



**Ionic & Covalent Bonding**  
**Chemistry Past Exam Questions**  
**Higher Level**

2013

Section B - Question 4 D

- (d) Give the shape and the corresponding bond angle for a molecule of formula  $QX_4$  where Q is an element from Group 4 of the periodic table.

Section B - Question 10 A

- (a) Distinguish between *intramolecular* bonding and *intermolecular* forces. (7)  
Explain each of the following in terms of intramolecular bonding *or* intermolecular forces *or* both.
- (i) The boiling point of hydrogen (20 K) is significantly lower than that of oxygen (90.2 K).
  - (ii) Iodine has a very low solubility in water.
  - (iii) When a charged rod is held close to a thin stream of water flowing from a burette, the stream of water is deflected. (18)

2012

Section B - Question 4 D

(d) Distinguish between sigma ( $\sigma$ ) and pi ( $\pi$ ) covalent bonding.

2011

Section B - Question 11 B

- (b) (i) Distinguish between *ionic bonding* and *polar covalent bonding*. (7)
- (ii) Why do ionic substances conduct electricity when molten or dissolved in water but not in the solid state? (6)
- (iii) Ammonia is polar covalent and is water-soluble.  
Show that the ammonia molecule ( $\text{NH}_3$ ) has polar covalent bonding.  
Describe the processes involved when ammonia dissolves in water. (12)

2010

Section B - Question 4 G

(g) Distinguish between sigma ( $\sigma$ ) and pi ( $\pi$ ) covalent bonding.

2008

Section B - Question 4 G

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5. (a) Define *electronegativity*. (5)
- (b) State and explain the trend in electronegativity values down the first group in the periodic table of the elements. (9)
- (c) Use electronegativity values to predict the types of bonding (i) in water, (ii) in methane, (iii) in magnesium chloride. (9)
- (d) Use dot and cross diagrams to show the formation of bonds in magnesium chloride. (6)
- (e) Explain the term *intermolecular forces*. (6)
- (f) Use your knowledge of intermolecular forces to explain why methane has a very low boiling point (b.p. =  $-164^\circ\text{C}$ ).  
The relative molecular mass of methane is only slightly lower than that of water but the boiling point of water is much higher (b.p. =  $100^\circ\text{C}$ ). Suggest a reason for this. (6)
- (g) The diagram shows a thin stream of liquid flowing from a burette. A stream of water is deflected towards a positively charged rod whereas a stream of cyclohexane is undeflected. Account for these observations  
Explain what would happen in the case of the stream of water if the positively charged rod were replaced by a negatively charged rod. (9)



## Section B - Question 5

5. (a) What are *isotopes*? (5)

Name the scientist pictured on the right who is credited with the discovery in 1896 that uranium salts emit radiation. (3)

Give an example of a radioactive isotope and state **one** common use made of this isotope. (9)



(b) Define *atomic radius (covalent radius)*. (6)

Describe and account for the trend in atomic radii (covalent radii) of the elements

(i) across the second period, (ii) down any group, of the periodic table. (15)

(c) Define *covalent bond*. (6)

Distinguish between a sigma ( $\sigma$ ) and a pi ( $\pi$ ) covalent bond. (6)