

2018 ORG MECH: Nucleophiles and Bases

Quiz #1 20 points

NAME: _____

1) By drawing correct Lewis structures for the following four IONIC compounds, determine how many *lone pairs* (non bonding pairs) of electrons are present in each basic reagent. (6pts)

a) KOH

b) NaNH₂

c) NaH

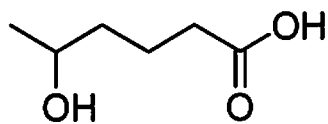
d) K₂CO₃

2) Compounds (e) and (f) are totally **covalent** species – draw Lewis structures for them, and determine how many lone pairs are present for each molecule. (4pts)

e) Pyridine (C₅H₅N)

f) CH₃MgBr

3) The below molecule has two relatively acidic Hydrogens, connected to the oxygen containing functional groups on the left and the right hand sides of this species.

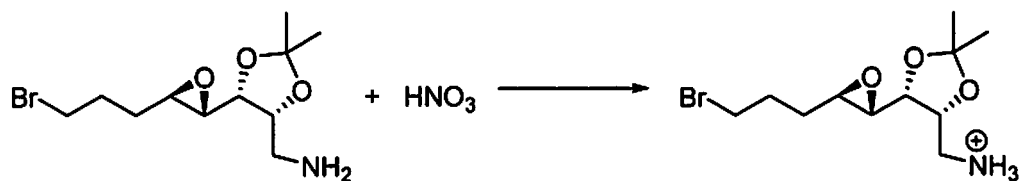


- a) What is the $\text{-CO}_2\text{H}$ containing function group called? (1pt)
- b) What is the oxygen containing functional group on the left called? Your precise answer should include **two** words (functional group name and classification). (1pt)
- c) Draw the two corresponding conjugate bases (oxygen anions) that would be produced by deprotonation at each OH site. (2pts)
- d) One of the oxygen anions has the benefit of resonance stabilization – draw these two resonance structures, and show the electron movement that converts one into the other (and back again). (3pts)

4) Draw a *structural* isomer of cyclohexene. (1pt)

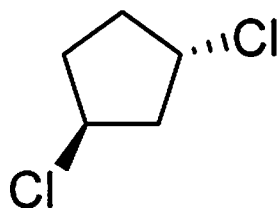
5) Nucleophilicity and Basicity are both characterized by movement of two electrons – provide one *difference* between nucleophiles and bases. (1pt)

6) Balance (complete) the following equation. (1pt)



*****Bonus question for up to 1point*****

Provide the (most complete) IUPAC name for the following molecule.



