

STEM Showdown

An Adelaide University, School of Education
STEMpire program

Chemistry Chaos

Name: _____

The STEM Showdown is a series of STEM challenges to solve by the end of the season. You can complete the tasks individually or in small groups (up to 3 people). Make sure you write all the names of the people in your group above. The student with the most tasks completed over the season will be crowned the Adelaide University STEM Showdown Champion. Good Luck.

Chemistry Chaos

The school has run out of hand sanitizer. You will need to make a model of the molecule that is the active ingredient so more hand sanitiser can be made.

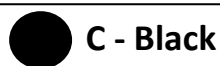
Your Task

- You will be supplied with a molecule kit representing the parts needed to make the active ingredient in hand sanitiser.
- Select 2 Carbon (black) 1 Oxygen (red) and 6 Hydrogen (white) pieces and 8 grey connectors (all the same size)
- Join the pieces up so that all the holes on the pieces are filled with a connector and no connectors are left unjoined to another piece.
- There are two ways these same pieces can be joined together, find the one that has the least symmetry (less mirror image down the middle). This is the molecule in hand sanitizer.
- Once you have created this molecule (called ethanol) show the STEM Showdown umpire and try to draw your molecule on the next page.

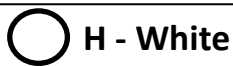
Drawing of your hand sanitizer molecule



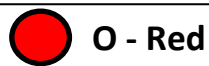
STEM Showdown Umpire Comments	Completed (STEM Showdown Umpire to sign)



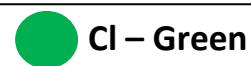
C - Black



H - White



O - Red



Cl - Green

= use 2 flexible connectors to join

All holes must be filled and no connectors can be left unjoined to another piece.
Where two lines are in the picture/model, you will need to use the flexible connectors.

<p>Octane C_8H_{18} – methane can be found in natural gas and farts</p> $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	<p>Hydrogen peroxide H_2O_2 – found in bleach</p> $\text{H}-\text{O}-\text{O}-\text{H}$	<p>Water H_2O – From drinking to swimming, this is essential for life on Earth</p> $\begin{array}{c} \text{O} \\ / \quad \backslash \\ \text{H} \quad \text{H} \end{array}$	<p>Carbon dioxide CO_2 – colourless and odourless gas that is a natural component of the air</p> $\text{O}=\text{C}=\text{O}$
<p>Amyl acetate $C_7H_{14}O_2$ – found in fruits like apples, bananas, and citrus</p> $\begin{array}{cccccccc} \text{H} & \text{O} & & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \\ & & & & & & & & \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & & & & & & & \\ \text{H} & & & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \end{array}$	<p>Benzene C_6H_6 – used for making plastics, nylon, resins, and rubber</p> $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}=\text{C}=\text{C}-\text{H} \\ \quad \backslash \quad / \\ \text{H}-\text{C}=\text{C}=\text{C}-\text{H} \\ \\ \text{H} \end{array}$	<p>Carbon tetrachloride CCl_4 – industrial chemicals</p> $\begin{array}{c} \text{Cl} \\ \\ \text{Cl}-\text{C}-\text{Cl} \\ \\ \text{Cl} \end{array}$	<p>Vinyl chloride C_2H_3Cl – used to make polyvinyl chloride (PVC), a type of plastic</p> $\begin{array}{c} \text{H} \quad \quad \text{Cl} \\ \backslash \quad / \\ \text{C}=\text{C} \\ / \quad \backslash \\ \text{H} \quad \quad \text{H} \end{array}$
<p>Diethyl Ether $C_4H_{10}O$ – used for dissolving substances in the lab, was once used as a cheap anaesthetic</p> $\begin{array}{cccc} \text{H} & \text{H} & & \text{H} & \text{H} \\ & & & & \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{C}-\text{C}-\text{H} \\ & & & & \\ \text{H} & \text{H} & & \text{H} & \text{H} \end{array}$	<p>Trichloroethylene (TCE) C_2HCl_3 – found in some glues, paint removers, and stain removers</p> $\begin{array}{cc} \text{H} & \text{Cl} \\ & \\ \text{H}-\text{C}-\text{C}-\text{Cl} \\ & \\ \text{H} & \text{Cl} \end{array}$	<p>Acetone C_3H_6O – dissolves glue and varnish and sometimes used in nail polish remover</p> $\begin{array}{ccc} \text{H} & \text{O} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & \\ \text{H} & & \text{H} \end{array}$	<p>Ethene C_2H_4 – causes fruit to ripen, and used to produce polyethylene, a common plastic in toys/packaging.</p> $\begin{array}{c} \text{H} \quad \quad \text{H} \\ \backslash \quad / \\ \text{C}=\text{C} \\ / \quad \backslash \\ \text{H} \quad \quad \text{H} \end{array}$

