**UNIT : 10**

# THE AIR STREAM MECHANISM & ORGANS OF SPEECH

## :: STRUCTURE ::

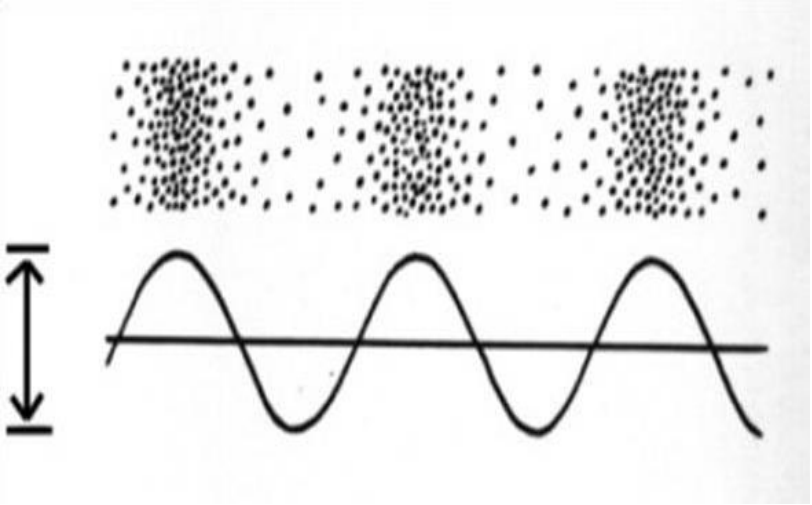


## 10.0 OBJECTIVES

When most of us think about language and speech, we tend to think about the way words arewritten.
However, here we are going to discuss about the study of speech sounds. This means we willbe **(A)** thinking and realizing about the way humans produce speech, and what speech soundslike, rather than the written form of language. We shall start with **(B**) understanding about what various organs are involved into speech. We shall also understand what **(C)** process takes place for discourse sounds to occur. This study may seem insignificant but understanding and appreciating the complexity can be overwhelming realization!

## 10.1 WHAT IS SOUND

Any sound is produced due to vibration. Sound waves are called travelling longitudinal waves which we can hear. In a Longitudinal wave, at a few places the medium is compacted, and at others the medium extends.



The compression and refraction of air is reflected in wavelength. Variety of pressure willcause change in wave pattern (Wavelength) and as a result, different sound is produced.
In human body the surge of air originates from lungs and various organs alter it duringpassage out of body. We shall study these organs now.

