

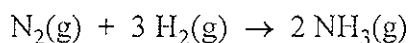
1. The ionic compound with the highest lattice energy is:

- (a) Li_2S
- (b) Cs_2S
- (c) CaSe
- (d) MgO
- (e) Na_2Te

2. Average bond energies for the following bonds are:

N-H	391 kJ/mol
H-H	432 kJ/mol
N-N	160 kJ/mol
N=N	418 kJ/mol
N≡N	945 kJ/mol

What is $\Delta H^\circ_{\text{rxn}}$ of the reaction represented by the following equation?

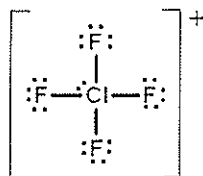


- (a) -105 kJ
- (b) -890 kJ
- (c) 986 kJ
- (d) 4587 kJ
- (e) 3582 kJ

3. Which of these statements is true for C_2H_4 and CH_3CN ?

- (a) It will take more energy to break a C_2H_4 molecule into individual atoms than to break a CH_3CN molecule into individual atoms.
- (b) It will take more energy to break a CH_3CN molecule into individual atoms than to break a C_2H_4 molecule into individual atoms.
- (c) It will take an equal amount of energy to break these two molecules into their individual atoms.
- (d) There is not enough information given to answer this question.

4. What is the molecular shape of a ClF_4^+ ion with the Lewis structure shown?



- (a) Tetrahedral
- (b) Trigonal Pyramidal
- (c) Trigonal Planar
- (d) Square Planar
- (e) See Saw

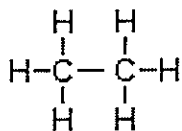
_____ 5. The Br-Br-Br bond angle in the Br_3^- ion is:

- (a) 120°
- (b) 180°
- (c) 90°
- (d) slightly less than 120°
- (e) 109.5°

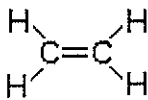
_____ 6. What are the O-N-O bond angles in the NO_3^- ion?

- (a) All equal 120° .
- (b) All equal 109.5° .
- (c) All are greater than 120° .
- (d) Two are greater than 120° one is less than 120° .
- (e) Two are less than 120° one is greater than 120° .

_____ 7. Which of the following molecules has the carbon-carbon bond that absorbs at the shortest wavelength in the infrared?



