DTE Question Bank – Unit 4 & 5

Short Question Answers

1. Recall tonometry
2. Write about lithotripsy
3. Define Air Conduction
4. What happens when ultrasound waves enter the body?
5. List any four instruments used in ophthalmology
6. Define Psychophysiology
7. Recall Polygraph
8. Brief about the term masking in audiometry
9. What is Obstetrical Ultrasound Imaging?
10. Tell about Doppler Effect

Detail Question Answers

1. Explain the types of diagnostic information obtained using audiometer with suitable diagram
2. Describe the mechanism and measurement of Basal skin resistance with neat diagram
3. Discuss in detail about the clinical applications of Thermography
4. Discuss in detail about the applications of ultrasound in the field of diagnosis.
5. Explain the working principle of Goldmann Applanation Tonometry
6. Differentiate Pure tone audiometer from Speech audiometer with suitable diagram
7. Differentiate Conventional Hearing Aids from Digital Hearing Aids with suitable diagram

1. Tonometry is a method of measuring the pressure in the eye by measuring the tone or firmness of its surface. Tonometry is very useful to doctors for measurement of the pressure in the eye, or the intraocular pressure (IOP).

2. Lithotripsy treats kidney stones by sending focused ultrasonic energy or shock waves directly to the stone first located with fluoroscopy

3. Air-conduction thresholds measure the function of the total hearing system, including the external, middle, and inner ear

4. The sound waves travel into your body and hit a boundary between tissues (e.g. between fluid and soft tissue, soft tissue and bone). Some of the sound waves get reflected back to the probe, while some travel on further until they reach another boundary and get reflected

5. Ophthalmic Instruments; Slit lamp, Automated Perimetry, Keratometer, Non Contact Tonometers, Optical Coherence Tomography

6. Psychophysiology is the study of the interrelationships between mind and body.

Psychophysiologists study primarily human subjects using non-invasive molar physiological responses

7. The term "polygraph" literally means "many writings." The name refers to the manner in which selected physiological activities are simultaneously recorded. A polygraph will collect physiological data from at least three systems in the body.

8. Clinical masking in audiology refers to the introduction of noise to the non-test ear during a pure tone audiogram. This aims to ensure that the test ear hears the presented tone and is not 'cross-heard' by the non-test ear

9. Obstetrical ultrasound is a useful clinical test to:

- establish the presence of a living embryo/fetus
- estimate the age of the pregnancy
- diagnose congenital abnormalities of the fetus
- evaluate the position of the fetus
- evaluate the position of the placenta

10. The Doppler effect is the perceived change in frequency of sound emitted by a source moving relative to the observer

Detail Answer

Q1. diagnostic information obtained using audiometer with suitable diagram

Why Audiometry Is Performed

The usual primary purpose of pure-tone tests is to determine the type, degree, and configuration of hearing loss.

Pure-Tone Air-Conduction Testing

Pure-tone air-conduction thresholds measure the function of the total hearing system, including the external, middle, and inner ear. In typical audiometric testing, pure tones that range in octave spacings from 250 to 8000 Hz are presented to the listener by headphones or insert earphones. Threshold is usually determined by the use of a version of the Hughson-Westlake "ascending method,"[4] in which sounds are initially presented well above threshold, and are then presented in decreasing steps of 10 to 15 dB until the sound is inaudible. The tone is increased in "up 5-dB, down 10-dB steps" until the single HL at which a response is obtained three times is reached.[5]

Because air-conduction thresholds measure the acuity of the entire hearing system, when evaluated alone they provide little information regarding the etiology of hearing loss and specific auditory pathology. When examined in conjunction with thresholds obtained by bone-conduction testing, however, they help determine the type and the severity of the hearing loss. When plotted on an audiogram, pure-tone thresholds also provide information regarding the severity of the hearing loss. Thresholds that fall into the 0- to 25-dB range are considered normal, whereas thresholds greater than 25 dB represent various levels of hearing loss (see Fig. 133-1).

Pure-Tone Bone-Conduction Testing

Pure-tone bone-conduction thresholds provide auditory threshold information when the cochlea is stimulated more or less directly, with stimuli bypassing external and middle ear structures. Differences between thresholds obtained through air and bone conduction are used to determine the type of hearing loss (normal hearing versus conductive loss versus sensorineural hearing loss [SNHL]) and the magnitude of conductive hearing loss if it exists.

The location of the bone-conduction thresholds on the audiogram helps determine the severity of the hearing loss (Figs. 133-1). In bone-conduction testing, a bone oscillator is typically placed on the mastoid process. Although this placement does not guarantee that the responses obtained are from the ear located on the side on which the oscillator was placed, such placement provides an enhanced dynamic range compared with other placements, such as at the frontal bone.[6] Most audiometers currently in use are calibrated for placement of the vibrator on the mastoid.

