HYSICAL SCIENCE **GRADE 10**

CHEMICAL CHANGE AND ELECTROSTATICS **TEST 3**

FORMULAE

Q new = $\frac{Q1+Q2}{2}$

no of e$^-$ transferred = $\frac{Q\ transferred}{charge\ on\ 1\ electron}$

Q transferred = Q final – Q initial

F = $\frac{k\ x\ Q1\ x\ Q\ 2}{r^2}$

CONSTANTS

Charge on an electron	-1,6 x 10^{-19} C
Charge on a proton	1.6 x 10^{-19} C
Coulombs Constant (k)	9 x 10^9 N.m^2.C^{-2}

INSTRUCTIONS

This test is divided into 2 sections:

Section A : Chemical change Section B : Electrostatics (xx)

Write all numbers with a **comma** eg 0,71

Do not leave spaces between the number and the unit eg 0,71Hz

If there are two steps to a calculation there will be two blocks provided. Fill in the answers in the correct order.

Round final answers off to two decimal places where necessary

When answers are very small or very big, write in scientific notation and still round off to **two decimal places.**

SECTION A : CHEMICAL CHANGE **(32)**

QUESTION 1 : NAMES TO FORMULAE **[10]**

Write the chemical formulae for the following compounds

1.1 ammonia

1.2 ammonium dichromate

1.3 potassium permanganate

1.4 barium chloride

1.5 sodium sulphite

1.6 silver iodide

1.7 copper (II) carbonate

1.8 calcium sulphate

1.9 methane

1.10 manganese (VII) hydroxide

QUESTION 2 : FORMULAE TO NAMES **[10]**

Write the chemical names (**using stock notation where necessary**) for the following compounds

2.1 H_2S

2.2 H_2SO_4

2.3 $Fe(NO_3)_2$

2.4 NH_4NO_2

2.5 Ag_2SO_4

2.6 CH_3COOH

2.7 NaOH

2.8 MnO_2

2.9 KBr

2.10 PbO_2

QUESTION 3 : BALANCING EQUATIONS **[12]**

Place a co-efficient into the blocks in front of the compounds in order to balance the equations.

If no number is required then place a number 1 in the block

3.1 $\square Al + \square Cl_2 \rightarrow \square AlCl_3$

3.2 $\square H_2SO_4 + \square NH_3 \rightarrow \square (NH_4)_2SO_4$

3.3 $\square C_{12}H_{22}O_{11} \rightarrow \square C + \square H_2O$

3.4 $\square AgNO_3 + \square CaCl_2 \rightarrow \square AgCl + \square Ca(NO_3)_2$

3.5 $\square NH_3 + \square O_2 \rightarrow \square NO + \square H_2O$

QUESTION 4 : CONSTRUCTING A BALANCED EQUATION **[11]**

Write the following chemical changes as balanced equations

Place the formulae for the chemicals into the box.

Place a co-efficient into the circle in front of the box in order to balance the equation.

If no number is required then place a number 1 in the block

4.1 Hydrogen gas burns in oxygen gas to produce water vapour. (3)

4.2 iron (III) oxide reacts with carbon monoxide to produce iron and carbon dioxide. (4)

4.3 Aspartame, (an artificial sweetener) has the formula $C_{14}H_{18}N_2O_5$.
Write a balanced for its combustion in oxygen gas to form carbon dioxide gas, water and nitrogen gas. (4)

SECTION B : ELECTROSTATICS **(43)**

QUESTION 5 : **[4]**

5.1 When a glass rod is rubbed in a silk cloth, the silk cloth gains /loses electrons and the glass rod becomes positively / negatively charged.

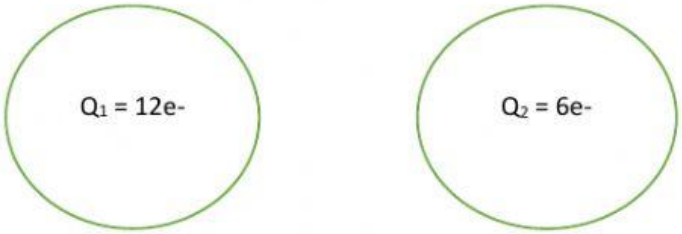
5.2 A physical quantity such as charge can be divided into smaller and smaller quantities. When that smallest quantity can no longer be divided, we say that the charge has been 

5.3 Charge cannot be created or destroyed but only transferred from one object to another. We call this the **Law of** _____ **of Charge**.

QUESTION 6

6.1 Two charged spheres Q_1 and Q_2 have an excess of electrons.

Q_1 has 12 extra electrons and Q_2 has 6 extra electrons



The spheres are brought together and allowed to separate again.

Calculate the charge on each sphere

And then the new charge on the spheres after they touch

{enter answers as follows: 6,32 x 10 -14 C }

Answer, with 2 deci

Exponent

unit

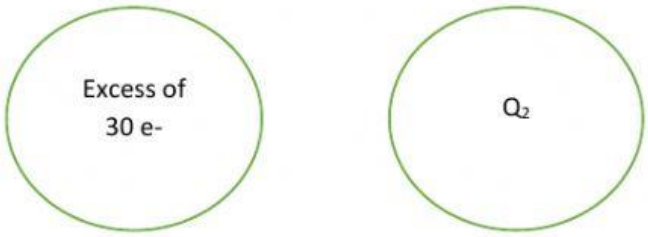
Q_1 = ____ x 10 ____ _____

Q_2 = ____ x 10 ____ _____

Q new = ____ x 10 ____ _____

6.2 Two charged spheres Q_1 and Q_2 have an excess/shortage of electrons.

Q_1 has 30 extra electrons and the charge on Q_2 is unknown.



