

[TP] Which is the correct order of decreasing intermolecular forces?

20% 1. HI > HBr > HCl
20% 2. HCl > HBr > HI
20% 3. $NH_3 > H_2O > CO$
20% 4. $NH_3 > CO > HCl$
20% 5. None of the above

Response Counter 10

Lecture 9 CH102 A1 (MWF 9:05 am)

Wednesday, February 8, 2017

- Review: Effect of molecular attraction
- Real gases: Effect of molecular size
- Real gases: van der Waals equation
- Phase diagrams

Next: Complete ch11: Phase diagrams; begin ch12: Solutions and their behavior.

Triple point YouTube video: http://goo.gl/4K1SR
Critical point YouTube video: http://goo.gl/xo2jU

Contributions to van der Waals *a*

Van der Waals *a* reflects intermolecular attractions present when gas particles encounter one another.

Therefore, hydrogen bonding can make a contribution.

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Response Counter 10

[Quiz] Which of the following is the correct order of species for increasing value of van der Waals b?

25% 1. $O_2 < Br_2 < CO_2 < He$
25% 2. $O_2 < CO_2 < He < Br_2$
25% 3. $He < O_2 < Br_2 < CO_2$
25% 4. $He < O_2 < CO_2 < Br_2$

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A gas law for "real" gases

We know the ideal gas law $p\,V = n\,R\,T$ where ...

$$p = p_{\text{empty}} = p_{\text{observed}} + a\,(n/V_{\text{container}})^2$$

$$V = V_{\text{empty}} = V_{\text{container}} - b\,n$$

Combine. these two expressions into an equation relating p_{observed}, $V_{\text{container}}$, and T.

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Combine. these two expressions into an equation relating p_{observed}, $V_{\text{container}}$, and T.

$$[\,p_{\text{observed}} + a\,(n/V_{\text{container}})^2\,]\,(V_{\text{container}} - b\,n) = n\,R\,T$$

This is known as the van der Waals equation

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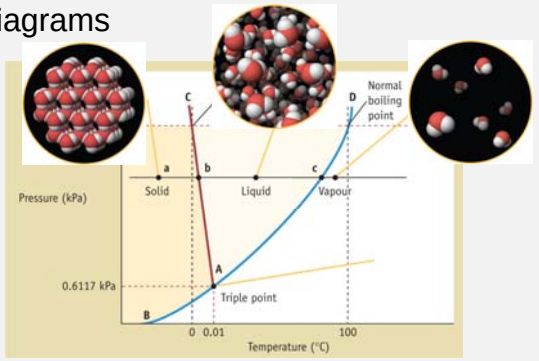
Phase diagrams



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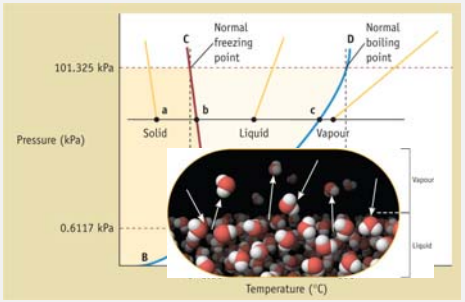
Phase diagrams

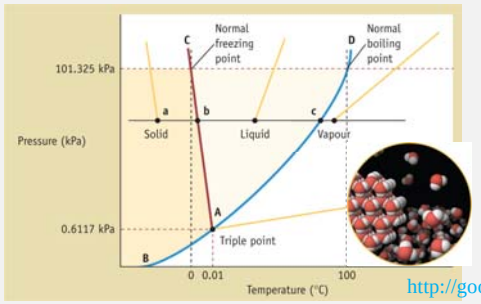
Lines of p versus T for which different phases are present at the same time.

That is, values of p and T for which different phases are in equilibrium.

How about on blue line at 45 °C?



What about the intersection marked “A”



http://goo.gl/4K1SR

Triple point

Liquid tert-butyl alcohol, $C(CH_3)_3OH$ can boil and freeze at the same time...
http://goo.gl/4K1SR