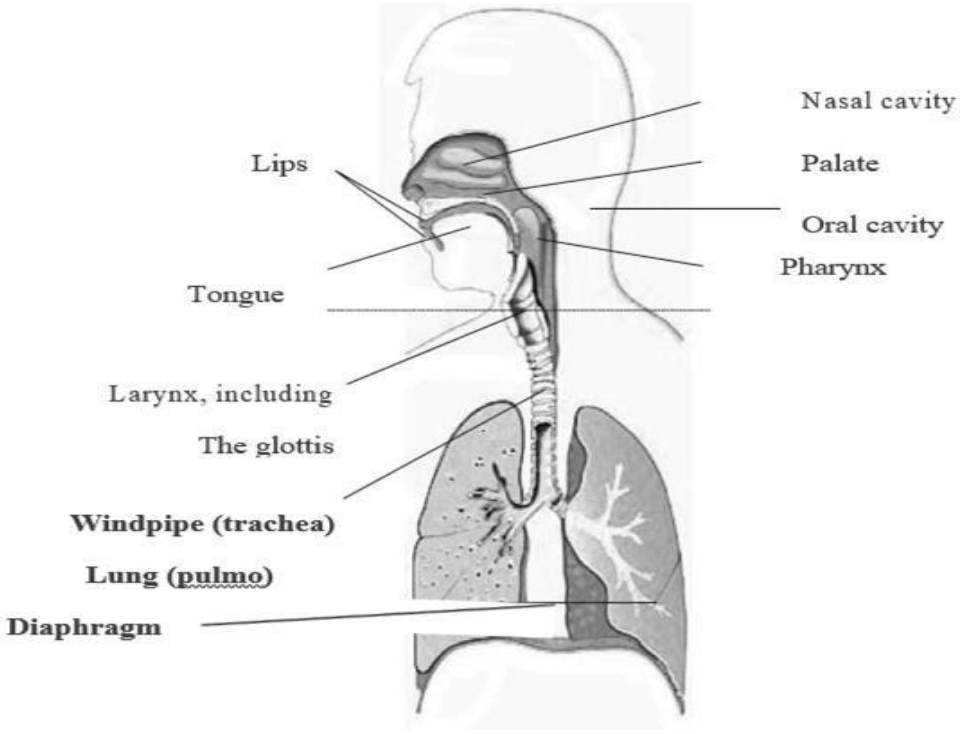
- **Check Your Progress**

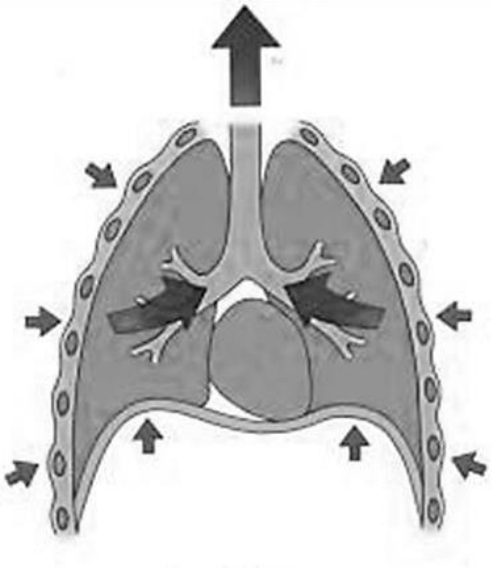
**State if the below statements are True or False**

1. The sound is produced only in air.
2. Sound can travel in any direction.
3. Lungs is responsible for production of sound.
4. The air atoms change their density due to vibration.
5. Multiple organs are involved in production of sound in human body

## 9.2 SPEECH ORGANS

Speech organs are those pieces of the human body that are effectively or inactively engaged with the creation of discourse sounds.
They incorporate the lung, the larynx, the pharynx, the tongue, the lips, and so forth. Clearly, their support in the generation of discourse is just an auxiliary reason; they really satisfy increasingly indispensable capacities (breath, gulping, nourishment handling)



The function of all the above mentioned body parts is to produce speech sounds and speech requires airsource. We produce majority of the speech sounds by forcing air upwards from the lungs, an action used in normal breathing. But it is necessary that inorder to produce a speech sound the outward moving airstream must be modified by manipulation of larynx and articulators in oral and nasal cavity which lead to change in pressure and thus the different sounds are produced. Thus when understanding the speech and human discourse sounds, it is imperative to understand the organs present in Vocal Tract.

We shall focus on how the air stream is modified.

- **Check Your Progress**

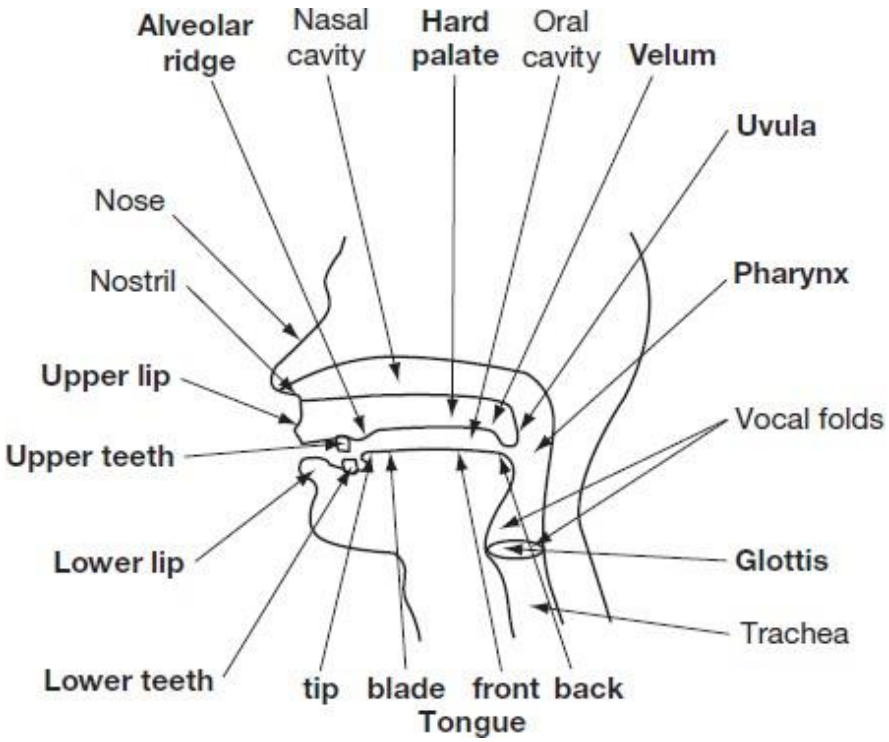
Complete the below given statements

1. The speech organs are…
2. The other functions of the organs involved in speech are …
3. The primary function of lungs is to…
4. To create different sounds,…..