I



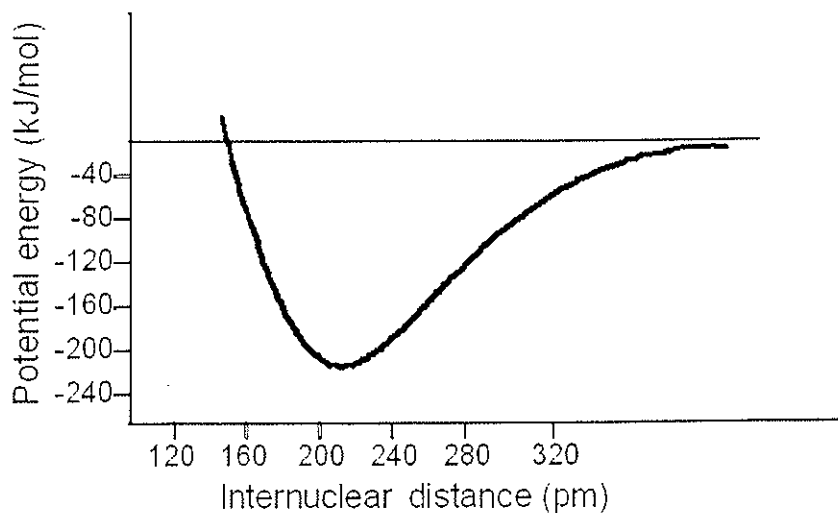
II



III

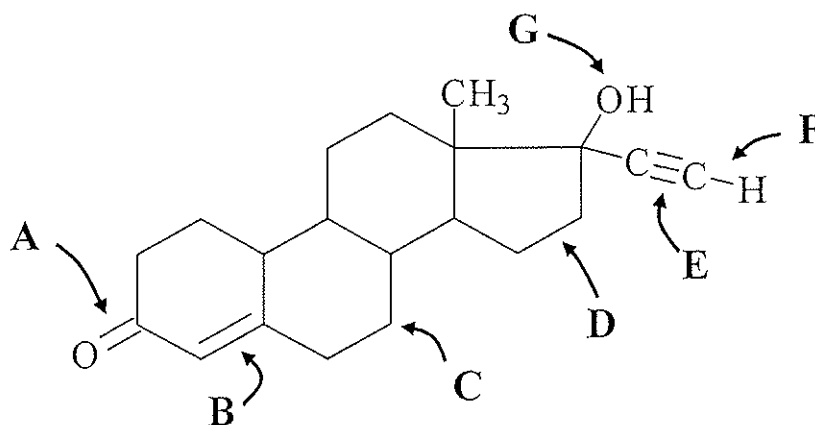
- (a) I
- (b) II
- (c) III
- (d) All three carbon-carbon bonds absorb the same wavelength.
- (e) The answer cannot be determined from the information given.

8. Where are attractive forces larger than repulsive forces?



- (a) between 150 pm and 180 pm
- (b) at 210 pm
- (c) between 240 pm and 320 pm
- (d) at 150 pm
- (e) between 120 pm and 150 pm

Questions 9–13 refer to the molecule shown below:

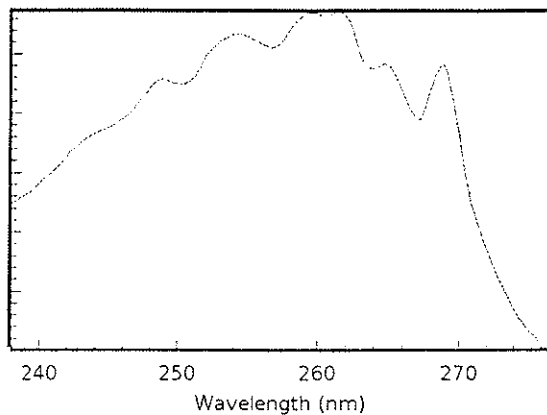


9. Which bond has the highest bond order?

- (a) A
- (b) B
- (c) D
- (d) E
- (e) F

- _____ 10. Which bond is the longest?
- (a) A
 - (b) B
 - (c) D
 - (d) E
 - (e) F
- _____ 11. Which label indicates a carbonyl group?
- (a) A
 - (b) B
 - (c) D
 - (d) E
 - (e) G
- _____ 12. Which of these rings is present in the molecule?
- (a) cyclopropene
 - (b) cyclobutane
 - (c) cyclopentene
 - (d) cyclohexane
 - (e) cycloheptene
- _____ 13. How many hydrogen atoms are bonded to the carbon labeled C?
- (a) 0
 - (b) 1
 - (c) 2
 - (d) 3
 - (e) 4

14. The absorption of octadecylbenzene in the region below 1000 nm is shown in the spectrum below:



NIST Chemistry WebBook (<http://webbook.nist.gov/chemistry>)

What color is a sample of octadecylbenzene?

- (a) Red
- (b) Yellow
- (c) Green
- (d) Purple
- (e) Colorless

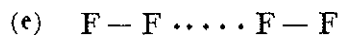
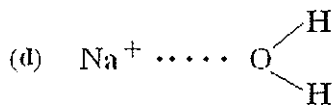
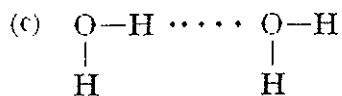
15. Xenon, Xe, is about 25 times more soluble than helium, He, in water. The *best* explanation for this is:

- (a) Xe is a larger atom than He.
- (b) Xe is more polarizable than He.
- (c) Xe forms diatomic molecules, He does not.
- (d) He liquifies at a lower temperature than Xe.
- (e) the molar mass of Xe is about 25 times that of He.

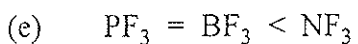
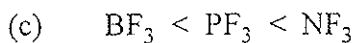
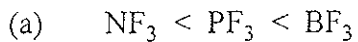
16. Which is the most polar single bond?

