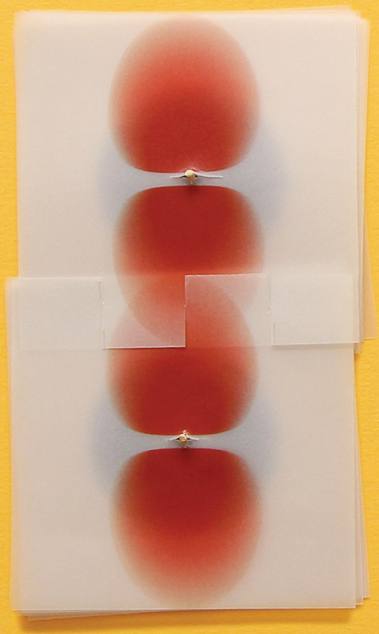

$\times 10^{22} =$

CREATE THE UNIVERSE - A FOUR-STEP METHOD

DIAMOND IS COMPOSED OF A MULTITUDE OF CARBON ATOMS, LINKED BY COVALENT BONDS. THIS BOND IS REALLY STRONG. AS A RESULT, DIAMOND IS A VERY STRONG MATERIAL.

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$\times 10^{22} =$

CREATE THE UNIVERSE - A FOUR-STEP METHOD

ICE IS COMPOSED OF A MULTITUDE OF WATER MOLECULES,
LINKED BY HYDROGEN BONDS. THIS BOND IS QUITE FRAGILE,
SO ICE ONLY FORMS BELOW 0°C, WHEN MOLECULES MOVE SLOWLY.

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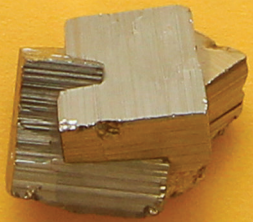
$\times 10^{22} =$



CREATE THE UNIVERSE - A FOUR-STEP METHOD

METAL IS COMPOSED OF A MULTITUDE OF ATOMS WHICH RELEASE ONE OF THEIR ELECTRONS TO FORM A "BAND". THIS METALLIC BAND GIVES ITS STRENGTH AND ITS ELECTRIC PROPERTIES TO THE MATERIAL.

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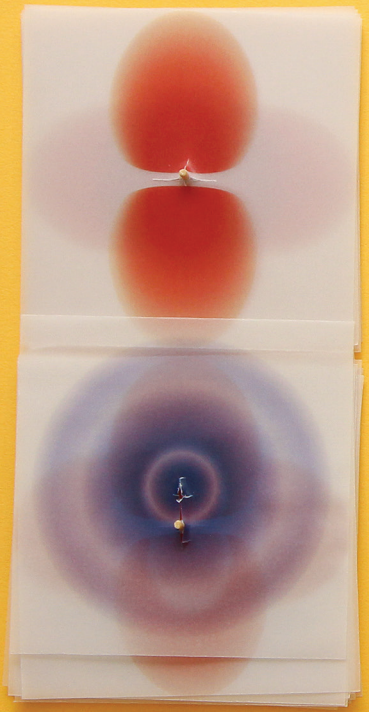

$\times 10^{22} =$

CREATE THE UNIVERSE - A FOUR-STEP METHOD

SALT IS COMPOSED OF A MULTITUDE OF CHLORINE ATOMS
AND SODIUM ATOMS, LINKED WITH EACH OTHER BY IONIC BONDS.

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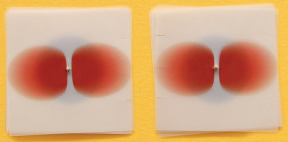
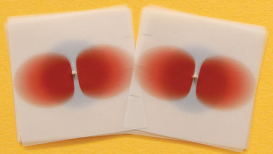
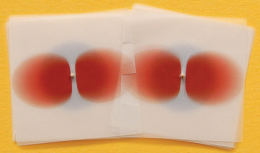
TWO CARBON ATOMS



