

AP Chemistry: Unit -2 - Intermolecular Forces and Properties Practice Test

Question 1

What explains the very high melting and boiling point of water?

- A. Strong dipole-dipole bonds between water molecules
- B. Strong hydrogen bonds between water molecules
- C. Dispersion forces which are present in all molecules
- D. Asymmetrical shape of the polar bonds.

Question 2

Hydrogen bonding occurs when hydrogen is bonded to N, O, or F. Which of the following has hydrogen bonding?

- A. CBr_4
- B. NO_2
- C. H_2S
- D. NH_3

Question 3

All molecules have London forces between them, but dipole-dipole and hydrogen bonding are so much stronger that when they are present we can ignore London forces. Which of these has ONLY London forces?

- A. I_2
- B. NH_3
- C. OCl_2
- D. SH_2

Question 4

Which substance would have the weakest intermolecular forces of attraction?

- A. CH_4
- B. NaCl
- C. H_2O
- D. MgF_2

Question 5

Determine the type of intermolecular force present in SiO₂.

- A. dipole dipole
- B. dispersion
- C. ionic
- D. covalent network

Question 6

What is the basis of a metallic bond?

- A. the attraction of neutral metal atoms.
- B. the attraction between protons and neutrons.
- C. the attraction between positive metal ions and interlocking electrons.
- D. the attraction between positive metal ions and free floating electrons.

Question 7

Which of the following would best remove Sharpie marker from your wall if this marker is known to be non-water soluble?

- A. salt water
- B. ammonia (nitrogen trihydride)
- C. acetone (finger nail polish remover)
- D. distilled water

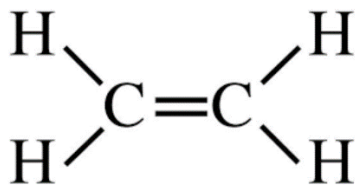
Question 8

Which of the following has the lowest boiling point?

- A. CaCl₂
- B. PH₃
- C. Cl₂
- D. N₂

Question 9

What will be the state of the following molecule?



- A. gas
- B. liquid
- C. solid
- D. plasma

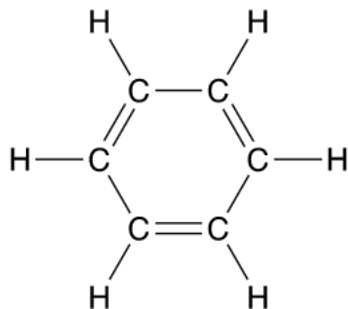
Question 10

Which of the following cations is likely to have the strongest attraction to an adjacent water molecule in an aqueous solution?

- A. Mg²⁺
- B. K⁺
- C. Ca²⁺
- D. Rb⁺

Question 11

The Lewis structure of benzene is shown below.



Which of the following identifies all of the intermolecular forces present among molecules of benzene?

- A. London dispersion forces only
- B. Dipole-dipole forces only
- C. London dispersion forces and dipole-dipole forces
- D. London dispersion forces and hydrogen bonding

Question 12

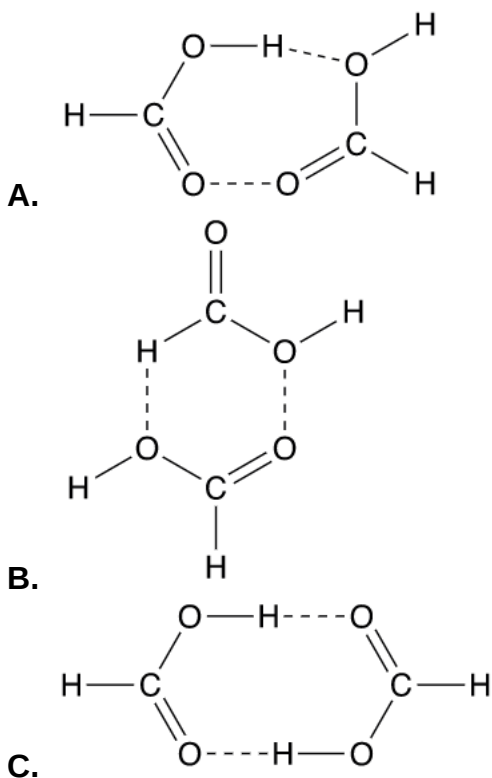
Which of the following correctly lists the HCN, N₂, and HF in order of increasing intermolecular forces?

