Introduction to Linguistics
Homework 1 Solutions: Articulatory and Acoustic Phonetics

Spring 2020
Assigned: April 13th
Due: April 20th, 11.59p on Canvas

Part 1: Natural classes (30 points)

A **natural class** is a group of phones that share one or more articulatory features in common. A natural class includes all of the sounds of a language that meet the criteria given, and excludes all sounds that do not. For the descriptions below, give all the sounds of American English that meet the criteria.

1. voiced fricatives
[v] [ð] [z] [ʒ]

2. postalveolars
[ʧ] [ʤ] [ʃ] [ʒ]

3. high vowels
[i] [u] (didn't take off points for [ɪ] [ʊ] - they sometimes act as high vowels in phonology.)

4. bilabials
[p] [b] [m]

Identify the natural class formed by each of the groups of sounds given below. You should give the *most specific* possible label - that is, name the features shared on the maximum possible number of dimensions to identify only these sounds and not any that were left out.

5. [k], [g], [ŋ], ([x])
Velar consonants.

6. [p], [t], [k], ([ʔ])
Voiceless stops. Fine but not necessary to include "oral".

7. [u], [ɑ], [ɔ]
Back vowels.

8. [p], [ʃ], [f], [t], [h], [s], [θ], [k], ([ʔ]), ([x])
Voiceless consonants.

9. [v], [f]
Labiodental consonants (or labiodental fricatives).

10. [w], [l], [ɹ], [j]
Approximants.

Part 2: Reading the IPA (10 points)

Identify each of the English words for which an IPA transcription is given below.
Hint: Trusten Sie das Spelling nicht!

1. [wɪp]	whip
2. [tɛlɪŋ]	telling
3. [stɪnʤi]	stingy
4. [spaɪtfəl]	spiteful
5. [ʤɚni]	journey
6. [smʌðɚ]	smother
7. [dɑlz]	dolls
8. [noʊteɪʃən]	notation
9. [kloʊð]	clothe
[taɪɾi]	tidy

Part 3: Transcribing words with the IPA (10 points)

Transcribe each of the English words given below using the IPA.
Hint: “Who’s the more foolish: the fool, or the fool who [trusts spelling]?”
-Obi Wan Kenobi

The diacritic [c̩] means that a consonant C is syllabic. When we have a situation where [əc] is the only content of the syllable, one way is to write it as [c̩] because some people don’t think there is actually a vowel there.

1. golden	[goʊldən], [goʊldn̩]
2. time	[tɑɪm]
3. oracle	[oʊɹəkəl], [oʊɹəkl̩], [ɔɹəkl̩]
4. state	[steɪt]
5. champions	[tʃæmpiənz], [tʃæmpjɪnz], etc...
6. arena	[əɹinə]
7. warriors	[woɹjɚz], [wɔɹjɚz], [woɹijɚz], ... first vowel is super tough here. would have to look at a spectrogram
8. splash	[sblæʃ] or [splæʃ]
9. three	[θɹi]
10. brothers	[bɹʌðɚz]

Part 4: Articulatory phonetics (30 points)

Describe in prose the articulatory process for pronouncing /tʃ/ and /ŋ/ in English. In your descriptions, please include the airstream mechanism (how is airflow generated), direction of airflow, the path (nasal or not) and (non-)centrality of airflow, the positions of relevant articulators and the voicing. As much as possible, try to get the correct ordering of the articulatory movements/events involved. Please try to be concise with your descriptions; bullet points work will be accepted.

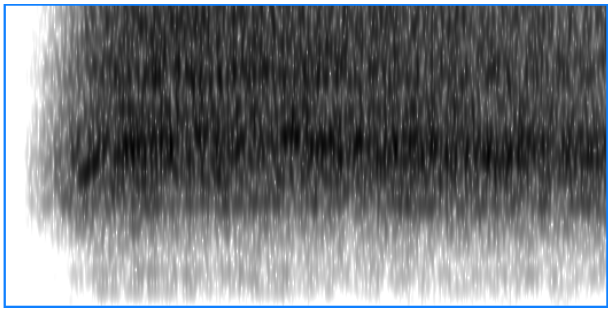
Voiceless post-alveolar affricate:
. tongue (blade or front) presses up against area just behind alveolar ridge to create complete obstruction of air in oral cavity
. velum presses up against pharynx to close off nasal cavity, so air will flow through oral cavity only
. the sound is pulmonic egressive, so air is pushed out from lungs
. as air passes vocal folds, they are open and do not vibrate, as this is a voiceless sound . air goes through center of oral cavity and pressure builds at closure
. closure is released, and the tongue remains close to the point of closure to produce audible frication

(Voiced) alveolar nasal (stop):
. tongue (back) presses up against velum to create closure in vocal tract
. velum is lowered to allow air to pass through nasal cavity
. sound is pulmonic egressive, so the lungs push air out
. as air passes glottis vocal folds which are tensed and closed, causing them to vibrate, producing voicing
. air flows through the nasal cavity and pressure builds up at velum until the closure is released
. airflow is through center of oral cavity

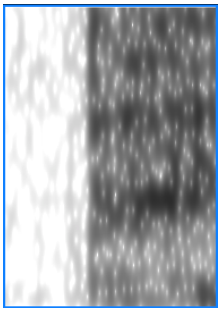
Part 5: Spectrograms (20 points)

(8 points) Match the descriptions below with the corresponding spectrogram.

