Electrostatics - Part 5

In the last worksheet we learnt how to calculate Q transferred. Now remember that **1 electron has a charge of 1.6 x 10^{-19} J**. So if we know the number of Coloumbs of charge transferred, we can calculate how many individual electrons were transferred using the following formula:

$$\text{No. of electrons transferred} = \frac{\text{Q transferred}}{\text{Charge on 1 electron}}$$

NOTE: **We do not use any signs for $Q_{transferred}$ or the charge on the electron because we cannot have a negative number of electrons transferred.**

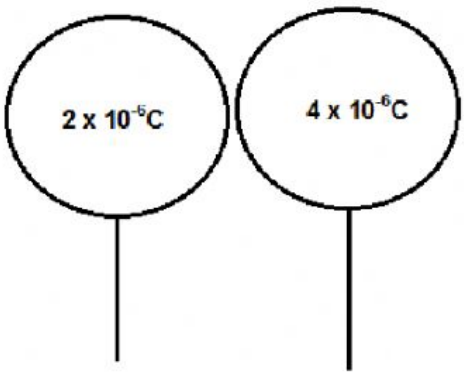
To calculate the number of electrons transferred you will first need to calculate $Q_{transferred}$. So this will usually be a THREE part problem:

(1) calculate Q_{new};

(2) calculate $Q_{transferred}$;

(3) calculate no. of electrons transferred.

Calculating the no. of electrons that were transferred:



$$Q_{new} = \frac{Q1 + Q2}{2}$$
$$= 3 \times 10^{-6}\ C$$

$$Q_{transferred} = Q_{final} - Q_{initial}$$
$$= 3 \times 10^{-6} - 4 \times 10^{-6}$$
$$= -1 \times 10^{-6}\ C$$

No of electrons transferred = $\frac{\text{Q transferred}}{\text{Charge on } e^-}$

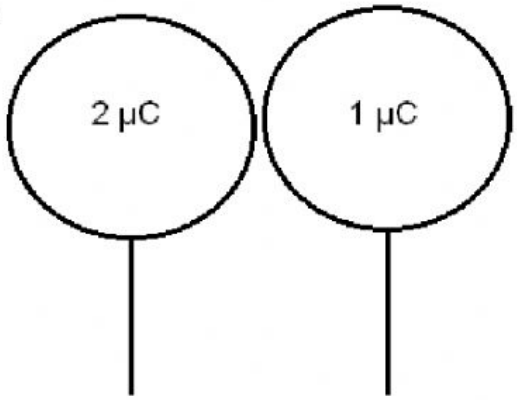
$$= \frac{1 \times 10^{-6}}{1{,}6 \times 10^{-19}}$$
$$= 6{,}25 \times 10^{25} \text{ electrons}$$

Exercise 4

Calculate the number of electrons transferred in each of the following examples.

Remember this will be a THREE step process. Continue to use the object on the left as Q1 and the right as Q2 and don't forget to include signs in all steps EXCEPT the final one where you are calculating no. of electrons transferred. Also keep remembering to convert the charge to Coulombs before doing the sums.

1.



$Q_{new} = \frac{Q_1 + Q_2}{2}$

$= \frac{\quad + \quad}{2}$

$=$ C

$Q_{trans} = Q_{final} - Q_{initial}$

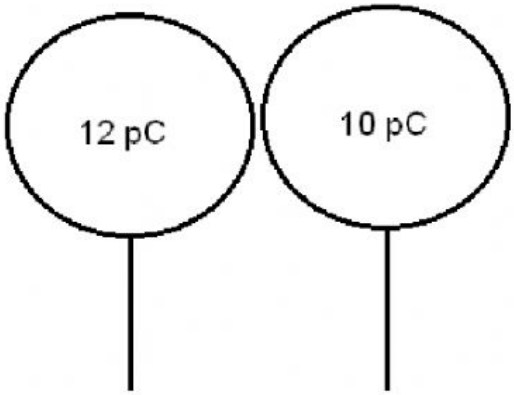
$=$ -

$=$ C

No. of electrons = $\frac{\text{Q transferred}}{1{,}6 \times 10^{-19}}$

= electrons

2.