The relationship between air-conduction and bone-conduction thresholds is used to determine the type of hearing loss. When air-conduction thresholds are elevated relative to normal bone-conduction thresholds—a phenomenon referred to as an *air-bone gap*—the loss is classified as conductive (Fig. 133-2). When air-conduction and bone-conduction thresholds indicate the same amount of hearing loss, the loss is classified as sensorineural (Fig. 133-3). Finally, when air-conduction thresholds are elevated relative to abnormal bone-conduction thresholds, the loss is classified as mixed (Fig. 133-4).

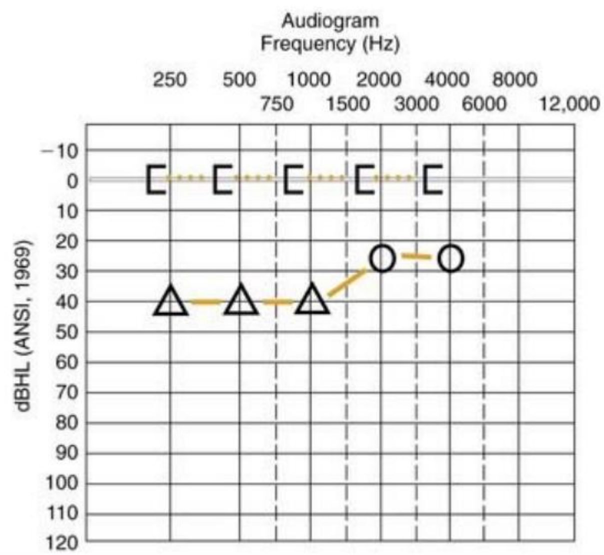

Figure 133-2. Example of an audiogram characterized by an air-bone gap indicating a conductive hearing loss.

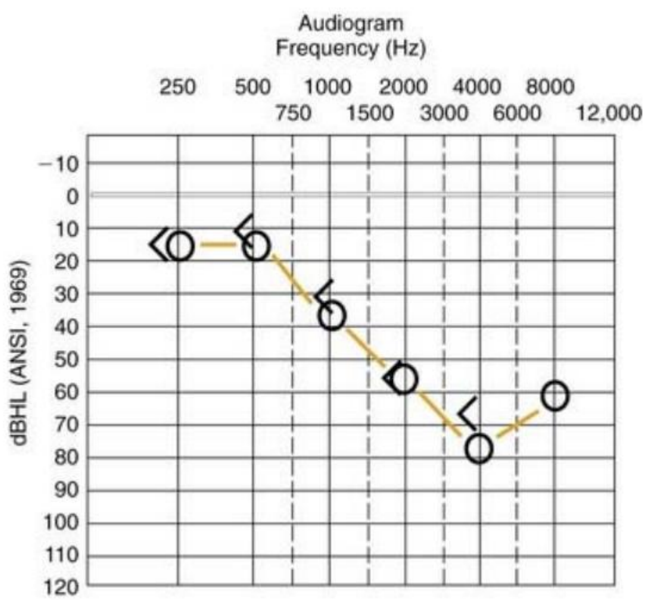

Figure 133-3. Audiogram showing a sloping, high-frequency sensorineural hearing loss (air-conduction and bone-conduction thresholds are identical).

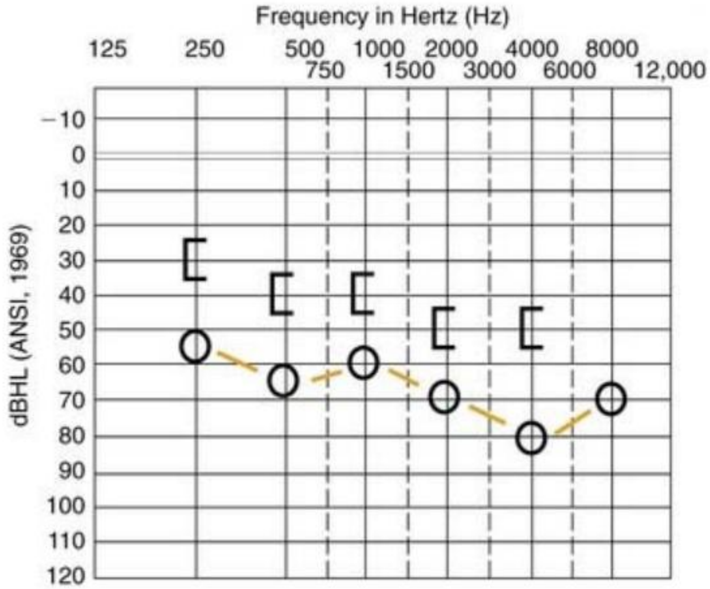

Figure 133-4. Audiogram showing a mixed hearing loss. Air-conduction and bone-conduction thresholds are elevated; however, there is also an air-bone gap.

