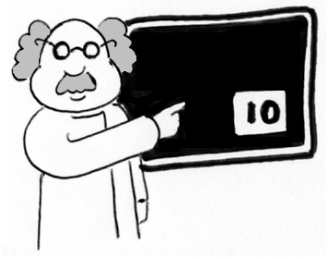
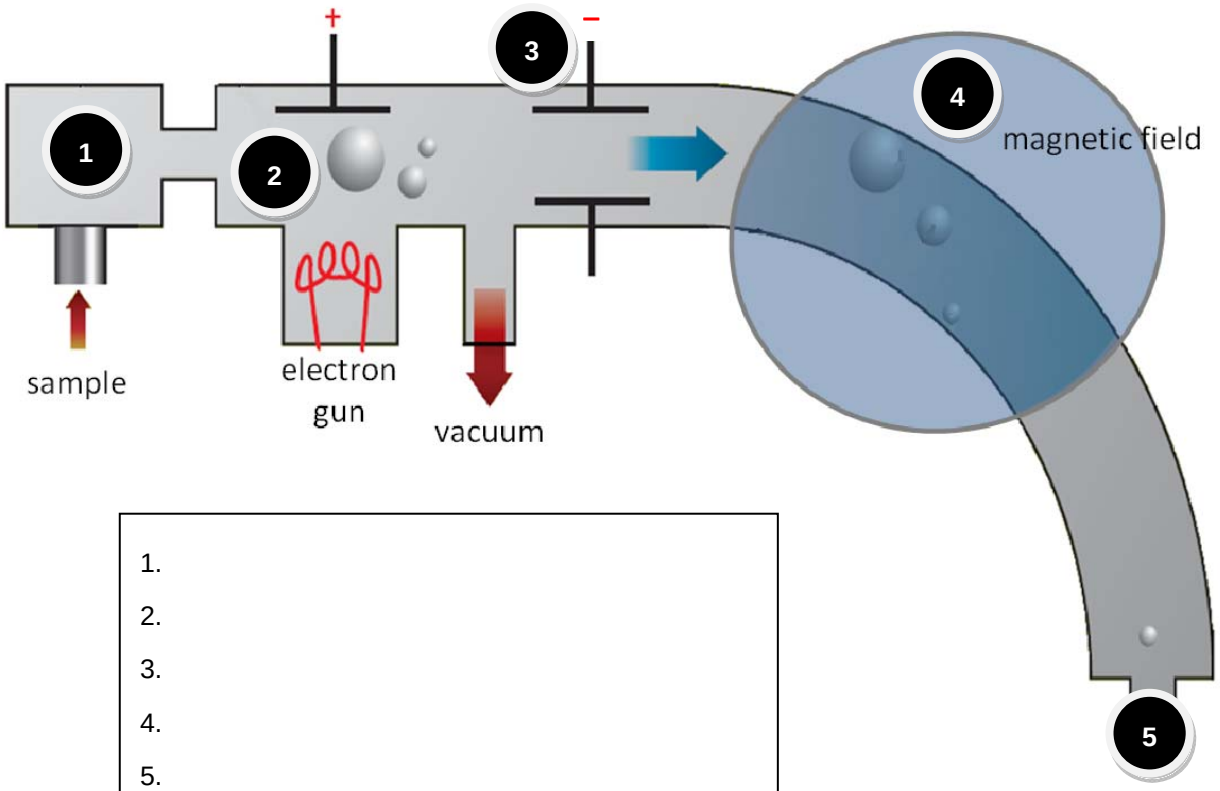


STARTER FOR 10...!

10.1.1. The mass spectrometer

1. The diagram below shows a simple mass spectrometer. Name the processes that occur at each of the points 1 - 5 highlighted; (5 marks)



1.
2.
3.
4.
5.

2. For each of the statements below, indicate with the appropriate number, the stage in the mass spectrometer at which that process occurs. The first one has been done for you. (5 marks)

Statement	Stage
The atoms are turned into ions	*2*
The ions are deflected. The size of the deflection depends upon the ratio of the ion's mass to its charge.	
A current is generated the size of which is proportional to the abundance of each ion	
$X(l) \rightarrow X(g)$	
The positive ions are attracted towards negatively charged plates	
$X(g) \rightarrow X^{+}(g)$	

STARTER FOR 10...

10. Analysis answers

10.1. Mass spectrometry

10.1.1. The mass spectrometer

1.
1. vaporisation
2. ionisation
3. acceleration
4. deflection
5. detection (5 marks)

2.

Statement	Stage
The atoms are turned into ions	*2*
The ions are deflected. The size of the deflection depends upon the ratio of the ion's mass to its charge.	**4**
A current is generated the size of which is proportional to the abundance of each ion	**5**
$X(l) \rightarrow X(g)$	**1**
The positive ions are attracted towards negatively charged plates	**3**
$X(g) \rightarrow X^{+}(g)$	**2**

(5 marks)

10.1.2. Isotopic abundance

1. $\dfrac{(4.3\% \times 50) + (85.1\% \times 52) + (8.2\% \times 53) + (2.4\% \times 54)}{100\ \%} = \mathbf{52.0}$ (2 marks)

As this is the relative atomic mass of chromium found on earth, this strongly suggests that the rock sample is indeed **from earth** and not a meteor. (1 mark)

2. $\dfrac{(2.7 \times 204) + (46.0 \times 206) + (42.2 \times 207) + (100 \times 208)}{(2.7 + 46.0 + 42.2 + 100.0)} = \mathbf{207.2}$ (2 marks)

(1 d.p. 1 mark)

Based on its atomic mass, X is likely to be **Pb, lead** (1 mark)

3. If there is 11% of the heaviest isotope present we can say that the percentage of the lightest isotope present is 'y' and therefore the percentage of the remaining isotope present must be;

$100\% - 11\% - y\% = 89\% - y$ (1 mark)

Therefore substituting these numbers into our equation;

$$\frac{(26 \times 11\%) + (24 \times y\%) + [25 \times (89 - y)\%]}{100\ \%} = 24.3$$

$286.0 + 24\,y\% + 2225 - 25\,y\% = 2430$

$2511 - y\% = 2430$ (1 mark)