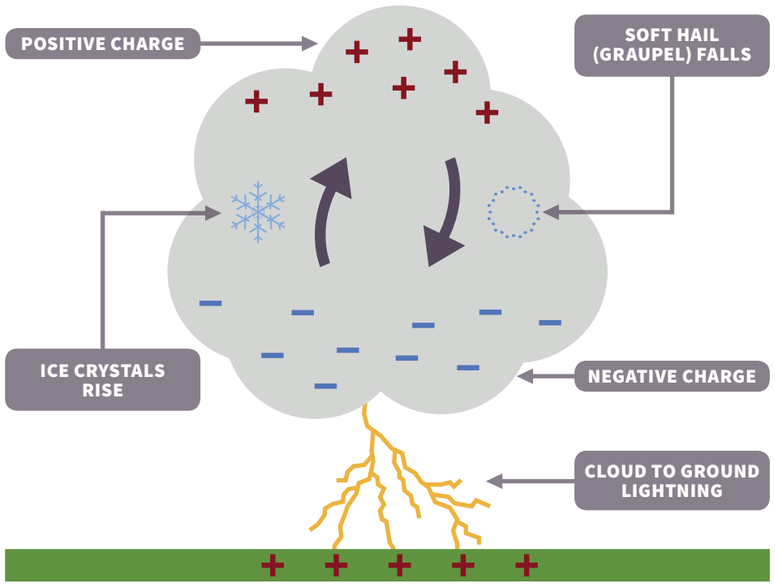
THE SCIENCE OF THUNDERSTORMS

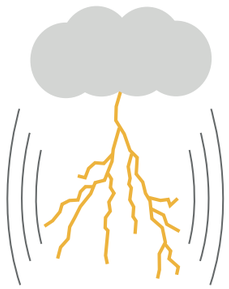
LIGHTNING

Air updrafts in storm clouds carry small water droplets and ice crystals up, while denser soft hail falls. When they collide, ice crystals become positively charged and soft hail becomes negatively charged. Consequently, the cloud's top becomes positively charged, with its base becoming negatively charged.



The cloud's negatively charged base repels electrons on the ground. Cloud-to-ground lightning is one type of lightning – others also result from the charge difference in clouds.

THUNDER



LIGHTNING TEMPERATURE

30,000 °C

(temperature of air channel through which lightning passes)

THUNDER SPEED

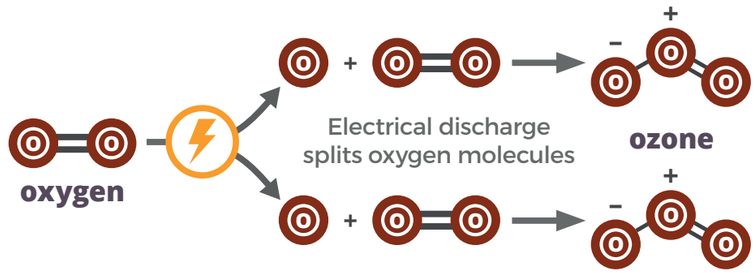
~ 343 m/s

(travels approximately 1 km in 3 s)

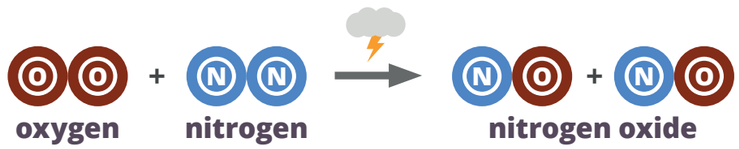
Lightning causes rapid heating and expansion of nearby air, followed by cooling and contraction. This creates a sonic shock wave – thunder.

LIGHTNING CHEMISTRY

Lightning strikes can split diatomic oxygen in the air into individual oxygen atoms. These combine with other oxygen molecules to form ozone, giving rise to the 'pre-rain' smell.



Lightning ionises air molecules in its path. The blue-violet colour of lightning is a consequence of light emissions from excited nitrogen and hydrogen atoms.



At the high temperatures lightning generates, nitrogen and oxygen combine to form nitrogen oxides. These dissolve in rain and form nitrates, important for plant growth.

nitrogen oxides + → **nitrates**