4.4 intermolecular forces multiple choice [28 marks]

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28		

1. Which describes an ionic compound?

	Melting point	Electrical conductivity of solid
A.	high	high
B.	high	low
C.	low	high
D.	low	low

2. What is the order of increasing boiling point?

A. $CH_3CH_2CH_2CH_3 < CH_3CH(OH)CH_3 < CH_3COCH_3 < CH_3CO_2H$

B. $CH_3CH_2CH_2CH_3 < CH_3COCH_3 < CH_3CH(OH)CH_3 < CH_3CO_2H$

C. $CH_3CO_2H < CH_3COCH_3 < CH_3CH(OH)CH_3 < CH_3CH_2CH_2CH_3$

D. $CH_3CH_2CH_2CH_3 < CH_3COCH_3 < CH_3CO_2H < CH_3CH(OH)CH_3$

3. Which compound has hydrogen bonds between its molecules?

A. CH_4 B. CH_4O C. CH_3Cl D. CH_2O

4. Which compound has the highest boiling point?

A. CH_3CHO B. CH_3CH_2F C. CH_3OCH_3 D. $CH_3CH_2NH_2$

5. What are the strongest intermolecular forces between molecules of propanone, CH_3COCH_3, in the liquid phase?

A. London (dispersion) forces B. Covalent bonding

C. Hydrogen bonding D. Dipole–dipole forces

6. The compounds shown below have similar relative molecular masses. What is the correct order of increasing boiling point?

A. $CH_3COOH < (CH_3)_2CO < (CH_3)_2CHOH$ B. $CH_3COOH < (CH_3)_2CHOH < (CH_3)_2CO$

C. $(CH_3)_2CO < CH_3COOH < (CH_3)_2CHOH$ D. $(CH_3)_2CO < (CH_3)_2CHOH < CH_3COOH$

7. Which of the following series shows increasing hydrogen bonding with water?

A. Propane < propanal < propanol < propanoic acid

B. Propane < propanol < propanal < propanoic acid

C. Propanal < propane < propanoic acid < propanol

D. Propanoic acid < propanol < propanal < propane

8. Which correctly states the strongest intermolecular forces in the compounds below?

	CH_4	CH_3Cl	CH_3NH_2
A.	dipole-dipole	London forces	hydrogen bonding
B.	London forces	dipole-dipole	hydrogen bonding
C.	hydrogen bonding	London forces	dipole-dipole
D.	London forces	hydrogen bonding	dipole-dipole

9. What is the order of increasing boiling point?

A. $C_4H_{10} < CH_3COOH < CH_3CH_2CHO < CH_3CH_2CH_2OH$

B. $C_4H_{10} < CH_3CH_2CHO < CH_3CH_2CH_2OH < CH_3COOH$

C. $CH_3COOH < CH_3CH_2CH_2OH < CH_3CH_2CHO < C_4H_{10}$

D. $C_4H_{10} < CH_3CH_2CH_2OH < CH_3CH_2CHO < CH_3COOH$

10. A substance has the following properties:

Melting point / °C	Electrical conductivity	
	Molten	Solid
1414	poor	poor

What is the most probable structure of this substance?

A. Network covalent B. Polar covalent molecule

C. Ionic lattice D. Metallic lattice

11. Which bonds cause the boiling point of water to be significantly greater than that of hydrogen sulfide?

A. London (dispersion) B. Covalent C. Ionic D. Hydrogen

12. Between which pair of molecules can hydrogen bonding occur?

A. CH_4 and H_2O B. CH_3OCH_3 and CF_4 C. CH_4 and HF D. CH_3OH and H_2O

13. Which of the following are van der Waals' forces?

I. Dipole-dipole forces II. Hydrogen bonds III. London (dispersion) forces

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

14. Which forces are present between molecules of carbon dioxide in the solid state?

A. Permanent dipole-permanent dipole interactions

B. Temporary dipole-induced dipole interactions (London/dispersion forces)

C. Covalent bonding D. Ionic bonding

15. The following compounds have similar molar masses:

CH_3CH_2COOH, $CH_3CH_2CH_2CH_2OH$ and $CH_3CH_2CH_2CH_2CH_3$

What is the order of **increasing** boiling points?

