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1.

Elemental iodine (I_2) is a solid at room temperature. What is the major attractive force that exists among different I_2 molecules in the solid?

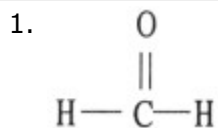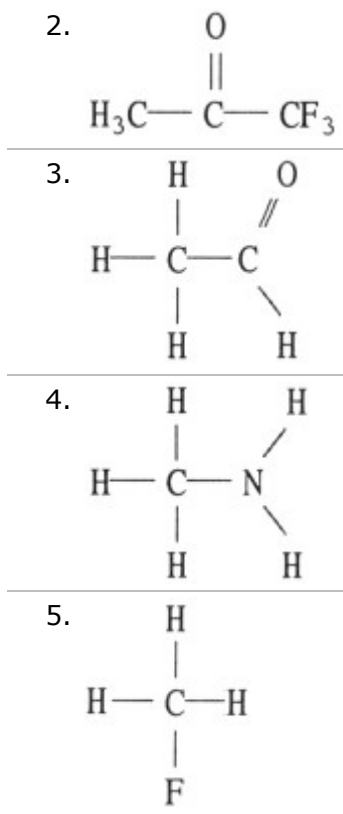| Student Response |
| --- |
| London dispersion forces |
| dipole-dipole rejections |
| ionic-dipole interactions |
| covalent-ionic interactions |
| dipole-dipole attractions |

2.

Which one of the following substances will have hydrogen bonding as one of its intermolecular forces?

Student Response
1.

2.

$$\begin{array}{c} O \\ \parallel \\ H_3C-C-CF_3 \end{array}$$

3.

$$\begin{array}{ccc} & H & O \\ & | & \parallel \\ H-C-C & \\ & | & \backslash \\ & H & H \end{array}$$

4.

$$\begin{array}{ccc} & H & H \\ & | & / \\ H-C-N & \\ & | & \backslash \\ & H & H \end{array}$$

5.

$$\begin{array}{c} H \\ | \\ H-C-H \\ | \\ F \end{array}$$

3-7 VAPOR PRESSURE & PHASE DIAGRAMS

3.

Given below are the temperature at which two different liquid compounds with the same empirical formula have a vapor pressure of 400 torr.

Compound		T (°C)
dimethyl ether,	CH_3-O-CH_3	-37.8
ethanol	CH_3CH_2OH	63.5

Which of the following statements isfalse?

Student Response
a. Increasing the temperature will increase the vapor pressure of both liquids.
b. Intermolecular

attractive forces are stronger in (liquid) ethanol than in (liquid) dimethyl ether.

c. The normal boiling point of dimethyl ether will be higher than the normal boiling point of ethanol.

d. The reason that the temperature at which the vapor pressure is 400 torr is higher for ethanol (than for dimethyl ether) is that there is strong hydogen bonding in ethanol.

e. None of these is false.

4.

Based on molecular mass and dipole moment of the five compounds in the table below, which should have the highest boiling point?

Substance	Molecular Mass (amu)	Dipole Moment (D)
Propane, $CH_3CH_2CH_3$	44	0.1
Dimethylether, CH_3OCH_3	46	1.3
Methylchloride, CH_3Cl	50	1.9
Acetaldehyde, CH_3CHO	44	2.7
Acetonitrile, CH_3CN	41	3.9

5.
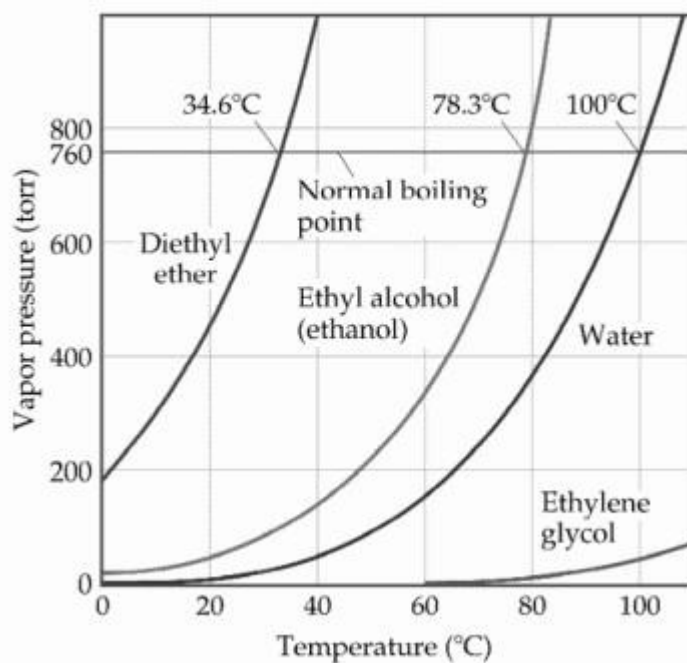
Based on the figure above, the boiling point of water under an external pressure of