## 10.3 THE ARTICULATORS

Produce the words ‘May’ and ‘December’ and focus on the initial sound in each word. Think about which parts of your mouth move when you make each sound. Be careful to focus only on the /m/ and the /d/. You will just make it hard for yourself if you try to focus on the wholeword at this stage.
Which parts of the mouth can you feel moving? Are the parts of the mouth that are moving the same for /m/ and /d/, or different? You will probably have noticed that the lips move for /m/ and that the tip of the tongue moves for /d/.

The vocal tract refers to all the passageways above the larynx through which air can flow when we produce speech. An **articulator** is the name given to a part of the vocal tract that can be used to form a constriction. When we describe consonant production and **place of articulation** in phonetics, we think about the place in the vocal tract where there is maximum constriction to airflow. There are always two articulators involved in making this maximum constriction. For /m/, the articulators are the two lips; for /d/, the articulators are the tip of the tongue and the roof of the mouth.



The articulators themselves are named using a special set of terminology. As in most disciplines, we use special names for things that we need to talk about often and with a highdegree of precision.

Figure above shows the vocal tract in more detail. The names of the articulators are shown inbold.

Many of the articulators will be familiar to you. For example, the *lips* and *teeth* are parts of our anatomy that we are all familiar with. Some of the other names may be less familiar. The *alveolar ridge*, for example, is not a term most people come across before they study phonetics. However, the alveolar ridge can be identified easily as the prominent ridge of hard bone behind the upper teeth, which you can feel with your tongue. The *palate* is the hard, bony surface further back than the alveolar ridge, and the *velum* is the soft palate, which is even further back in the mouth. The *uvula* is the piece of flesh that hangs down from the backof the velum and can be seen if you open your mouth and look in the mirror. Vocal folds can vibrate to produce voicing or they can be used to restrict the airflow and act as a place of articulation. The space between the vocal folds is called the *glottis*.

The *tongue* is also an articulator and is involved in the production of the majority of the sounds present in English and other languages. However, in order to be precise when we talk about articulation, we need to label parts of the tongue separately. The tip, blade, front and back of the tongue can all be labelled individually. You will note that there are also names for the cavities of the vocal tract, namely the *oral cavity* and the *nasal cavity*. These two are joined together, and joined to the space above the larynx by another space called the pharynx,at the back of the mouth.

### 10.3.1 Active & Passive articulators

As we have said previously, when we produce consonants we constrict air, which is usually flowing up from the lungs. To form a constriction, we use two articulators. In the majority of cases, only one articulator moves and this is called the **active articulator**. The articulator that it moves towards is called the **passive articulator**.
In the examples that we have looked at already, we can identify active and passive articulators. In /m/ the active articulator is the bottom lip, because it moves, whereas thepassive articulator is the top lip, which the bottomlip moves towards. For /d/ the active articulator is the tip of the tongue; the passive articulator is the alveolar ridge.

*Activity* Think about the sounds at the start of the words below. Remember to isolate them from the rest of the word. Say them slowly and try to work out which is the Consonant place of articulation active and passive articulator for each one. As with the previous exercise, it may help to look in a mirror.

car tank van lorry bike

It is worth noting that this is quite a difficult exercise to do. We are not used to thinking abouthow we speak or introspecting about our own vocal organs. However, this will get easier with practice. Have a look at the answers below and then go back to the exercise to see if you can relate the answers to your own articulation.

The /k/ in 'car' is formed by the back of the tongue (active) moving towards the velum (passive). /t/ in 'tank' and /l/ in 'lorry' are both formed in the same place as /d/, with an activetongue tip and a passive alveolar ridge. /v/ in 'van' is formed when the bottom lip approachesthe top teeth. /b/ in 'bike' is formed in the same place as /m/, when the bottom lip approaches the top one.

