

### Exercise 0.43 – Intermolecular forces

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**Q043-01** As the size of the halogen molecules,  $X_2$ , increases down the group, their boiling points:

- A. Decrease due to decreasing electronegativity
  - B. Decrease due to decreasing bond angles
  - C. Increase due to increasing permanent dipole-dipole attractions
  - D. Increase due to increasing permanent Van der Waals' forces
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**Q043-02** The compounds A, B and C have approximately the same molar mass:

A	B	C
$C_4H_{10}$	$CH_3CH_2CH_2OH$	$CH_3OCH_2CH_3$

When the compounds are arranged in order of increasing boiling points (lowest boiling point first) the correct order is:

- A. A, C, B
  - B. A, B, C
  - C. B, C, A
  - D. C, B, A
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**Q043-03** Which of the compounds  $H_2O$ ,  $H_2S$ ,  $H_2Se$  and  $H_2Te$  has the highest boiling point?

- A.  $H_2O$
  - B.  $H_2S$
  - C.  $H_2Se$
  - D.  $H_2Te$
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**Q043-04** Which intermolecular forces exist in dry ice  $CO_2(s)$ ?

- A. Covalent bonds
  - B. Dipole - dipole attractions
  - C. Van der Waals forces
  - D. Hydrogen bonds
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**Q043-05** The molar masses of  $C_2H_6$ ,  $CH_3OH$ ,  $CH_3F$  are very similar. How do their boiling points compare?

- A.  $C_2H_6 < CH_3OH < CH_3F$
  - B.  $CH_3F < CH_3OH < C_2H_6$
  - C.  $CH_3OH < CH_3F < C_2H_6$
  - D.  $C_2H_6 < CH_3F < CH_3OH$
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**Q043-06** Which sequence of Group 8 elements demonstrates a gradual decrease in the strength of the Van der Waals forces? All the choices are elements in the liquid state.

- A. Ar, Kr, Ne, Xe
  - B. Kr, Xe, Ar, Ne
  - C. Ne, Ar, Kr, Xe
  - D. Xe, Kr, Ar, Ne
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**Q043-07** Which types of bonding are present in  $CH_3CHO$  in the liquid state?

- I - Single covalent bonding
  - II - Double covalent bonding
  - III - Hydrogen bonding
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III
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**Q043-08** Why is the boiling point of  $\text{PH}_3$  lower than that of  $\text{NH}_3$ ?

- A.  $\text{PH}_3$  is non-polar whereas  $\text{NH}_3$  is polar
  - B.  $\text{PH}_3$  is not hydrogen bonded, whereas  $\text{NH}_3$  is hydrogen bonded
  - C. Van der Waals forces are weaker in  $\text{PH}_3$  than in  $\text{NH}_3$
  - D. The molar mass of  $\text{PH}_3$  is greater than that of  $\text{NH}_3$
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**Q043-09** In ethanol,  $\text{C}_2\text{H}_5\text{OH}(\text{l})$ , there are covalent bonds, hydrogen bonds and van der Waals forces. Which bonds or forces are broken when ethanol is vaporised?

- A. Only hydrogen bonds
  - B. Covalent bonds and hydrogen bonds
  - C. Covalent bonds and van der Waals forces
  - D. Hydrogen bonds and van der Waals forces
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**Q043-10** When the following bond types are listed in decreasing order of strength (strongest first) what is the correct order?

- A. Covalent < hydrogen bonds < van der Waals
  - B. Covalent < van der Waals < hydrogen
  - C. Hydrogen < covalent < van der Waals
  - D. Van der Waals < hydrogen bonds < covalent
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