8 Electric charge and Coulomb's law – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	**Write it 3 times** (English)
Electric charge	
Coulomb's law	

Recall

You have seen electric charge in everyday life:

- Rub a balloon on your hair and it sticks to a wall.
- Like charges push apart; opposite charges pull together.
- Static shocks are charge jumping across a gap.

This sheet makes the force between charges exact. Each idea has a worked example.

New ideas

1 Electric charge

Electric charge comes in two kinds, positive and negative. Like charges **repel**; opposite charges **attract**. Charge is carried by electrons moving between objects.

2 Coulomb's law

The force between two point charges is **Coulomb's law** :

$$F = \frac{kq_1q_2}{r^2},$$

with $k = 9.0 \times 10^9$. It is an inverse-square law – like gravity, but it can push or pull.

Worked example. Two charges of 3.0 μC and 2.0 μC, 0.10 m apart: $F =$

$$\frac{9.0 \times 10^9 \times (3.0 \times 10^{-6})(2.0 \times 10^{-6})}{(0.10)^2} = 5.4 \text{ N}.$$

3 Conductors and insulators

A **conductor** lets charge move freely (metals); an **insulator** holds it in place (plastic, rubber).

4 Charge is conserved

Charge is never created or destroyed, only moved from one object to another.

Watch out: Coulomb's law is inverse-square – **doubling** the distance makes the force **four times smaller**, not two times. Always square the distance.

Practice

Try these in order. The methods are all above.

2.1 State whether the force is a push or a pull between (a) two negative charges, (b) a positive and a negative charge. [2]

2.2 Two charges of 2.0 μC and 2.0 μC are 0.20 m apart. Find the force ($k = 9.0 \times 10^9$). [3]

2.3 Give one example of a conductor and one of an insulator. [2]

2.4 Two charges are moved from 0.10 m to 0.30 m apart. State the factor by which the force changes. [2]

2.5 State what "charge is conserved" means. [1]