### 10.3.2 Places of Articulation

Now that we know which articulators are involved in producing sounds, we have another set of labels to learn. As mentioned above, when we refer to the place of articulation of consonants, we are describing the place in the vocal tract where there is the most constrictionof airflow. The place of articulation is normally named after the passive articulator. So, a sound formed with the tip of the tongue approaching the alveolar ridge is said to have an alveolar place of articulation. /t/, /d/ and /l/, for example, all have the alveolar ridge as the passive articulator, so are said to have an alveolar place of articulation.
Below are the names of the places of articulation that are used for consonants. They areordered from the front of the vocal tract towards the back.

| **POA** | **Active articulator** | **Passive articulator** |
|---|---|---|
| Bilabial | Bottom lip | Top lip |
| Labiodental | Bottom lip | Top teeth |
| Dental | Tongue tip | Upper front teeth |
| Alveolar | Tongue tip | Alveolar ridge |
| Postalveolar | Tongue tip or alveolar blade | Region behind the ridge |
| Palatal | Tongue front | Hard palate |
| Velar | Tongue back | Velum |
| Glottal | Vocal folds | None (the vocal folds move towards each other) |

- **Check Your Progress**

**Answer the following**

1. How is sound produced in human body?

_____
_____
_____
_____
_____

2. Differentiate the organs responsible for creation of air stream and ones thatinterfere to create sounds.

_____
_____
_____
_____
_____

3. Define Articulators. What are active and passive articulators? State theirfunctions.

_____
_____
_____
_____
_____

4. Try speaking the words given below and observe the articulators involved actively.

- Bee
- Go
- See
- Tie
- My

5. Assign POA to below mentioned words by speaking them (You can use a mirror to observe the movement of your mouth) from the 8 places given above. Focus on theword that is underlined

| | **Word** | **POA** |
|---|---|---|
| 1 | Purse | |
| 2 | Calf | |
| 3 | Thick | |
| 4 | No man | |
| 5 | Shot | |
| 6 | Jam | |
| 7 | Suit | |
| 8 | Mad | |
| 9 | Have | |

| | | |
|---|---|---|
| 10 | Uncle | |
| 11 | Wet | |
| 12 | Bahamas | |
| 13 | Yes | |

6. Can you think of the possible reasons that you are not aware about your speech organsthough you keep on using them every day?

## 10.4 PROCESSES OF SPEECH PRODUCTION

**Labialization**: - This is a process in which the lips play an active part in various ways. They come together to form various stages or degrees of rounding which is a crucial factor in producing back vowels /u/, /o/, as in shoe, shore, and.a. The two lips are joined together for the pronunciation of the plosive sounds /p/, /b/; and the voiced nasal continuant /m/. The lower lip is raised approximate the edge of the upper teeth for the fricatives /f/, /v/. For the semi-vowel /w/ again there is a noticeable lip-rounding.

**Palatalization**: - In palatalization the tongue approximates the hard palate leaving only a narrow space through which the airstream passes producing friction noise; or the tongue mayform complete occlusion and then gradually withdraw, creating a turbulence of air due to the breath-stream escaping through the space slowly being allowed to form. This is how thesound in jar /dʒɑ::/ and chair /tʃeə/ is pronounced.

**Velarization**: - Velar sounds are produced by this process. The back of the tongue either approximates or forms total occlusion for articulating certain types of stop and fricative sounds. The velar sounds are /k/ and /g/ in English. /h/ is a velar nasal heard.

**Glottalization**: - The space between the vocal cords is called glottis. If the vocal cords are brought together and released with a 'popping' action, the resultant sound will be heard as a'glottal stop'. The use of this process is restricted in English Language.

**Nasalization**: - This is a process whereby we produce nasal sounds or nasalized vowels. In articulating these sounds, the soft palate is lowered to close off the oral passage and direct theairstream through nasal cavity. In another case, the air is allowed to go into both the oral and the nasal cavities, but the active articulators check it in the mouth. For /m/ two lips come together to form a closure, and channelize the air flow, through the nose. Similarly, for /n/ thetip of the tongue comes into contact with the back of the upper teeth and forms a closure.

'Although the vocal tract is blocked at one point, the breath-stream flows outward throughwhat has been called a secondary aperture consisting of the nasal airway Nasals are also classed as resonant or continuants.