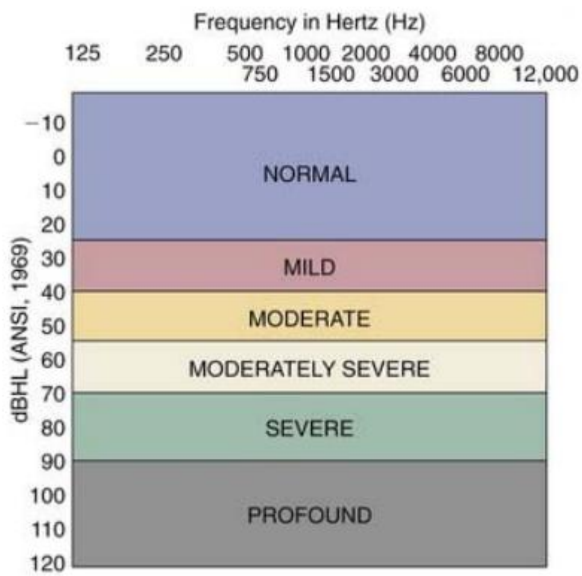

Figure 133-1. Graphic representation of categories of hearing loss.

Q2. Differentiate Pure tone audiometer from Speech audiometer with suitable diagram

Pure tone audiometer

A wave in air, which involves only one frequency of vibration, is known as pure-tone. Pure-tone audiometry is used in routine tests and, therefore, it is the most widely used technique for determining hearing loss. Pure-tone audiometers usually generate test tones in octave steps from 125 to 8000 Hz, the signal intensity ranging from –10 dB to +100 dB.

Pure-tone audiometry has several advantages, which makes it specifically suitable for making threshold sensitivity measurements. A pure-tone is the simplest type of auditory stimulus. It can be specified accurately in terms of frequency and intensity. These parameters can be controlled with a high degree of precision. Speech audiometry normally allows measurements to be made within the frequency range of 300–3000 Hz. Some patients may have impaired high frequency response due to high intensity level occupational noise at 4000 or 6000 Hz. Pure-tone measurements at these frequencies prove to be a more sensitive indicator of the effect of such noise on the ear than speech tests. Changes in threshold sensitivity associated with various middle ear surgical procedures can be monitored more accurately with pure-tone than speech tests.

A pure-tone audiometer basically consists of an LC oscillator in which the inductance and tuning capacitance are of close tolerances for having a precise control on the frequency of oscillations. The oscillator is coupled to an output current amplifier stage to produce the required power levels. The attenuators used in these instruments are of the ladder type, of nominal 10 W impedance. The signals are presented acoustically to the ear by an earphone or small loudspeaker

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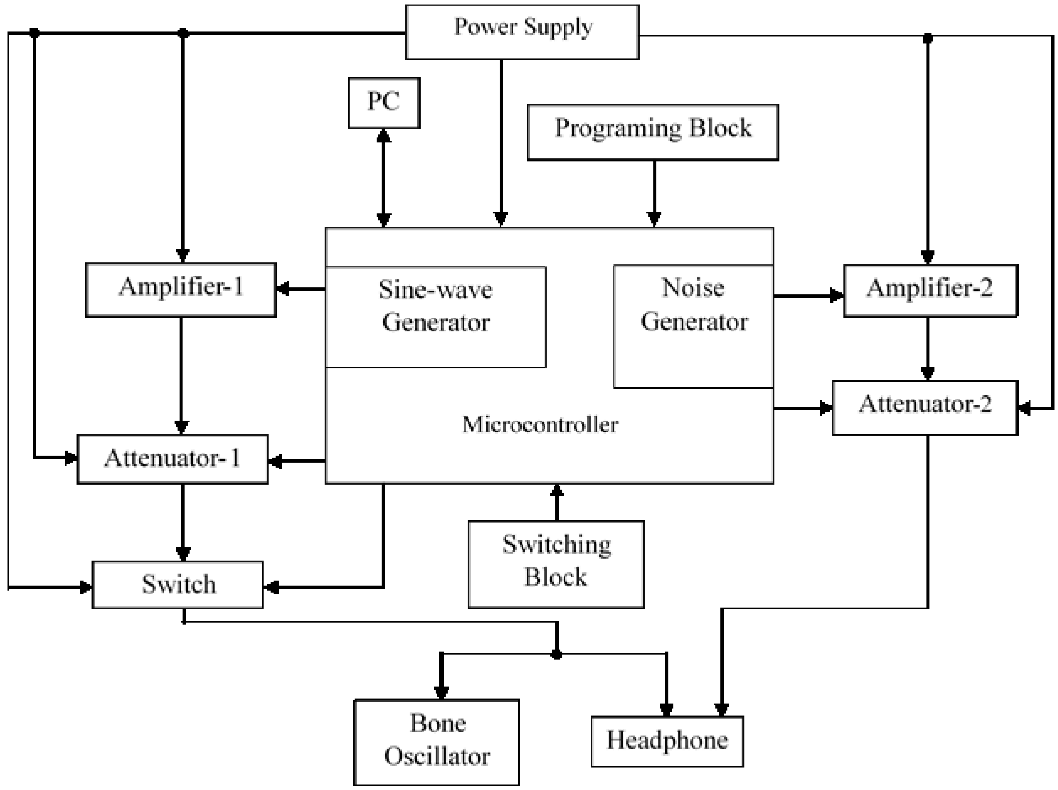


