Intermolecular Forces, Liquids, Solids, Materials Sample Multiple Choice Questions

16/25

The number of sample questions does not reflect the number of questions that may appear on a test or exam.

1. Which ONE of the following pairings of molecule and intermolecular force is CORRECT?

   A Ethene (C_2H_4), dipole-dipole. ✗ dispersion only
   B H_2S, only London dispersion ✗ dipole
   C $CH_3CH_2NH_2$, hydrogen bonding ✓
   D NCl_3, only London dispersion ?
   E $MgBr_2$, dipole-dipole ✗ ionic

✗ 2. Which of the following substances exhibits only London dispersion forces?

   A Potassium bromide (KBr) dissolved in water (H_2O)
   B Liquid bromine (Br_2) ← because its the same element
   C Boiling methanol (CH_3OH)
   D Solid magnesium oxide (MgO)
   E Solid gold (Au)

✓ 3. Ice is less dense than water. Why? ? need to memorize notes

   A Dispersion forces are lower in a solid than in a liquid.
   B When water crystallizes into ice, ion-dipole forces are no longer effective.
   C Hydrogen bonds are less effective in the solid state than in the liquid state, reducing intermolecular forces and lowering the density.
   D Hydrogen bonding is optimized in the solid state when each water molecule is involved in a tetrahedral arrangement of hydrogen bonds, creating an open lattice.
   E More dipole-dipole interactions can be formed for each water molecule in the liquid state.

✓ 4. At room temperature, which of the following compounds is most ordered?

   A NaCl solid
   B H_2O liquid
   C CO_2 gas
   D O_2 gas
   E polyethylene ? solid maybe

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✓ 5. Which of the following mixtures will contain an example of an ion-dipole interaction?

A HF and CO_2
B HCl and HF
C $NaCl$ and $[PH_4][BrO_4]$
D $NaCl$ and CCl_4
E H_2O and $[NH_4][ClF_4]$

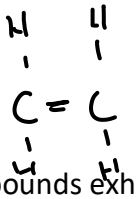
✗ 6. Which of the following compounds has the weakest intermolecular forces?

A HBr
B H_2Te
C HI
D H_2S
E H_2Se

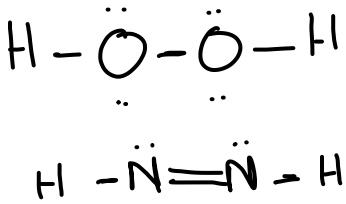
✓ 7. Which of the following compounds will experience the strongest covalent bond?

tricky question

A Na_2CO_3
B HNNH
C HOOH
D CO_2
E H_2CCH_2



O = C = O



✓ 8. Which of the following compounds exhibits the strongest London dispersion forces?

longest one

$2 \times 5 + 2 \times 1 = 12$
$-\ 4$
8

A 3-methyl-1-pentene
B 2-methylpentane
C hexane
D heptene ✓
E cyclopentane

✗ 9. What is the most appropriate classification for hydrogen bonding? need to memorize notes

A ionic
B dipole-dipole
C ion-dipole
D dipole-induced dipole
E induced dipole-induced dipole

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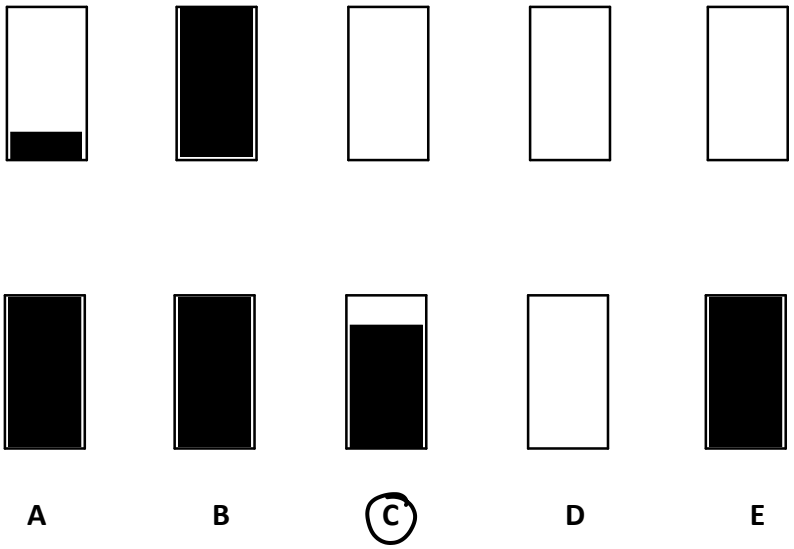
✓ 10. Which of the following compounds will experience the strongest intermolecular forces?

ionic >

A HNNH
B H_2O
C H_2CCH_2
D MgH_2
(E) CaO

✓ 11. Which of the following drawings represents the band structure of a p-type semiconductor?



