The following 14-line poem is one of the four sections of a grammar of Sanskrit, an ancient Indian language, written by the 4th-century BCE Indian grammarian Pāṇini. It is called the Akṣarasamāmnāya or Śivasūtras, and it functions as an ordering of the sounds of the Sanskrit language – like the English “A, B, C...” with some special properties.

1. a i u ṇ
2. ṛ l ḷ
3. e o ŏ
4. ai au C
5. h y v r ṭ
6. l n N
7. ŋ m ŋ ṇ n ṇ M
8. jh bh ṇ
9. gh dh dh ṣ
10. j b g d d Ś
11. kh ph ch th th c t t V
12. k p Y
13. ś s s ṛ R
14. h ḷ

NOTE: ṛ and ḷ are vowels; ŋ, ŋ, ṇ, ṇ, and ʂ are consonants. A consonant with a letter h after it (e.g. jh) is considered a separate ‘sound’ from the consonant without the h (e.g. j). The vowels a i u each have a long counterpart, ā ī ū, which for purposes of the Śivasūtras is considered equivalent with the short form.

The organization of the Śivasūtras allows us to give names to certain groups of sounds. For example, the single syllable aC refers to the vowels (a i u ṛ ē o ai au). Similarly, haL refers to the consonants (all the sounds that are not vowels), and yaN refers to a specific class of consonants (y v r l). Each of these single-syllable words (and the group of sounds that it describes) is known as a pratyāhāra.

L1. To what do the following pratyāhāras refer? List the sounds:

...ik?

...haN?

...khaY?

1 An ancient Indo-European language of India from which many northern Indian languages are derived.
L2. Give the pratyāhāras for the following classes.

(i) ...ङ m ŋ ṇ n (nasal consonants)

(ii) ...ai au (diphthongs)

(iii) ...all sounds

L3. Explain how to form a pratyāhāra.

You may have noticed that, in English, the same thing can be pronounced differently in different contexts. For example, the words a and an mean the same thing, but we use a before consonants and an before vowels. Such rules can often be described as a substitution operation performed under a specified set of conditions, such as “substitute an for a before a vowel.”

An advantage of the pratyāhāras is that they can be used to efficiently describe such sound change processes, which often operate on the types of sound groupings that can be expressed as pratyāhāras.² Approximately 4,000 rules describing the sound change processes of Sanskrit are laid out in another section of Pāṇini’s grammar, known as the Aṣṭādhyāyī.

Here is an example of a rule from the Aṣṭādhyāyī:

6.1.77 iKah yaN aCi

This rule contains three pratyāhāras: iK, yaN, and aC, which you have already seen in the previous part of this problem. Each of these pratyāhāras is followed by an ending (the ending may be empty, in which case it is marked by the symbol ∅):

6.1.77 iK-aḥ yaN-∅aC-i

² In technical linguistic terminology, groups of sounds that have meaningful linguistic roles, such as the set of consonants or the set of vowels, are known as natural classes; pratyāhāras are generally natural classes.
Here are a few of the changes triggered by this rule 6.1.77; the underlying form is the form before the rule has been applied, while the written form is the result of applying the rule:

<table>
<thead>
<tr>
<th>Underlying form</th>
<th>Written form</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>muniāśrama</td>
<td>munyāśrama</td>
<td>‘the sages’ hermitage’</td>
</tr>
<tr>
<td>devīeva</td>
<td>devyeva</td>
<td>‘the goddess herself’</td>
</tr>
<tr>
<td>madhuiva</td>
<td>madhviva</td>
<td>‘like honey’</td>
</tr>
<tr>
<td>pitraśva</td>
<td>pitraśva</td>
<td>‘the father’s horse’</td>
</tr>
</tbody>
</table>

However, the following forms are not affected by rule 6.1.77 (although they may be affected by other rules):

<table>
<thead>
<tr>
<th>Underlying form</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>munitapas</td>
<td>‘the sages’ asceticism’</td>
</tr>
<tr>
<td>kanyāeva</td>
<td>‘the girl herself’</td>
</tr>
<tr>
<td>dhenuśiva</td>
<td>‘like a cow’</td>
</tr>
<tr>
<td>kimcit</td>
<td>‘something’</td>
</tr>
</tbody>
</table>

In everyday contexts in Sanskrit, the endings seen above (-aḥ, -∅, -i) are used to mark the role of a noun in a sentence. For example, from the noun manas ‘mind’ the following forms are derived:

<table>
<thead>
<tr>
<th>Form</th>
<th>Translation</th>
<th>Role in the sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>manas-∅</td>
<td>‘the mind (does, is, etc.)’</td>
<td>subject</td>
</tr>
<tr>
<td>manas-ah</td>
<td>‘of the mind’</td>
<td>possessor</td>
</tr>
<tr>
<td>manas-i</td>
<td>‘on the mind’</td>
<td>location</td>
</tr>
</tbody>
</table>

However, within the Aṣṭādhyāyī these endings have a slightly different meaning.

**L4.** Express in your own words the meaning of rule **6.1.77**.
L5. How would you translate the meaning of the following endings as they are used in the Aṣṭādhyāyi?

(i) ...-ah?

(ii) ...-∅?

(iii) ...-i?

L6. The following is a simplified version of rule 8.4.53 of the Aṣṭādhyāyi: jhaLaḥ jaŚ jhaŚi. For each of the following underlying forms, write the corresponding written form; if the form is unaffected, write “no change.”

(i) jagatdhana ‘the wealth of the universe’

(ii) tatduhkha ‘that sorrow’

(iii) bhrātrnāman ‘brother’s name’

Note that the designations of the rules (6.1.77, 8.4.53) refer to book, chapter, and line numbers of the Aṣṭādhyāyi.