

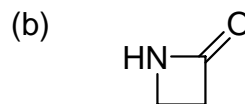
Name _____

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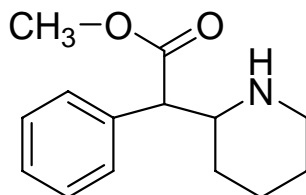
1-15 are True / False. (15pts)

- 1) The Periodic Table has the elements arranged in increasing number of total electrons
- 2) A π bond is a covalent bond
- 3) Carbon has a larger atomic radius than Silicon
- 4) Carbon is more electronegative than Iodine
- 5) All π bonds are polar
- 6) The electron configuration of Beryllium is $1s^2 2s^2 2p^1$
- 7) Carbon has 6 electrons but only 4 valence electrons
- 8) Butane has more ring strain than cyclopentane
- 9) An sp hybridized atom has two unhybridized p orbitals
- 10) Pentane and cyclopentane are not isomers
- 11) Cyclohexane in the chair conformation has zero ring strain
- 12) Thermodynamics (and energy changes) provide information about the position of equilibrium
- 13) The lowest energy conformation of butane is *anti*
- 14) This arrow \longleftrightarrow means "is in equilibrium"
- 15) A nucleophile is a 2 electron acceptor

16) Draw Lewis structures (lines for bonds and dots for all lone pairs) for the following molecules: (6pts)



17) (16pts): For the below molecule, calculate the number of...



- a) carbon atoms
- b) hydrogen atoms
- c) nitrogen atoms
- d) π bonds
- e) sp^2 hybridized carbons
- f) sp^2 hybridized atoms
- g) sp^3 hybridized atoms
- h) lone pairs (non bonding pairs) of electrons

(2 bonus points for providing the trade name of this molecule, for which in 2006 doctors wrote over 20 million prescriptions for US children).

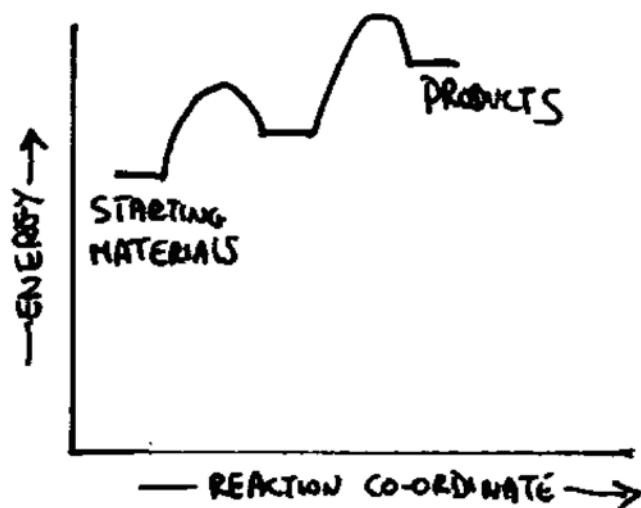
18) (8pts) (i) What is meant by the term *Hydrocarbon* ?

(ii) What is meant by the term *Lewis Acid* ?

(iii) What is a *free radical* ?

(iv) Provide an everyday example of an increase in Entropy.

19) (12pts): For the below energy level diagram...



a) is this reaction *exothermic* or *endothermic* ?

b) Will the Equilibrium constant (K) be *greater* or *less* than 1.00 ?

c) how many transition states are there ?

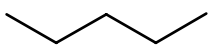
d) how many steps is this multistep reaction ?

e) which step is the rate determining step ?

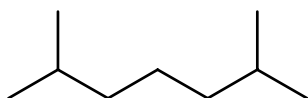
f) which is the fastest step ?

20) Name the following compounds in IUPAC form. (15pts)

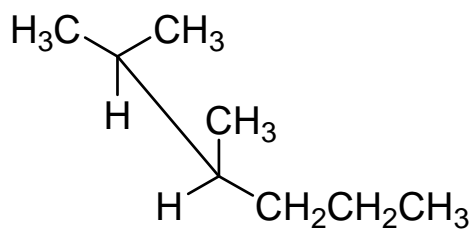
(a)



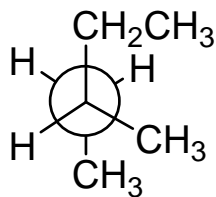
(b)



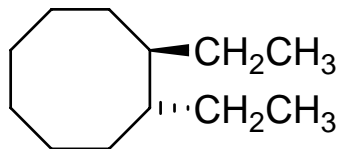
(c)



