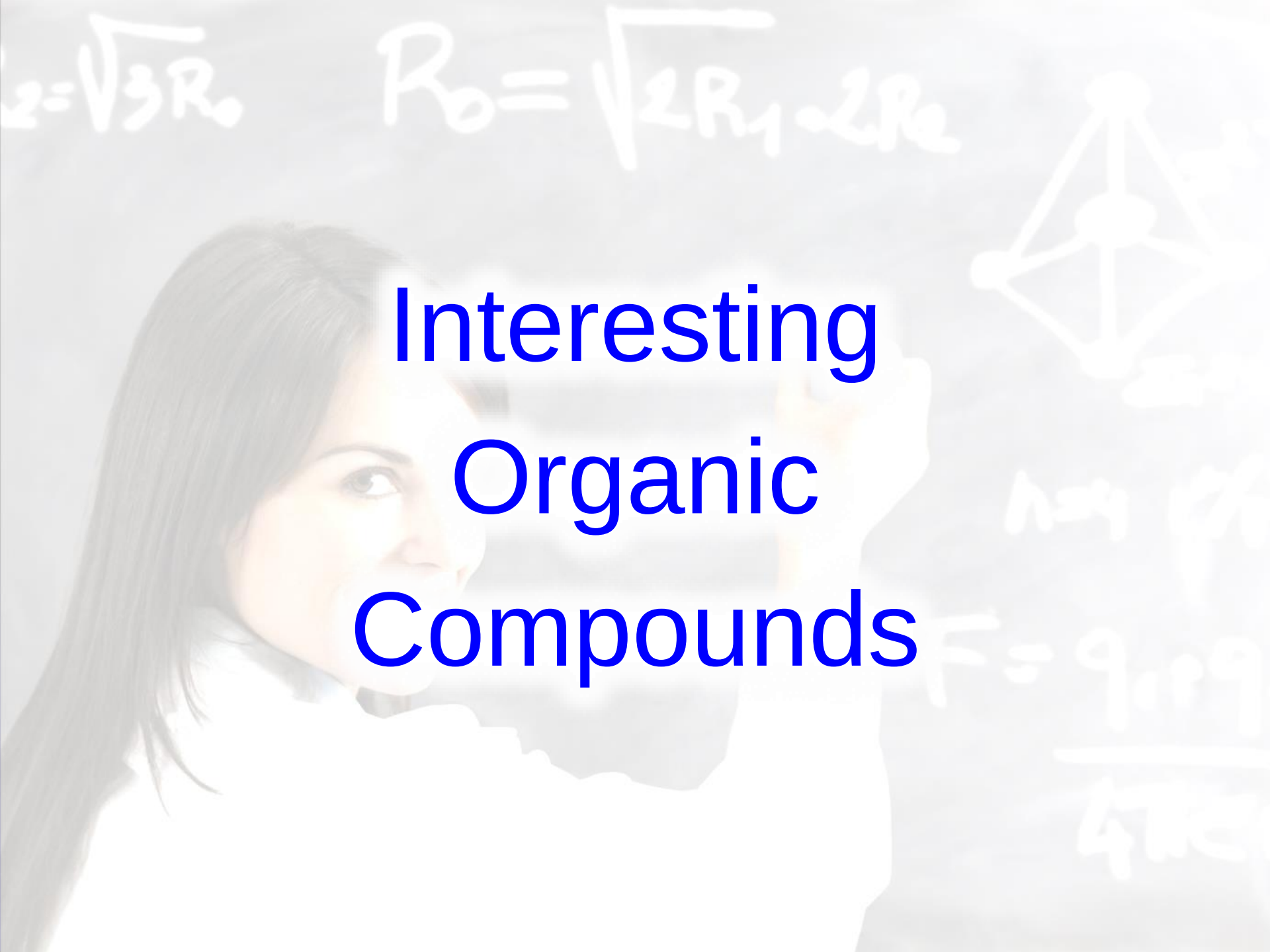
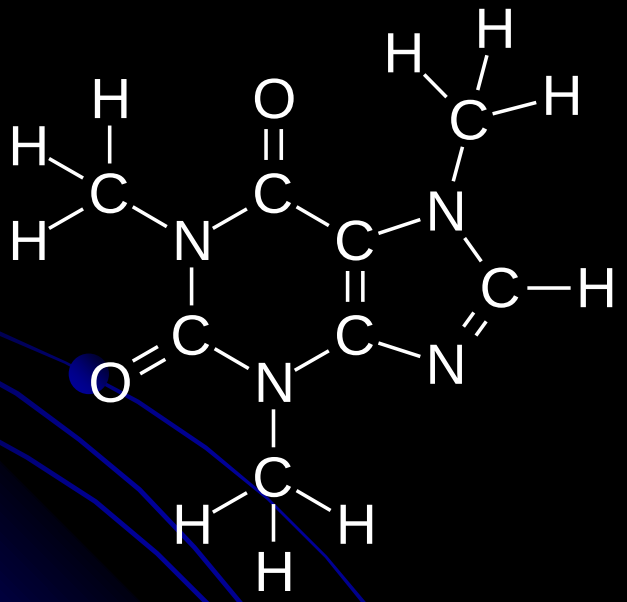

$R_2=\sqrt{3}R_0$
$R_0=\sqrt{2R_1+2R_2}$
$F=9.0$

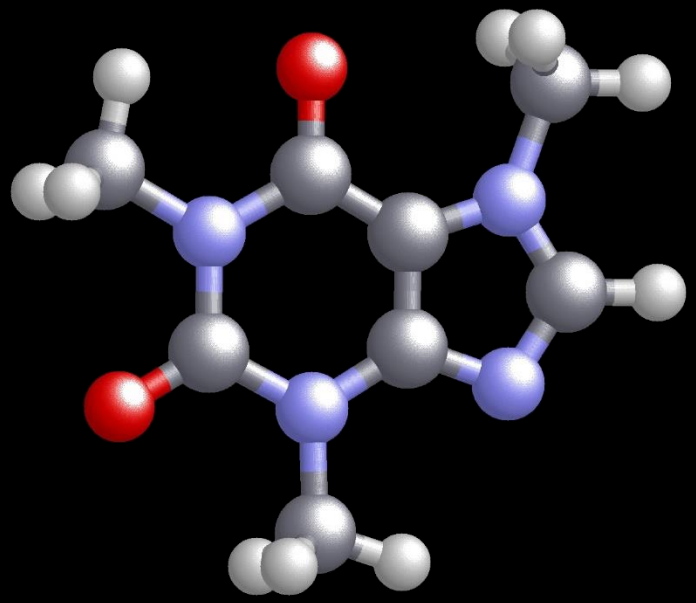


Interesting Organic Compounds

Chemicals to Keep You Awake...

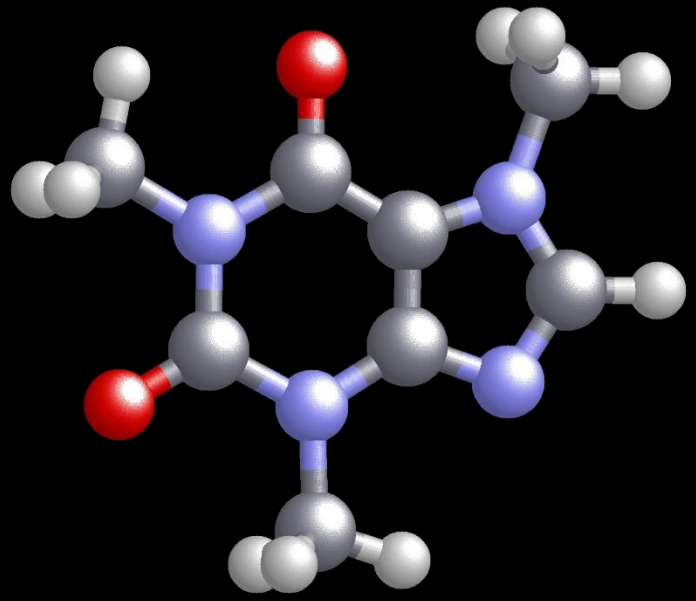
Caffeine - $C_8H_{10}O_2N_4$





Chemicals to Keep You Awake…
Caffeine – $C_8H_{10}O_2N_4$

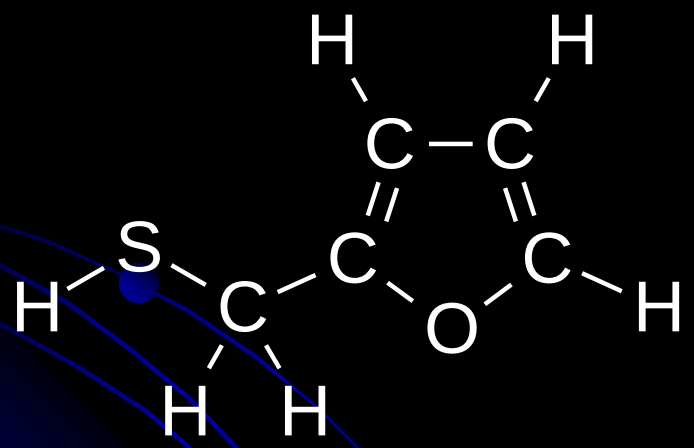
A typical cup of coffee or tea contains about 0.1 g of caffeine. Coffee is obtained from the roasted seeds of *Coffea arabica*, and tea from the fermented leaves of *Camellia thea*.

