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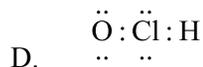
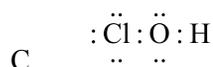
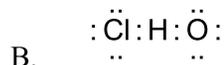
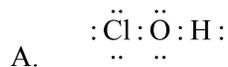
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Practice Exam: Paper 1

Topic 4: Bonding

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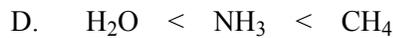
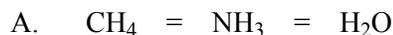
1. What is the correct Lewis structure for hypochlorous acid, a compound containing chlorine, hydrogen and oxygen?



2. Which compound forms hydrogen bonds in the liquid state?



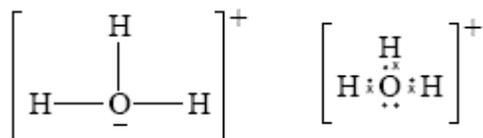
3. How do the bond angles in CH_4 , NH_3 and H_2O compare?



4. Which combination of the characteristics of element X, a metal, and element Y, a non metal, is most likely to lead to ionic bonding?

| | X | Y |
|----|------------------------|------------------------------|
| A. | low ionization energy | high electronegativity value |
| B. | low ionization energy | low electronegativity value |
| C. | high ionization energy | high electronegativity value |
| D. | high ionization energy | low electronegativity value |

5. Which particles are responsible for electrical conductivity in metals?
- A. Anions C. Electrons
B. Cations D. Protons
6. Which molecule has a non-bonding (lone) pair of electrons on the central atom?
- A. BF_3 C. CO_2
B. SO_2 D. SiF_4
7. When C_2H_2 , C_2H_4 and C_2H_6 are arranged in order of **increasing** carbon-carbon bond strength (weakest bond first), what is the correct order?
- A. C_2H_2 , C_2H_4 , C_2H_6
B. C_2H_2 , C_2H_6 , C_2H_4
C. C_2H_6 , C_2H_4 , C_2H_2
D. C_2H_6 , C_2H_2 , C_2H_4
8. The number of electrons in the valence shell of elements A and B, are 6 and 7 respectively. What is the formula and type of bonding in a compound formed by these elements?
- A. A_2B , covalent C. A_2B , ionic
B. AB_2 , covalent D. AB_2 , ionic
9. Lewis structures are represented in different ways in different parts of the world. Two ways of drawing the Lewis structure for H_3O^+ are shown below.



Which statement is correct about H_3O^+ ?

- A. The ion has a tetrahedral shape.
B. The H–O–H bond angle is 120° .
C. The H–O–H bond angle is 90° .
D. The ion has a trigonal pyramidal shape.

10. Which statement best describes metallic bonding?
- Electrostatic attractions between oppositely charged ions
 - Electrostatic attractions between a lattice of positive ions and delocalized electrons
 - Electrostatic attractions between a lattice of negative ions and delocalized protons
 - Electrostatic attractions between protons and electrons
11. Which is the best description of the bonding present in the ammonium ion, NH_4^+ ?
- Sharing of electrons between atoms
 - Electrostatic attraction between ions
 - Electrostatic attraction between positive ions and delocalized electrons
 - Sharing of electrons between atoms and electrostatic attraction between ions
12. The formula of cerium(III) sulfate is $\text{Ce}_2(\text{SO}_4)_3$. What is the correct formula of cerium(III) phosphate?
- CeP
 - $\text{Ce}_2(\text{PO}_4)_3$
 - $\text{Ce}_3(\text{PO}_4)_2$
 - CePO_4
13. Which molecule has the shortest carbon-oxygen bond length?
- CH_3COOH
 - $\text{CH}_3\text{CH}_2\text{OH}$
 - CO_2
 - CO
14. Which pair of compounds is arranged in correct order of relative boiling points?

| | Lower Boiling Point | Higher Boiling Point |
|----|--------------------------|-----------------------------------|
| A. | H_2S | H_2O |
| B. | NH_3 | PH_3 |
| C. | HF | HCl |
| D. | CH_3COOH | $\text{CH}_3\text{CH}_2\text{OH}$ |