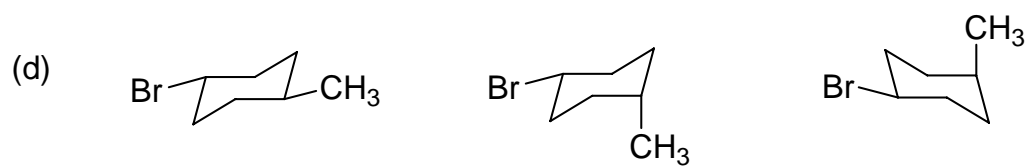
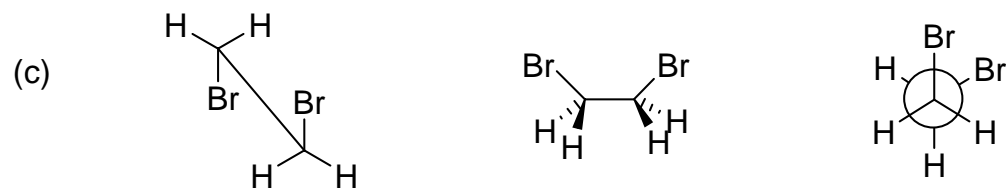
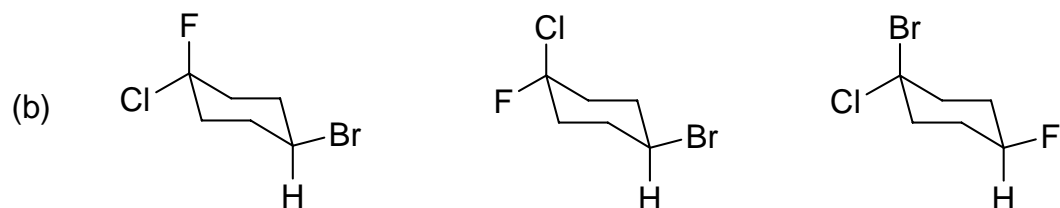
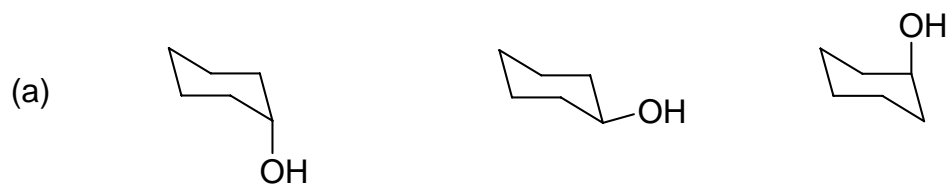
(d)



(e)

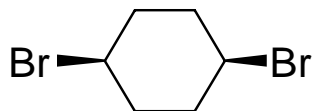


21) Circle the **most stable** member of each threesome (12pts)



22) In the lowest energy conformation of *trans*-1,2-dimethylcyclohexane, how many axial positions are occupied by Hydrogen atoms ? (5pts)

23) How many axial positions are occupied by Hydrogen atoms in the lowest energy conformation of the below molecule? (5pts)



24) Draw the 6 isomers of C_4H_8 (6pts).

(Hint: four of them are acyclic)

*****Bonus question for 2 points*****

What was the basic field of Chemistry that this year's recipients of the Nobel Prize in Chemistry worked in ?

Name

BENNY FITZ O'STUDYIN

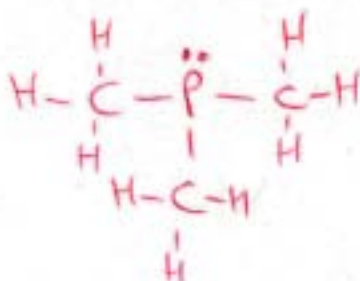
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1-15 are True / False. (15pts)

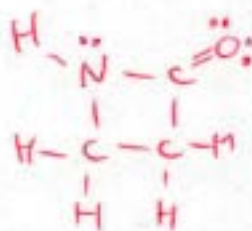
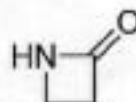
- 1) The Periodic Table has the elements arranged in increasing number of total electrons **T**
- 2) A π bond is a covalent bond **T**
- 3) Carbon has a larger atomic radius than Silicon **F**
- 4) Carbon is more electronegative than Iodine **F**
- 5) All π bonds are polar **F**
- 6) The electron configuration of Beryllium is $1s^2 2s^2 2p^1$ **F**
- 7) Carbon has 6 electrons but only 4 valence electrons **T**
- 8) Butane has more ring strain than cyclopentane **F**
- 9) An sp hybridized atom has two unhybridized p orbitals **T**
- 10) Pentane and cyclopentane are not isomers **T**
- 11) Cyclohexane in the chair conformation has zero ring strain **T**
- 12) Thermodynamics (and energy changes) provide information about the position of equilibrium **T**
- 13) The lowest energy conformation of butane is *anti* **T**
- 14) This arrow \longleftrightarrow means "is in equilibrium" **F**
- 15) A nucleophile is a 2 electron acceptor **F**