$Q_{new} = \frac{Q_1 + Q_2}{2}$

$= \frac{\quad + \quad}{2}$

$=$ C

$Q_{trans} = Q_{final} - Q_{initial}$

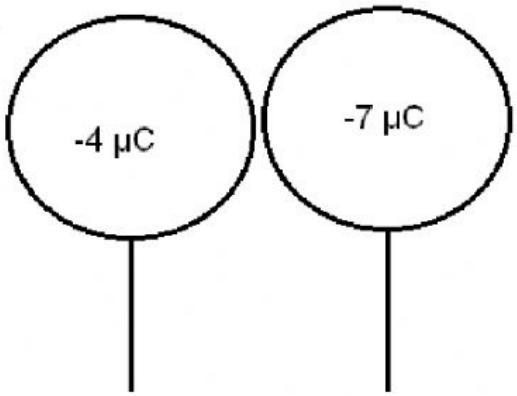
$=$ -

$=$ C

No. of electrons = $\frac{\text{Q transferred}}{1{,}6 \times 10^{-19}}$

= electrons

3.



$Q_{new} = \frac{Q_1 + Q_2}{2}$

$= \frac{\quad + \quad}{2}$

$=$ C

$Q_{trans} = Q_{final} - Q_{initial}$

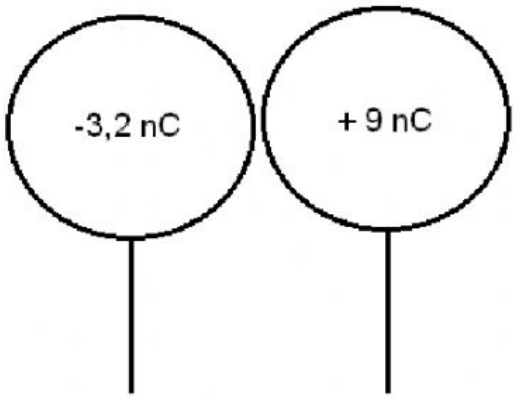
$=$ -

$=$ C

No. of electrons = $\frac{\text{Q transferred}}{1{,}6 \times 10^{-19}}$

= electrons

4.



$Q_{new} = \frac{Q_1 + Q_2}{2}$

$= \frac{\quad + \quad}{2}$

$=$ C

$Q_{trans} = Q_{final} - Q_{initial}$

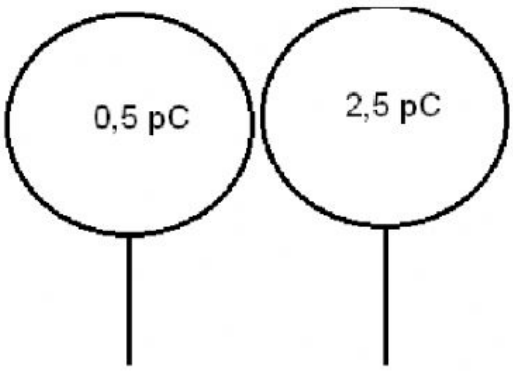
$=$ -

$=$ C

No. of electrons = $\frac{\text{Q transferred}}{1{,}6 \times 10^{-19}}$

= electrons

5.



$Q_{new} = \frac{Q_1 + Q_2}{2}$

$= \frac{\quad + \quad}{2}$

$=$ C

$Q_{trans} = Q_{final} - Q_{initial}$

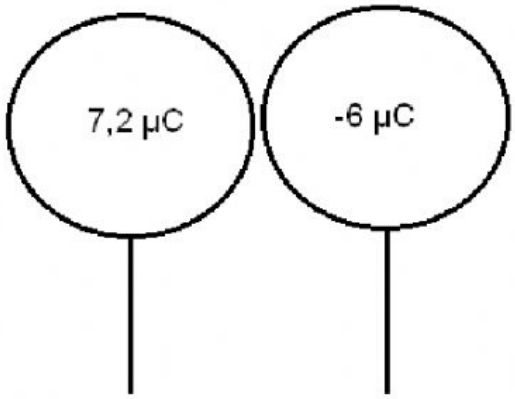
$=$ -

$=$ C

No. of electrons = $\frac{\text{Q transferred}}{1,6 \times 10^{-19}}$

= electrons

6.



$Q_{new} = \frac{Q_1 + Q_2}{2}$

$= \frac{\quad + \quad}{2}$

$=$ C

$Q_{trans} = Q_{final} - Q_{initial}$

$=$ -

$=$ C

No. of electrons = $\frac{\text{Q transferred}}{1,6 \times 10^{-19}}$

= electrons