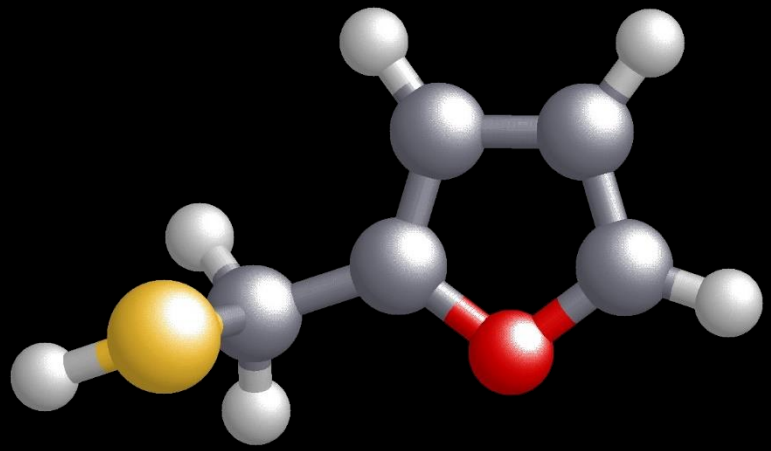


Caffeine acts as a stimulant in the cerebral cortex by inhibiting the enzyme *phosphodiesterase*, that in turn inactivates a certain form of the energy supply molecule ATP.

Pleasant Aromas…

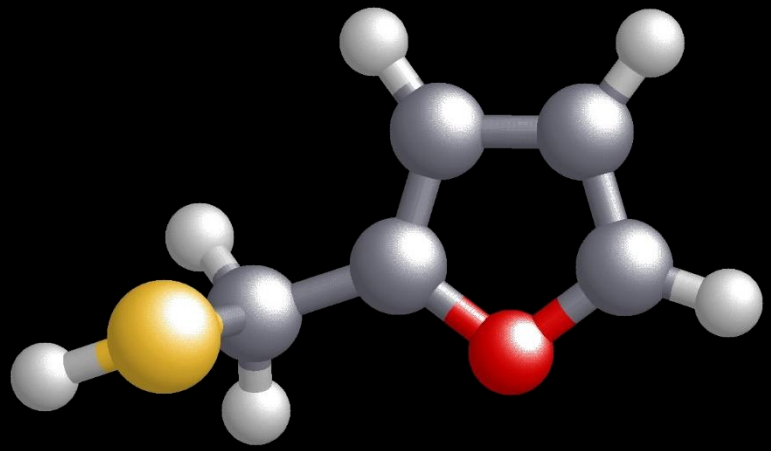
2-Furylmethanethiol – C_5H_6OS





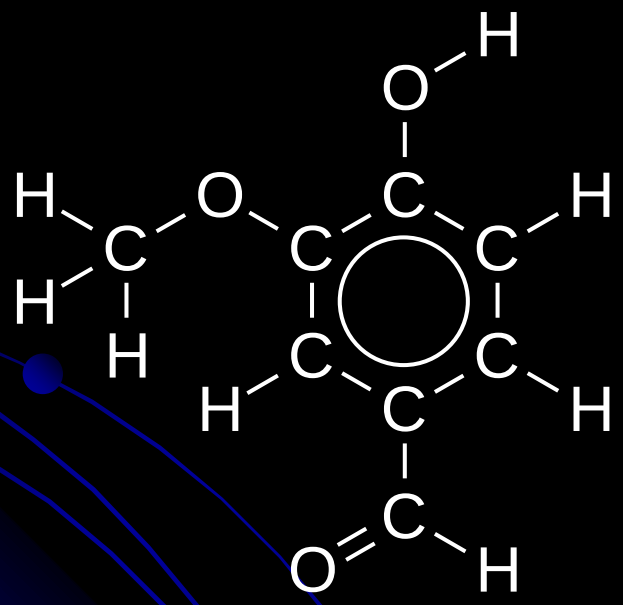
Pleasant Aromas…
2-Furylmethanethiol – C_5H_6OS

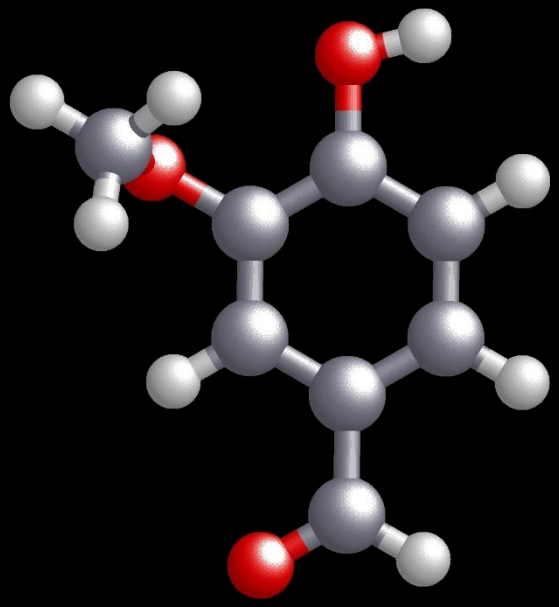
This molecule is one of those responsible for the aroma of coffee, the roasted beans of *Coffea arabica*. The plant *Coffea arabica* was first cultivated near Mocha in the Yemen. Mocha is now the name given to a drink which is made from a mixture of coffee and chocolate.



Beautiful Smells…

Vanillin – $C_8H_8O_3$





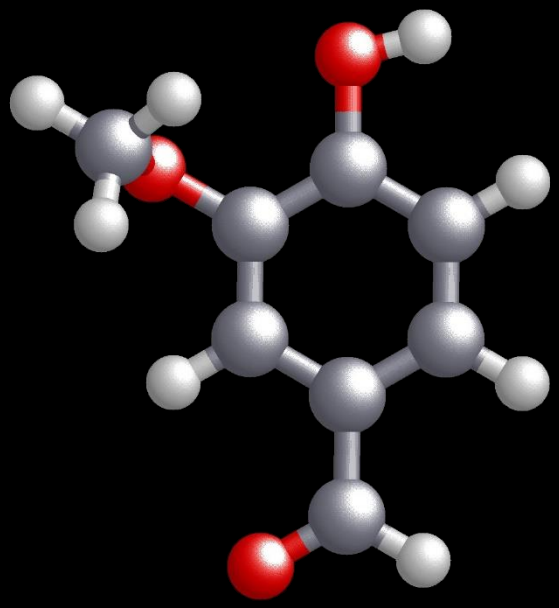
Beautiful Smells…

Vanillin – $C_8H_8O_3$

Vanillin is the essential component of *oil of vanilla*, which is extracted from the dried, fermented seed pods of the vanilla orchid (*Vanilla fragrans*) which is grown principally in Madagascar, Mexico and Tahiti.

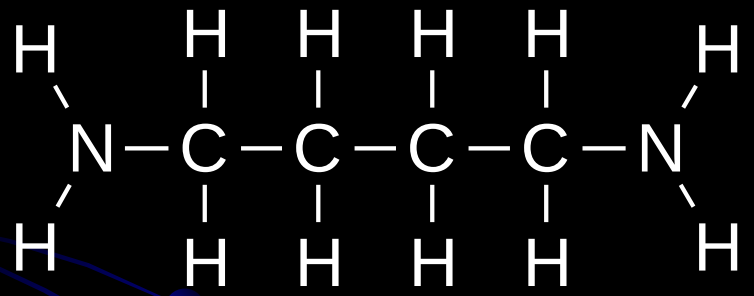
Vanillin is one of the most widely used flavour and odour compounds, and because natural supplies are inadequate, it is synthesised on a large scale.

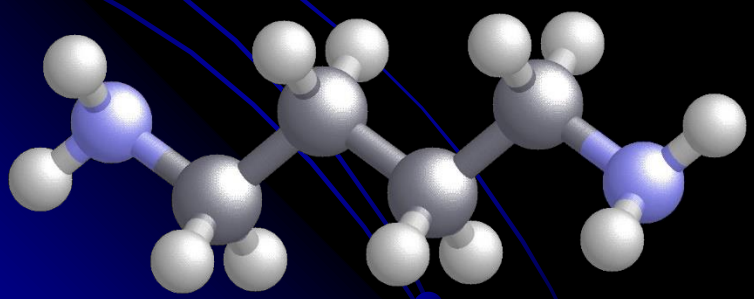
Vanillin can be detected in extremely low concentrations, but the strength of its flavour does not increase greatly as its concentration is increased.



