

Substance	Molar mass (g.mol ⁻¹)	Phase	Melting point (°C)	Boiling points (°C)
Helium	4	gas	-272	-269
Oxygen	32	gas	-218	-183
Petrol (C ₈ H ₁₈)	114	liquid	-57	126
Candle wax (C ₂₃ H ₄₈)	324	solid	63	380

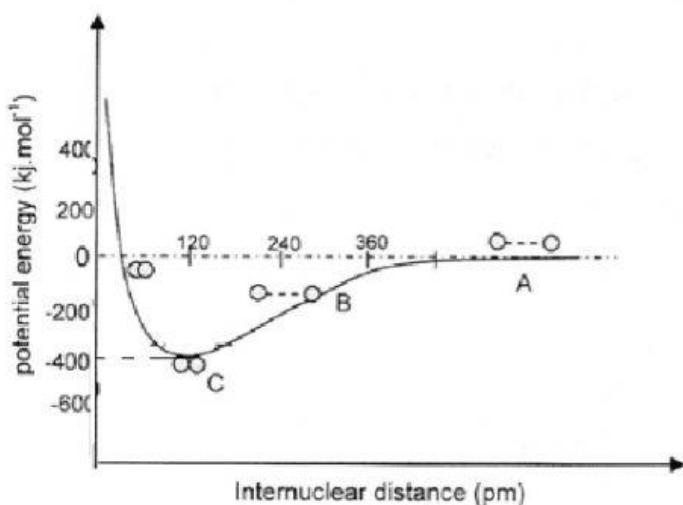
10.1 Give the name of the substances above that has the strongest IMF? (1)

10.2 What are the key words you would use to explain the above (5)

The chosen substance :

- Is polar
- Is non-polar
- Has the largest molar mass
- Has the smallest molar mass
- Strongest IMF
- Weakest IMF
- Van der Waals, London
- Van der Waals, dipole-dipole
- More energy required to weaken IMF and change its phase
- Less energy required to weaken IMF and change its phase

11. The graph shows the change in energy that takes place when a hydrogen (H) atom approaches a chlorine (Cl) atom.



11.1 How much energy is released when the H-Cl bond forms? (1)

11.2 What is the bond length, in pm, of the H-Cl bond? (1)

12.1 Which molecule, between H-Cl and Cl-Cl will have the highest bond energy? (1)

12.2 Choose the appropriate key words to explain this. (4)

The chosen molecule has:

The smallest bond length

The biggest bond length

Bigger EN difference

Smaller EN difference

More polar molecule

Less polar molecule

Thus requires more energy to break the bond

Thus requires less energy to break the bond

13. HCl ; HBr and HF are three compounds with the same geometric shape, but different boiling points

13.1 What is the geometric shape of the compounds? (1)

13.2 By referring to the nature and strengths of the forces between the particles and the energy needed explain the difference in the boiling points between:

a) HF and HCl (4)

HF contains hydrogen bonds

HF contains Van der Waals, dipole-dipole forces

HCl contains hydrogen bonds

HCl contains Van der Waals, dipole-dipole forces

Hydrogen bonds are stronger than Van der Waals, dipole-dipole forces

Hydrogen bonds are weaker than Van der Waals, dipole-dipole forces

More energy needed to overcome the IMF forces between HF

Less energy needed to overcome the IMF forces between HF

b) HCl and HBr

(5)

HCl contains Van der Waals, dipole-dipole IMF

HCl contains Hydrogen bonds

HBr have Hydrogen bonds

HBr have Van der Waals, dipole-dipole IMF

Hydrogen bonds are stronger than Van der Waals, dipole-dipole forces

Hydrogen bonds are weaker than Van der Waals, dipole-dipole forces

The 2 molecules have the same strength of IMF

HBr has a greater molar mass than HCl

HBr has a smaller molar mass than HCl

More energy needed to overcome the IMF forces between HBr

Less energy needed to overcome the IMF forces between HBr

13.3 Arrange these molecules in order of increasing boiling points

Watch the first 4 mins of the following video and then consider the following example

14. Use this one as an example

Consider the molecules

PF_3 and BF_3

State the bond and molecular polarity of each molecule

14.1 PF_3 :

bond polarity - polar

shape: trigonal pyramidal

molecular polarity – polar

14.2 BF_3 :

bond polarity - polar

shape: trigonal planar

molecular polarity – non-polar

14.3 Choose key phrases to explain the molecular polarity of each

PF_3

The shape is trigonal pyramidal

The shape is asymmetrical

Asymmetrical distribution of charge

Polar molecules are asymmetrical in shape and have asymmetrical distribution of charge.

BF_3

The shape is trigonal planar

The shape is symmetrical

Symmetrical distribution of charge

Non-polar molecules are symmetrical in shape and have symmetrical distribution of charge.

14.4 What is the key difference between the 2 molecules

NH_3 has a lone pair whereas BF_3 does not

15. Consider the compounds CH_4 and CH_3F

15.1 CH_4 :

bond polarity:

shape:

molecular polarity:

15.2 CH_3F :

C-H bond polarity:

C-F bond polarity:

shape:

molecular polarity:

15.3 Choose key phrases to explain the molecular polarity of each (3)
 CH_4

The shape is trigonal planar

The shape is trigonal pyramidal

The shape is tetrahedral

The shape is asymmetrical

The shape is symmetrical

Symmetrical distribution of charge

Non-symmetrical distribution of charge

CH_3F (3)

The shape is trigonal planar

The shape is trigonal pyramidal

The shape is tetrahedral

The shape is asymmetrical

The shape is symmetrical

Symmetrical distribution of charge

Non-symmetrical distribution of charge

16. Consider the table below and answer the questions that follow

Substance	Boiling point(°C)
He (4g.mol ⁻¹)	-272
F (36 g.mol ⁻¹)	-188
Ar (40g.mol ⁻¹)	-186
I (254 g.mol ⁻¹)	184

16.1 Which of the substances above has the weakest IMF? (1)

16.2 What are the key words you would use to explain the above. (5)

The chosen substance:

- Polar molecule
- Non-polar molecule
- The largest molar mass
- The smallest molar mass
- Strongest IMF
- Weakest IMF
- Contains Van der Waals, London forces
- Contains Van der Waals, Dipole-dipole forces
- Contains H-bonding
- More energy required to weaken IMF and change its phase
- Less energy required to weaken IMF and change its phase

17. State whether the following will dissolve in the solvent or not

	Dissolve (yes or no)
Iodine in water	17.1
Sugar in water	17.2
Sugar in CCl ₄	17.3
CH ₄ in water	17.4
HCl in CCl ₄	17.5

Homework from chemistry booklet:

Pg 311 Q2

Pg 312/313 Q2 and Q3

Pg 316/317 Q2

Pg 318 Q2

Pg 319/320 Q3 and Q4

Pg 321 Q3

Pg 324 Q3 and Q4

Pg 328/329 Q3