SHARE

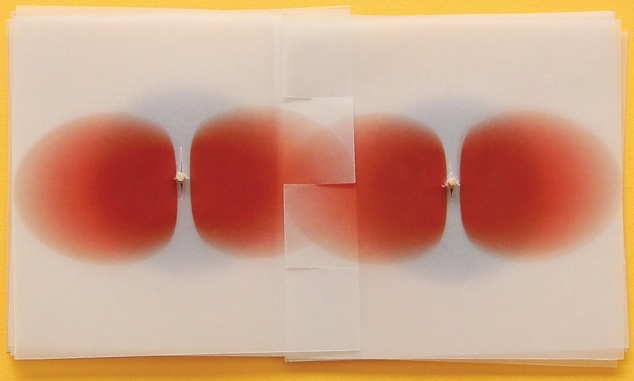


ONE OF THEIR ELECTRONS



TOGETHER

THIS CREATES



A COVALENT BOND

CREATE THE UNIVERSE - A FOUR-STEP METHOD

CARBON ATOMS WANT TO GAIN ELECTRONS; THEREFORE, THEY SHARE ONE OF THEIR ELECTRONS. THIS IS A COVALENT BOND, WHICH IS REALLY STRONG.

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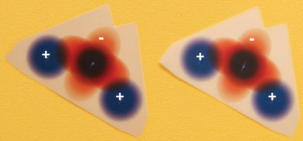
TWO WATER MOLECULES

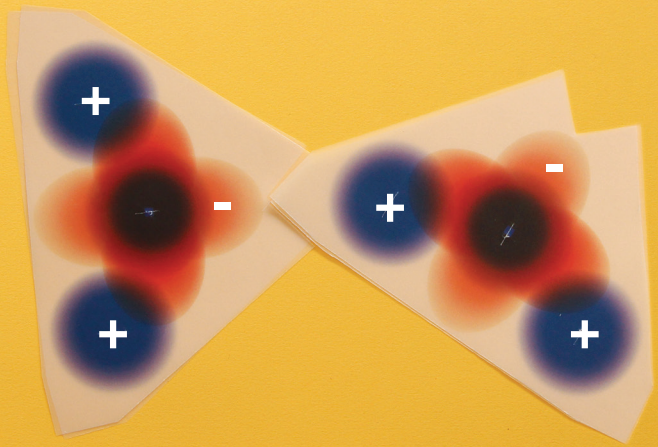


ATTACH WITH EACH OTHER

BECAUSE THEY ARE

POLARIZED

THIS CREATES



A HYDROGEN BOND

CREATE THE UNIVERSE - A FOUR-STEP METHOD

WATER MOLECULES ARE POLARIZED. POSITIVE AND NEGATIVE CHARGES ATTRACT EACH OTHER. THIS IS A HYDROGEN BOND, BUT IT'S QUITE FRAGILE.

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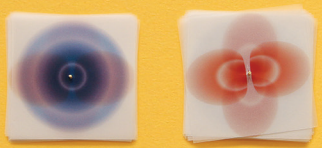
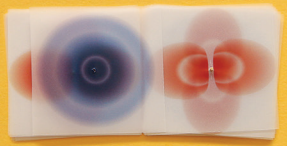
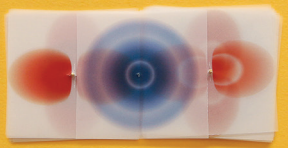
ONE SODIUM ATOM



GIVE ONE OF ITS ELECTRONS

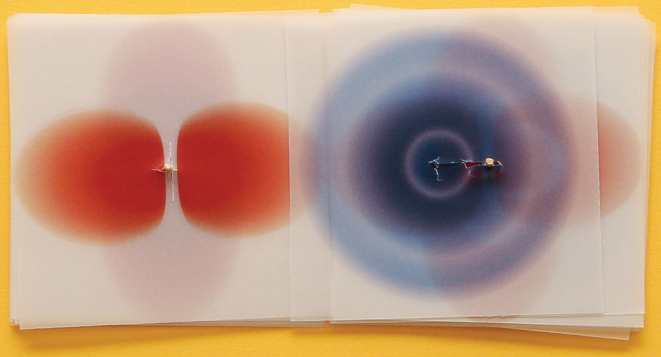


TO A NEIGHBORING



CHLORINE ATOM

THIS CREATES



AN IONIC BOND

CREATE THE UNIVERSE - A FOUR-STEP METHOD

SODIUM GIVES ITS ELECTRON TO CHLORINE BECAUSE IT WANTS TO LOOSE ONE WHILE CHLORINE WANTS TO GAIN ONE. THIS CREATES AN IONIC BOND.