A **B** **(C)** **D** **E**

✗ 12. Which of the following statements is false? need to memorize notes

(A) The strength of an intermolecular attraction or repulsion is proportional to the distance between the molecules.
B The strength of an intermolecular attraction or repulsion is proportional to the charges of the molecules involved.
(C) The energy of an intermolecular attraction or repulsion is generally weaker than the energy for covalent bonds.
D Compounds with greater intermolecular forces have higher boiling points.
E Compounds with greater intermolecular forces have higher viscosity.

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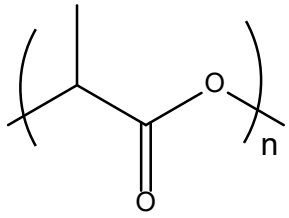
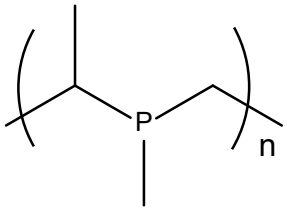
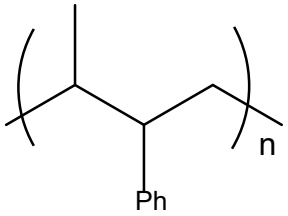
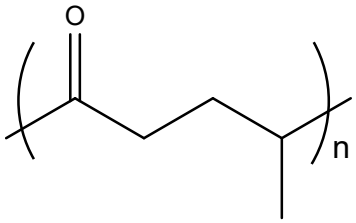
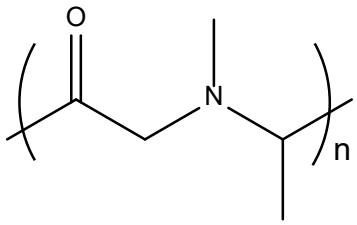
13. Which of the following polymers can be formed by condensation polymerization?
(NOTE Fall 2020– condensation polymerization is not examinable this year)

A) 

B) 

C) 

D) 

E) 

carboxylic acid + alcohol → ester + water (maybe)

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14. Which of the series below indicates the correct relationship for the boiling points of the shown compounds?

A $H_2S < SiH_4 < CH_3CH_2CH_2CH_3 < H_2O$
B $SiH_4 < CH_3CH_2CH_2CH_3 < H_2S < H_2O$
C $SiH_4 < H_2S < CH_3CH_2CH_2CH_3 < H_2O$
D $H_2S < CH_3CH_2CH_2CH_3 < SiH_4 < H_2O$
E $CH_3CH_2CH_2CH_3 < H_2S < SiH_4 < H_2O$

C_4H_{10} butane

15. What is the strongest intermolecular force for $CaCl_2$ in methanol?

A Hydrogen bonding
B Dispersion force
C Dipole-dipole forces
D Ion dipole forces
E Ionic bond

16. Which of the following compounds exhibits the strongest intermolecular forces?

A 2-hexanol
B 2,3-dimethyl-2-butanol
C pentane
D heptane
E 2-pentanol

17. If it takes 10 minutes to cook an egg in boiling water at sea level, how long would it take to cook an egg in boiling water on a mountain at an elevation of 2,500 meters?

A The boiling point of water on top of the mountain is less than 100 °C because of the lower atmospheric pressure and it will take longer to boil the egg.
B The boiling point of water on top of the mountain is greater than 100 °C because of lower atmospheric pressure and it will take less time to boil the egg.
C The boiling point of water is always 100 °C regardless of elevation so it would take the same amount of time to boil the egg.
D The boiling point of water on top of the mountain is less than 100 °C because of the lower atmospheric pressure and it will take less time to boil the egg.
E The boiling point of water on top of the mountain is greater than 100 °C because of lower atmospheric pressure and it will take longer to boil the egg.

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18. Why does the viscosity of a liquid increase when the temperature is lowered?

A At lower temperature the kinetic energy of the molecules in the liquid is higher making it possible for more intermolecular interactions to occur.
B At lower temperatures the kinetic energy of the molecules in a liquid is lower and more intermolecular interactions can occur.
C As the temperature is lowered the kinetic energy of the molecules in a liquid is constant but the strength of the intermolecular interactions increases.
D At lower temperatures the movement of the molecules in the liquid increases leading to more collisions between the molecules.
E There is no direct relationship between the temperature and the viscosity of a liquid.