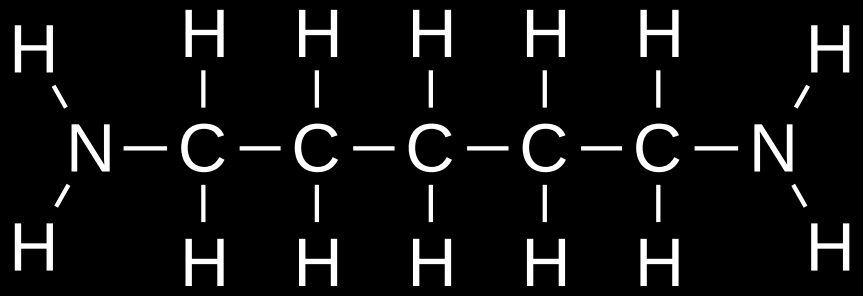
Disgusting Odours...

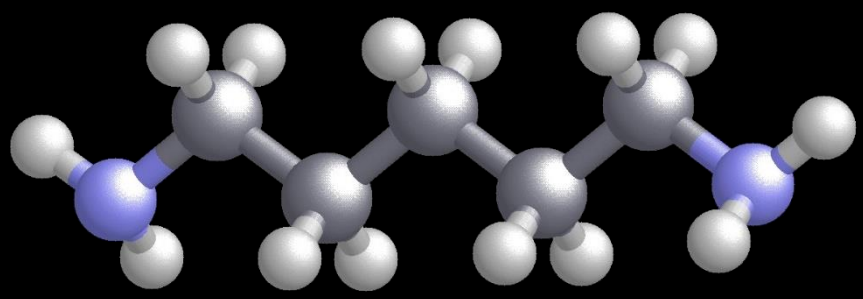
Putrescine
$C_4H_{12}N_2$





Cadaverine
$C_5H_{14}N_2$



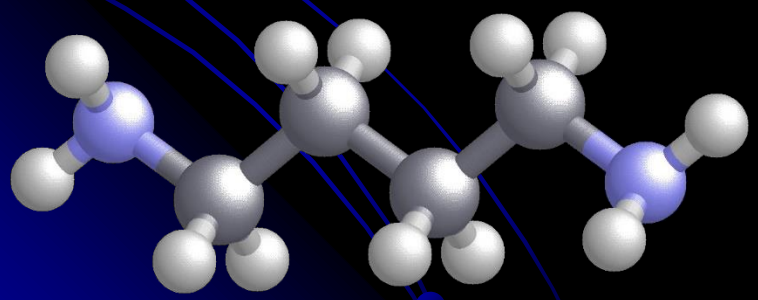


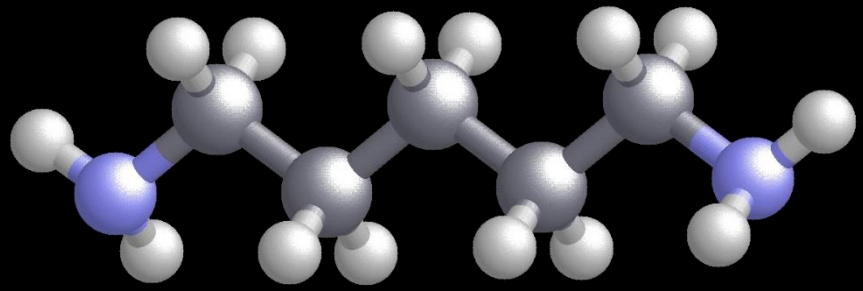
Disgusting Odours...

Putrescine
$C_4H_{12}N_2$

Cadaverine
$C_5H_{14}N_2$

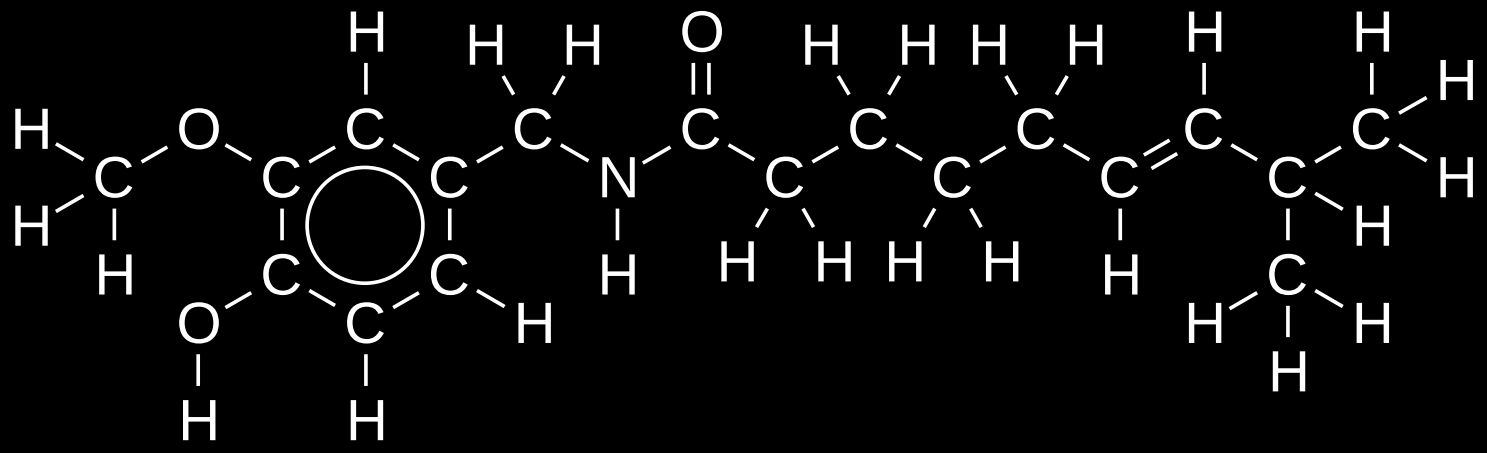
The names of putrescine and cadaverine speak for themselves. Little more needs to be said to describe their odour or their origin in rotting flesh. Both compounds add to the odour of urine and are present in bad breath. Putrescine is a poisonous solid and cadaverine is a poisonous viscous liquid.

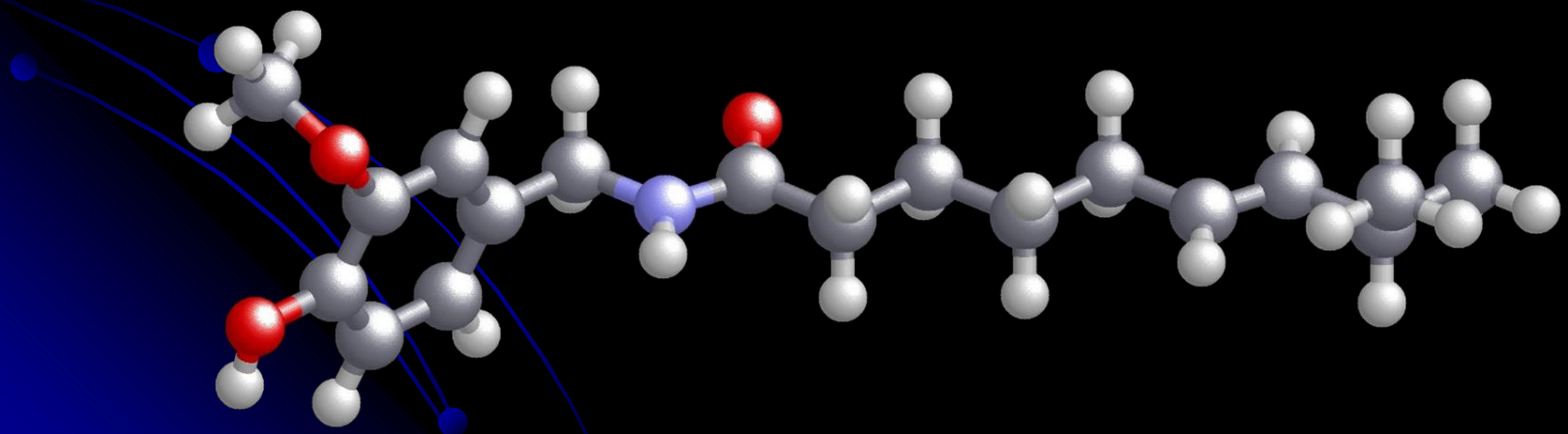




Hot 'n' Spicy...