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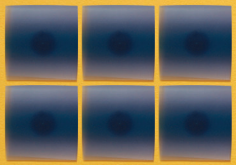
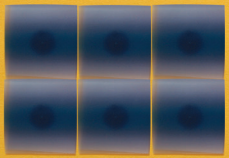
SOME LITHIUM ATOMS

GIVE AWAY

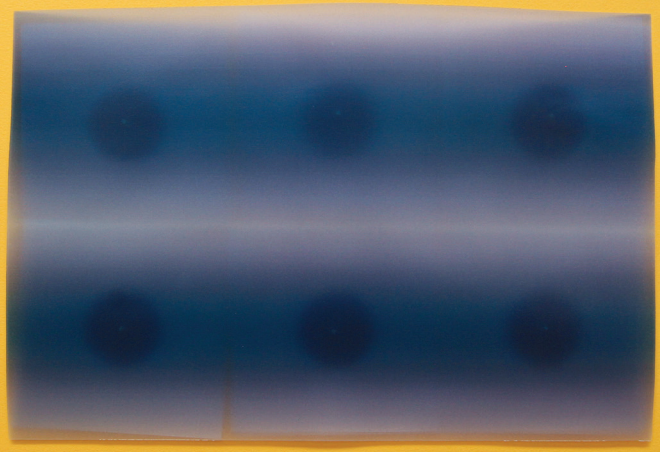


ONE OF THEIR ELECTRONS



WHICH DELOCALISES

THIS CREATES



A METALLIC BOND

CREATE THE UNIVERSE - A FOUR-STEP METHOD

SOME ATOMS CAN GIVE AWAY ONE OF THEIR ELECTRONS,
WHICH IS THEN SHARED BETWEEN ALL THE ATOMS:
THIS CREATES A METALLIC BOND. THIS BOND IS REALLY STRONG
AND ALLOWS ELECTRICITY TO CONDUCT.

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CREATE THE UNIVERSE - A FOUR-STEP METHOD

EACH TIME YOU MOVE ONE STEP FORWARD IN THE PERIODIC TABLE OF ELEMENTS, THE ATOM HAS ONE MORE ELECTRON. HERE,THE SHAPE OF THE LAST ADDED ELECTRON IS SHOWN.

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$$-\frac{h^2}{2m}\nabla^2\psi - \frac{1}{4\pi\varepsilon_0}.\frac{e^2}{r}\psi = E\psi(r)$$

$$\psi(r) = \psi(r,\theta,\phi)$$

$$\nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}$$

$$\nabla^2 = \frac{1}{r^2}\frac{\partial^2}{\partial r}\left(r^2\frac{\partial}{\partial r}\right) + \frac{1}{r^2 sin\theta}\frac{\partial}{\partial\theta}\left(sin\theta\frac{\partial}{\partial\theta}\right) + \frac{1}{r^2 sin^2\theta}\frac{\partial^2}{\partial\phi^2}$$

$$-\frac{h^2}{2m_e}\frac{1}{r^2 sin\theta}\left[\frac{1}{r^2}\frac{\partial^2}{\partial r}\left(r^2\frac{\partial\psi}{\partial r}\right) + \frac{1}{r^2 sin\theta}\frac{\partial}{\partial\theta}\left(sin\theta\frac{\partial\psi}{\partial\theta}\right) + \frac{1}{r^2 sin^2\theta}\frac{\partial^2\psi}{\partial\phi^2}\right]$$
$$-\frac{1}{4\pi\varepsilon_0}.\frac{e^2}{r}\psi = E\psi$$

$$\psi_{n,l,m_l}(r,\theta,\phi) = R_{n,l}(r).Y_{l,m_l}(\theta,\phi)$$

CREATE THE UNIVERSE - A FOUR-STEP METHOD

THIS COMPUTATION RESULTS IN THE DETERMINATION OF A WAVE FUNCTION, WHICH CORRESPONDS TO ALL THE POSSIBLE SHAPES OF THE ELECTRONS IN THE ATOMS.

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