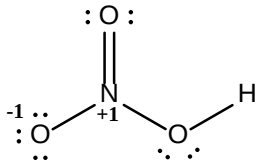
Answers to Exercise 11.3
Oxoacids

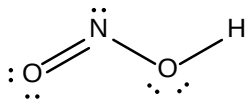
1.

(a) i. HNO_3 ii. HNO_2

(b) *Remember that, with the exception of H_3PO_3, the H in oxoacids are attached to O (*not* to the central atom).*

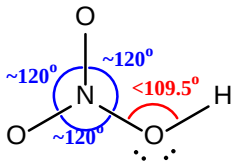
i. ii.

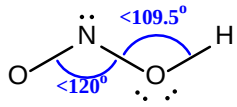




(c) *The answers to part (b) happen to show the correct molecular geometry; however, that was not necessary for the Lewis diagrams.*

i. ii.





(d) *For oxoacids consisting of a central atom attached to some O and some OH, an approximate pK_a value can be calculated using the formula $pK_a \approx 8 - 5p$ where p is the number of O (that are *not* part of an OH) attached to the central atom.*

i. $pK_a \approx 8 - 5(2) \approx -2$ ii. $pK_a \approx 8 - 5(1) \approx 3$

(e) The pK_a value for nitric acid is negative (-2). Strong acids have negative pK_a values.
The pK_a value for nitrous acid is positive (+3). Weak acids have positive pK_a values.

(f) The oxidation state of N in nitric acid is +5.
The oxidation state of N in nitrous acid is +3.
The stronger acid (nitric acid) has a more positive oxidation state on its central atom (N).
When comparing oxoacids with the same central atom, the strength of the acid will increase as the oxidation state of the central atom becomes more positive.