A-Level Chemistry

Bonding
(Multiple Choice)

Question Paper

Time available: 33 minutes
Marks available: 30 marks

1. Which molecule is **not** able to form a co-ordinate bond with another species?

A BH_3 ⬭

B CH_4 ⬭

C NH_3 ⬭

D H_2O ⬭

(Total 1 mark)

2. Which species has a square planar shape?

A NH_4^+ ⬭

B SF_4 ⬭

C XeF_4 ⬭

D PCl_4^+ ⬭

(Total 1 mark)

3. Which bond has the most unsymmetrical electron distribution?

A H–O ⬭

B H–S ⬭

C H–N ⬭

D H–P ⬭

(Total 1 mark)

4. Which statement about inorganic ionic compounds is **always** correct?

A They dissolve in water to give neutral solutions. ⬭

B They release energy when they melt. ⬭

C They contain metal cations. ⬭

D They form giant structures. ⬭

(Total 1 mark)

5. Which species has a lone pair of electrons on the central atom?

A CO_2 ⬭

B SO_2 ⬭

C PCl_6^- ⬭

D SO_4^{2-} ⬭

(Total 1 mark)

6. In which substance do covalent bonds break when it melts?

A hexane ⬭

B ice ⬭

C iodine ⬭

D silicon dioxide ⬭

(Total 1 mark)

7. In which molecule are all the atoms in the same plane?

A CH_3CHO ⬭

B CH_3NH_2 ⬭

C C_6H_5Cl ⬭

D $C_6H_5CH_3$ ⬭

(Total 1 mark)

8. Which molecule has a permanent dipole?

A BF_3 ⬭

B NH_3 ⬭

C $SiCl_4$ ⬭

D SO_3 ⬭

(Total 1 mark)

9. Which substance contains delocalised electrons?

A cyclohexane ⬭

B graphite ⬭

C iodine ⬭

D sodium chloride ⬭

(Total 1 mark)

10. Which species contains bonds that have different polarities?

A NH_4^+ ⬭

B CCl_4 ⬭

C CH_3Cl ⬭

D H_3O^+ ⬭

(Total 1 mark)

11. Which compound has hydrogen bonding?

A NaH ⬭

B NH_3 ⬭

C HI ⬭

D SiH_4 ⬭

(Total 1 mark)

12. Which statement is **not** correct?

A $CuCl_4^{2-}$ is square planar. ⬭

B NH_4^+ is tetrahedral. ⬭

C $[Co(H_2NCH_2CH_2NH_2)_3]^{2+}$ is octahedral. ⬭

D $[Fe(H_2O)_6]^{2+}$ is octahedral. ⬭

(Total 1 mark)

13. Which species is **not** pyramidal in shape?

A PF_3 ⬭

B H_3O^+ ⬭

C CH_3^- ⬭

D BF_3 ⬭

(Total 1 mark)

14. Which compound has the highest boiling point?

A $CH_3CH_2CH_2Br$ ⬭

B $CH_3CH_2CH_2F$ ⬭

C CH_3CH_2CHO ⬭

D CH_3CH_2COOH ⬭

(Total 1 mark)

15. Which is **not** responsible for conduction of electricity?

A The sodium ions in molten sodium chloride ⬭

B The electrons between layers of carbon atoms in graphite ⬭

C The bonding electrons in a metal ⬭

D The lone pair electrons on water molecules ⬭

(Total 1 mark)

16. Which species has a shape that is influenced by the presence of one or more lone pairs of electrons around the central atom?

A $AlCl_3$ ⬭

B ClF_3 ⬭

C IF_6^+ ⬭

D PCl_6^- ⬭

(Total 1 mark)

17. Which compound has the highest boiling point?

A $CH_3CH_2CH_2OH$ ⬭

B CH_3CH_2CHO ⬭

C CH_3COCH_3 ⬭

D CH_3COOCH_3 ⬭

(Total 1 mark)

18. Which molecule does **not** have a permanent dipole?

A CH_3Cl ⬭

B $CHCl_3$ ⬭

C CF_4 ⬭

D $CHCl_2F$ ⬭

(Total 1 mark)

19. Which of these statements best describes a dative covalent bond?

A A pair of electrons shared between two atoms where each atom has donated one electron. ⬭

B A pair of electrons shared between two atoms where one atom has donated two electrons. ⬭

C Two pairs of electrons shared between two atoms where each atom has donated one electron. ⬭

D Two pairs of electrons shared between two atoms where each atom has donated two electrons. ⬭

(Total 1 mark)

20. Which molecule is the least polar?

A Bromomethane ⬭

B Dibromomethane ⬭

C Tribromomethane ⬭

D Tetrabromomethane ⬭

(Total 1 mark)

21. Use your understanding of intermolecular forces to predict which of these compounds has the highest boiling point.

A HF ⬭

B HCl ⬭

C HBr ⬭

D HI ⬭

(Total 1 mark)

22. Which type of bond is formed between N and B when a molecule of NH_3 reacts with a molecule of BF_3?

A Ionic. ⬭

B Covalent. ⬭

C Co-ordinate. ⬭

D Van der Waals. ⬭

(Total 1 mark)

23. Which of these atoms has the highest electronegativity?

A Na ⬭

B Mg ⬭

C Cl ⬭

D Ar ⬭

(Total 1 mark)

24. Which substance exists as a macromolecule?

A Cu ⬭

B SiO_2 ⬭

C P_4O_{10} ⬭

D MgO ⬭

(Total 1 mark)

25. In which one of the following species is the shape influenced by the presence of one or more lone pairs of electrons?

A NH_2^-

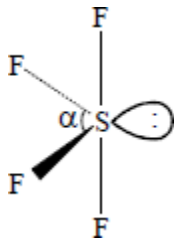
B NH_4^+

C $[CH_3NH_3]^+$

D $[Co(NH_3)_6]^{2+}$

(Total 1 mark)

26. Which one of the following is the most likely value for the bond angle α shown in the diagram of SF_4 below?



A 118°

B 101°

C 90°

D 88°

(Total 1 mark)

27. The equation for a reaction is

$$AsH_3 + H^+ \rightarrow AsH_4^+$$

What type of interaction forms in this reaction?

A Co-ordinate bond ⬭

B Dipole–dipole force ⬭

C Hydrogen bond ⬭

D Ionic bond ⬭

(Total 1 mark)

28. Which reaction does **not** result in a change in the shape around a carbon atom?

A chloromethane with aqueous sodium hydroxide ⬭

B ethene with bromine ⬭

C propane with excess oxygen ⬭

D propan-1-ol with acidified potassium dichromate(VI) ⬭

(Total 1 mark)

29. Which pair of reagents reacts to form a tetrahedral complex?

A $CoCl_2(aq)$ and concentrated $NH_3(aq)$ ⬭

B $CuSO_4(aq)$ and concentrated $NH_3(aq)$ ⬭

C $CuSO_4(aq)$ and sodium ethanedioate(aq) ⬭

D $FeCl_3(aq)$ and concentrated HCl(aq) ⬭

(Total 1 mark)

30. Which substance has **no** delocalised electrons?

A graphite ⬭

B methylbenzene ⬭

C poly(propene) ⬭

D sodium ⬭

(Total 1 mark)