**8Questions**

**Q1.**

Which of the following molecules does **not** absorb infrared radiation?

   **A**    N2

   **B**    NO2

   **C**    CO

   **D**    CO2

**(Total for Question = 1 mark)**

**Q2.**

The following liquids all have the same number of electrons in each molecule.  Which  
 one is likely to have the lowest boiling point?

   **A**     CH3CH2CH2CH2OH

   **B**     CH3CH2CH2CH2CH3

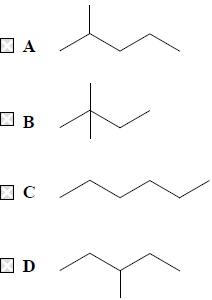
   **C**     CH3C(CH3)2CH3

   **D**     CH3CH(CH3)CH2CH3

**(Total for question = 1 mark)**

**Q3.**

Which of these isomers has the highest boiling temperature?



**(Total for question = 1 mark)**

**Q4.**

Ethanol is soluble in water. The **best** explanation for this is

   **A**   ethanol molecules form hydrogen bonds with water molecules.

   **B**   ethanol molecules form London (dispersion) forces with water molecules.

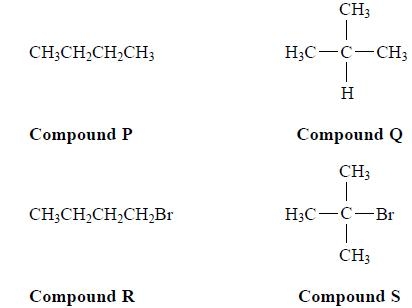
   **C**   ethanol molecules form permanent dipole interactions with water molecules.

   **D**   ethanol and water are miscible liquids.

**(Total for question = 1 mark)**

**Q5.**

Consider the following compounds, **P**, **Q**, **R** and **S**.



The boiling temperatures of compounds P, Q, R and S **increase** in the order

   **A**     P Q R S

   **B**     R S P Q

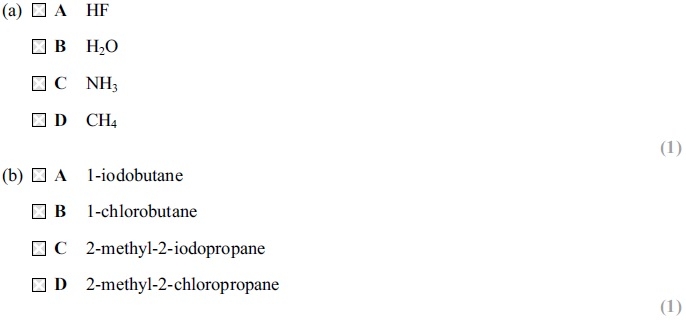
   **C**     Q S P R

   **D**     Q P S R

**(Total for question = 1 mark)**

**Q6.**

For parts (a) and (b), use your knowledge of intermolecular forces to predict the  
 compound with the highest boiling temperature.



**(Total for question = 2 marks)**

**Q7.**

Which list below shows the compounds in order of **increasing** boiling temperature?

   **A**     CH4, HCl, HF

   **B**     HF, CH4, HCl

   **C**     HCl, HF, CH4

   **D**     HF, HCl, CH4

**(Total for question = 1 mark)**

**Q8.**

Which of the following has the highest boiling temperature?

   **A**     Pentane, CH3CH2CH2CH2CH3

   **B**     Hexane, CH3CH2CH2CH2CH2CH3

   **C**     2-methylbutane, CH3CH(CH3)CH2CH3

   **D**     2-methylpentane, CH3CH(CH3)CH2CH2CH3

**(Total for question = 1 mark)**

**Q9.**

Which of the following has dipole-dipole interactions between its molecules, but no  
 hydrogen bonding?

   **A**     Methane, CH4

   **B**     Methanol, CH3OH

   **C**     Ammonia, NH3

   **D**     Hydrogen iodide, HI

**(Total for question = 1 mark)**

**Q10.**

Which of these is likely to be the best solvent for cyclohexanol?

   **A**     H2O(l)

   **B**     CH3COCH3(l)

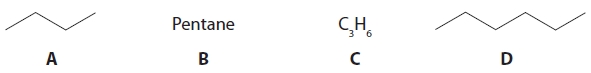
   **C**     NaCl(aq)

   **D**     CH3CH2CH2CH2CH2CH3(l)

**(Total for question = 1 mark)**

**Q11.**

Which of the following molecules has the lowest boiling temperature?



   **A**

   **B**

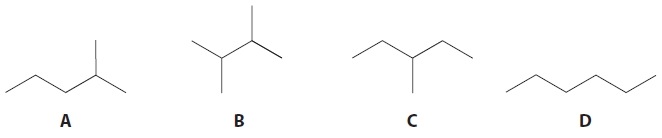
   **C**

   **D**

**(Total for question = 1 mark)**

**Q12.**

Which of the following molecules has the highest melting temperature?



