

### Essay Title: The sound system of Japanese

This essay aims to introduce the sound system of Japanese, including the inventories of consonants, vowels, and diphthongs. The phonological variations of the sound segments in different phonetic environments are also included. For the illustration, word examples are given and they are presented in the following format: [IPA] (*Romaji*: “*meaning*”).

#### Consonants

In Japanese, there are 14 core consonants, and some of them have a lot of allophonic variations. The various types of consonants classified with respect to their manner of articulation are presented as follows.

#### **Stop**

Japanese has six oral stops or plosives, /p b t d k g/, which are classified into three place categories, bilabial, alveolar, and velar, as listed below. In each place category, there is a pair of plosives with the contrast in voicing.

/p/ = a voiceless bilabial plosive [p]: [ippai] (*ippai*: “A cup of”)

/b/ = a voiced bilabial plosive [b]: [ban] (*ban*: “Night”)

/t/ = a voiceless alveolar plosive [t]: [ototo] (*ototo*: “Brother”)

/d/ = a voiced alveolar plosive [d]: [tomodachi] (*tomodachi*: “Friend”)

/k/ = a voiceless velar plosive [k]: [kaiwa] (*kaiwa*: “Conversation”)

/g/ = a voiced velar plosive [g]: [gakusai] (*gakusai*: “Student”)

Phonetically, Japanese also has a glottal stop [ʔ] which is commonly produced to separate the neighboring vowels occurring in different syllables. This phonological phenomenon is known as ‘glottal stop insertion’. The glottal stop may be realized as a pause, which is used to indicate the beginning or the end of an utterance. For instance, the word “*Japanese money*” is actually pronounced as [ʔɛ̃ɴ], instead of [jɛ̃ɴ], and the pronunciation of “¥15” is [dʒw<sup>β</sup>:gɔ ʔɛ̃ɴ].

#### **Nasal**

Japanese has three nasal stops /m n ŋ/. Similar to the plosives, the nasals are classified into three place categories, including bilabial, alveolar, and uvular as illustrated below. In each place category, there is only voiced nasal.

/m/ = a voiced bilabial nasal [m]: [minna] (*minna*: “We”)

/n/ = a voiced alveolar nasal [n]: [namae] (*namae*: “Name”)

/ŋ/ = a voiced uvular nasal [ŋ]: [kinen] (*kinen*: “Remember”)

The uvular nasal /ɴ/ is a special consonant in Japanese. It is considered as a moraic nasal, correlating to the katakana “ん” in Japanese. Different from /m/ and /n/, /ɴ/ only occurs after a vowel in the syllable-final position, whereas /m/ and /n/ can occur before a vowel in the syllable-initial position.

Aside from the three basic nasals /m n ɴ/, a palatal nasal [ɲ] also occurs in Japanese which is derived from /n/ due to allophone variation. When /n/ is followed by a palatal sound, such as /i/ or /j/, [n] is palatalized to become [ɲ], e.g., [ɲiwa] (*niwa*: “Court”) and [ɲo:bɔ:] (*nyobo*: “Wife”). It is added that /n/ will become [m] or [ŋ] when it is followed by a bilabial or velar sound, e.g., [ɛmpʲitsu<sup>β</sup>] (*enpitsu*: “Pencil”) and [nʲihɔŋɔ] (*nihongo*: “Japanese”).

### **Fricative**

The fricatives /s z h/ are the three basic ones in Japanese as illustrated by the words given below. For /z/, it may be optionally pronounced as an affricate [dz].

/s/ = a voiceless alveolar fricative [s]: [sɛ̃sɛ̃i] (*sensei*: “Teacher”).

/z/ = a voiced alveolar fricative [z] or affricate [dz]: [dzɛ̃ɔ] (*zero*: “Zero”).

/h/ = a voiceless glottal fricative [h]: [hɛ̃ja] (*heya*: “Room”).

The alveolar /s/ and /z/, similar to the alveolar /n/, will be palatalized before /i/ to become [ɕ] and [ʑ] or [dʑ], respectively, e.g., [ɕisii] (*oisii*: “Delicious”) and [dʑisʲiɴ] (*jishin*: “earthquake”). It should be noted that the fricative /z/ will be neutralized with /d/ when they are followed by the high vowels /i/ and /u/. For instance, both the katakana /zi/ じ and /di/ ぢ are pronounced as [dʑi], e.g., [hanadʑi] (*hanaji*: “nosebleed”) and [dʑimɛ̃ɴ] (*jimen*: “Floor”). Similarly, both /zu/ ず and /du/ づ are pronounced as [dzɯ<sup>β</sup>].