			Causes fruit to ripen
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● C - Black

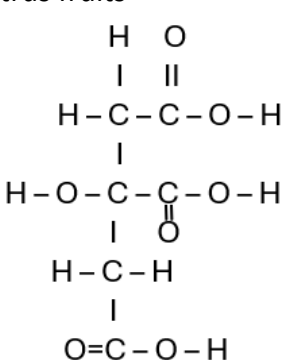
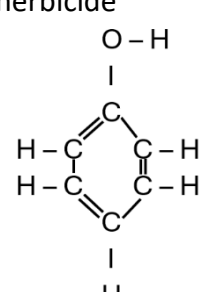
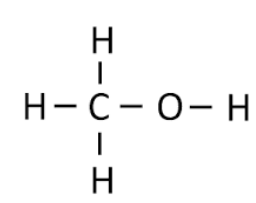
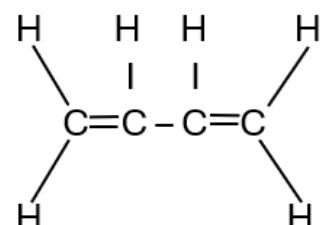
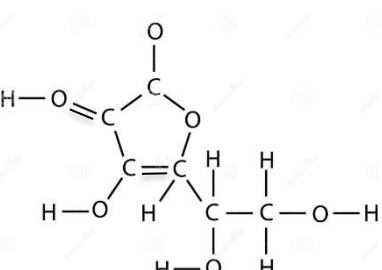
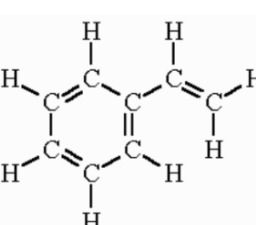
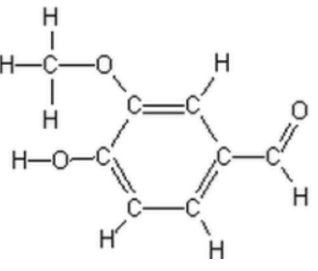
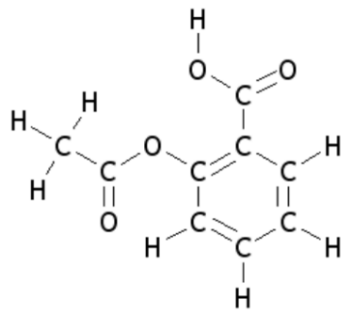
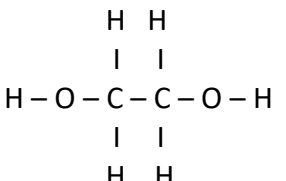
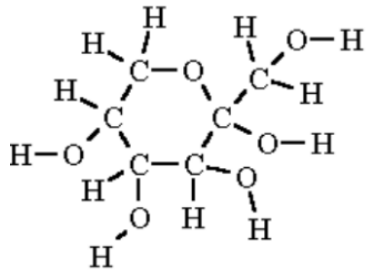
○ H - White

● O - Red

● Cl - Green

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<p>Citric acid $C_6H_8O_7$ – found in citrus fruits</p> 	<p>Trichlorophenol $C_6H_2Cl_3OH$ - glue preservative, and herbicide</p> 	<p>Methanol CH_4O – household cleaners</p> 	<p>Butadiene C_4H_6 – used for making artificial rubber</p> 
<p>Vitamin C $C_6H_8O_6$ – in fruits</p> 	<p>Styrene C_8H_8 – for making plastic polystyrene</p> 	<p>Vanillin $C_8H_8O_3$ – vanilla flavour</p> 	<p>Aspirin $C_9H_8O_4$ - medication</p> 
<p>Ethylene glycol $C_2H_6O_2$ – used to make car antifreeze</p> 	<p>Fructose $C_6H_{12}O_6$ - natural sugar found in fruit, honey and some vegetables</p> 	<p>Octane C_8H_{18} – one of the key parts in petrol. Higher octane fuels are used in performance cars</p> 