

Development of the Periodic table

Answer all the questions below then check your answers

1. What is an element?
2. What did John Dalton contribute on the journey towards constructing a periodic table of elements?
3. What were Dobereiner's triads? Give an example of one of his triads.
 - a. How might Dobereiner's triads been useful in the construction of a periodic table?
4. What was Newlands law of octaves?
 - a. What was the main problem with Newlands law of octaves?
 - b. Name 2 differences between Newlands periodic table and the periodic table we use today?
5. How did Mendeleev improve upon Newlands periodic table?
 - a. What was the iodine tellurium problem that Mendeleev had? How did he solve it?
 - b. Why did Mendeleev leave gaps in his periodic table?
 - c. Why was the discovery of gallium seen as a vindication of Mendeleev's periodic table?

d. Which complete group of elements was missing from Mendeleev's periodic table?
Why were they missing?

Development of the periodic table

Answers

1. What is an element? *Simple substance made up only 1 type of atom*
2. What did John Dalton contribute on the journey towards constructing a periodic table of elements?
 - *Atoms of a particular element are identical and they join with other elements to form compounds.*
 - *Elements were made of small particles called atoms.*
 - *Atoms of different elements varied in mass.*
 - *Compounds are made up of elements that combine in whole number ratios only.*
 - *In chemical reactions atoms rearrange themselves into compounds. The atoms are not changed in these compounds and it is possible to break the compounds back up into the elements that make them up.*
 - *Dalton also made an attempt at calculating the masses of some elements, though his calculations were not always correct.*

3. What were Dobereiner's triads? Give an example of one of his triads.

Dobereiner arranged the elements in 3s and noticed that the mass of the middle element was the average of the one above and below it e.g. chlorine, bromine, iodine, the mass of bromine is the average of the mass of chlorine and iodine.

- a. *How might Dobereiner's triads been useful in the construction of a periodic table? Should have made chemists realise that the elements in his triads were related and should have been grouped together in the periodic table.*

4. What was Newlands law of octaves?

Newlands believed that the chemical properties of elements in his periodic table repeated every eighth element, but they did not!

a. What was the main problem with Newlands law of octaves?

His law of octaves only really worked for the first 20 elements, he had boxes with more than one element in them, he grouped elements together that had little in common and he assumed that all the elements had been discovered when they had not been.

b. Name 2 differences between Newlands periodic table and the periodic table we use today?

- Newlands arranged the elements by their relative atomic masses, in the modern periodic table they are arranged by their atomic number.
- Group 0, the noble gases is missing from Newlands table, they had not been discovered yet.

5. How did Mendeleev improve upon Newlands periodic table?

He left gaps for undiscovered elements and made prediction about the properties of these as yet unknown elements. He was not worried about having to swap or move elements around in his table to match up their chemical and physical properties.

a. What was the iodine tellurium problem that Mendeleev had? How did he solve it? Mendeleev arranged the elements by their relative atomic mass, however if you do this then iodine and tellurium are not in their correct places in the periodic table. Iodine needs to be in the same group as the other halogens because it has similar chemical properties, however if you arrange the elements

by their atomic masses iodine and tellurium need to swap groups. Mendeleev did not solve this problem, he simply switched them around but did not know why. He had no idea of electrons, protons, isotopes or atomic numbers as none had been discovered/were known about.

b. Why did Mendeleev leave gaps in his periodic table?

He believed that there were as yet many undiscovered elements.

c. Why was the discovery of gallium seen as a vindication of Mendeleev's periodic table? Mendeleev had predicted the properties of gallium based on his new periodic table before it was discovered. The fact that the properties of gallium were close to what Mendeleev had predicted suggested his table was correct.

d. Which complete group of elements was missing from Mendeleev's periodic table? Why were they missing? Noble gases, group 0, they had not been discovered yet.