16) Draw Lewis structures (lines for bonds and dots for all lone pairs) for the following molecules: (6pts)

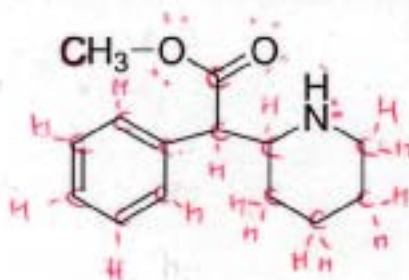
(a) $P(CH_3)_3$



(b)



17) (16pts): For the below molecule, calculate the number of...



a) carbon atoms 14

b) hydrogen atoms 19

c) nitrogen atoms 1

d) π bonds 4

e) sp^2 hybridized carbons 7

f) sp^2 hybridized atoms 8

g) sp^3 hybridized atoms 9

h) lone pairs (non bonding pairs) of electrons 5

(2 bonus points for providing the trade name of this molecule, for which in 2006 doctors wrote over 20 million prescriptions for US children).

"RITALIN" or "MPH"

18) (8pts) (i) What is meant by the term *Hydrocarbon* ?

A compound that only contains Hydrogen & Carbon atoms.

(ii) What is meant by the term *Lewis Acid* ?

A 2 electron acceptor

(iii) What is a *free radical* ?

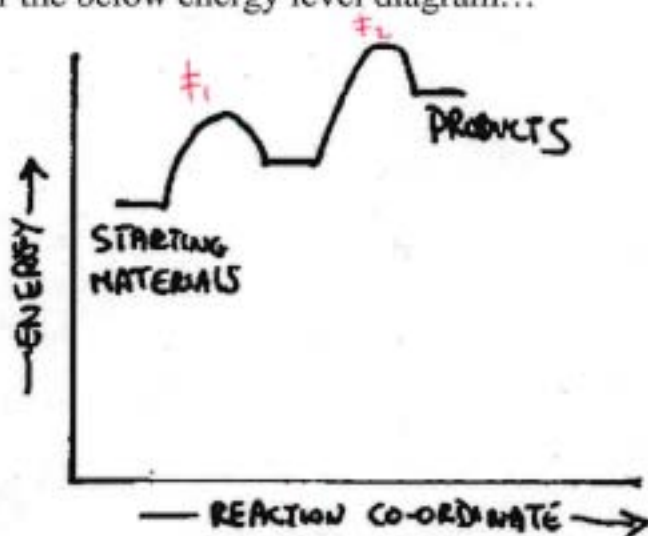
A species with an unpaired electron.

(iv) Provide an everyday example of an increase in Entropy.

- Go to sleep with tidy & styled hair, wake up and it is a mess.

- If you do not look after your garden, it becomes overgrown & messy

19) (12pts): For the below energy level diagram...



a) is this reaction *exothermic* or *endothermic* ?

ENDOTHERMIC

b) Will the Equilibrium constant (*K*) be *greater* or *less* than 1.00 ?

LESS THAN 1

c) how many transition states are there ?

TWO

d) how many steps is this multistep reaction ?

TWO

e) which step is the rate determining step ?

2nd step

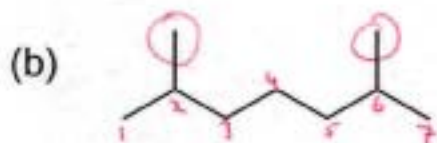
f) which is the fastest step ?