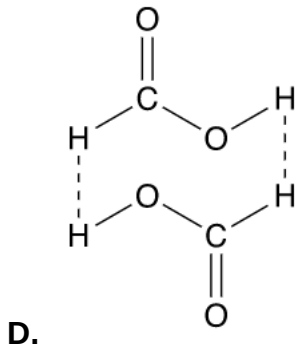
- A. HF < N₂ < HCN
- B. N₂ < HCN < HF
- C. N₂ < HF < HCN
- D. HCN < N₂ < HF

Question 13

In the vapor phase, formic acid exists as dimers (complexes consisting of two formic acid molecules) rather than individual molecules. The formic acid dimer is held together by two hydrogen bonds.

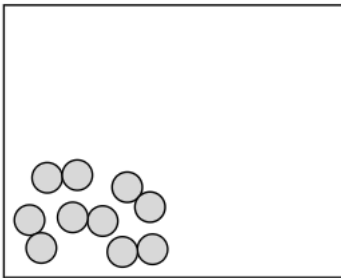
Which of the following diagrams correctly represents the hydrogen bonding (denoted by dotted lines) in the formic acid dimer?



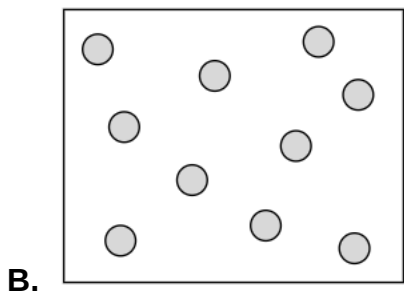
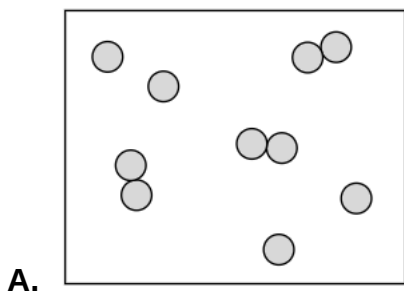


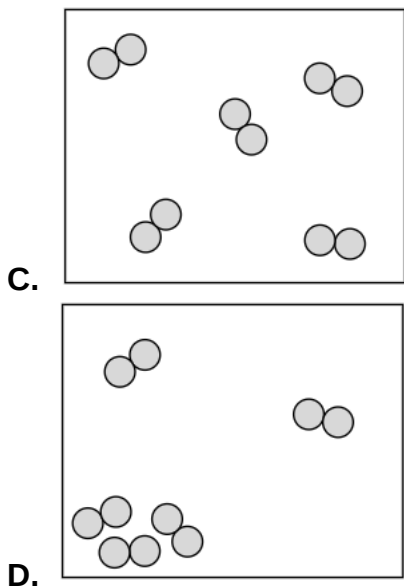
Question 14

The diagram below represents five molecules of Br_2 in the liquid state.



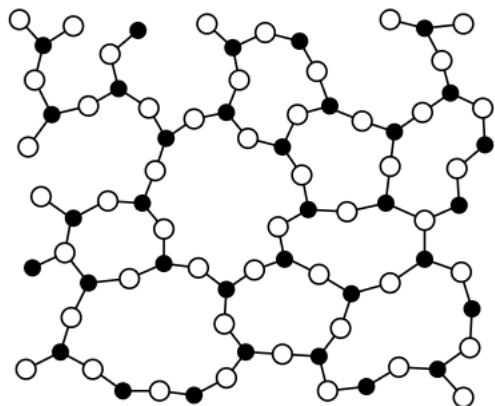
Which of the following diagrams best represents the molecules of Br_2 after complete vaporization has occurred?





Question 15

Obsidian, a type of volcanic glass, consists mainly of silicon dioxide (SiO_2). The general structure of obsidian is shown below.

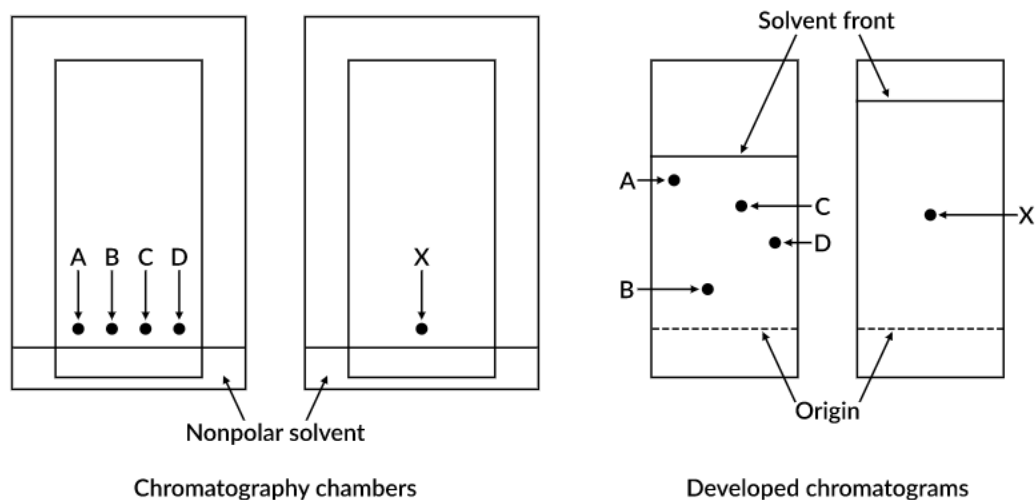


Based on the diagram above, which of the following can be concluded about obsidian?

