Review Questions of McKeague Content: Dec 2/4 (content from Nov 4 to 29)

SCIENTIST: I just boiled water
ME: solid
SCIENTIST: no
ME: I just mean that's cool
SCIENTIST: WRONG AGAIN

Keep an eye on mycourses "announcements"!

Exam: Datasheet provided
- Bring your pen(cils); calculator; molecular model kit (or other model)
- Slightly more than 50% McKeague content

Practice Exams: posted
Office Hours: See announcements

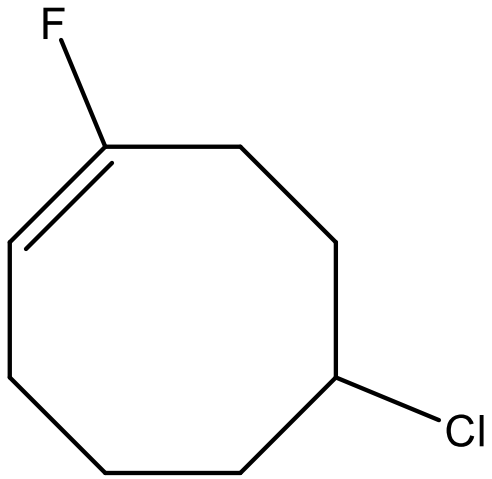
QR code for Mercury Course Evaluations! 1% bonus if >75% of class does them!!!

Section 001

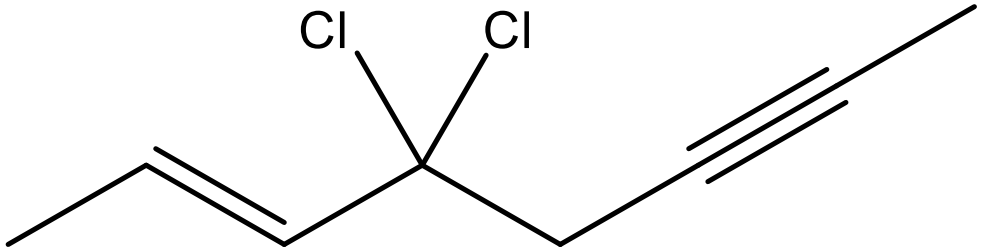
Section 002

Q1: Draw the following molecules using skeletal structures.