Capsaicin - $C_{18}H_{27}O_3N$



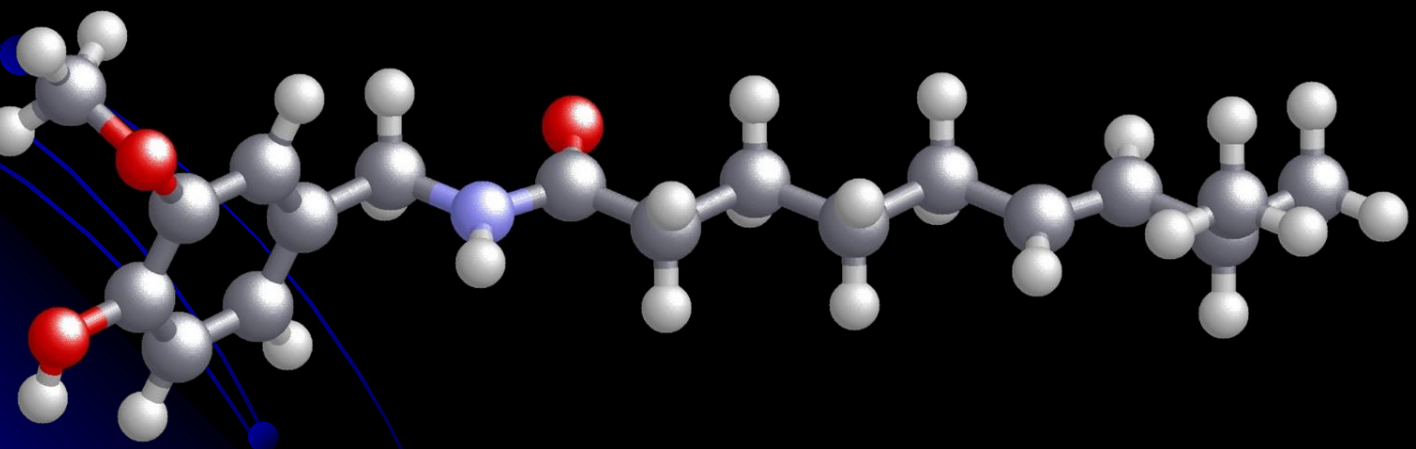


Hot 'n' Spicy...

Capsaicin – $C_{18}H_{27}O_3N$

Capsaicin is the hot, pungent spice found in various species of *Capsicum*, including red and green chilli peppers. To quench the fire of chilli, it is best to drink milk or milk based products. Milk contains a protein (*casein*) that removes capsaicin from the nerve receptors on the taste buds.

The pungency of chilli peppers is traditionally measured in *Scoville units*.



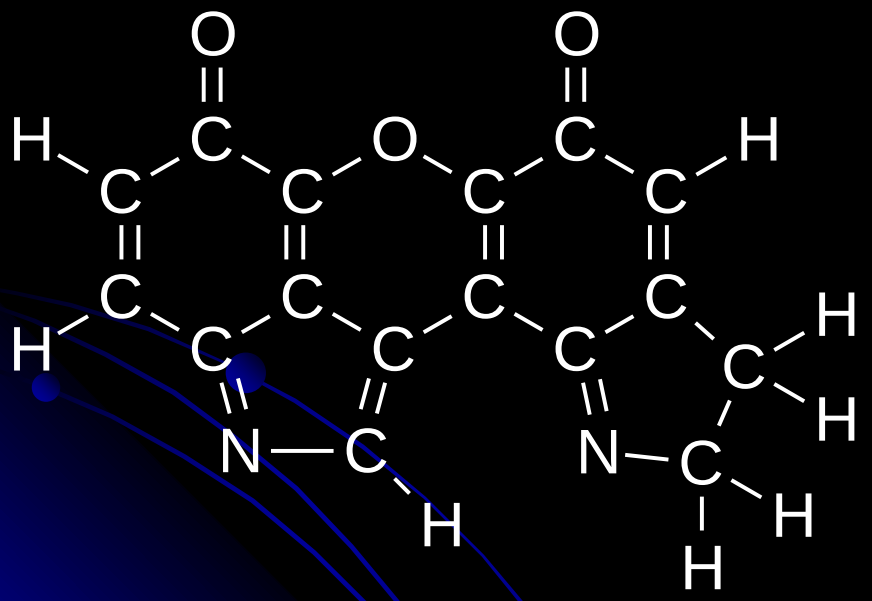
The Scoville Scale

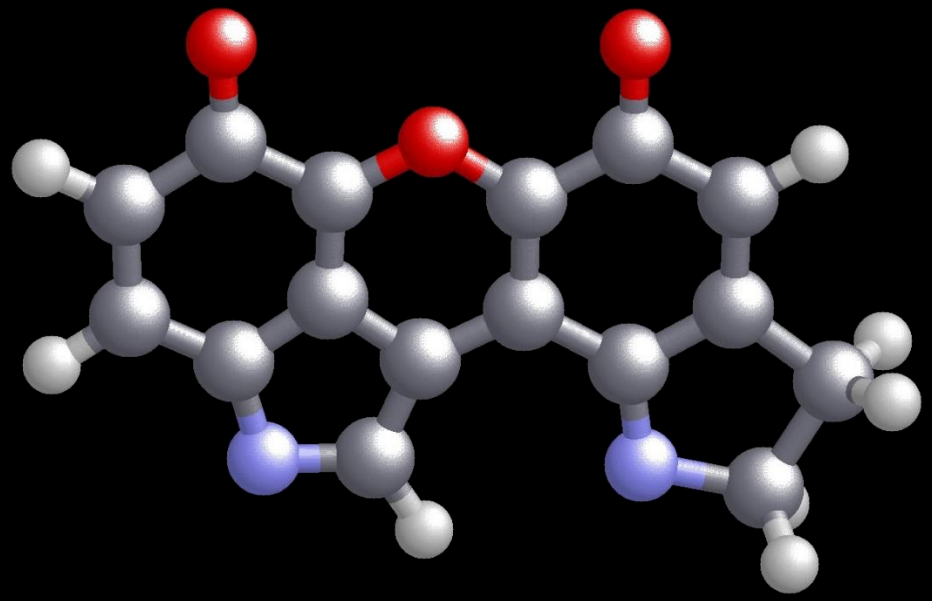
This was developed by Wilbur Scoville in 1912. It was originally measured subjectively by taste tests, but is now measured more scientifically by *high performance liquid chromatography* (HPLC).

Pepper	Pungency
Bell	0
Peperocini	100 – 500
Jalapeno	2 500 – 10 000
Serrano	5 000 – 23 000
Habenero	80 000 – 300 000
★ Hottest Recorded (Dragon's Breath, May 2017)	2 480 000
★ Pure Capsaicin	16 000 000

More than Just Skin Deep...

Melanin – $C_{16}H_8O_3N_2$

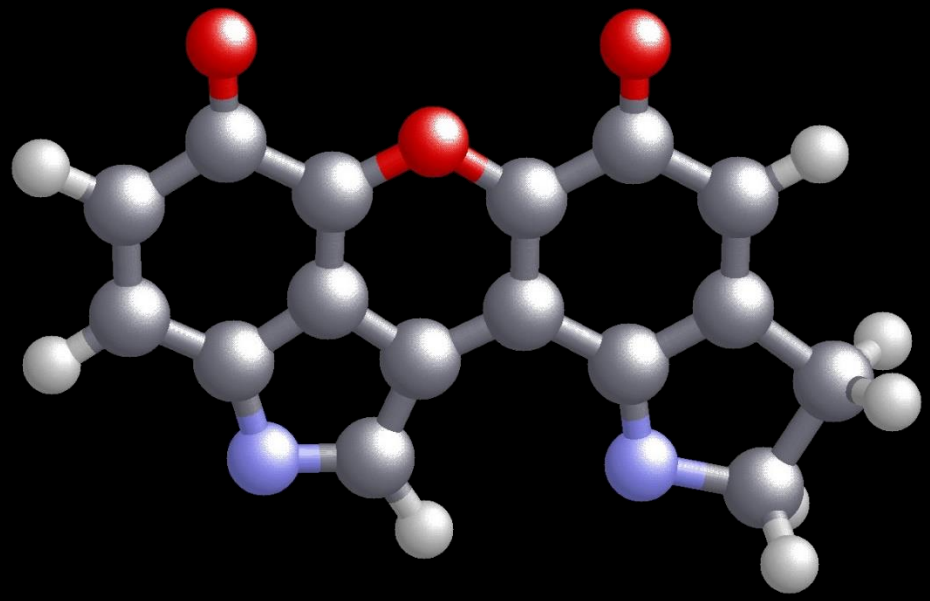




More than Just Skin Deep...
Melanin – $C_{16}H_8O_3N_2$

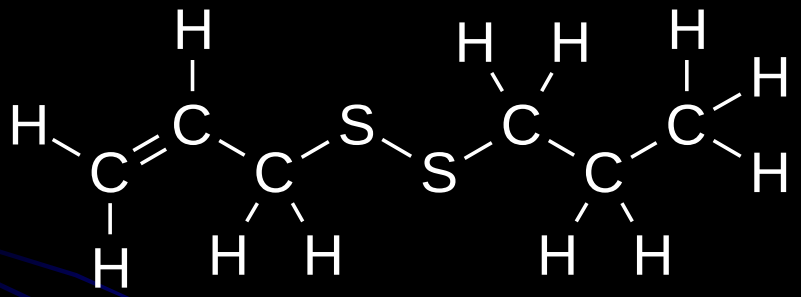
Melanin contributes to the pigmentation of the skin and hair. The number of melanin producing cells in light-skinned and dark-skinned people are similar, but they are more active in dark skinned people.