first

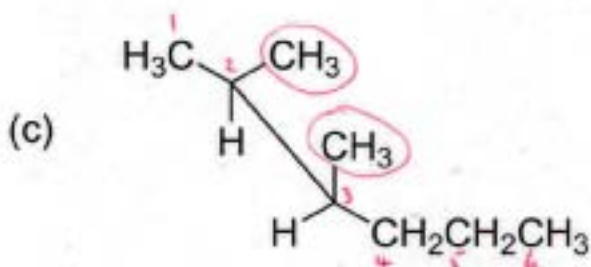
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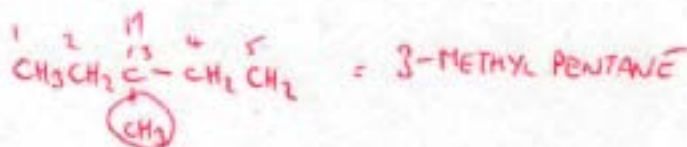
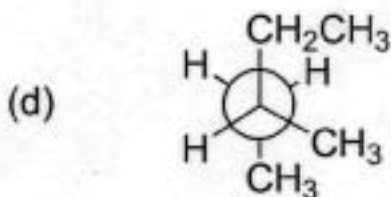
PENTANE



2,6-DIMETHYL HEPTANE

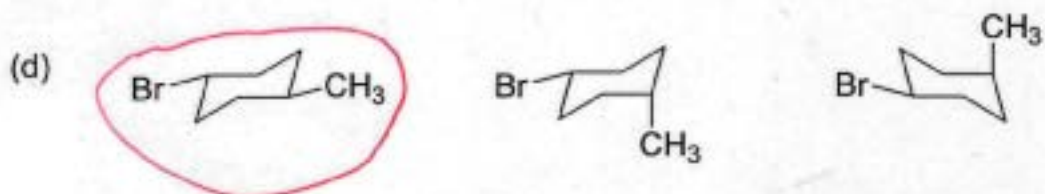
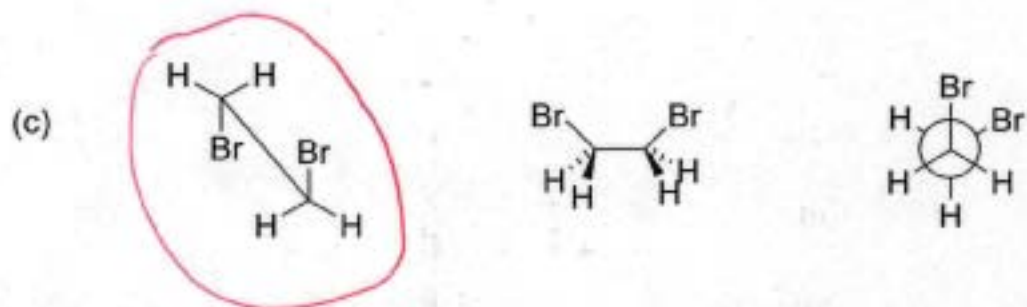
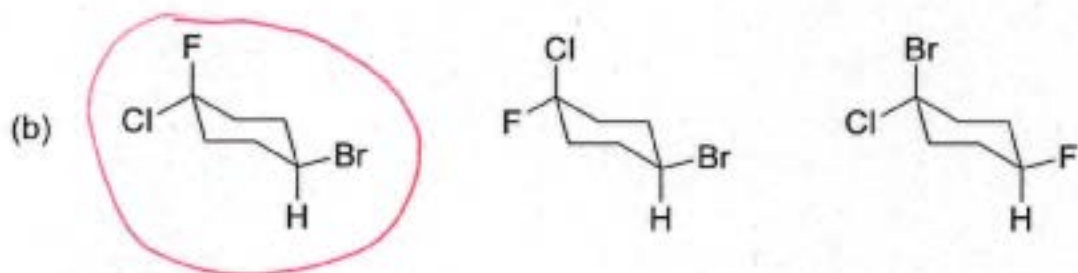