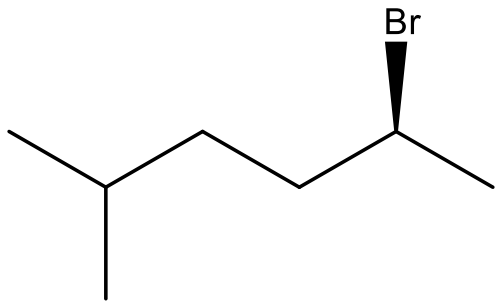
6-chloro-1-fluorocyclooct-1-ene



(*E*)-4,4-dichlorooct-2-en-6-yne

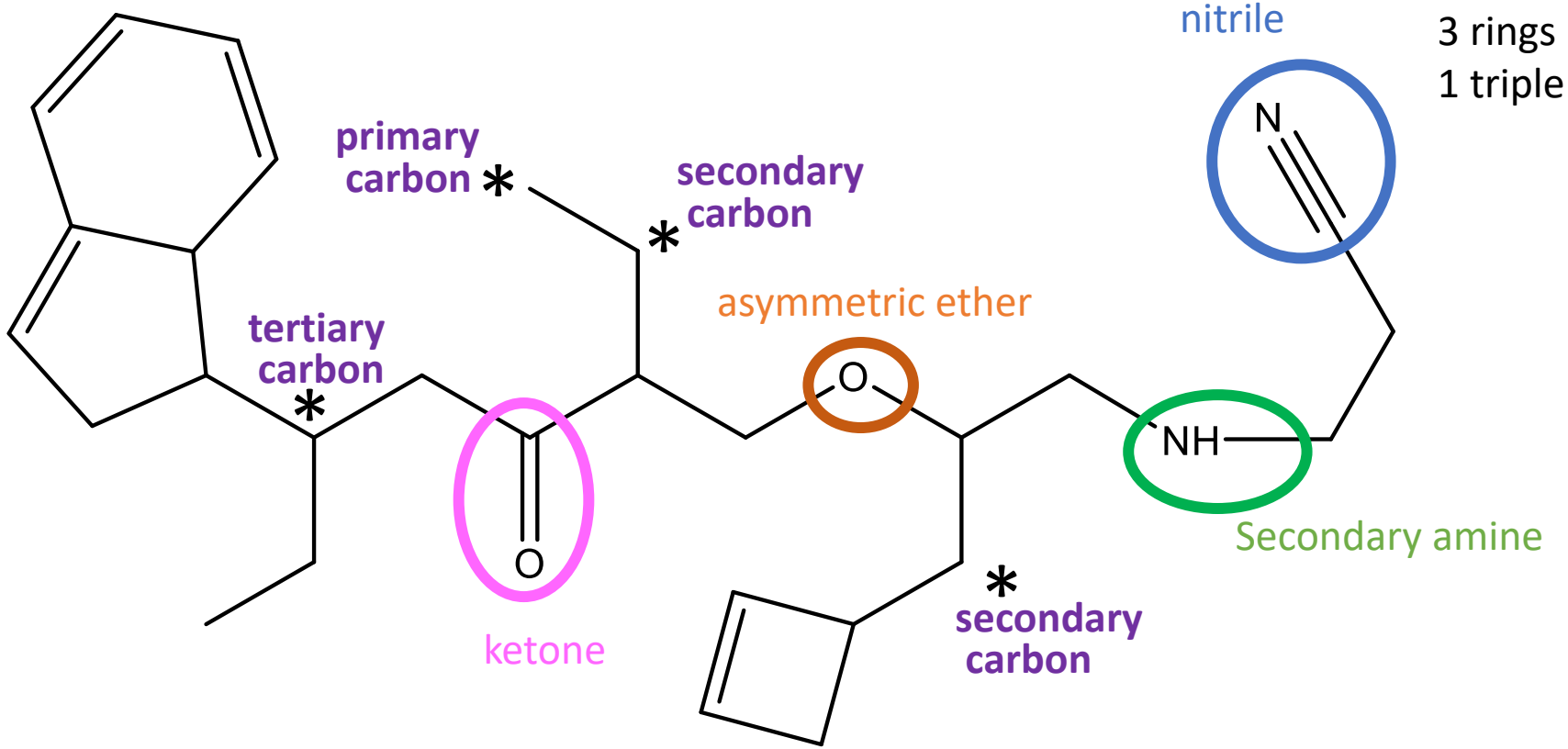


(S)-2-bromo-5-methylhexane



Note these are examples. You are the artist so many ways to draw these same molecules ☺

Q2: Calculate the units of unsaturation and identify functional groups (specify primary, asymmetric etc) in 3-((3-(cyclobut-2-en-1-yl)-2-((5-(2,7a-dihydro-1H-inden-1-yl)-2-ethyl-3-oxoheptyl)oxy)propyl)amino)propanenitrile**, shown below. Indicate if the starred* carbons are primary, secondary, tertiary.**



5 double bonds = 5
3 rings = 3
1 triple bond = 2

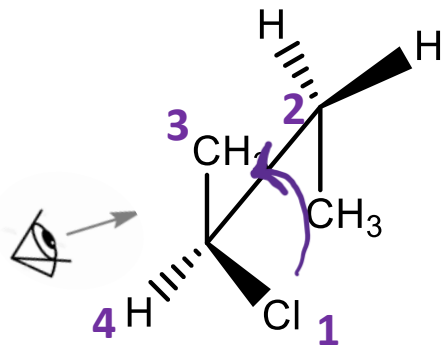
10 units of unsaturation

Q3: Draw *(S)*-2-chlorobutane as corresponding Sawhorse diagrams and Newman diagrams in *a* stable conformation and *an* unstable conformation. What do we call unstable conformations?

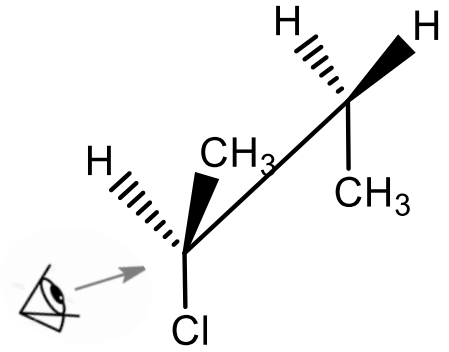
Stable (staggered)

Not stable (eclipsed!)

