1. Helium atoms do not combine to form \( \text{He}_2 \) molecules, yet He atoms do attract one another weakly through

A. dipole-dipole forces.
B. ion-dipole forces.
C. dispersion forces.
D. dipole-induced dipole forces.
E. hydrogen bonding.

2. The molecular property related to the ease with which the electron density in a neutral atom or molecule can be distorted is called

A. a dipole moment.
B. polarizability.
C. a dispersion force.
D. surface tension.
E. a van der Waals force.

3. Which one of the following substances will have both dispersion forces and dipole-dipole forces?

A. \( \text{HCl} \)
B. \( \text{BCl}_3 \)
C. \( \text{Br}_2 \)
D. \( \text{H}_2 \)
E. \( \text{CO}_2 \)

4. Which one of the following substances should exhibit hydrogen bonding in the liquid state?

A. \( \text{PH}_3 \)
B. \( \text{H}_2 \)
C. \( \text{H}_2\text{S} \)
D. \( \text{CH}_4 \)
E. \( \text{NH}_3 \)
5. Which two properties are more typical of molecular compounds than of ionic compounds?

1. They are gases or liquids at room temperature.
2. They have high melting points.
3. Solids do not conduct electricity, but liquids do.
4. Atoms share electrons.

A. 1 and 4  
B. 1 and 3  
C. 2 and 3  
D. 2 and 4  
E. 3 and 4

6. Which of the following substances should have the highest boiling point?

A. CH₄  
B. Cl₂  
C. Kr  
D. CH₃Cl  
E. N₂

7. Which of the following liquids would have the highest viscosity at 25°C?

A. CH₃OCH₃  
B. CH₂Cl₂  
C. C₂H₅OH  
D. CH₃Br  
E. HOCH₂CH₂OH

8. Which of the following characteristics indicates the presence of weak intermolecular forces in a liquid?

A. a low heat of vaporization  
B. a high critical temperature  
C. a low vapor pressure  
D. a high boiling point  
E. none of these
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10. For which of the following species are the intermolecular interactions entirely due to dispersion forces?

A. C₂H₆  
B. CH₃OCH₃  
C. NO₂  
D. H₂S  
E. CaNO₃

11. For which of the following species are the dispersion forces strongest?

A. C₄H₁₀  
B. C₅H₁₂  
C. C₆H₁₄  
D. C₇H₁₆  
E. C₈H₁₈

12. Which of the following would be expected to have the highest vapor pressure at room temperature?

A. ethanol, bp = 78°C  
B. methanol, bp = 65°C  
C. water, bp = 100°C  
D. acetone, bp = 56°C  

13. Given the following liquids and their boiling points, which has the highest vapor pressure at its normal boiling point?

A. ethanol, bp = 78°C  
B. methanol, bp = 65°C  
C. water, bp = 100°C  
D. benzene, bp = 80°C  
E. The vapor pressure of each of the liquids at its normal boiling point would be the same.
14. Choose the response that lists the member of each of the following pairs that has the higher boiling point.
   (I) H₂O or KI (II) HF or HI (III) Cl₂ or Br₂

   A. H₂O, HF, and Cl₂
   B. KI, HF, and Br₂
   C. KI, HI, and Br₂
   D. H₂O, HI, and Cl₂
   E. KI, HF, and Cl₂

15. Krypton has a higher melting point than argon because of its

   A. hydrogen bonding.
   B. stronger dispersion forces.
   C. permanent dipole moment.
   D. ionic bonds.
   E. greater ionization energy.

16. Which one of the following substances should exhibit hydrogen bonding in the liquid state?

   A. PH₃
   B. He
   C. H₂S
   D. CH₄
   E. CH₃OH

17. Which of the following atoms does not participate in hydrogen bonding?

   A. S
   B. O
   C. F
   D. N

18. Each of the following substances is a gas at 25°C and 1 atmosphere pressure. Which one will liquefy most easily when compressed at a constant temperature?

   A. F₂
   B. H₂
   C. HF
   D. SiH₄
   E. Ar
19. Which of the following is not true with regard to water?

   A. Water has a high heat capacity.
   B. Water has an unusually high boiling point.
   C. Water can form hydrogen bonds.
   D. Ice is more dense than liquid water.
   E. Water is a polar molecule.

20. Which property of water allows a razor blade to float on it without sinking?

   A. viscosity
   B. surface tension
   C. density
   D. specific heat
   E. triple point
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a. C\textsubscript{4}H\textsubscript{10}

b. C\textsubscript{5}H\textsubscript{12}

c. C\textsubscript{6}H\textsubscript{14}

d. C\textsubscript{7}H\textsubscript{16}

E C\textsubscript{8}H\textsubscript{18}

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(I) H\textsubscript{2}O or KI  (II) HF or HI  (III) Cl\textsubscript{2} or Br\textsubscript{2}

a. H\textsubscript{2}O, HF, and Cl\textsubscript{2}

B KI, HF, and Br\textsubscript{2}

c. KI, HI, and Br\textsubscript{2}

d. H\textsubscript{2}O, HI, and Cl\textsubscript{2}

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