

HSC Biology

Communication

Focus 5:

 *Sound is also a very important communication medium for humans and other animals.*

Explain why sound is a useful and versatile form of communication.

- Sound is a very common form of communication between animals.
- Sound is very versatile:
 - Animals can vary sounds produced.
 - Pitch, loudness, tone, frequency.
 - Used day & night.
 - Bends around objects.
 - Travels around corners.
 - Travels over long distances.
 - Sender not needed to be visible to receiver.
 - Travels through solids, liquids & gases.
- Animals in all habitats are surrounded by a medium that can transmit sound.
- Sound allows communication when tactile, olfactory and visual senses are impaired or absent.
 - Variety of sounds can be produced to express different emotions by altering pitch & amplitude (volume).
 - Sound travels rapidly.

Explain that sound is produced by vibrating objects and that the frequency of the sound is the same as the frequency of the vibration of the source of the sound.

- Sound is a form of energy that requires a medium for propagation.
 - Medium requires particles that can be displaced & return to original position.
- Sound produced by particles in a medium vibrating against one another.
 - Creates a compression wave travelling through the medium.
 - Compression wave will only travel through a medium which allows particles to be compressed or spread.
 - Particles move in the same direction as flow of energy.
 - Frequency of vibrating air molecules = frequency of sound produced.
 - High frequency = high pitch.
 - Low frequency = low pitch.
- Hertz:
 - Number of cycles per second.
 - A measure of frequency.
- Pitch:
 - Determined by the frequency of a sound wave.
 - Low frequency = low pitch.
 - High frequency = high pitch.
- Amplitude:
 - Maximum distance a particle moves away from original position.
 - Determines volume.

Outline the structure of the human larynx and the associated structures that assist the production of sound.

- Structures assisting in the production of sound:
 - Epiglottis.
 - Nasal cavity.
 - Soft palate.
 - Tongue.
 - Larynx.
 - Vocal chords.
 - Lips.
- Function of larynx:
 - Provide open airway.
 - Provide mechanism for sound production.
 - Closes air channel when swallowing.
 - Prevent food from entering trachea.
- Larynx (voice box) situated below tongue & soft palate (the throat).
 - Contains vocal chords consisting of muscles.
 - Adjust pitch of sound by altering tension & position.

- Structure of larynx:
 - Hollow box containing vocal chords.
 - Framework of 9 cartilages joined by membranes & ligaments.
 - A box formed which produces & resonates sound.
 - Upper opening termed *glottis*.
 - *Epiglottis* tips forward to cover trachea during swallowing.
 - *Laryngeal prominence* created by ring of *thyroid* cartilage at top of larynx.
 - *Arytenoid* cartilages anchor vocal chords.
 - Muscles connecting to cartilage used to alter tension on vocal chords.
 - Mucous & cilia line larynx & push substances towards pharynx.
 - Clears the throat.
 - Vocal ligaments lie under mucous on each side.
 - Join cartilages together & create vocal folds (true vocal chords) out of mucous lining.
 - True vocal chords vibrate as air rushes past them to produce sound.
 - Vestibular vocal chords (false vocal chords) produce mucous to lubricate true vocal chords & prevent liquids entering.

- Phonation:
 - Process of producing intelligible sounds / speech.
 - Diaphragm relaxes to push air up the trachea fast enough to open vocal chords.
 - Pressure in higher chest cavity greater than pressure of air outside.
 - Air rushes out to equalise pressure.
 - Rapid opening & closing of glottis sets vibration pattern, producing sound.
 - Causes vibration of vocal chords.
 - Length of vocal chords & size of glottis controlled by *vagus nerve*.
 - Glottis wide open for deep sounds, small slit for high pitched sounds.
 - Sound produced is a buzzing sound.
 - Resonance created by cavities in sinuses & pharynx.
 - Sound shaped into words using muscles of tongue, soft palate, cheeks & lips.

Plan and Perform a first-hand investigation to Gather data to Identify the relationship between wave-length, frequency and pitch of a sound.

- Cathode ray oscilloscope (CRO) used to demonstrate the relationship between frequency, wavelength & pitch of a sound.
- Screen demonstrated wavelength, frequency & amplitude of sound.
- Speaker demonstrated pitch.
- Short wavelength = high frequency = high pitch.
- Long wavelength = low frequency = low pitch.
- Volume affected by amplitude.

Gather and Process information from secondary sources to Outline and Compare some of the structures used by animals to produce sound.

<i>Structures Used To Produce Sound</i>				
	Animal	Frequency Range	Medium	Structure Used
<i>Insects</i>	Crickets	High frequency	Air	<ul style="list-style-type: none"> - Scrape body parts together. - Legs, wings.
<i>Fish</i>	Most fish	Low frequency	Water	<ul style="list-style-type: none"> - Vibrate a bone against a swim bladder.
<i>Birds</i>	Most birds	High frequency	Air	<ul style="list-style-type: none"> - Sound producing organ: syrinx. - Situated at the base of the trachea. - Holds structures with similar function to vocal chords.
<i>Mammals</i>	Dolphins	High frequency	Water	<ul style="list-style-type: none"> - Tissue in nasal complex used to produce grunts, clicks, squeaks & whistles. - Trachea, nasal sacs & blowhole.