Sawhorse

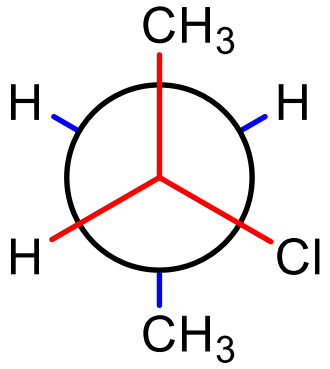


Counterclockwise = *S*

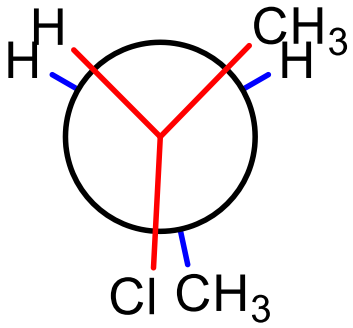


Draw in the "eye" or write "eye" to show perspective and make sure your Newman matches that perspective.

Newman

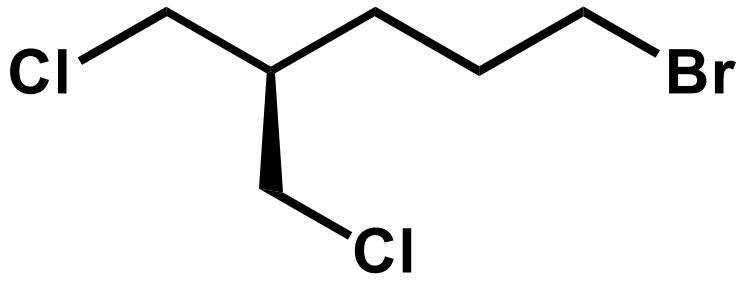


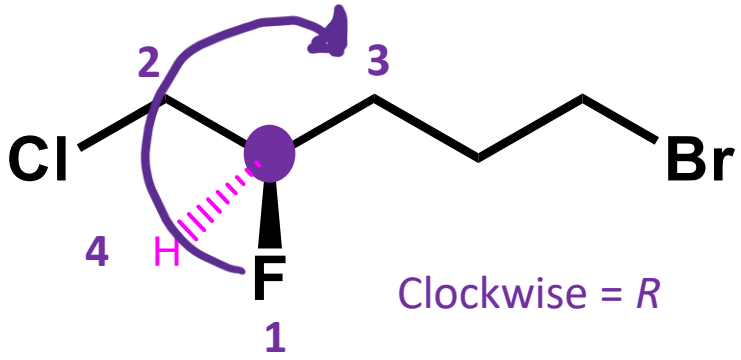
Note I said an example, so a few answers possible here ☺



Q4: Identify chiral centers, then label as R or S (show your work)!

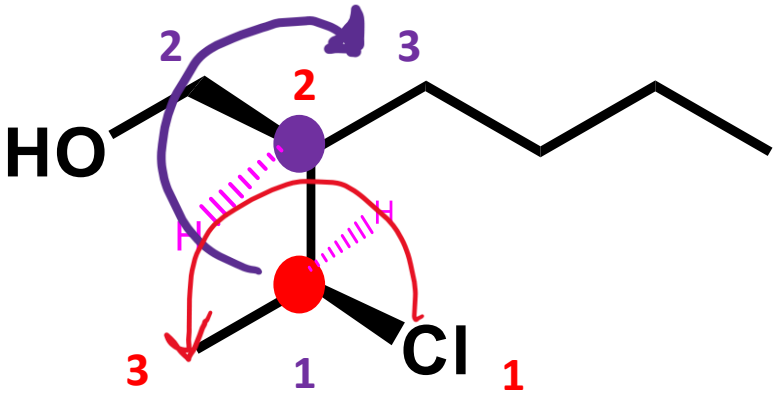
No chiral center here because there are not 4 different groups!



