

SL Topic 4. Chemical bonding & structure (First test)

For each question choose the answer you consider to be the best.

1. What are the correct formulas for magnesium sulfate and aluminium phosphide?

- A. $\text{Mg}(\text{SO}_4)_2$ and AlPO_4
- B. MgSO_4 and AlPO_4
- C. $\text{Mg}(\text{SO}_4)_2$ and AlP
- D. MgSO_4 and AlP

2. Which is the correct formula for iron(III) hydroxide?

- A. $\text{Fe}_2(\text{OH})_3$
- B. Fe_3OH
- C. $\text{Fe}(\text{OH})_3$
- D. $\text{Fe}_3(\text{OH})_2$

3. Which describes ionic bonding best?

- A. The electrostatic attraction between nuclei and pairs of electrons
- B. The electrostatic attraction between positive ions and negative ions
- C. The electrostatic attraction between a positive ion and an electron
- D. The electrostatic attraction between protons and electrons



4. Which are the correct formulas for their respective ions?

	nitrate	hydrogensulfate	ammonium
A.	NO_3^-	HSO_4^-	NH_4^+
B.	NO_3^-	HSO_4^{2-}	NH_4^+
C.	N^{3-}	HSO_4^-	NH_3^+
D.	N^{3-}	H_2SO_4^-	NH_3^+

5. Metal M shows only one oxidation state when it forms compounds. The formula of the oxide of M is M_2O_3 ? Which is the correct formula for another of the compounds M forms?

- A. M_3P_2
- B. MP
- C. M_2P
- D. M_2P_3

6. What is the correct formula for an ionic compound formed between a Group 2 element, A, and a Group 16 element, B.

- A. AB
- B. A_2B_6
- C. AB_3
- D. A_3B

7. Which molecule or ion contains a dative (coordinate) covalent bond?

- A. CO_2
- B. C_2H_4
- C. OH^-
- D. NH_4^+

8. Which substance contains both ionic and covalent bonds?

- A. HCN
- B. NaNO_3
- C. MgO
- D. HCOOH

9. Which is the best description of the bonding present in ice?

- A. Each oxygen atom is covalently bonded to four hydrogen atoms.
- B. Each oxygen atom is attracted to four hydrogen atoms by hydrogen bonding.
- C. Each oxygen atom is covalently bonded to two hydrogen atoms and attracted to two other hydrogen atoms by hydrogen bonding.
- D. Each oxygen atom is covalently bonded to two hydrogen atoms and attracted to two other hydrogen atoms by dative bonding.



10. Which is the correct order when the molecules ethane, ethene and ethyne are arranged in order of decreasing carbon to carbon bond length?

- A. $C_2H_6 > C_2H_4 > C_2H_2$
- B. $C_2H_2 > C_2H_4 > C_2H_6$
- C. $C_2H_6 > C_2H_2 > C_2H_4$
- D. $C_2H_2 > C_2H_6 > C_2H_4$

11. Which is a correct statement about the bond lengths in ethanoic acid, CH_3COOH ?

- A. The carbon to oxygen bond length for the $C-OH$ bond is the same as the carbon to oxygen bond length for the $C=O$ bond.
- B. The carbon to oxygen bond length for the $C-OH$ bond is shorter than the carbon to oxygen bond length for the $C=O$ bond.
- C. The carbon to oxygen bond length for the $C-OH$ bond is longer than the carbon to oxygen bond length for the $C=O$ bond.
- D. The carbon to carbon bond length for the $C-CH_3$ bond is the same as the carbon to oxygen bond length for the $C=O$ bond.

12. Which molecules or ion contain a bond angle **less than** 109° ?

- I. NH_3
- II. CCl_4
- III. H_3O^+

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III



13. Which is correct when the species NH_2^- , NH_3 and NH_4^+ are arranged in order of increasing H-N-H bond angle?

- A. $\text{NH}_3 < \text{NH}_4^+ < \text{NH}_2^-$
- B. $\text{NH}_4^+ < \text{NH}_3 < \text{NH}_2^-$
- C. $\text{NH}_2^- < \text{NH}_4^+ < \text{NH}_3$
- D. $\text{NH}_2^- < \text{NH}_3 < \text{NH}_4^+$

14. Which molecule has a linear shape?

- A. HCN
- B. SO_2
- C. H_2S
- D. SiO_2

15. What intermolecular forces are present in fluorine gas?

- A. Dipole-dipole attractions
- B. London (dispersion) forces
- C. Covalent bonds
- D. Hydrogen bonds

16. Which is a non-polar molecule?

- A. CCl_4
- B. HCN
- C. H_2S
- D. SO_2



17. Which is a non-polar liquid?

- A. Propan-1-ol
- B. Pentane
- C. Propan-2-ol
- D. Propanone

18. What is the high electrical conductivity of metals due to?

- A. Delocalized atoms
- B. Delocalised negative ions
- C. Delocalised positive ions
- D. Delocalized outer electrons

19. Why is the boiling point of HCl lower than the boiling point of HF?

- A. The H-Cl bond is weaker than the H-F bond.
- B. Van der Waals' forces are weaker in HCl than in HF.
- C. HF is polar whereas HCl is non-polar.
- D. HF contains hydrogen bonding whereas HCl does not.

20. Which compound dissolves in water to form a solution that conducts electricity?

- A. C_2H_5OH
- B. CH_3COCH_3
- C. CH_3COOH
- D. CH_3COOCH_3



