

HL BONDING TEST

- 1 Potassium dichromate(VI) is an important oxidizing agent in organic chemistry. The formula of the dichromate(VI) ion is $\text{Cr}_2\text{O}_7^{2-}$. The **total** number of electrons in the dichromate(VI) ion is
 A 106 B 104 C 102 D 56

- 2 The formula of silver nitrate is
 A $\text{Ag}(\text{NO}_3)_2$ B Ag_3N C AgNO_3 D Ag_3N_2

- 3 What is the electron domain geometry and the F-Xe-F bond angle in XeF_2 ?
 A Tetrahedral 104° B Linear 180°
 C Octahedral 90° D Trigonal bipyramidal 180°

- 4 The formal charge (FC) on the carbon atom in carbon monoxide is
 A 0 B 1+ C 1- D 2-

- 5 In which of the following do all the carbon atoms have sp^2 hybridization?
 A CH_3CHCH_2 B H_2CCH_2 C H_3CCH_3 D HCCCH_3

- 6 Which of the following is a catalyst for the destruction of ozone in the upper atmosphere?
 A Cl_2 B Cl C O D CF_2Cl_2

- 7 The molar masses C_2H_6 , CH_3OH and CH_3F of are very similar. How do their boiling points compare?
 A $\text{CH}_3\text{F} < \text{C}_2\text{H}_6 < \text{CH}_3\text{OH}$ B $\text{CH}_3\text{F} < \text{CH}_3\text{OH} < \text{C}_2\text{H}_6$
 C $\text{CH}_3\text{OH} < \text{CH}_3\text{F} < \text{C}_2\text{H}_6$ D $\text{C}_2\text{H}_6 < \text{CH}_3\text{F} < \text{CH}_3\text{OH}$

- 8 Which of the following nitrogen compounds contains the fewest π bonds?
 A N_2 B N_2F_2 C N_2H_4 D N_2H_2

- 9 Which of the following is correct?
 A MgF_2 has a higher melting point than XeF_2 because ionic bonds are stronger than covalent bonds.
 B XeF_2 has a higher melting point than MgF_2 because it has stronger London forces between molecules
 C MgF_2 has a higher melting point than XeF_2 because MgF_2 is more polar than XeF_2
 D MgF_2 has a higher melting point than XeF_2 because ionic bonding is stronger than London forces between molecules.

- 10 In which of the following are the P-O bond lengths all equal?
 A H_3PO_4 B H_2PO_4^- C HPO_4^{2-} D PO_4^{3-}

HL BONDING TEST

11 This question is about the hydrides of Group 16 elements with the general formula H_2X .

(a) Draw a Lewis structure for H_2Se and predict the H-Se-H bond angle. [2]

Bond angle.....

(b) Explain which of the compounds H_2O , H_2S or H_2Se contains the most polar H-X bond. [1]

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(c) The boiling points of some of the Group 16 hydrides are shown in the table

	boiling point / °C
H_2O	100
H_2S	-60
H_2Se	-41

Explain why H_2O has a greater boiling point than H_2S [2]

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HL BONDING TEST

12 Cyanogen is a colourless, poisonous gas with the formula $(\text{CN})_2$.

- (a) Cyanogen can be prepared by the reaction between copper(II) sulfate and potassium cyanide.



(i) Balance the equation for the reaction. [1]

(ii) Compare the charge on the copper ion in CuSO_4 with that in CuCN . [1]

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(b) (i) Draw the Lewis structure of cyanogen [1]

(ii) Deduce the shape of cyanogen [2]

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(c) In alkaline solution the following reaction occurs:



(i) Deduce two possible Lewis structures for OCN^- . [2]

(iii) Explain whether the C-N bond length is longer in CN^- or OCN^- [3]

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HL BONDING TEST

13 Some physical properties of some Group 13 halides are shown in the table

	melting point / °C	Conducts electricity in solid state?	Conducts electricity in liquid state?
AlF ₃	1290	no	yes
AlBr ₃	98	no	no
AlI ₃	189	no	no

Explain the data in the table in terms of structure and bonding.

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