2,3-DIMETHYL HEXANE

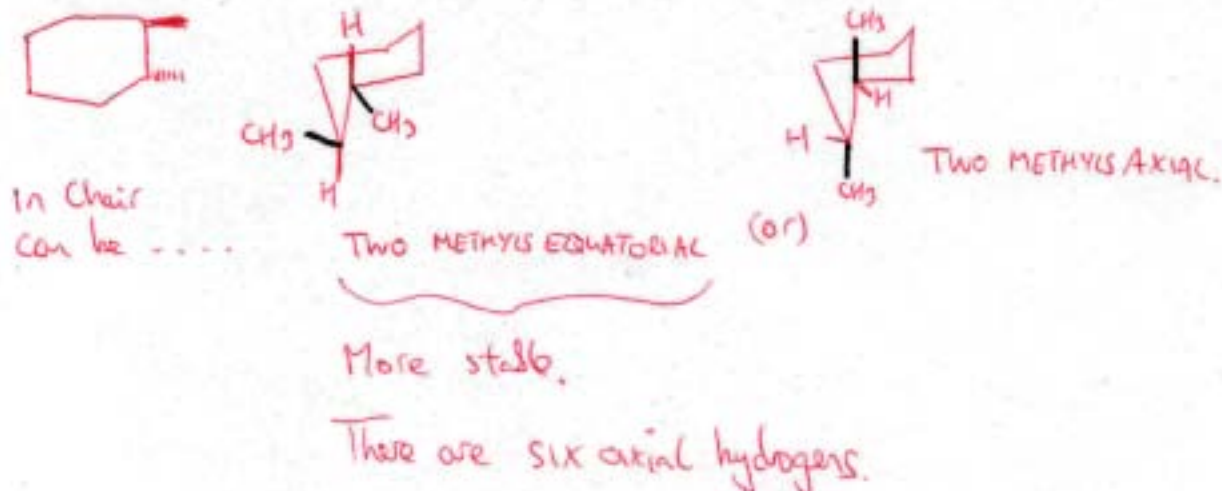


TRANS-1,2-DIETHYL CYCLOOCTANE

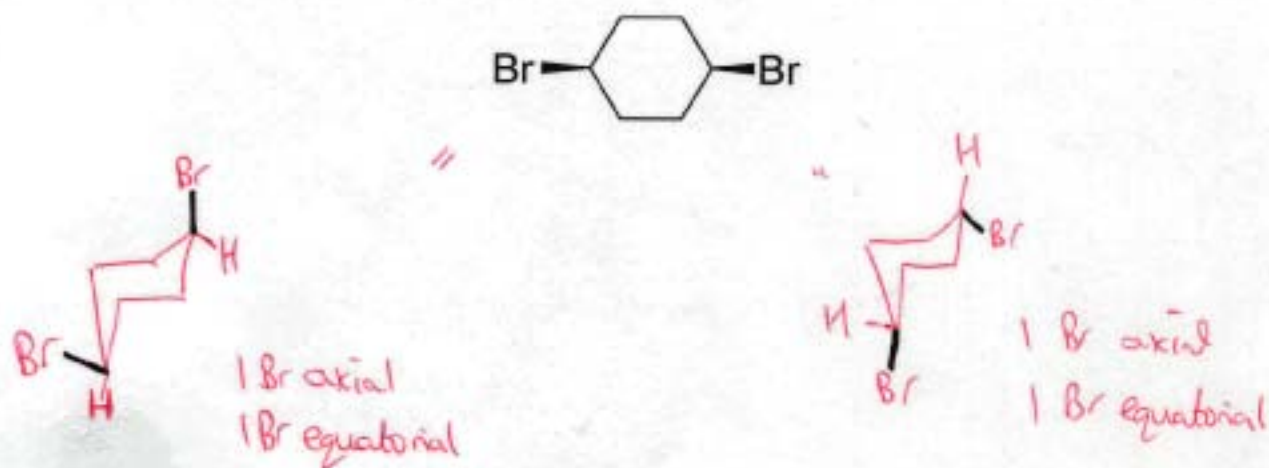
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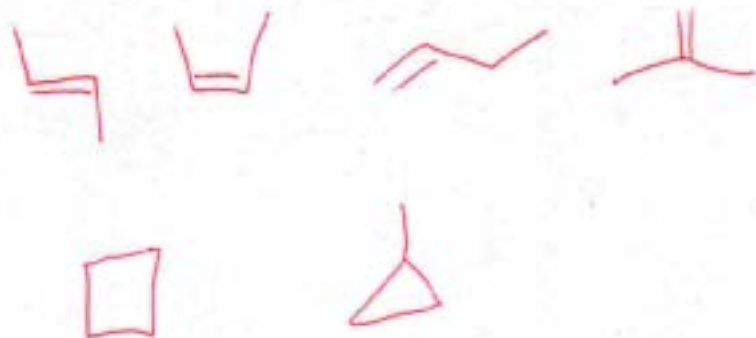
23) How many axial positions are occupied by Hydrogen atoms in the lowest energy conformation of the below molecule? (5pts)



There are 5 Hydrogens in AXIAL Positions.

24) Draw the 6 isomers of C_4H_8 (6pts).

(Hint: four of them are acyclic)



*****Bonus question for 2 points*****

What was the basic field of Chemistry that this year's recipients of the Nobel Prize in Chemistry worked in?

CRYSTALLOGRAPHY OF THE RIBOSOME