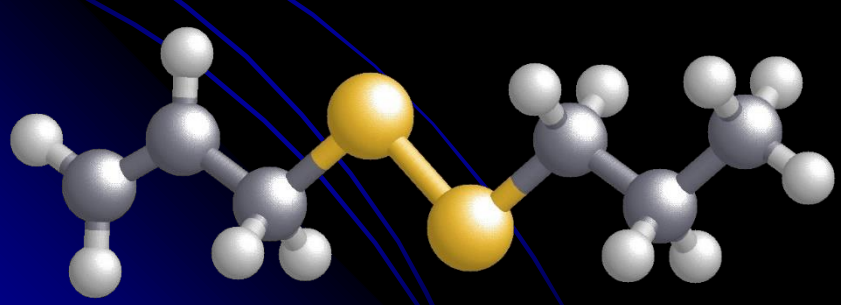
The condition of *albinism* in humans stems from the genetic corruption of the enzyme *tyrosinase*, which leads to the failure of the body to produce melanin from the amino acid tyrosine.



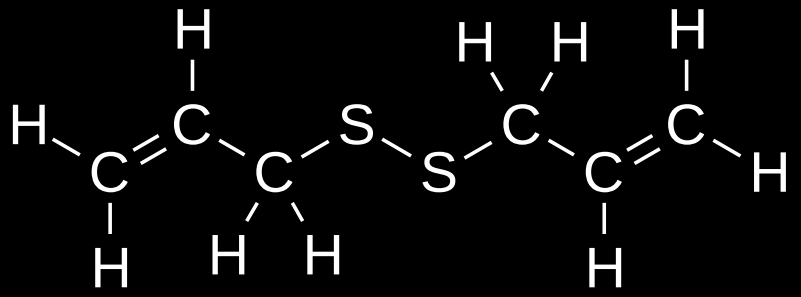
Chemicals to Make Your Eyes Water…

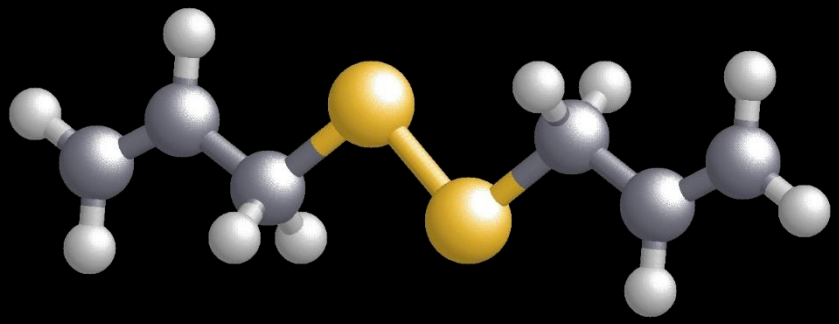
Allyl Propyl Disulphide
$C_6H_{12}S_2$





Diallyl Disulphide
$C_6H_{10}S_2$



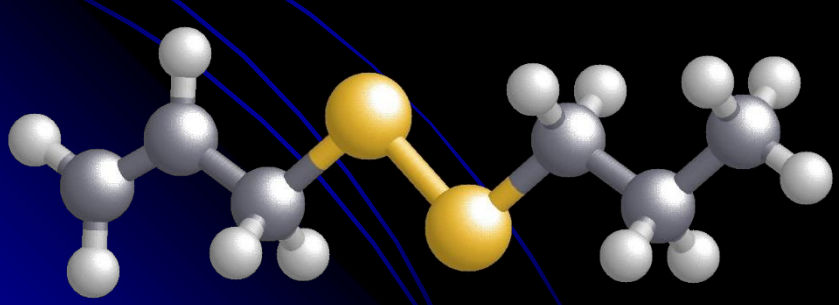


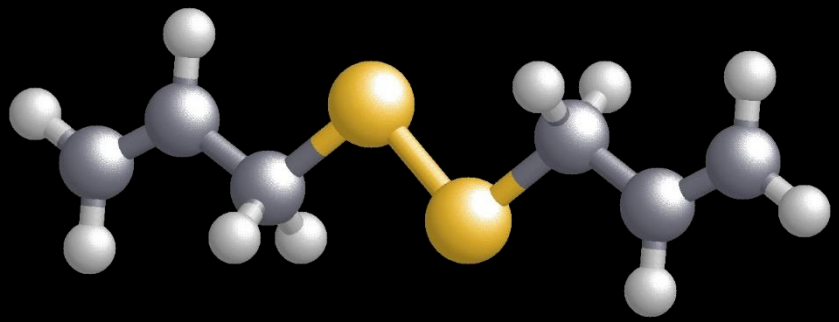
Chemicals to Make Your Eyes Water...

Allyl Propyl Disulphide
$C_6H_{12}S_2$

Diallyl Disulphide
$C_6H_{10}S_2$

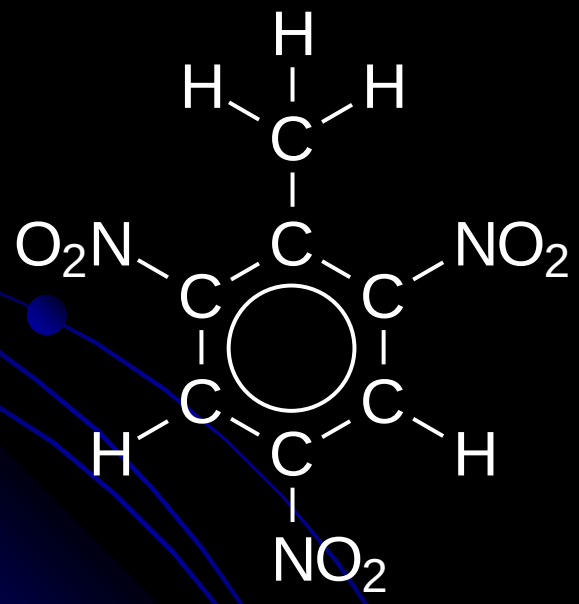
Organic compounds that contain sulphur are responsible for the pungent odour of garlic (*Allium sativum*) and onion (*Allium cepa*). Garlic and onion are odourless until either crushed or chopped. Once the plant cells are damaged, enzymes convert the sulphur containing amino acid *cysteine* into volatile and pungent compounds such as the two shown here.

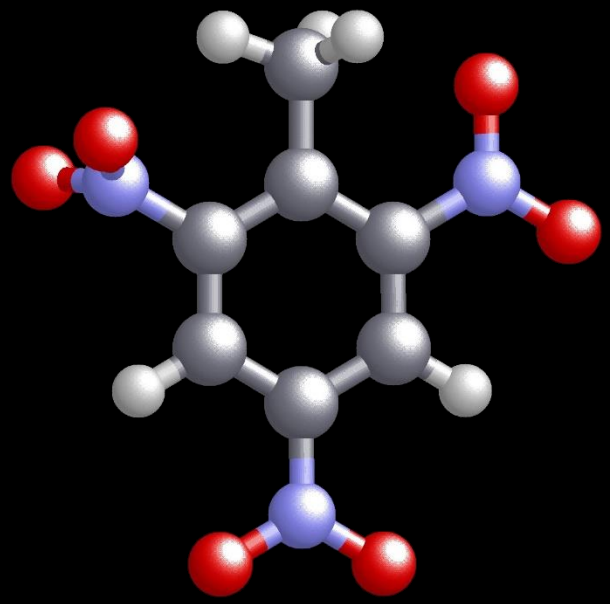




Yes, Some Chemicals do Explode...