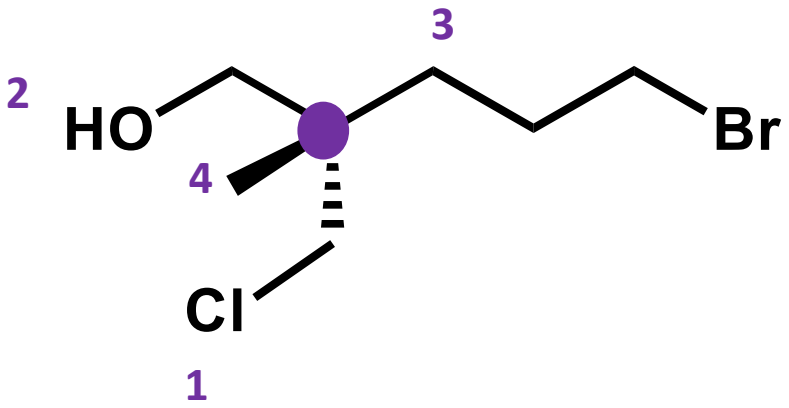


Clockwise = *R*

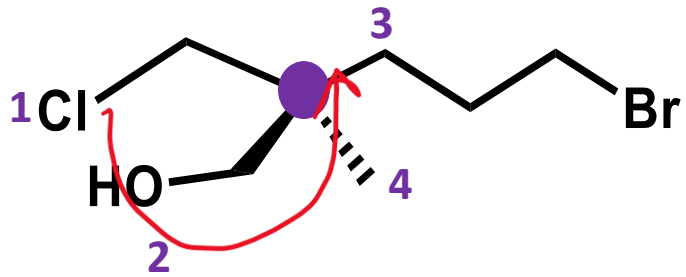
Clockwise = R



counterclockwise = S

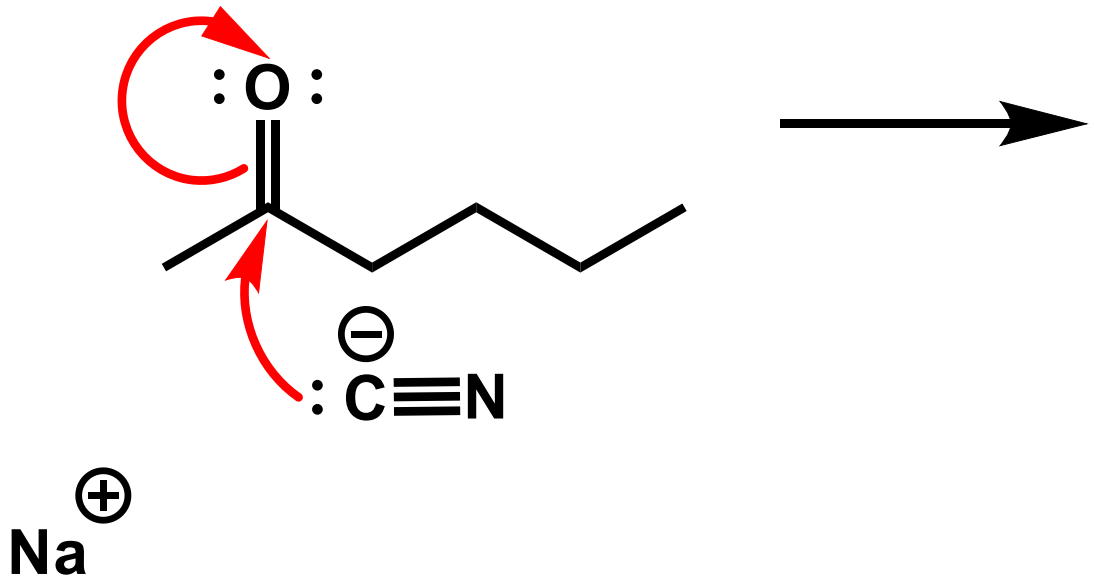


<u>Redraw</u> <u>so lowest is in the back</u>

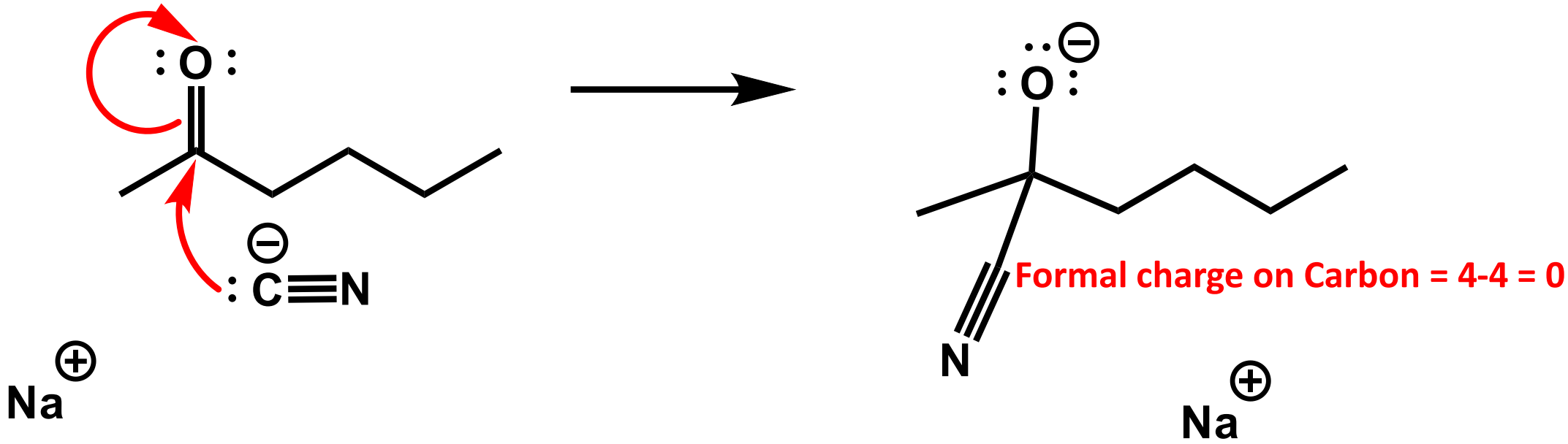


counterclockwise = S

Q5: Show the product of the following arrow pushing. Indicate charge.



Q5: Show the product of the following arrow pushing. Indicate charge.

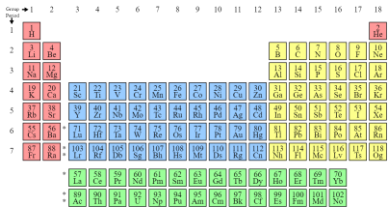


Remember that the overall charge has to be the same on both sides of the "equation"

Q6: Which complex is likely low spin? Which is more likely to absorb blue light? Show using d orbital splitting: $[Fe(CN)_6]^{3-}$ or $[Fe(H_2O)_6]Cl_2$

$[Fe(CN)_6]^{3-}$

What is the oxidation state?



What do you know?

- Overall bracket = -3
- CN is -1 O.N. each

Equation:

Fe + 6(CN) = -3
x + 6(-1) = -3
x -6 = -3
x = -3 + 6
x = +3

How many d electrons?

Fe^0 (neutral)
$[Ar]4s^2\ 3d^6$

Take away 3 electrons

~~$[Ar]4s^2\ 3d^6$~~ **$3d^5$**

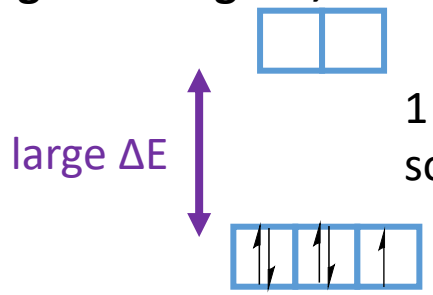