hydrogen 1 H	beryllium 4 Be	scandium 21 Sc	yttrium 39 Y	lanthanum 57 La	cerium 58 Ce	praseodymium 59 Pr	neodymium 60 Nd	promethium 61 Pm	samarium 62 Sm	europium 63 Eu	gadolinium 64 Gd	terbium 65 Tb	dyprosium 66 Dy	holmium 67 Ho	erbium 68 Er	thulium 69 Tm	ytterbium 70 Yb	helium 2 He								
lithium 3 Li	sodium 11 Na	calcium 20 Ca	potassium 19 K	rubidium 37 Rb	cesium 55 Cs	barium 56 Ba	strontium 38 Sr	zinc 30 Zn	cadmium 48 Cd	mercury 80 Hg	tin 50 Sn	antimony 51 Sb	tellurium 52 Te	iodine 53 I	xenon 54 Xe	argon 18 Ar	neon 10 Ne	neonium 1026 He								
beryllium 4 Be	magnesium 12 Mg	calcium 20 Ca	strontium 38 Sr	barium 56 Ba	radium 88 Ra	barium 56 Ba	strontium 38 Sr	yttrium 39 Y	zirconium 40 Zr	niobium 41 Nb	molybdenum 42 Mo	technetium 43 Tc	ruthenium 44 Ru	rhodium 45 Rh	nickel 28 Ni	copper 29 Cu	zinc 30 Zn	gallium 31 Ga	germanium 32 Ge	arsenic 33 As	selenium 34 Se	bromine 35 Br	krpton 36 Kr	argon 18 Ar	neon 10 Ne	helium 2 He
hydrogen 1 H	beryllium 4 Be	scandium 21 Sc	yttrium 39 Y	lanthanum 57 La	cerium 58 Ce	praseodymium 59 Pr	neodymium 60 Nd	promethium 61 Pm	samarium 62 Sm	europium 63 Eu	gadolinium 64 Gd	terbium 65 Tb	dyprosium 66 Dy	holmium 67 Ho	erbium 68 Er	thulium 69 Tm	ytterbium 70 Yb	helium 2 He								
lithium 3 Li	sodium 11 Na	calcium 20 Ca	potassium 19 K	rubidium 37 Rb	cesium 55 Cs	barium 56 Ba	strontium 38 Sr	yttrium 39 Y	zirconium 40 Zr	niobium 41 Nb	molybdenum 42 Mo	technetium 43 Tc	ruthenium 44 Ru	rhodium 45 Rh	nickel 28 Ni	copper 29 Cu	zinc 30 Zn	gallium 31 Ga	germanium 32 Ge	arsenic 33 As	selenium 34 Se	bromine 35 Br	krpton 36 Kr	argon 18 Ar	neon 10 Ne	helium 2 He
beryllium 4 Be	magnesium 12 Mg	calcium 20 Ca	strontium 38 Sr	barium 56 Ba	radium 88 Ra	barium 56 Ba	strontium 38 Sr	yttrium 39 Y	zirconium 40 Zr	niobium 41 Nb	molybdenum 42 Mo	technetium 43 Tc	ruthenium 44 Ru	rhodium 45 Rh	nickel 28 Ni	copper 29 Cu	zinc 30 Zn	gallium 31 Ga	germanium 32 Ge	arsenic 33 As	selenium 34 Se	bromine 35 Br	krpton 36 Kr	argon 18 Ar	neon 10 Ne	helium 2 He

* Lanthanide series

lanthanum 57 La	cerium 58 Ce	praseodymium 59 Pr	neodymium 60 Nd	promethium 61 Pm	samarium 62 Sm	europium 63 Eu	gadolinium 64 Gd	terbium 65 Tb	dyprosium 66 Dy	holmium 67 Ho	erbium 68 Er	thulium 69 Tm	ytterbium 70 Yb
actinium 89 Ac	thorium 90 Th	protactinium 91 Pa	uranium 92 U	neptunium 93 Np	plutonium 94 Pu	americium 95 Am	curium 96 Cm	berkelium 97 Bk	californium 98 Cf	einsteinium 99 Es	fermium 100 Fm	mendelevium 101 Md	nobelium 102 No

** Actinide series

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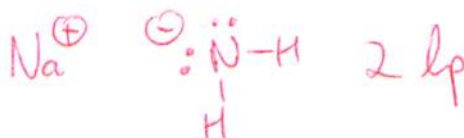
NAME: Perfect Answers

1) By drawing correct Lewis structures for the following four IONIC compounds, determine how many *lone pairs* (non bonding pairs) of electrons are present in each basic reagent. (6pts)

a) KOH



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c) NaH

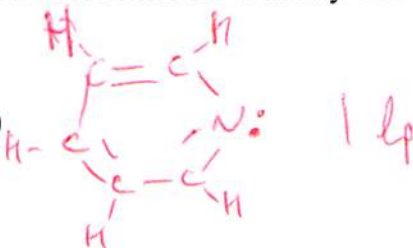


d) K₂CO₃

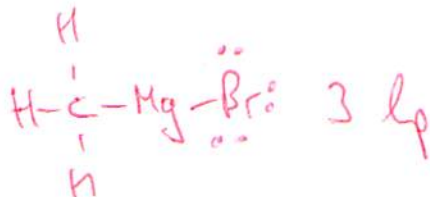


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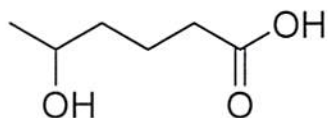
e) Pyridine (C₅H₅N)



f) CH₃MgBr



3) The below molecule has two relatively acidic Hydrogens, connected to the oxygen containing functional groups on the left and the right hand sides of this species.



a) What is the $-\text{CO}_2\text{H}$ containing function group called? (1pt)