Trinitrotoluene (TNT) – $C_7H_5O_6N_3$

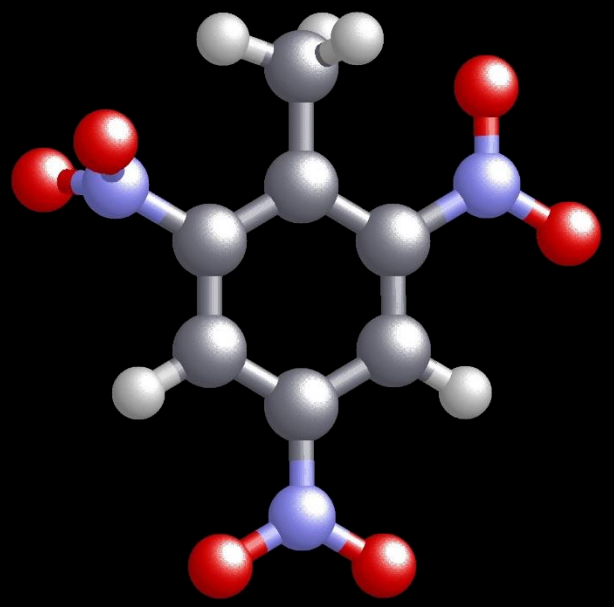




Yes, Some Chemicals do Explode…

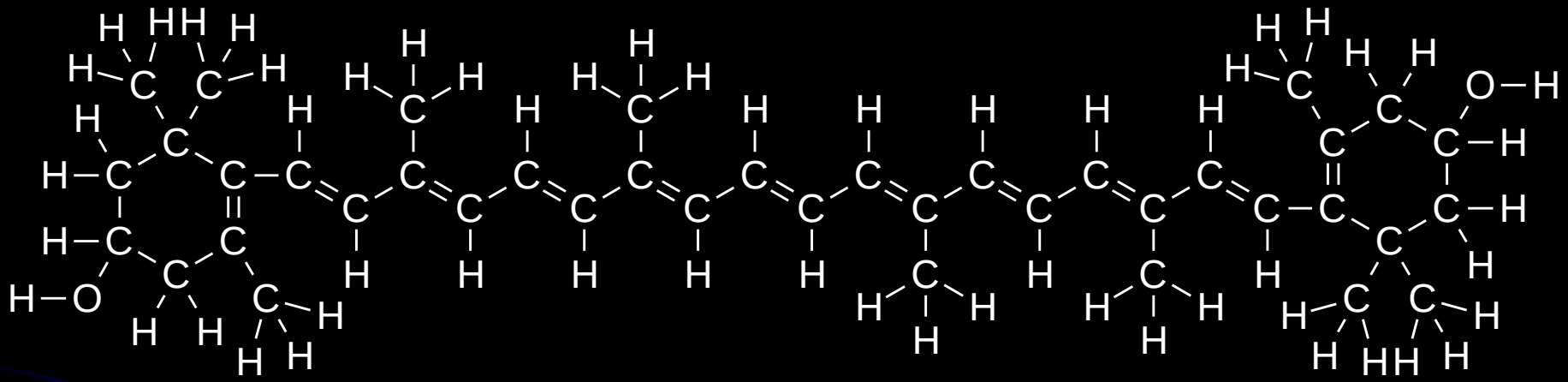
Trinitrotoluene (TNT) – $C_7H_5O_6N_3$

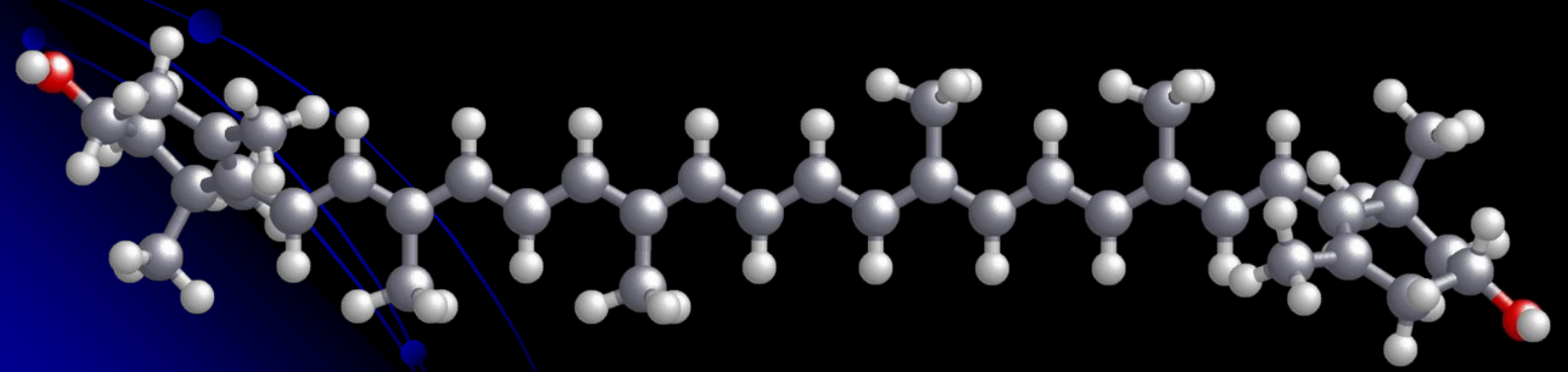
TNT is explosive because it contains a group of carbon atoms on the brink of oxidation. All that is required for the explosion is for the carbon, hydrogen and oxygen atoms to rearrange themselves into carbon dioxide and water, leaving behind a cloud of molecular nitrogen. In a instant, therefore, the compact molecule can be converted into a voluminous cloud of gas, and the pressure wave of its rapid expansion is the destructive shock of the explosion.



What Colour is Yellow?

Zeaxanthin – $C_{40}H_{56}O_2$



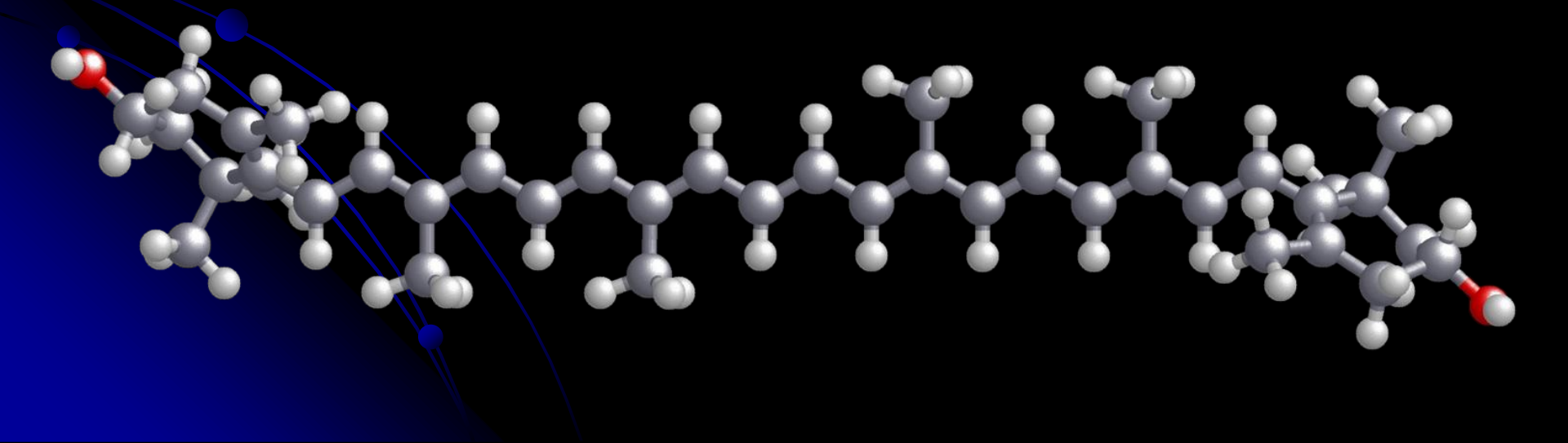


What Colour is Yellow?

Zeaxanthin – $C_{40}H_{56}O_2$

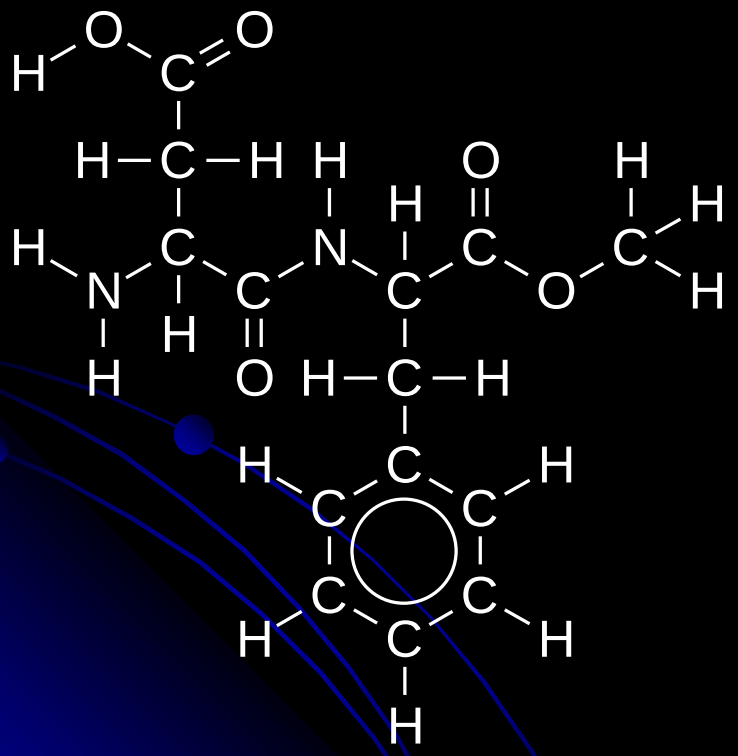
Zeaxanthin and carotene jointly colour corn (*Zea mays*). Zeaxanthin also contributes to the colour of egg yolk and orange juice along with a very similar molecule called *lutein*. Both zeaxanthin and lutein dissolve in animal fats and are responsible for their yellowish tint.