Splitting?

Spectrochemical Series (of Ligands)

I^-, Cl^-, F^-, HO^-, H_2O, SCN^-, NH_3, en, NO_2^-, NC^-, CO

Increasing Field Strength

Stronger field ligand; more splitting!



1 unpaired electron; so low spin!

Color?

Large ΔE absorbed, means short wavelength absorbed (violet, blue).

$[Fe(H_2O)_6]Cl_2$

What do you know?

- Overall bracket balanced with Cl_2
- Cl = -1, so overall bracket must be 2+
  $[Fe(H_2O)_6]^{2+}$ and 2 x Cl^-
- Water (aqua) is neutral (zero) O.N.

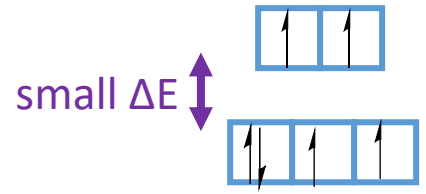
Equation:

Fe + 6(H_2O) =+2
x + 6(0) = +2
x = +2

Take away 2 electrons

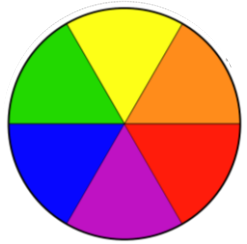
~~$[Ar]4s^2$~~ $3d^6$ **$3d^6$**

Weaker field ligand; less splitting!



4 unpaired electrons; so high spin!

Small ΔE absorbed, means long wavelength absorbed (red).



Please fill out Mercury Evaluations 1% bonus is >75% of class fills it out!

https://www.mcgill.ca/mercury/students

Good luck on exams. Focus, but “relax”. You can do it ☺

Thank you for your enthusiasm, patience, and participation!