0.316 atm is
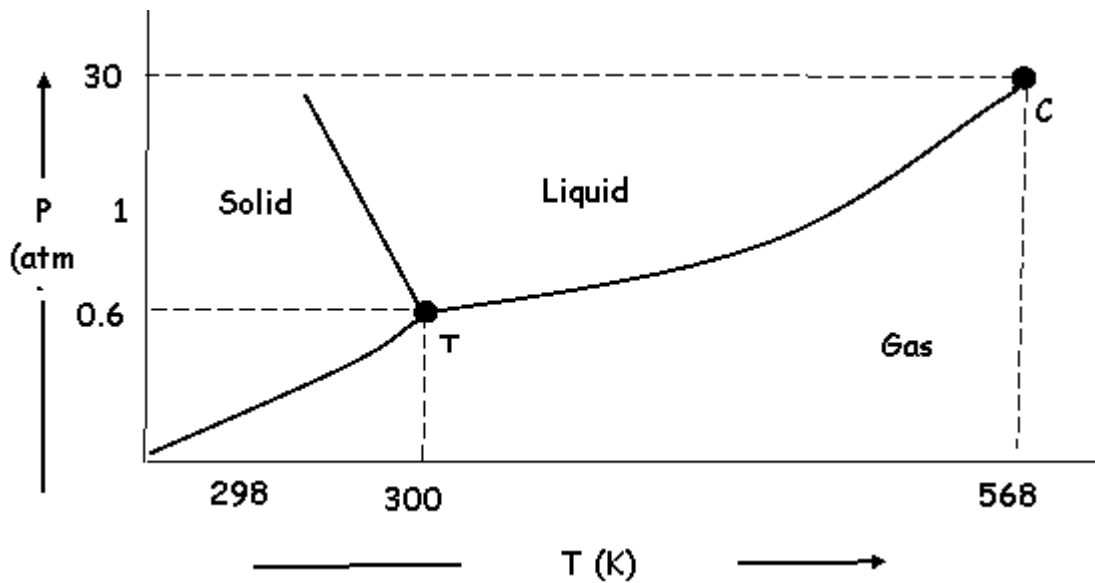
Student
Response

a. 70

b. 40

c. 60

d. 80

e. 90

6.

A certain liquid has a vapor pressure of 341 torr at 246 K and a vapor pressure of 503 torr at 614 K. What ΔH_{vap} for this liquid.

Answer

7.

Consider the following phase diagram for substance X

1. Under normal atmospheric conditions (298K, 1 atm) will substance X exist as a solid, liquid, or gas?
2. If heat is applied to the solid, will it melt or sublime?
3. Which is more dense, the solid or the liquid?

4. Point C is the critical point. Provide a clear definition of this.

8-8 LIQUID PROPERTIES
8.

Explain why water sheets on an unwaxed metal car hood but beeds up on a waxed car hood in terms of the cohesive and adhesive forces involved. (Note wax is nonpolar). Does this involve surface tension, cappilary action, or viscosity?

9-12 SOLUTION FORMATION & SOLUBILITY
9.

Which of the following would be most soluble in benzene, C_6H_6?

Student Response
a. C_8H_{18} (octane)
b. H_2O
c. CH_3CH_2OH (ethanol)
d. NH_3 (ammonia)
e. NaCl

Score: 5/5

10.

When a bottle of champaign is opened the cork often pops out with such force that it can fly accross the room. Considering that pressure of CO_2 above the liquid in the unopened bottle is about 2.8 atm and the partial pressure of CO_2 in the atmosphere is about 0.15 atm, explain what causes the cork to launch when the bottle is opened.

Student Response:

11.

There is an old saying "oil and water don't mix." Given that oil is a mixture of nonpolar hydrocarbons. Explain in terms of the cohesive and adhesive forces involved, why oil and water are immiscible. Cleary identify the cohesive and adhesive forces involved

Student Response:

12.

Gas X has a solubility of 2.48 g/L at a pressure of 3.564 atm. What will the solubility of gas X be at a pressure of 3.703 atm?

13-14 CONC UNITS

13.

A 42.7% (mass/mass) solution of compound Buba {FW = 202} has a density of 0.363 g/mL. What is the molarity of this solution?

14.

If 33.6 mL of a 7.8 solution is diluted to a total volume of 746 mL, what is the molarity of the resulting diluted solution?

15-20 COLLIGATIVE PROPERTIES

15.

When sucrose (a non volatile, non electrolytic) solute is dissolved in water it causes.

1. The vapor pressure of the water to decrease
2. The boiling point of water to increase
3. The freezing point of water to decrease.

Explain in sufficient detail why this occurs. These solution properties are called colligative properties. What exactly does this mean?

16.

Determine the mole fraction of solvent in a solution that has a vapor pressure of 174 mmHg at at temperature of 20.6°C. (The vapor pressure of the pure solvent is 717 at this temperature. Assume the solute is nonvolitile)

17.

Two volatile liquids A and B are mixed together to form a miscible solution. If the vapor pressures of pure A and B are respectively 154.4 mmHg and 105.6 mmHg, and the mole fraction of B (liquid phase) is 0.40, what is the vapor pressure of this solution (in mmHg)

18.

Liquid A and liquid B form a solution that behaves ideally according to Raoult's law. The vapor pressure of pure substances A and B are 426 mmHg and 327 mmHg. If the mole fraction of liquid A in a particular solution is 0.42, what is the mole fraction of A in the vapor phase in equilibrium with that solution?

19.

When 31.3-g sample of an unknown solute is dissolved in 507-g of solvent, the boiling point increases by 2.98°. Given that the molal boiling point constant for the solvent is K_b = 2.59°C/m, calculate the molar mass of the unknown solute.

20.

Calculate the osmotic pressure (**in mmHg**) at 43.9 °C for a 0.46 molar electrolytic solution with a Van't Hoff factor of i=3.0