

London, dipole and hydrogen bond attractions between molecules

Chemistry grades 11-12 (A Level · IB · Class 11-12) · Test

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

This test covers the three types of intermolecular force, boiling points and the energy of changes of state. Answer every question, name the forces precisely and show your working. The total is 20 marks.

Level: Chemistry grades 11-12 (A Level · IB · Class 11-12) · **Curriculum:** IB S2.2

Time: 45 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Boiling bromine (2 marks)

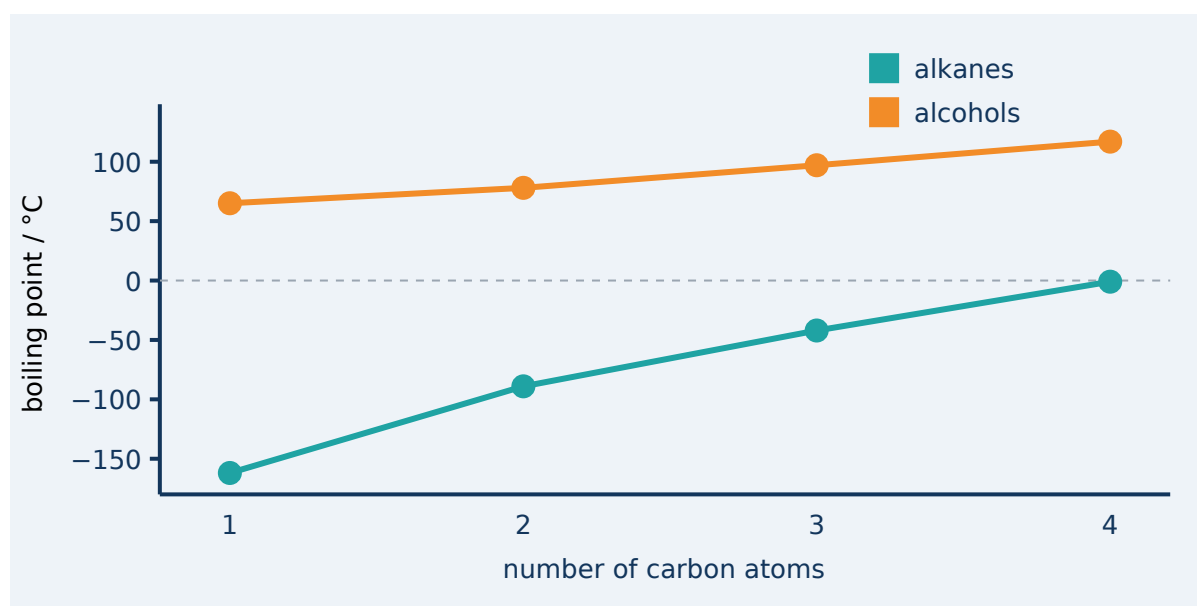
Bromine, Br₂, is a non-polar liquid. State the type of force broken when it boils and explain why the Br-Br bonds are not broken. (2 marks)

Question 2 Krypton and argon (3 marks)

Krypton boils at 120 K and argon at 87 K. Explain the difference. (3 marks)

Question 3 Alkanes and alcohols (4 marks)

The graph shows boiling points of alkanes and alcohols with the same number of carbons.



Boiling points of straight-chain alkanes and alcohols with the same number of carbons.

- a. Describe the difference between the two series. (1 mark)
- b. Explain why the alcohols boil higher. (2 marks)
- c. Explain why the gap narrows as the chain gets longer. (1 mark)

Question 4 Propanol and methoxyethane (2 marks)

Propan-1-ol ($\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$) boils at $97\text{ }^\circ\text{C}$ and methoxyethane ($\text{CH}_3\text{OCH}_2\text{CH}_3$) at $7\text{ }^\circ\text{C}$.
Explain the difference. (2 marks)

Question 5 Hydrogen bond in water (2 marks)

Describe how a hydrogen bond forms between two water molecules. (2 marks)

Question 6 Energy to vaporise water (2 marks)

The enthalpy of vaporisation of water is 40.7 kJ mol^{-1} . Calculate the energy to vaporise 36.0 g of water ($M = 18.0\text{ g mol}^{-1}$). (2 marks)

Question 7 Why ice floats (3 marks)

Explain why ice is less dense than liquid water. (3 marks)

Question 8 Pentane and butan-1-ol (2 marks)

Pentane boils at $36\text{ }^\circ\text{C}$ and butan-1-ol at $117\text{ }^\circ\text{C}$. They have similar numbers of electrons.
Explain why butan-1-ol boils higher. (2 marks)