

## Phonological Features

[illegible]

Place and Manner of Articulation	Place of articulation											
	Labial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal	
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ	
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ			
Trill	ʙ			r					ʀ			
Tap/Flap				ɾ		ɽ						
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ	
Lateral Fricative				ɬ ɮ								
Approximant		ʋ		ɹ		ɻ	j	ɰ				
Lateral Approximant				l		ɭ	ʎ	ʟ				
anterior	+	+	+	+	-	-	-	-	-	-	-	-
coronal	-	-	+	+	+	+	-	-	-	-	-	-
distributed	-	-	+	-	+	-	-	-	-	-	-	-
high	-	-	-	-	-	-	+	+	-	-	-	-
low	-	-	-	-	-	-	-	-	-	+	-	-
back	-	-	-	-	-	-	-	+	+	+	-	-

SONORITY SCALE (varies somewhat across languages)					
1 vowels	2 glides	3 liquids	4 nasals	5 fricatives	6 stops & affricates
+syllabic	– syllabic				
– consonantal			+ consonantal		
+approximant			– approximant		
+ sonorant				– sonorant	
+ continuant		[ -cont]*	[± cont]		– continuant

\*Though nasals are [-cont] due to obstruction of the oral cavity, the nasal airflow makes them more sonorous than stops.

Variables	More Sounds
š = ʃ	⊙ bilabial click
č = tʃ	dental click
y = j	! (post) alveolar click
r = ɹ	‡ palato-alveolar click
j = ɟ	alveolar lateral click
c = ts	l alveolar lateral flap
ɬ = tɬ	fj simultaneous ʃ and x
ž = ʒ	ɥ voiced labio-palatal approximate
ʝ = dʒ	ʜ voiceless epiglottal fricative
ü = y	ʕ voiced epiglottal fricative
ö = ø	ç [-voi] alveolo-palatal fricative
a = ɑ	ʐ voiced alveolo-palatal fricative

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graph TD
    CVCV[C,V] --> RootTier
    subgraph RootTier [Root Tier]
        CVCV --> C[consonantal]
        CVCV --> V[sonorant]
    end
    C --> RootLinkedTiers
    subgraph RootLinkedTiers [Root-linked Tiers]
        C --> cont[cont]
        C --> lat[lat]
        C --> nas[nas]
    end
    V --> LaryngealTier
    subgraph LaryngealTier [Laryngeal Tier]
        V --> LAR[LAR]
    end
    V --> PlaceTier
    subgraph PlaceTier [Place Tier]
        V --> PLACE[PLACE]
    end
    LAR --> voi[voi]
    LAR --> SG[SG]
    LAR --> CG[CG]
    PLACE --> labial[labial]
    PLACE --> coronal[coronal]
    PLACE --> dorsal[dorsal]
    PLACE --> phar[phar]
    labial --> round[round]
    labial --> unround[unround]
    coronal --> ant[ant]
    coronal --> dist[dist]
    coronal --> prox[prox]
    dorsal --> hi[hi]
    dorsal --> lo[lo]
    dorsal --> mid[mid]
    phar --> ATR[ATR]
  
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**Front** [+front -back]

**Central** [-front -back]

**Back** [-front +back]

**High** [+high -low]

**Mid** [-high -low]

**Low** [-high +low]

i y — i̯ u — ʊ u [+tense]

ɪ ʏ — ʊ θ — ʊ o [+tense]

ɛ œ — ɜ ɐ — ʌ ɔ [-tense]

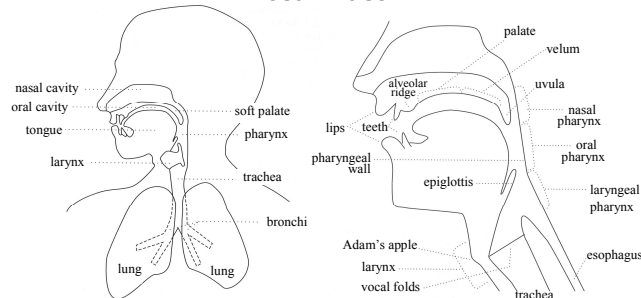
æ ɐ — ɐ — ɐ [-tense]

ɑ ɶ — ɒ ɒ [-tense]

[+rd] [+rd] [-rd] [+rd] [-rd] [+rd]

DIACRITICS		SUPRASEGMENTALS
<sup>a</sup> voiceless ɲ̥ d̥	.. breathy voice b̤ a̤	' primary stress
<sup>v</sup> voiced ṣ ṭ	~ creaky voiced b̰ a̰	secondary stress
<sup>h</sup> aspirated tʰ dʰ	~ linguolabial t̟ d̟	: long   · half long
<sup>ɔ</sup> more rounded ɔ̞	<sup>w</sup> labialized t <sup>w</sup> d <sup>w</sup>	˘ extra short
<sup>ɛ</sup> less rounded ɛ̝	<sup>j</sup> palatalized tʲ dʲ	minor (foot) group
<sup>±</sup> advanced u̟	<sup>Y</sup> velarized tʷ dʷ	major (intonation) group
<sup>~</sup> retracted e̠	<sup>ŋ</sup> pharyngealized tˤ dˤ	. syllable break
<sup>n</sup> dental t̪ d̪	˜ nasalized ĕ	<b>TONES AND WORD ACCENTS</b>
<sup>u</sup> apical t̺ d̺	<sup>n</sup> nasal release d <sup>n</sup>	ĕ ↗ extra high   ↗ rising
<sup>o</sup> laminal t̻ d̻	<sup>l</sup> lateral release d <sup>l</sup>	é ↗ high   ↘ falling
ˉ centralized ē	ˆ no audible release	ē ↖ mid   ↗ hi rising
* md-centralized ĕ	˙ velar or pharyngeal ɫ	è ↘ low   ↗ low rising
<sup>s</sup> syllabic ŋ̩	A TR ĕ̩ , RTR ĕ̩	ĕ̩ ↘ extra low   ↗ rise fall
<sup>ə</sup> non-syllabic ɐ̯	ˑ lowered ɐ̯	↓ downstep ↗ global rise
˚ rhoticity ə̃	ˀ raised ɐ̯	↑ upstep ↘ global fall

## Vocal Tract



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