   **A**

   **B**

   **C**

   **D**

**(Total for question = 1 mark)**

**Q13.**

      Hydrogen iodide has a higher boiling temperature than hydrogen bromide. This is because

   **A**       the H—I bond is stronger than the H—Br bond.

   **B**       hydrogen iodide has stronger London forces than hydrogen bromide.

   **C**       hydrogen iodide has a larger permanent dipole than hydrogen bromide.

   **D**       hydrogen iodide forms hydrogen bonds but hydrogen bromide does not.

**(Total for question = 1 mark)**

**Q14.**

Which of the following compounds shows hydrogen bonding in the liquid state?

   **A**     Hydrogen bromide, HBr

   **B**     Hydrogen sulfide, H2S

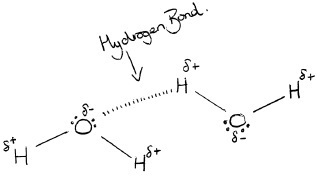
   **C**     Silane, SiH4

   **D**     Ammonia, NH3

**(Total for question = 1 mark)**

**Q15.**The diagram below is taken from a student's examination paper. It shows the hydrogen bonding between two water molecules.

Identify the error in the diagram.



   **A**    The H—O—H bond angle within each water molecule should be 90°.

   **B**    There should only be one lone pair of electrons on each oxygen atom.

   **C**    The O—H—O bond angle between the water molecules should be 180°.

   **D**    The hydrogen atoms should be **− and the oxygen atoms should be **+.

**(Total for Question = 1 mark)**

**Q16.**

The difference in boiling temperature between methane (Tb = 109 K) and ethane (Tb = 185 K) is best explained by the different numbers of

   **A**   protons.

   **B**   electrons.

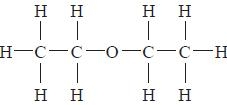
   **C**   covalent bonds.

   **D**   hydrogen bonds.

**(Total for question = 1 mark)**

**Q17.**

Which intermolecular forces exist between molecules of ethoxyethane?



   **A**     Instantaneous dipole − induced dipole only

   **B**     Permanent dipole − permanent dipole only

   **C**     Instantaneous dipole − induced dipole and hydrogen bonds

   **D**     Instantaneous dipole − induced dipole and permanent dipole − permanent  
                dipole

**(Total for question = 1 mark)**

**Q18.**What are the strongest forces between molecules of hydrogen fluoride, HF?

   **A**    Dipole-dipole forces.

   **B**    Hydrogen bonds.

   **C**    Ionic interactions.

   **D**    London forces.

**(Total for Question = 1 mark)**

**Q19.**

The ability of a liquid to flow is linked to the strength of its intermolecular forces.  
 Suggest which of these liquids flows the slowest when poured.

   **A**     Propane-1,2,3-triol

   **B**     Propane-1,2-diol

   **C**     Pentane

   **D**     Butane

**(Total for question = 1 mark)**

**Q20.**

Which of the following substances does **not** have intermolecular hydrogen bonds?

   **A**    Ethanoic acid, CH3COOH

   **B**    Propanone, CH3COCH3

   **C**    Methanol, CH3OH

   **D**    Water, H2O

**(Total for question = 1 mark)**

**Q21.**

      Butane has a higher boiling temperature than 2–methylpropane. This is because butane has

   **A**       stronger C—H bonds.

   **B**       more electrons.

   **C**       a larger surface area.

   **D**       hydrogen bonds.

**(Total for question = 1 mark)**

**Mark Scheme**

**Q1.**



**Q2.**



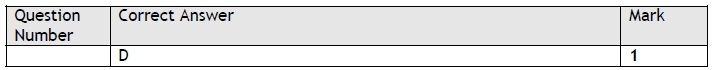
**Q3.**



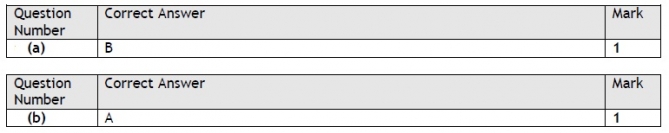
**Q4.**



**Q5.**



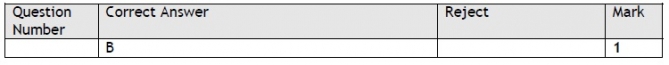
**Q6.**



**Q7.**



**Q8.**



**Q9.**



**Q10.**



**Q11.**



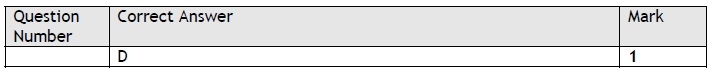
**Q12.**



**Q13.**



**Q14.**



**Q15.**



**Q16.**



**Q17.**



**Q18.**



**Q19.**



**Q20.**



**Q21.**