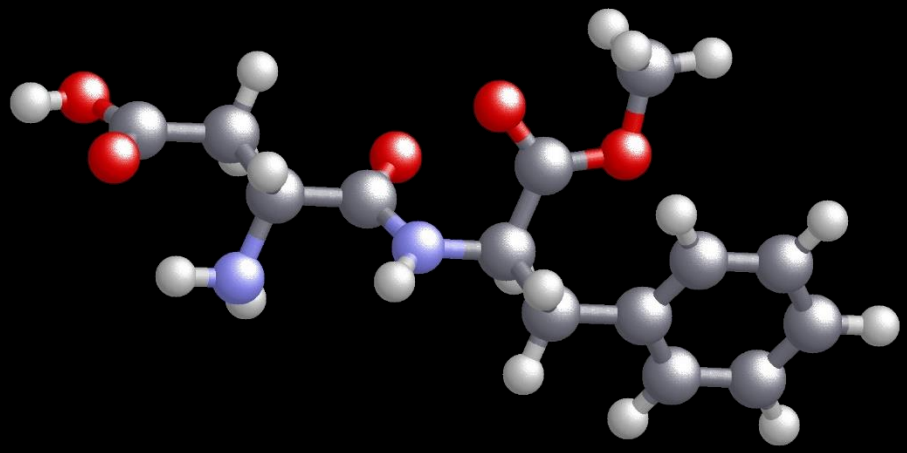
Both zeaxanthin and lutein collect in the yellow spot of the eye (*macula lutea*) where they filter out ultraviolet radiation and react with harmful free radicals.



Sweets for My Sweet…

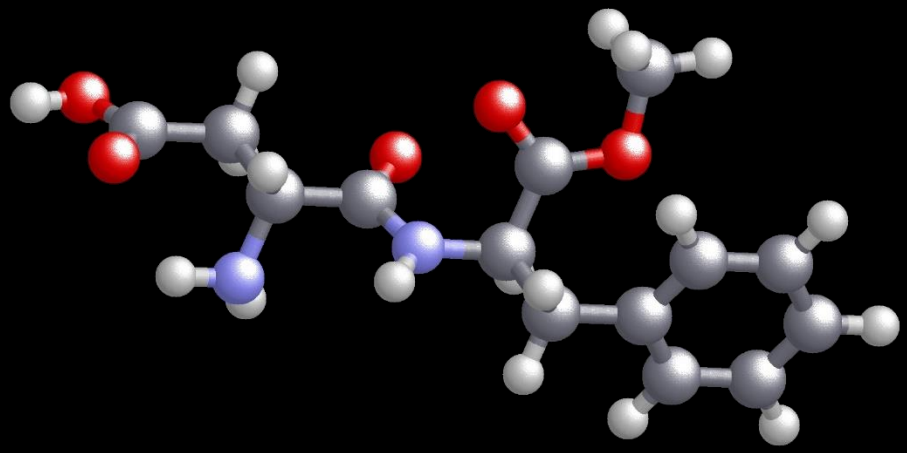
Aspartame – $C_{14}H_{18}O_5N_2$





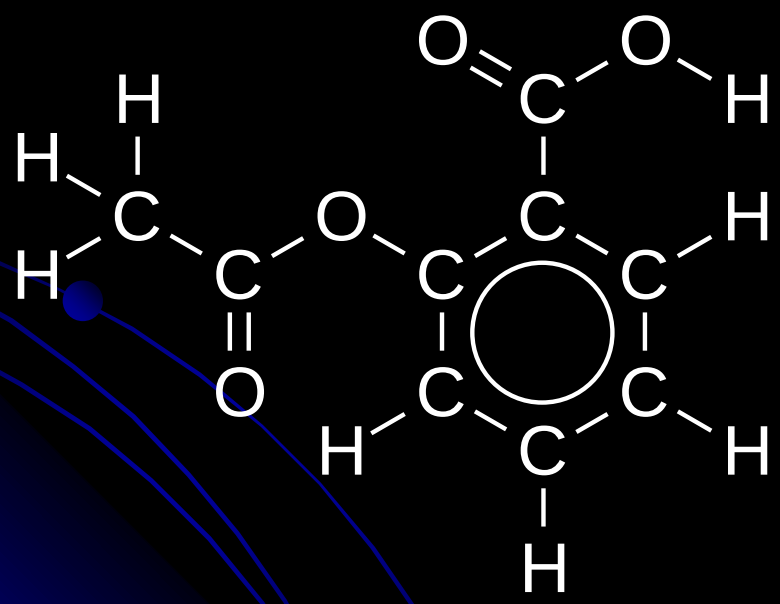
Sweets for My Sweet…
Aspartame – $C_{14}H_{18}O_5N_2$

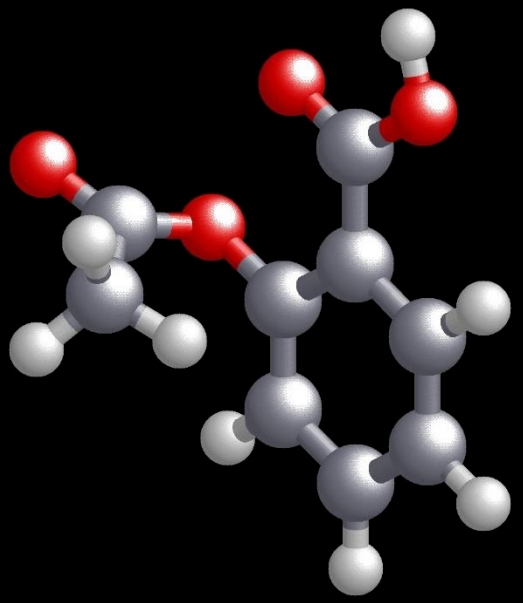
Aspartame (sold as *Nutrasweet* and *Equal*) is a combination of two naturally occurring amino acids, *aspartic acid* and *phenylalanine*. It tastes 100 – 200 times sweeter than sucrose and lacks the unpleasant aftertaste of saccharin. The sweet taste of aspartame was discovered by accident in 1965 after a chemist, who had just synthesised the compound, licked his fingers before picking up a piece of paper!



All that Chemistry Gives Me a Headache…

Aspirin – $C_9H_8O_4$

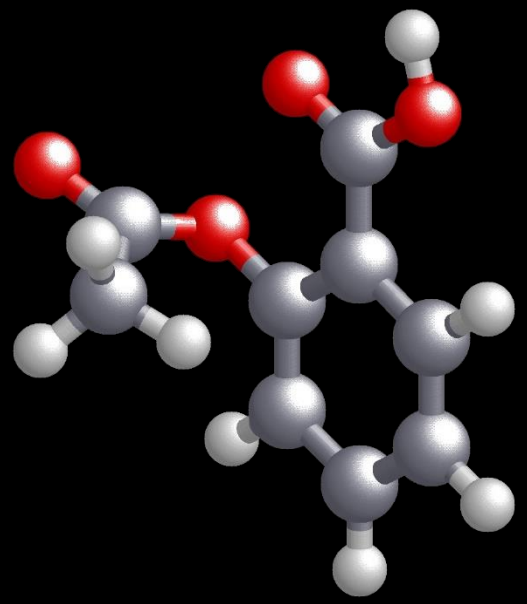




All that Chemistry Gives Me a Headache…

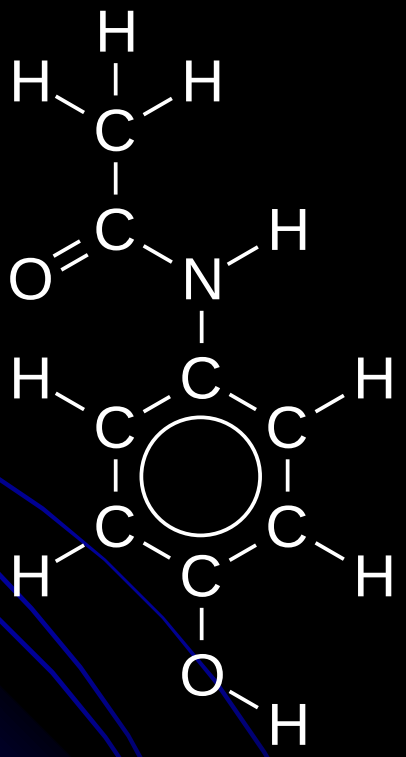
Aspirin – $C_9H_8O_4$

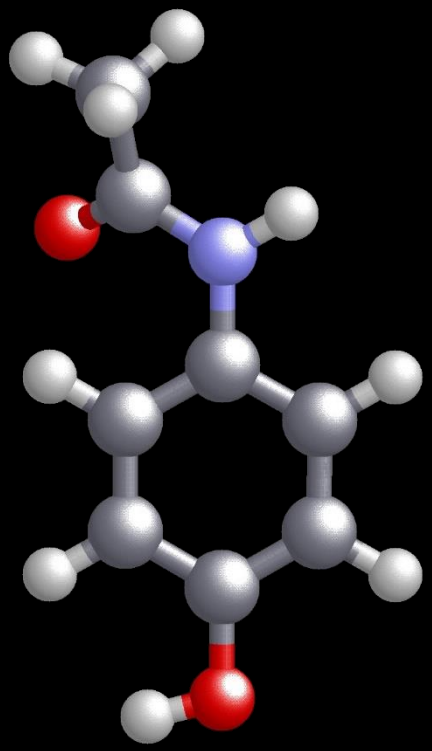
Aspirin is a derivative of salicylic acid, which is in turn extracted from the bark of the willow tree (*Salix alba*). The extract of willow tree bark has been used as an analgesic for hundreds of years. Aspirin interferes with the synthesis of *prostaglandins* in the human body by inhibiting the enzyme *prostaglandin cyclooxygenase*. Prostaglandins are locally acting hormones that, amongst other functions, interfere with the chemical signals sent across synapses, especially signals related to pain.