- A. It is a crystalline network solid.
- B. It is a crystalline molecular solid.
- C. It is an amorphous network solid.
- D. It is an amorphous molecular solid.

Question 16

Samples of four pure dyes, labeled A through D, are spotted on chromatography paper (a polar material) at the positions indicated in the diagram below. An unknown dye sample, labeled X, is then spotted on a separate piece of chromatography paper. Both papers are placed in chromatography chambers containing a small amount of a nonpolar solvent and developed. The developed chromatograms are shown below on the right.

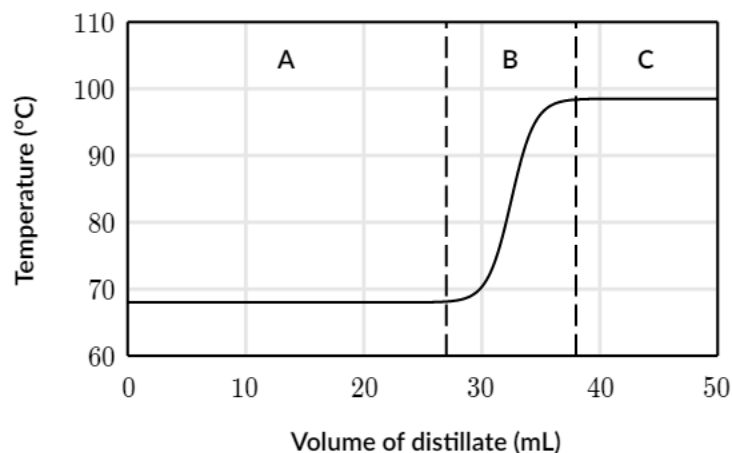


Which of the four dyes is most likely present in sample X?

- A. Dye A
- B. Dye B
- C. Dye C
- D. Dye D

Question 17

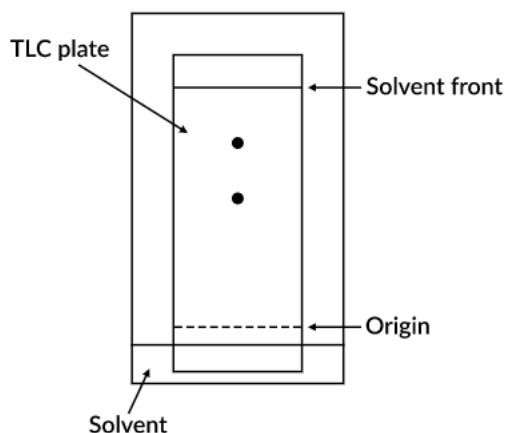
A student performs a distillation of a 2 : 1 mixture of two straight-chain hydrocarbons, hexane (C_6H_{14}) and heptane (C_7H_{16}). During the distillation, the student collects fractions of distillate over three volume ranges. These fractions, labeled A, B, and C, are indicated on the distillation curve below.



Based on the curve, what is the most likely composition of fraction C?

- A. Pure hexane
- B. 2 : 1 hexane to heptane
- C. 1 : 1 hexane to heptane
- D. Pure heptane

Question 18



The results of a thin-layer chromatography (TLC) experiment are shown above. In the experiment, a TLC plate coated with a thin layer of silica gel (a polar material) was spotted with a mixture containing two different polar pigments. The plate was then developed using a solvent mixture of 70%, percent pentane and 30%, percent diethyl

ether. The relative polarities of pentane, diethyl ether, and another common TLC solvent, ethyl acetate, are shown in the table below.

Solvent	Relative polarity
Pentane	0.01
Diethyl ether	0.12
Ethyl acetate	0.23

According to the information above, which of the following changes to the solvent mixture would likely decrease the R_f values of the pigments in a subsequent experiment?

- A. Replacing pentane with ethyl acetate
- B. Replacing diethyl ether with ethyl acetate
- C. Increasing the percentage of diethyl ether
- D. Decreasing the percentage of diethyl ether

Answer Key

1. B
2. D
3. A
4. A
5. D
6. D
7. C
8. D
9. A
10. A
11. A
12. B
13. C
14. C
15. C
16. D
17. D
18. D