The glottal fricative /h/ also has allophonic variations. It becomes a voiceless bilabial fricative [ɸ] when it is followed by [w<sup>β</sup>] that is derived from /u/, e.g., [ɸɯ<sup>β</sup>tsɯ<sup>β</sup>:] (*hutsu*: “Common”). The glottal /h/ also undergoes palatalization to become a voiceless palatal [ç] before /i/ and /j/, e.g., [çʲitsu<sup>β</sup>ɔ:] (*hitsuyo*: “Necessary”) and [çɔ:dʑi] (*hyoji*: “Expression”).

### **Affricate**

Some affricate consonants, such as [ts], [dz], [tɕ], and [dʑ], are found in the speech of Japanese speakers, while all of them are only the variants of the other consonants. The dental affricate [ts] is a variant of /t/, which appears in the katakana “っ tsu” [tsɯ<sup>β</sup>] such as in [w<sup>β</sup>kɛ̃tsɯ<sup>β</sup>kɛ̃] (*uketsuke*: “Reception”) and [çʲitsu<sup>β</sup>mɔ̃ɴ] (*shitsumon*: “Question”). The voiceless alveolo-palatal affricate [tɕ] is also the allophonic variant of /t/, which has been romanized as “chi” (ち), e.g., [itɕi] (*ichi*: “One”).

As for the voiced alveolar [dz] and the voiced alveolo-palatal [dʑ], they are the variants of /z/ and /d/ before /u/, e.g., [tsɯ<sup>β</sup>dzɯ<sup>β</sup>kuw<sup>β</sup>] (*tsudzuku*: “To be continued”) and [kidʑɯ<sup>β</sup>na] (*kizuna*: “Bond”).

## **Liquid**

/r/ is the single liquid consonant in Japanese, while its pronunciation varies in different dialects in Japan. In general, /r/ is realized as an apical lateral flap [J], e.g., [naJu<sup>β</sup>hɔdɔ] (*naruhodo*: “That’s right”/“I see”).

## **Approximant**

/j/ and /w/ are two approximant consonants in Japanese. /j/, a voiced palatal approximant, is romanized as “y”, e.g., [çijaku<sup>β</sup>] (*hiyaku*: “Be quick”). Moreover, the approximant /j/ is also realized as a secondary palatalization feature of other consonants to form ‘Yoon’, e.g. [g<sup>j</sup>ɔ] “gyo”, [ŋ<sup>j</sup>ɔ] “nyo”, etc., which is a special feature of mora in Japanese language. The word example for this case is [b<sup>j</sup>ɔ:iN] (*byoin*: “Hospital”).

/w/ is a compressed labio-velar approximant and it is pronounced as [ɰ] without the lip-rounding feature, e.g., [ɰadai] (*wadai*, “Topic”). This is similar to the case of the vowel /u/ in Japanese, which is pronounced as an unrounded [ɰ<sup>β</sup>].

## **Vowels**

In Japanese, there are 10 vowels. All of them are monophthongs and there is no diphthong. In some words, such as [kaiɰa] (*kaiwa*: “Conversation”), “ai” is pronounced like as a diphthong. However, it is not considered as a “true” diphthong, in view of the fact that “ai” are represented separately as two units in the corresponding katakana for the words, i.e., “kaiwa” かいわ with the sounds “ka”, “i”, and “wa” represented as separate units.

The ten Japanese monophthongal vowels are elaborated below. The ten vowels have a contrast in length and then they are divided into two groups, with five classified as long vowels and the other five as short vowels.

### **Short vowels**

The five short vowels in Japanese include /a/, /e/, /i/, /o/, and /u/. They are illustrated below with respect to their vowel height and the backness of tongue.

/a/ = an open-central vowel: [tabɛmasu<sup>β</sup>] (*tabemasu*: “Eat”); [tamago] (*tamago*: “Egg”)

/e/ = a mid-front vowel [ɛ]: [dɛŋki] (*denki*: “Electricity”); [ɛmp<sup>j</sup>itsu<sup>β</sup>] (*enpitsu*: “Pencil”)

/i/ = a high-front vowel [i]: [itsido] (*ichido*: “again”); [dziɕo] (*jiŋŋo*: “Dictionary”)

/o/ = a back-mid vowel [o]: [ɔdzisan] (*ojisan*: “Uncle”); [koɰɔba] (*kotoba*: “Language”)

/u/ = a low-back vowel [ɰ<sup>β</sup>] (“<sup>β</sup>” indicating compression of the lip rounding): [ku<sup>β</sup>tsu<sup>β</sup>] (*kutsu*: “Shoes”); [ɕo<sup>β</sup>ku<sup>β</sup>ɔ] (*shokudo*: “Canteen”)

## Long vowels

Equivalent to the five short vowels, the five long vowels in Japanese include /aa/, /ee/, /ii/, /oo/, and /uu/, represented with a double short vowel. The long vowels are quite common in the loanwords in Japanese. Some word examples for illustration of the Japanese long vowels are given below.