Carboxylic acid

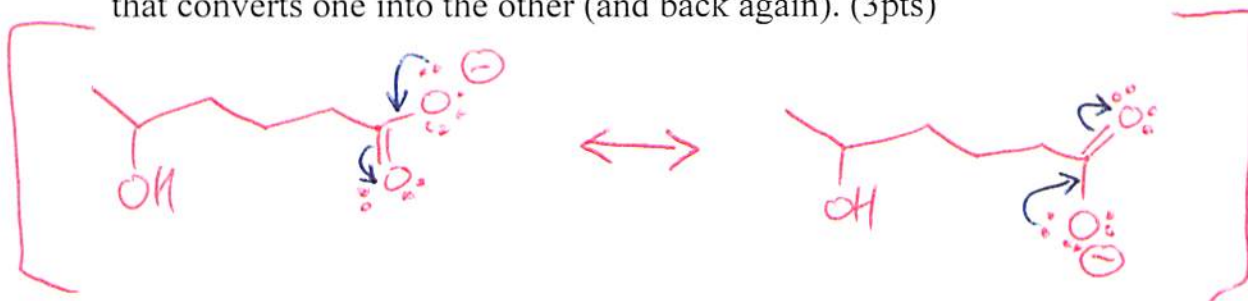
b) What is the oxygen containing functional group on the left called? Your precise answer should include **two** words (functional group name and classification). (1pt)

Secondary alcohol

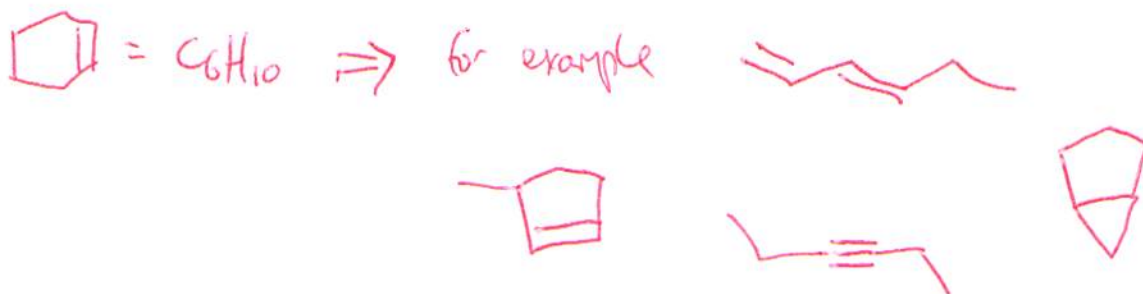
c) Draw the two corresponding conjugate bases (oxygen anions) that would be produced by deprotonation at each OH site. (2pts)



d) One of the oxygen anions has the benefit of resonance stabilization – draw these two resonance structures, and show the electron movement that converts one into the other (and back again). (3pts)



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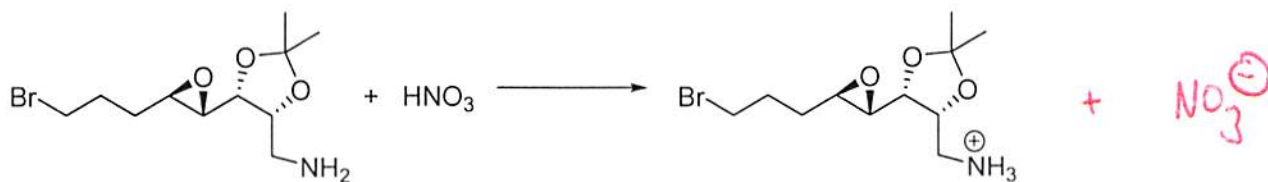


5) Nucleophilicity and Basicity are both characterized by movement of two electrons – provide one *difference* between nucleophiles and bases. (1pt)

Nucleophiles donate $2e^-$ s to an element(atom) other than Hydrogen.
(Bases donate $2e^-$ s to Hydrogen).

Nucleophilicity is described by rates of reaction. Basicity is described by position of equilibrium (e.g. K_a & pK_a).

6) Balance (complete) the following equation. (1pt)



Bonus question for up to 1point

Provide the (most complete) IUPAC name for the following molecule.

