

## C3 - The Periodic Table Quiz

1. What gas is produced when group 1 metals react with water?

Hydrogen gas

2. When group 1 metals react with water, an alkaline solution is produced. What ion causes the solution to be alkaline?

Hydroxide ion OH<sup>-</sup>

3. How is the reaction between potassium and water different from sodium and water?

The reaction with potassium is faster, produces more fizzing, the potassium moves more; the potassium melts and a purple flame is produced.

4. Why were many scientists critical about Newland's octaves?

There was no clear division between metals and non-metals, there were no gaps left, he put two elements in one box, and elements in the same group had dissimilar properties.

5. Give two ways in which Mendeleev's periodic table was better than Newland's.

It left gaps for undiscovered elements, elements were arranged by mass order and by properties, divided metals and non-metals.

6. The modern periodic table is an arrangement of the elements in terms of their atomic structures. Explain how.

Rows show number of shells, group number is the number of electrons in the outer shell, arranged by atomic number which is the proton number.

7. Give 3 differences between Newlands' and today's periodic table.

Hydrogen is in the same group as the halogens, there are only 7 groups, halogens are in group 1, metals and non-metals not separated, elements are arranged in mass order not atomic number order.

8. What order is used in the modern periodic table?

Atomic number.

9. Argon has a higher atomic mass than potassium. Why is this not a problem?

Because by swapping their positions, they are arranged by atomic number and their electron structure matches the group number.

10. Why was Mendeleev able to predict the existence of undiscovered elements?

Because he had arranged the elements based on their mass and properties.

11. If you could react Francium with water, how would the reaction compare to Sodium and water? Why?

More violent with Francium because the outer electron is further from the nucleus and more shielded from the nuclear attraction so lost more easily.

12. What is the balanced equation for group 1 metals reacting with water?



13. Why should potassium be placed before argon in the periodic table?

Because potassium has a lower mass number than argon. The order is swapped to match the group number to the outer electron configuration and match the chemical properties within the groups.

14. Why did scientists think Mendeleev's table was incorrect?

Because group 4 contained metals and non-metals.

15. In 1890s the noble gases were discovered. Why did they easily fit into Mendeleev's periodic table?

Because they could be added to the end.

16. Give one piece of evidence that supports the law of octaves.

Li/Na/K all are in the same group and have similar chemical properties (same for F/Cl/Br).

17. Why do elements in the same group have similar chemical properties?

Because they have the same number of electrons on the outer shell.

18. What happens when sodium reacts with water?

Floats on the surface of water, moves across surface, melts into a ball and disappears, bubbles of gas produced, alkaline solution left behind (NaOH) might produce a yellow flame.

19. Which group and period does 2, 8, 5 belong to?

Period 3 and Group 5.

20. What are the names of groups 1, 7 and 0?

Alkali metals, halogens, noble gases.

21. Which group is missing from Mendeleev's table?

The noble gases.

22. State the physical properties of Group 1 metals.

Very low density, very soft, silvery shiny surface when first cut, dull outer layer.

23. State the physical properties of the transition metals.

Harder and denser than Group 1 or 2 metals, good conductors of heat and electricity, hard, high melting points (apart from mercury).

24. State the chemical properties of the transition metals.

Form coloured compounds, good catalysts, less reactive than metals in Group 1.

25. State the physical properties of the group 7 elements.

Fluorine yellow gas, chlorine green gas, bromine orange-brown liquid, iodine purple-grey solid; low melting and boiling points, poor electrical and thermal conductors.

26. What do you see when chlorine is added to a bromide solution?

Colour change from colourless to orange/yellow/red/brown/red-brown.

27. Why is bromine less reactive than chlorine?

Bromine is bigger and the outer shell is further from the nucleus. The outer shell is more shielded and there is less attraction to the positive nucleus. It is therefore more difficult for bromine to attract another electron onto the outer shell.

28. Why do all group 7 elements react in a similar way with hydrogen?

They all have 7 electrons on the outer shell.

29. Explain why group 0 elements are monatomic.

The outermost shell is full and there is no tendency to lose or gain electrons.

30. Explain why chlorine can displace iodide from sea water.

Chlorine atom is smaller in size and has fewer shells than an iodine atom. There is less shielding in chlorine and it is easier for chlorine to attract another electron to the outer shell.

31. If aluminium ions react with chlorine, what is the formula of the product aluminium chloride?

Al is in Group 3 and forms a 3+ ion. Chlorine is in Group 7 and forms a 1- ion. The formula will then be  $\text{AlCl}_3$ .

32. What is the electron structure of chloride  $\text{Cl}^-$ ?

2, 8, 8

33. What are the similarities and differences in electron structure going from Na to Ar?

Same number of shells. Outer shell gains one extra electron from one element to the next.

34. What are the differences and similarities in electron structures going from F to At?

Same number of outer shell electrons. Each element gains one extra shell (8 electrons) going from one element to the next.

35. Why could Hydrogen be placed in group 1 or 7?

It can lose one electron and form a 1+ ion like the alkali metals and it can gain one electron to gain a full outer shell and form a 1- ion like the halogens.

36. Why are group 1 metals stored in oil?

Because they would react with the oxygen in the air or with water.

37. Why are the group 1 elements called the Alkali metals?

When added to water they react to form an alkaline solution.

38. Why are group 0 elements unreactive?

They have a full outer shell.