formula $\text{C}_3\text{H}_6\text{I}$.

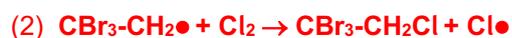


4) For the conversion of 1,1,1-tribromoethane to 1,1,1-tribromo-2,2,2-trichloroethane.

a) Give the overall equation.



b) Give the pair of propagation steps to form 1,1,1-tribromo-2-chloroethane from 1,1,1-tribromoethane.



c) Give the pair of propagation steps to form 1,1,1-tribromo-2,2,2-trichloroethane from 1,1,1-tribromo-2,2-diichloroethane.



d) Give the termination step that forms a bromoalkane.