**Voicing**: - It is an articulatory process in which the vocal flaps are set in vibration by the outgoing column of air. During voicing, the vocal cords are brought close enough to hold them taut and the airstream vibrates them in rapid succession. There is as a result, quick opening and closing of these vocal cords several times a second. Sounds can be produced without the vibration of the vocal cords. Such sounds are called unvoiced or voiceless sounds; sounds produced with the cords in vibration are called voiced sounds. See consonant chart for voiced and voiceless consonants.

- **Check Your Progress**

Which process of speech production do the letters in underlined words

1. king, sing and conquer
2. Which, Pause
3. Dune, Sun
4. Cheese, Joker
5. Jumper, Happy

## 10.5 THE AIRSTREAM PROCEDURE

*Definition:*
An air stream mechanism is how air set into motion for speech to occur. By far the mostcommon airstream mechanism in the world is outflow of air from the lungs.

### 10.5.1 Pulmonic Egressive And Ingressive Airstreams

To start with, we are going to think about how we usually use the air from the lungs and whathappens when we breathe in while speaking.

***Activity:***
Pick a phrase that you know and can easily repeat, such as the first line of 'Twinkle, twinkle, little star', or 'the quick brown fox jumps over a lazy dog'. Produce the phrase as you normally would, several times in succession, taking only one breath at the start.Then, try to repeat the same phrase, but this time breathing in. What do you notice?

a) Is the phrase still intelligible?
b) Does it sound the same in both cases?
c) Is one version more effortful than the other?

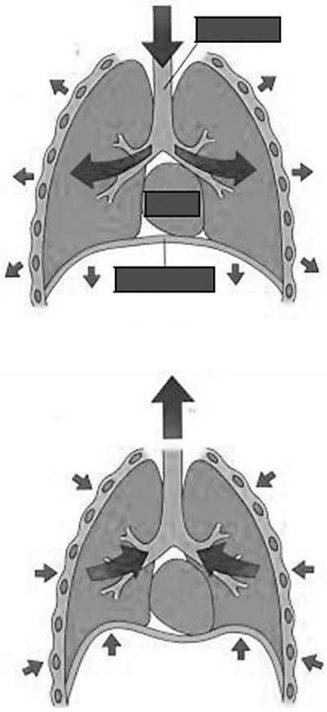
You can, in fact, talk while you breathe in, and that the speech you produce while doing so islargely intelligible. However, you will also have noticed that speech in the two conditions

does not sound identical – for example, the quality and pitch of the utterance will sound different. In addition, you probably found the 'breathing in' condition to be quite difficult, and that you could repeat your phrase fewer times before you needed to return to normal breathing.

The ‘breathing out’ condition is much more practised. We have all been doing it since we first began to speak; therefore, it feels easier and more efficient. Obviously we can speak while breathing in, but, as the air now passes in a reverse direction through our vocal tract, the quality of the sound produced is different. There is, however, no difference in meaning between the words produced in these two different ways.

Speaking while breathing in is certainly much more unusual than speaking while breathing out. However, there are some occasions when we might speak while breathing in, such as if we are surprised. Imagine the word ‘oh’ spoken in shock, for example.

**DESCRIBING AIRSTREAMS**



As we have seen in earlier units, airflow is crucially important for speech. An **airstream mechanism** is how air is set into motion for speech to occur. By far the most common airstream mechanism in the languages of the world is the outward flow of air from the lungs. The technical term for this type of airstream is **pulmonic egressive**; *‘pulmonic’ refers to the lungs and ‘egressive’ means that air flows out of the body*. This outward flow happens because muscular activity contracts the ribcage, thereby compressing the lungs and thorax, which causes the air inside the lungs to be under higher pressure than in the surrounding air. As always, air flows from an area of higher pressure to an area of lower pressure.

The other type of airstream mechanism that we considered above is

termed **pulmonic ingressive**. The lungs are still responsible for the movement of air, *but this time the air flows into the body*. This happens because muscular activity lifts the ribcage, allowing the lungs to expand, and creating a lower pressure inside the lungs than in the air outside the body.

As you can see, then, there are two things that we need to name when describing an airstream mechanism. Firstly, we need to describe the part of the body that causes the movement of air. This part of the body is called the **initiator**, which is the lungs in the two airstreams we have looked at so far. Next, we need to describe the direction of airflow in relation to the body, which can beinwards (ingressive) or outwards (egressive).

## 10.6 NON-PULMONIC AIRSTREAMS

It may surprise you to learn that airstreams other than pulmonic airstreams can be used to produce speech. These can be referred to as **non-pulmonic airstreams**. Although they are not used to create meaning in English, they may be used in other contexts and are used to produce meaningful speech sounds in other languages. They exist in about 13 per cent of languages and are quite common in languages in Africa and Asia, although less so in Europe.