15. Which statement about the bonding between carbon atoms is correct?
- A. In C_{60} fullerene each carbon atom is covalently bonded to three other carbon atoms.
 - B. In C_{60} fullerene each carbon atom is covalently bonded to four other carbon atoms.
 - C. In graphite each carbon atom is covalently bonded to four other carbon atoms.
 - D. In graphite each carbon atom forms a double covalent bond with three other carbon atoms.
16. Which intermolecular forces exist between molecules of carbon monoxide, CO?
- A. Hydrogen bonds and Dispersion forces
 - B. Dipole-dipole attractions and Dispersion forces
 - C. Dispersion forces only
 - D. Dipole-dipole attractions only
17. What is the formula of magnesium fluoride?
- A. Mg_2F_3
 - B. Mg_2F
 - C. Mg_3F_2
 - D. MgF_2
18. What is the shape of the ammonia molecule, NH_3 ?
- A. Trigonal planar
 - B. Trigonal pyramidal
 - C. Linear
 - D. V-shaped (bent)
19. Which molecule is polar?
- A. CH_2Cl_2
 - B. BCl_3
 - C. Cl_2
 - D. CCl_4

20. Which substance can form intermolecular hydrogen bonds in the liquid state?

- A. CH_3OCH_3
- B. $\text{CH}_3\text{CH}_2\text{OH}$
- C. CH_3CHO
- D. $\text{CH}_3\text{CH}_2\text{CH}_3$

21. Which compound has a covalent macromolecular (giant covalent) structure?

- A. $\text{MgO}(\text{s})$
- B. $\text{Al}_2\text{O}_3(\text{s})$
- C. $\text{P}_4\text{O}_{10}(\text{s})$
- D. $\text{SiO}_2(\text{s})$

22. The electronegativities of four different elements are given below (the letters are not their chemical symbols).

| Element | W | X | Y | Z |
|-------------------|-----|-----|-----|-----|
| Electronegativity | 0.9 | 1.2 | 3.4 | 4.0 |

Based on this information which statement is correct?

- A. W is a non-metal.
- B. W and X form an ionic compound.
- C. Y is a metal.
- D. Y and Z form a covalent compound.

23. Which species contain a dative covalent bond?

- I. HCHO
 - II. CO
 - III. H_3O^+
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

24. Which substance is made up of a lattice of positive ions and free moving electrons?
- Graphite
 - Sodium chloride
 - Sulfur
 - Sodium
25. Which order is correct when the following compounds are arranged in order of **increasing** melting point?
- $\text{CH}_4 < \text{H}_2\text{S} < \text{H}_2\text{O}$
 - $\text{H}_2\text{S} < \text{H}_2\text{O} < \text{CH}_4$
 - $\text{CH}_4 < \text{H}_2\text{O} < \text{H}_2\text{S}$
 - $\text{H}_2\text{S} < \text{CH}_4 < \text{H}_2\text{O}$
26. What are the correct formulas of the following ions?

| | Ammonium | Hydrogencarbonate | Phosphate |
|----|-----------------|--------------------------|--------------------|
| A. | NH_4^+ | HCO_3^{2-} | PO_4^- |
| B. | NH_3^+ | HCO_3^- | PO_4^{3-} |
| C. | NH_4^+ | HCO_3^{2-} | PO_4^{2-} |
| D. | NH_4^+ | HCO_3^- | PO_4^{3-} |

27. What happens when magnesium metal reacts with chlorine gas?
- Each magnesium atom loses two electrons and each chlorine atom gains two electrons.
 - Each magnesium atom gains one electron and each chlorine atom loses one electron.
 - Each magnesium atom loses two electrons and each chlorine atom gains one electron.
 - Each magnesium atom gains one electron and each chlorine atom loses two electrons.
28. Which is the best description of ionic bonding?
- The electrostatic attraction between positively charged nuclei and an electron pair
 - The electrostatic attraction between positive ions and delocalized negative ions
 - The electrostatic attraction between positive ions and delocalized electrons
 - The electrostatic attraction between oppositely charged ions

29. Which is the best description of the bonding present in silicon dioxide, SiO_2 ?
- A. Each silicon atom forms four single covalent bonds to oxygen atoms.
 - B. Each silicon atom forms two double covalent bonds to oxygen atoms.
 - C. Each silicon atom forms two single covalent bonds to oxygen atoms.
 - D. Each silicon atom forms four double covalent bonds to oxygen atoms.
30. Which statement best describes the **intramolecular** bonding in $\text{HCN}(\text{l})$?
- A. Electrostatic attractions between H^+ and CN^- ions
 - B. Only Dispersion forces
 - C. Dispersion forces and hydrogen bonding
 - D. Electrostatic attractions between pairs of electrons and positively charged nuclei