/aa/ = [a:]: [ɔ̣ba:saɴ] (*obaasan*: “Grandmother”)

/ee/ = [e:]: [e̞ɽe̞βe:ta] (*erebeta*: “Lift”)

/ii/ = [i:]: [bi:ɽɯ<sup>β</sup>] (*biiru*: “Beer”)

/oo/ = [o:]: [ko:ko:] (*kookoo*: “High school”)

/uu/ = [u<sup>β</sup>]: [pu<sup>β</sup>:ɽɯ<sup>β</sup>] (*puru*: “Pool”)

## Other phonetic characteristics of the Japanese vowels

In Japanese, among all the vowels, the short /i/ and /u/ are treated as weak vowels, as they are usually unstressed in speech. Moreover, the vowels /i/ and /u/ are commonly to become voiceless when they occur in between two voiceless consonants. For instance, in the word “student” [gakɯ<sup>β</sup>sɛ:], the vowel /u/ is devoiced as [ɯ<sup>β</sup>] in between the two voiceless consonants /k/ and /s/. Similarly, in the word “hope/expect” [ki̥tai], the vowel /i/ is devoiced as [i̥] in between the two voiceless consonants /k/ and /t/. Also, in the word “shock” [kɯ<sup>β</sup>tsɯ<sup>β</sup>ɕi̥ta], both the vowel /u/ occurring between the voiceless consonants /k/ and /t/ and the vowel /i/ between the voiceless consonants /ɕ/ and /t/ are devoiced.

## Conclusion

To sum up, the consonants and vowels in Japanese have many phonetic variant forms, while the size of the phonemic inventories of consonants and vowels is small.

## References

1. Labrune, L. (2012). *The phonology of Japanese*. Oxford: Oxford University Press.
2. Kubozono, H. (2015). *Handbook of Japanese Phonetics and Phonology*. Boston: De Gruyter Mouton.
3. Vance, Timothy J. (2008). *The Sounds of Japanese*. Cambridge: Cambridge University Press.
4. Vance, Timothy J. (1987). *An Introduction to Japanese Phonology*. Albany, NY: State University of New York Press.
5. 3A Corporation (株式会社 スリーエーネットワーク) (2016). *大家的日本語 初級 I* (*Our Japanese Language, Elementary I*). Taiwan: Dahhsin Publisher (大新書局).

## Appendix

Katakana and Romaji of the Japanese sounds and the corresponding IPA transcription.

Katakana	Romaji	IPA
1. か, き, く, け, こ	ka, ki, ku, ke, ko	[ka], [ki], [kɯ <sup>β</sup> ], [kɛ], [kɔ]
2. さ, す, せ, そ	sa, su, se, so	[sa], [sɯ <sup>β</sup> ], [sɛ], [sɔ]
3. し	shi	[ɕi]
4. た, て, と	ta, te, to	[ta], [tɛ], [tɔ]
5. ち	chi	[tɕi]
6. つ	tsu	[tsw <sup>β</sup> ]
7. な, ぬ, ね, の	na, nu, ne, no	[na], [nɯ <sup>β</sup> ], [nɛ], [nɔ]
8. に	ni	[ni]
9. は, へ, ほ	ha, he, ho	[ha], [hɛ], [hɔ]
10. ひ	hi	[çi]
11. ふ	hu	[ɸɯ <sup>β</sup> ]
12. ま, み, む, め, も	ma, mi, mu, me, mo	[ma], [mi], [mɯ <sup>β</sup> ], [mɛ], [mɔ]
13. や, ゆ, よ	ya, yu, yo	[ja], [jɯ <sup>β</sup> ], [jɔ]
14. ら, り, る, れ, ろ	ra, ri, ru, re, ro	[ɽa], [ɽi], [ɽɯ <sup>β</sup> ], [ɽɛ], [ɽɔ]
15. わ, ゐ, ゑ	wa, we, wo	[ɰa], [ɰi], [ɰɛ]
16. を	o	[ɰɔ]
17. ん	n	[n], [m], [ŋ], [ŋ <sup>β</sup> ], [ɲ], [ɳ]
18. が, ぎ, ぐ, げ, ご	ga, gi, gu, ge, go	[ga], [gʲi], [gɯ <sup>β</sup> ], [gɛ], [gɔ]
19. ざ, ぜ, ぞ	za, ze, zo	[dza], [dzɛ], [dzɔ]
20. だ, で, ど	da, de, do	[da], [dɛ], [dɔ]
21. じ, ぢ	ji	[dʒi]
22. ず, づ	zu	[dzɯ <sup>β</sup> ]
23. ば, び, ぶ, べ, ぼ	ba, bi, bu, be, bo	[ba] [bʲi] [bɯ <sup>β</sup> ] [bɛ] [bɔ]
24. ぱ, ぴ, ぷ, ぺ, ぽ	pa, pi, pu, pe, po	[pa] [pʲi] [pɯ <sup>β</sup> ] [pɛ] [pɔ]