- (a) C-F
- (b) C-O
- (c) C-Cl
- (d) Si-N
- (e) Si-F

17. Which has the strongest intermolecular force?



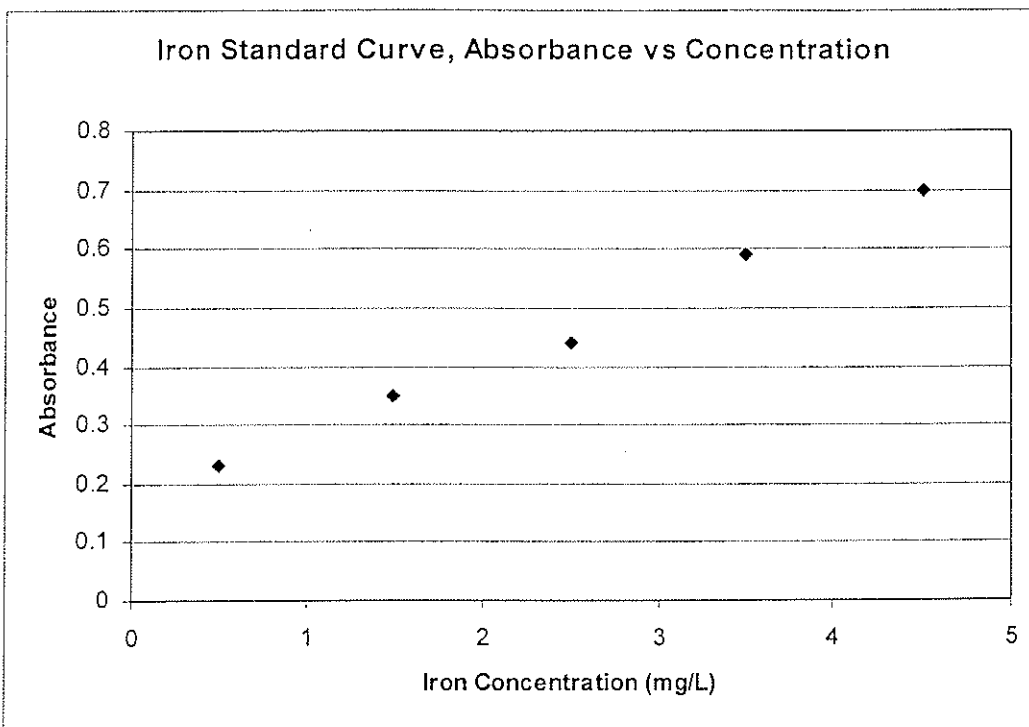
18. Which lists the molecules in increasing order of their dipole moments?



19. The best representation for sodium chloride dissolved in water is:

<p>(a)</p> <p>Diagram (a) shows a collection of ions: Cl^-, H^+, Na^+, OH^-, H^+, Cl^-, and Na^+. There are no water molecules or other species present.</p>	<p>(c)</p> <p>Diagram (c) shows a central Na^+ ion surrounded by several water molecules. The water molecules are oriented with their oxygen atoms (the more electronegative atoms) pointing towards the Na^+ ion, forming a hydration shell.</p>
<p>(b)</p> <p>Diagram (b) shows several $\text{Na}-\text{Cl}$ ion pairs. Each pair is surrounded by water molecules, but the water molecules are not specifically oriented towards either the sodium or chlorine ion.</p>	<p>(d)</p> <p>Diagram (d) shows several $\text{Na}-\text{OH}$ ion pairs. Each pair is surrounded by water molecules, but the water molecules are not specifically oriented towards either the sodium or hydroxide ion.</p>

20. A standard curve for the concentration of an iron sample is shown in the following figure. For this curve, $y = 0.115x + 0.179$.



If the absorbance of an unknown is 0.50, what is the concentration of iron in the unknown?

- (a) 0.50 M
- (b) 2.4 M
- (c) 2.4 mg/L
- (d) 2.8 M
- (e) 2.8 mg/L

- END OF EXAM -

Before you turn in your scan sheet, be sure you have the following information coded correctly on your scan sheet:

- Your name
- Your PUID number
- Your 4-digit section number
- The test number printed on the cover sheet in the upper right-hand corner.

Answers to the exam questions will be posted on the CHM 115 website sometime tomorrow morning (Tuesday, Oct 24), hopefully between 10 AM and Noon.