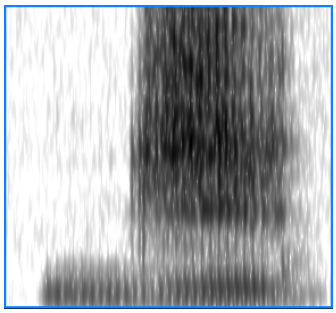
monophthong voiceless oral stop diphthong
voiceless fricative voiced affricate



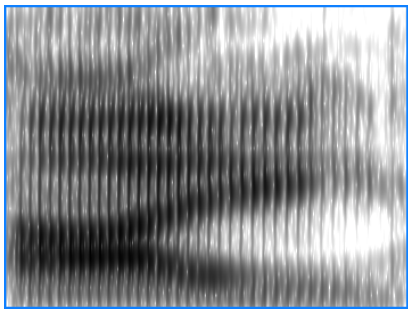
A



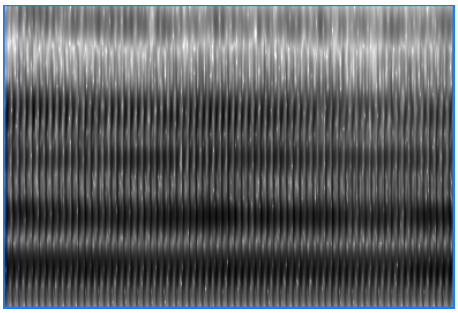
D



B



E

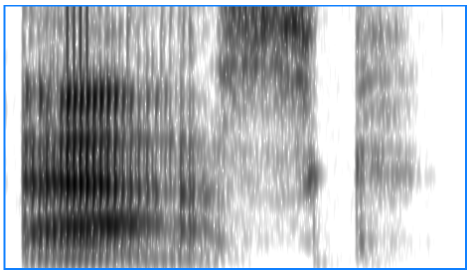


C

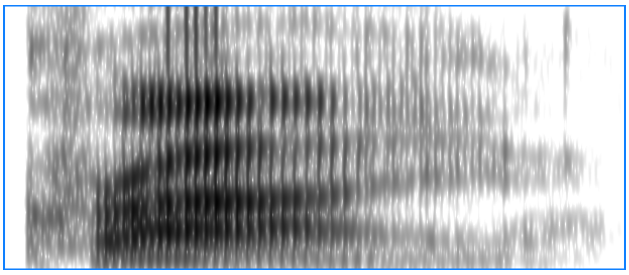
A. voiceless fricative, B. voiced affricate, C. monophthong,
D. voiceless oral stop, E. diphthong

(12 points) Match the words below with the corresponding spectrogram.

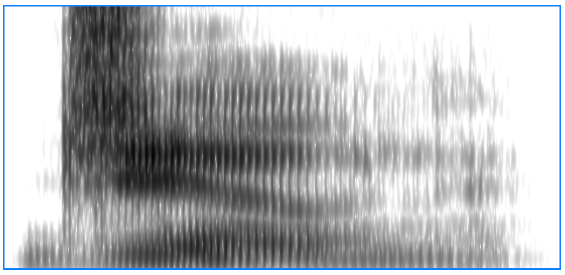
June	leer	ask
cry	neat	sing



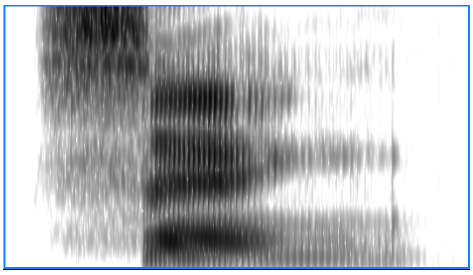
A



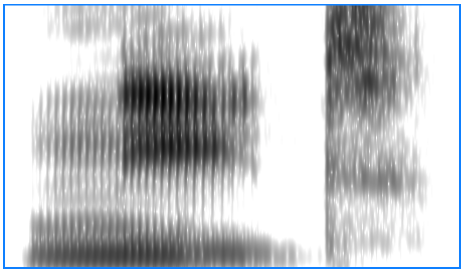
D



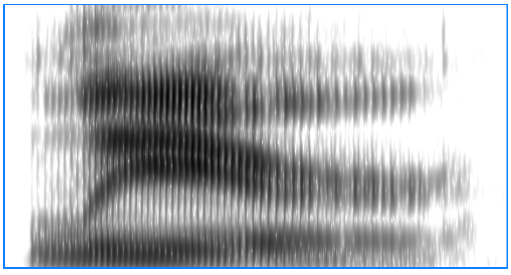
B



E



C



F

A. ask, B. June, C. neat, D. cry, E. sing, F. leer