The spheres are brought together and allowed to separate again.

The new charge on each sphere shows an excess of 10 e –

Calculate the charge on Q1 = ____ x 10 ____ _____

Calculate the new charge on each sphere after they touched

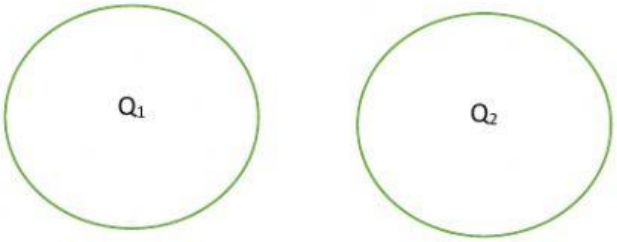
= ____ x 10 ____ _____

Calculate the initial charge on Q_2.

Q_2 = ____ x 10 ____ _____

QUESTION 7

7.1 Two spheres have charges as follows Q_1 has a charge of $2,5 \times 10^{-6}$C while Q_2 has a charge of -4 x 10 nC



The spheres are brought together and allowed to separate again.

7.1.1 Do electrons transfer from Q_1 to Q_2 or from Q_2 to Q_1?

7.1.2 Calculate the new charge on the spheres.

Q new = ____ x 10 ____ _____

7.1.3 Calculate the charge that was transferred during the process

Q transferred = ____ x 10 ____ _____

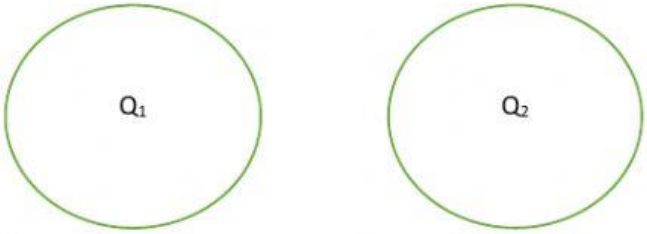
7.1 4 Calculate the number of electrons that were transferred during the process.

no of e^- transferred = $\frac{Q\ transferred}{charge\ on\ 1\ electron}$

no of e- transferred = ____ x 10 ____ e-

7.2 Two charged spheres Q_1 and Q_2 have an excess/shortage of electrons.

Q_1 has a charge of 3×10^{-6}C while the charge on Q_2 is unknown.



The spheres are brought together and allowed to separate again.

The new charge on each sphere is now $5{,}5 \times 10^{-6}$C .

7.2.1 Calculate the initial charge on Q_2.

Q_2 = ____ x 10 ____ _____

7.2.2 Calculate the charge that was transferred during the process.

Q transferred =____ x 10 ____ _____

7.2 3 Calculate the number of electrons that were transferred during the process.

no of e- transferred = ____ x 10 ____ e^-

7.2.4 How many coulombs of electrons does your answer in 7.2.3 represent? =____ x 10 ____ _____

8.1 <———— 30 cm ———— >

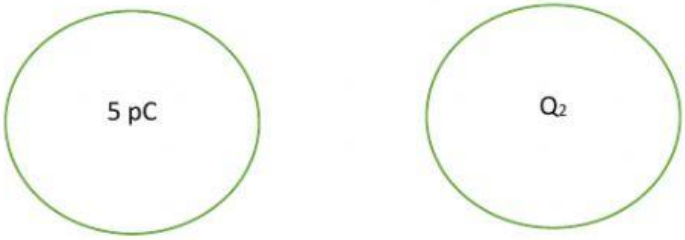
Two charged spheres are positioned 30 cm apart from their centres.

Calculate the electrostatic force of attraction between them.

$$F = \frac{k \times Q1 \times Q2}{r^2}$$

F = ____ x 10 ____ _____

8.2 < ---------- 100 cm --------- >



Two positively charged spheres are placed 100 cm apart from their centres.

The Q_1, sphere on the left carries a charge of 5pC while the charge on Q_2, the sphere on the right is unknown. The force between them is 150 N.

Calculate the size of the unknown charge on the right.

$$F = \frac{k \times Q1 \times Q2}{r^2}$$

$$k \times Q_1 \times Q_2 = Fr^2$$

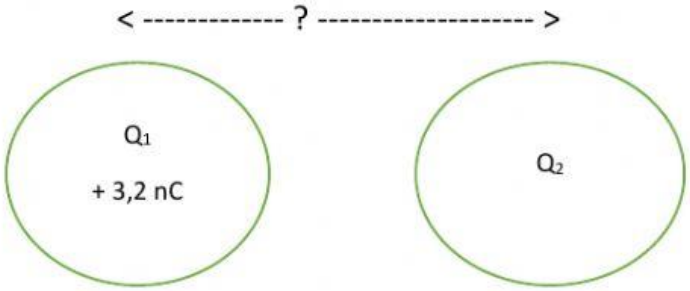
$Q_2 = \frac{\square\square}{\square\square}$

(change the subject of the formula- only substitute the symbols in the above equation, not actual values)

Q_2 = ____ x 10 ____ _____

QUESTION 9

Two identically charged spheres are situated at an unknown distance apart.



There is an electrostatic force of 2,30 x10^{-6} N between them.

9.1.1 Is the force between them one of attraction or repulsion?

9.1.2 Calculate the distance between the spheres (in metres).

$F = \frac{k\ x\ Q1\ x\ Q\ 2}{r^2}$

$Fr^2 = k \times Q_1 \times Q_2$

$r = \sqrt{\frac{\square\square}{\square\square}}$

(change the subject of the formula)

r = ____ x 10 ____ _____