Calculate the acidification potential of NH_3 relative to SO_2, given the equation:

$$AP_i = \frac{\alpha_i / MW_i}{\alpha_{SO2} / M_{SO2}}$$

where α is the number of acidic protons in its resultant acid

A. 1.07
B. 0.88
C. 1.60
D. 1.88

Since the resultant acid from NH_3 is HNO_3, which has 1 acidic proton, the α_i will be 1; and the resultant acid from SO_2 is H_2SO_4 which has 2 acidic protons, the α_{SO2} is 2.

Substituting the numbers into the equation gives:

$$AP_{NH3} = \frac{\alpha_{NH3} / MW_{NH3}}{\alpha_{SO2} / M_{SO2}} = \frac{1/17}{2/64} = 1.88$$

Volatile compounds that are emitted into the atmosphere can dissolve in water and form atmospheric precipitations, resulting in acid rains. The acid rain will further damage plants, soil, water streams and affect ecosystems. The acidification potential is a metric to measure the potential a volatile compound can form acid rains. This metric uses SO_2 as a reference, and is dependant on a molecule's molar mass and its number of acidic protons. Usually, molecules that have smaller molar weight and higher number of acidic protons in its resultant acid will have a higher acidification potential. Since NH_3 is a very light molecule but gives 2 acidic protons in its resultant acid, HNO_3, it gives a higher acidification potential than SO_2.

Table 1. Acidification potential for a selected choice of volatile compounds:

Compound	MW		Resulting Acid	α	AP_i
SO_2	64.1	→	H_2SO_4	2	1.00
NO	30.0	→	HNO_3	1	1.07
NH_3	17.0	→	HNO_3	1	1.88
HCl	36.5	→	HCl	1	0.88
HF	20.0	→	HF	1	1.60
H_2S	34.8	→	H_2SO_4	2	1.88

Useful links:

http://www.ziegel.at/gbc-ziegelhandbuch/eng/umwelt/wirkkatap.htm
https://www.acs.org/content/dam/acsorg/greenchemistry/education/summerschool/Tamer%20Andrea_Choosing%20Greenest%20Synthesis.pdf