Exercise 7.4 The sounds we will look at below are produced using the following airstreammechanisms. Using just what you know already, what do you think are the initiators and directions of airflow in the following airstream mechanisms?

Looking at the names for these airstream mechanisms, you will see that two are ingressive, so air flows into the body, while one is egressive, so air flows out of the body. Your knowledge of terminology so far will suggest that the first two have the glottis (the space between the vocal folds) as an initiator, while the last mechanism has the velum as the initiator. We willnow look at each of the airstream mechanisms in turn, to see how they work, and the type of sounds they produce.

### The glottalic ingressive airstream mechanism and implosives

The glottalic ingressive airstream mechanism produces sounds called implosives. Implosives are not meaningful sounds in English, but can be used to imitate sounds in the environment, Let's see!

What noise do you make when you imitate someone drinking out of a bottle (glug-glug), orthe sound a chicken makes (bok-bok)?

These sounds are very hard to describe in writing, and it is possible that different readers might use a variety of different sounds to imitate drinking and chickens. Many readers, however, will make velar and bilabial implosives as part of their imitations of these noises. Implosives have a distinctive 'gulping' sound. It would be worth asking your teacher to produce them for you.

### The glottalic egressive airstream mechanism and ejectives

We saw that the glottis can be the initiator of an airstream, as its movement causes pressure changes in the vocal tract. We saw that, for implosives, the larynx moves down, and, of course, the glottis moves down too, as it is inside the larynx. This movement leads to pressure differences, which, in turn, move air and create an airstream flowing into the mouth.

Now we will continue to look at glottalic airstreams, but this time we will look at sounds produced on a **glottalic egressive airstream**. Sounds produced on a glottalic egressive airstream are called **ejectives**. They exist in about 15 per cent of the world's languages and are quite common in North American and African languages. They are not found linguistically in English, so they never make a meaning difference. However, they can be found as one way of producing voiceless plosives (/p t k/) at the end of a phrase, especially if the speaker is being particularly forceful.

For example: Try saying the word 'quick' loudly and forcefully. Listen carefully to the final
/k/.
Now compare the forceful production to that when the word is said quietly and gently. Whatdo you notice?
If you succeeded in producing an ejective, then the /k/ at the end of 'quick' will have soundedquite different when it is produced loudly and forcefully. Of course, it is difficult to describe sounds in writing, but it will have sounded sharper and more explosive. As you did for the implosives, it is worth listening to some examples from your teacher.

**The velaric ingressive airstream mechanism and clicks**
The final airstream mechanism we will consider is **the velaric ingressive airstream**, whichis responsible for the production of click sounds. **Clicks** only exist in southern and eastern African languages. Click sounds are not part of the sound inventory of English, but they occur frequently when English speakers try to imitate sounds in the environment, or to express certain emotions, so will probably be familiar to all readers.

For example, what sounds would you make to do the following?Blow a kiss
Tut your disapproval Imitate the sound of horses' hooves (at a Nativity play, for example)
Tell a horse to giddy-up (this one may be familiar only to those who have learntto ride horses).
All of the sounds above are click sounds and therefore have a number of similarities in theirproduction.

- **Check Your Progress**

Answer the following

1. Why is it easier to speak while breathing out? DO you think same organsare involved in ingressive and Egressive sounds?

_____
_____
_____
_____

What is air stream? Define Pulmonic Egressive and Ingressive airstream &Describe their processes.

_____
_____
_____
_____

2. Do you think all discourse sounds originate from lungs? If not, which areother origins?

_____
_____
_____
_____

What are different sounds produced through Egressive Mechanism?

_____
_____
_____
_____

3. Do you think all the sounds produced carry direct meaning, independentlyin English language? If not, which are those sounds and how are they categorized?

_____
_____
_____
_____
_____

**Summary:**

- In human body the surge of air originates from lungs and various organs alter itduring passage out of body called Speech Organs.
- An articulator is part of the vocal tract that can be used to form a constriction. Theexact place where constriction is formed is called place of articulation.
- Most discourse sounds in English language are Pulmonic Egressive, i.e. formed withthe airstream going out of body from lungs.
- Apart from the lungs, the sounds originate from the glottis and base of tongue(Velum), but they are not frequently used in English language, directly.