I Still Have a Headache...

Paracetamol - $C_8H_9O_2N$

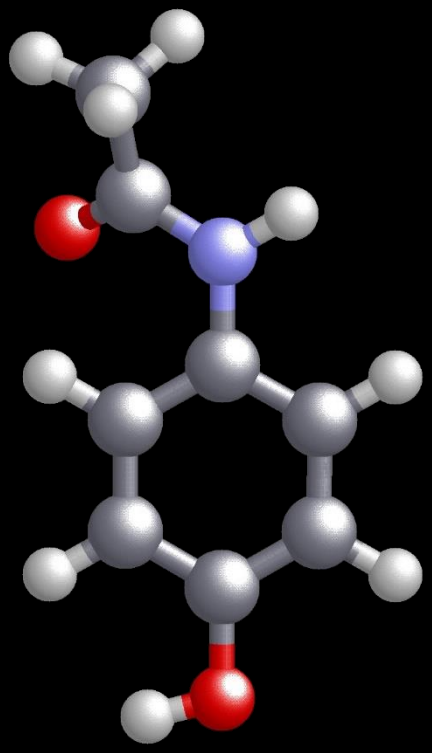




I Still Have a Headache…

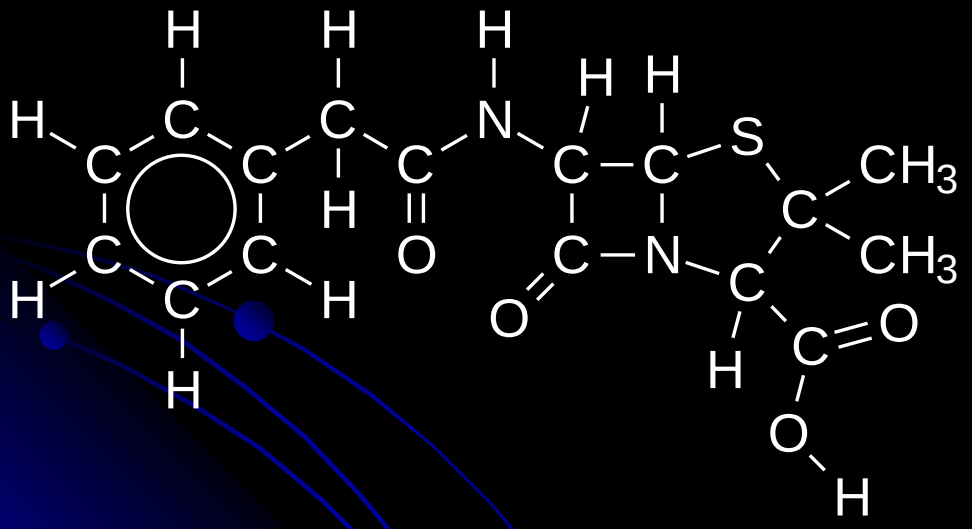
Paracetamol – $C_8H_9O_2N$

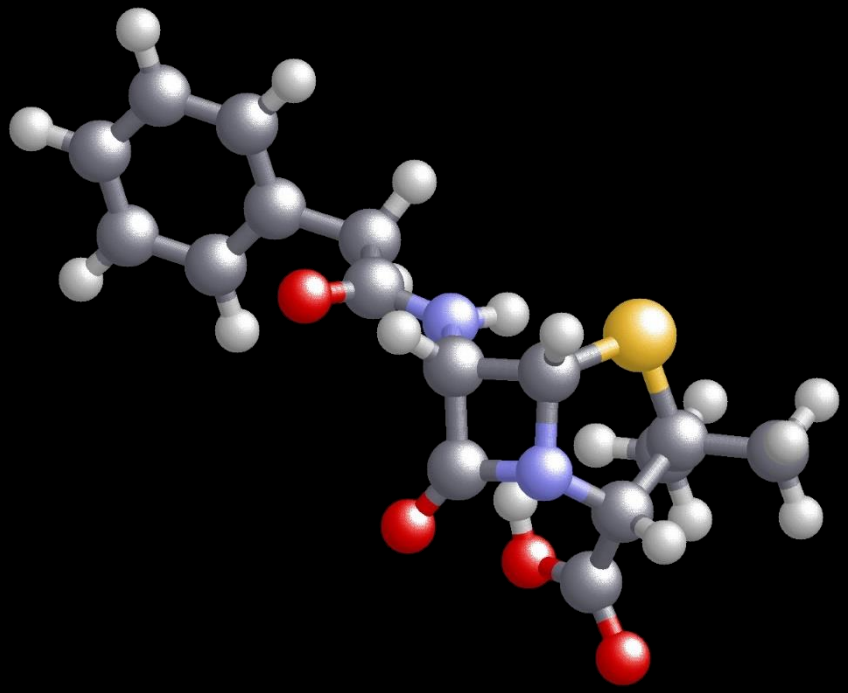
The analgesic properties of paracetamol were discovered by accident when some *acetanilide* (similar in structure to paracetamol, but without the –OH group at the bottom) was added to a patient's prescription by mistake. Note the similarity between the structure of aspirin and the structure of paracetamol. Although they are constructed from different atoms, they have very similar shapes and consequently inhibit the same enzyme.



Now I Feel Really Ill...

Penicillin G - $C_{16}H_{18}O_4N_2S$

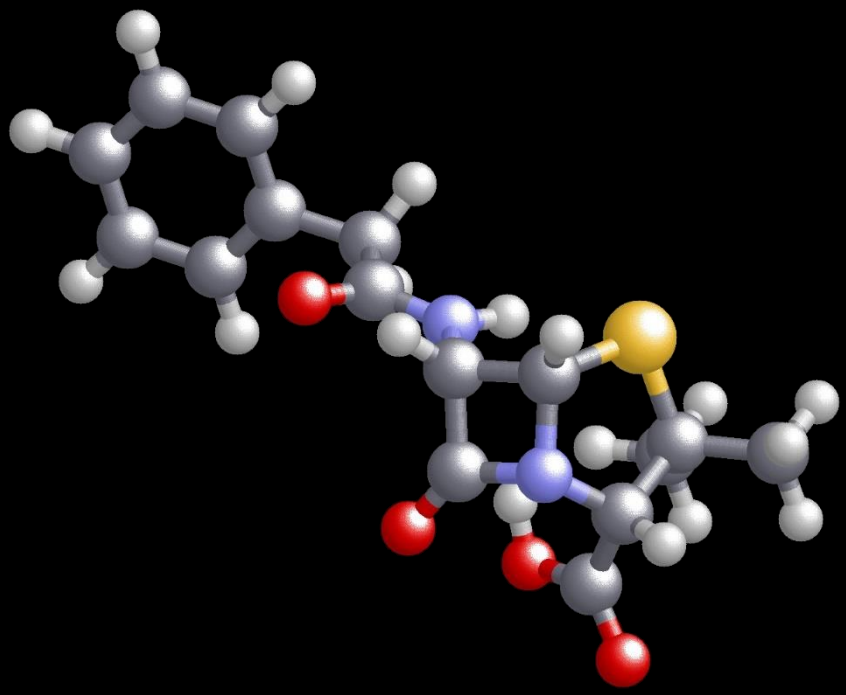




Now I Feel Really Ill…

Penicillin G – $C_{16}H_{18}O_4N_2S$

Penicillin was discovered by Alexander Fleming in 1928 at St. Mary's hospital in London. This is an example of yet another accidental discovery. While Fleming was away on holiday, an exposed culture plate of *staphylococci* was inoculated by some spores of the mould *Penicillium notatum* which blew in through an open window. Upon his return, Fleming noticed the culture plate and realised that the mould was somehow inhibiting the growth of bacteria. Further studies showed that the mould was producing a natural antibiotic which was in turn named penicillin.



References:

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