A. $CH_3CH_2CH_2CH_2OH < CH_3CH_2COOH < CH_3CH_2CH_2CH_2CH_3$

B. $CH_3CH_2COOH < CH_3CH_2CH_2CH_2CH_3 < CH_3CH_2CH_2CH_2OH$

C. $CH_3CH_2COOH < CH_3CH_2CH_2CH_2OH < CH_3CH_2CH_2CH_2CH_3$

D. $CH_3CH_2CH_2CH_2CH_3 < CH_3CH_2CH_2CH_2OH < CH_3CH_2COOH$

16. Which process involves the breaking of hydrogen bonds?

A. $2HI(g) \rightarrow H_2(g) + I_2(g)$ B. $CH_4(g) \rightarrow C(g) + 4H(g)$

C. $H_2(l) \rightarrow H_2(g)$ D. $NH_3(l) \rightarrow NH_3(g)$

17. What is the correct order of **increasing** boiling point?

A. $C_2H_6 < HCHO < CH_3OH$ B. $HCHO < C_2H_6 < CH_3OH$

C. $CH_3OH < HCHO < C_2H_6$ D. $C_2H_6 < CH_3OH < HCHO$

18. Which compound has the highest boiling point?

A. CH_3CH_3 B. CH_3OH C. CH_3CH_2OH D. $CH_3CH_2CH_3$

19. Which statements are correct about hydrogen bonding?

I. It is an electrostatic attraction between molecules.

II. It is present in liquid ammonia.

III. It is a permanent dipole-permanent dipole attraction.

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

20. Which series shows **increasing** boiling points?

A. $CH_3CH_2CH_3 < CH_3CH_2OH < CH_3CHO$ B. $CH_3CHO < CH_3CH_2CH_3 < CH_3CH_2OH$

C. $CH_3CH_2OH < CH_3CHO < CH_3CH_2CH_3$ D. $CH_3CH_2CH_3 < CH_3CHO < CH_3CH_2OH$

21. Which compound has the **lowest** boiling point?

A. $CH_3CH_2CH_2OH$ B. $CH_3CH_2CH_2Br$ C. CH_3CH_2COOH D. $CH_3CH_2CH_2CH_3$

22. What is the correct order of **increasing** boiling points?

A. $CH_3CH_3 < CH_3CH_2Cl < CH_3CH_2Br < CH_3CH_2I$ B. $CH_3CH_2Cl < CH_3CH_2Br < CH_3CH_3 < CH_3CH_2I$

C. $CH_3CH_2I < CH_3CH_2Br < CH_3CH_2Cl < CH_3CH_3$ D. $CH_3CH_2Br < CH_3CH_2Cl < CH_3CH_2I < CH_3CH_3$

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

A. C_2H_5OH B. $CHCl_3$ C. CH_3CHO D. $(CH_3CH_2)_3N$

24. Which change explains why the boiling points of the halogens increase as their molecular masses increase?

A. The intermolecular attraction due to temporarily induced dipoles increases.

B. The gravitational attraction between molecules increases.

C. The polarity of the bond within the molecule increases.

D. The strength of the bond within the molecule increases.

25. Which order is correct when the following compounds are arranged in order of **increasing** melting point?

A. $CH_4 < H_2S < H_2O$ B. $H_2S < H_2O < CH_4$ C. $CH_4 < H_2O < H_2S$ D. $H_2S < CH_4 < H_2O$

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

A. CH_3OCH_3 B. CH_3CH_2OH C. CH_3CHO D. $CH_3CH_2CH_3$

27. Which compound does **not** form hydrogen bonds between its molecules?

A. CH_3NH_2 B. CH_3COCH_3 C. CH_3COOH D. CH_3CH_2OH

28. Which statement best describes the **intramolecular** bonding in HCN(l)?

A. Electrostatic attractions between H^+ and CN^- ions B. Only van der Waals' forces

C. Van der Waals' forces and hydrogen bonding

D. Electrostatic attractions between pairs of electrons and positively charged nuclei