19. The capillary action for a liquid in a glass tube leads to a concave surface when:

A The adhesive force is smaller than the cohesive force.
B The adhesive force is non-existent.
C The adhesive force is larger than the cohesive force.
D The adhesive and cohesive forces are the same.
E The liquid does not have cohesive forces.

20. A solid has a very high melting point, great hardness, poor electrical conduction, and does not dissolve in polar solvents. This is a(n) _____ solid.

A ionic
B molecular
C metallic
D covalent network
E metallic and covalent network

21. For which of the substances below is(are) the crystalline solid(s) a molecular solid?

i) SiO_2
ii) KCl
iii) CO_2
iv) Co
v) N_2O

A i only **B** iii only **C** iii and v only **D** i, iii, and v **E** iv only

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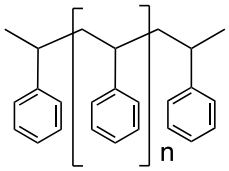
22. Which of the statements is correct with respect to the synthesis of the polymer shown in the structure below?



A The monomer is an alcohol and the polymers is formed through an addition reaction.

B The monomer is an alkyne and the polymer is formed through a condensation reaction.

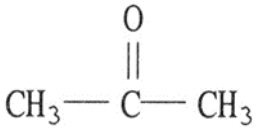
C The monomer is an alkene and the polymer is formed through an addition reaction

D The monomers are an alkene and an alkyne, and the polymer is formed through a condensation reaction.

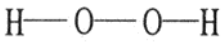
E The monomer is an alkene and the polymer is formed through a condensation reaction.

23. Which one of the following substances will not have hydrogen bonding as one of its intermolecular forces?

A



B



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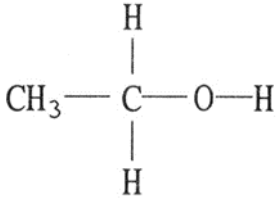
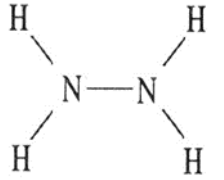
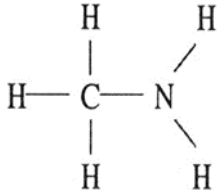


D



E



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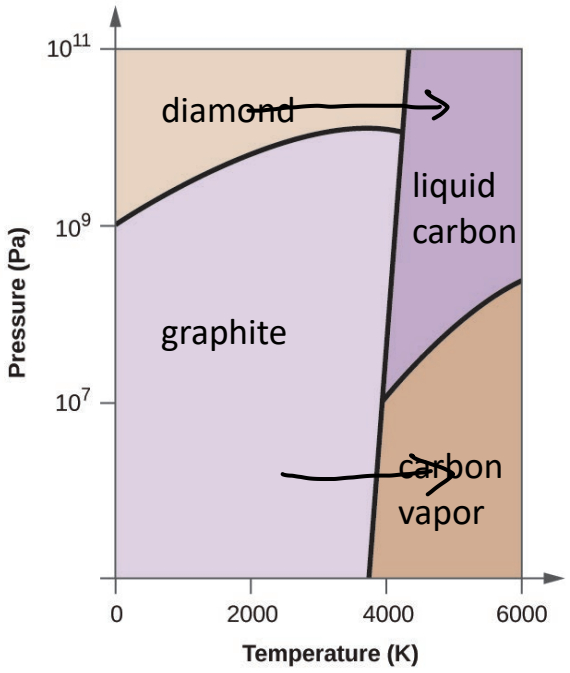
24. Based on the phase diagram for carbon (below), what are the transitions when (a) the pressure is kept constant at 10^{10} Pa and the temperature is raised from 3200 K to 5800 K and (b) the pressure is kept constant at 10^{6} Pa and the temperature is raised from 3000 K to 4500K?



A (a) no transition and (b) solid-to-liquid transitions
B (a) solid-to-liquid and (b) liquid-to-gas transitions
C (a) solid-to-solid and (b) gas-to-liquid transition
D (a) solid-to-solid and (b) liquid-to-solid transition
E (a) solid-to-liquid and (b) solid-to-gas transition

25. Considering intermolecular forces, which of the following liquids has the highest vapour pressure:

A acetone
B methanol
C water
D ethyl ether
E ethanol

?

lower the intermolecular force, higher the vapour pressure (I guess)

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Question	Answer
1	C
2	B
3	D
4	A
5	E
6	B
7	D
8	D
9	B
10	E
11	C
12	A
13	A
14	C
15	D
16	A
17	A
18	B
19	C
20	D
21	C
22	C
23	A
24	E
25	D