Pure tone audiometer Block Diagram

Speech audiometer

Besides tonal audiometry, it is sometimes necessary to carry out tests with spoken voices. These tests are particularly important before prescribing hearing-aids and in determining the deterioration of speech understanding of patients. Specially designed speech audiometers are used for this purpose. They incorporate a good quality tape recorder, which can play recorded speech. A double band tape recorder is preferred to interface the two channel audiometer units. Masking noise is supplied by the noise generator. The two channels supply the two head-phones or the two loud speaker which are of 25 W each.

The tape recorder has a capacity for recording a limitless variety of test material and a consistency of speech input, which cannot be obtained for live-voice audiometry in relation to test – retest repeatability. Another advantage of the tape recorded material is that the test words and sentences can be selected to cater for the widely differing needs of age, intelligence, dialect and language.

In speech audiometers, live-voice facilities are incorporated primarily for communication purposes as the inherent unreliability of live-voice speech tests may lead to serious errors. The microphone amplifier used for this purpose is a simple two stage amplifier. The frequency response characteristics of a live-voice channel should be such that with the microphone in a free sound field having a constant sound pressure level, the sound pressure level developed by the earphone of the audiometer in the artificial ear at frequencies in the range 250 to 4000 Hz does not differ from that at 1000 Hz by more than 110 dB. Also, it shall not rise at any frequency outside this band by more than 15 dB, relative to the level at 1000 Hz.

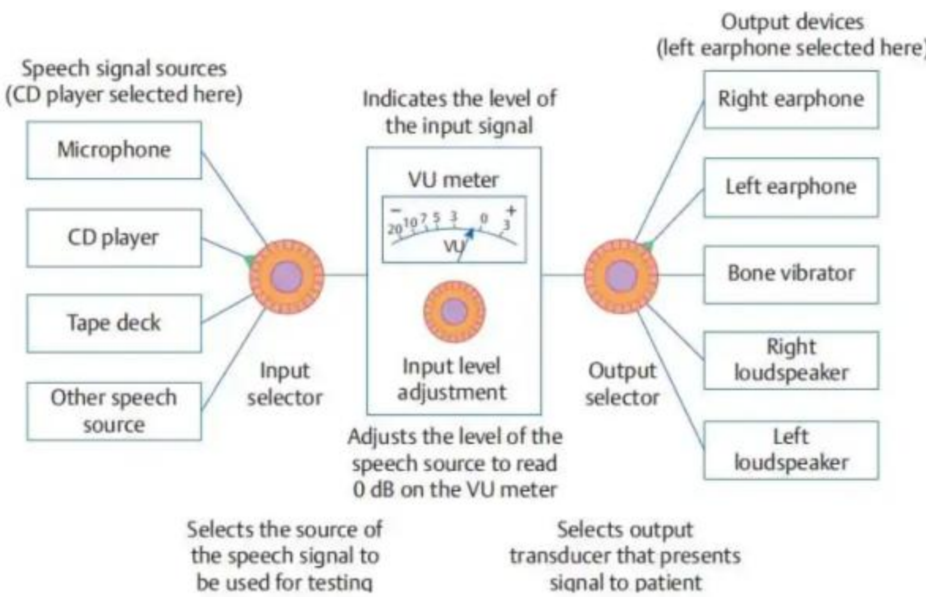
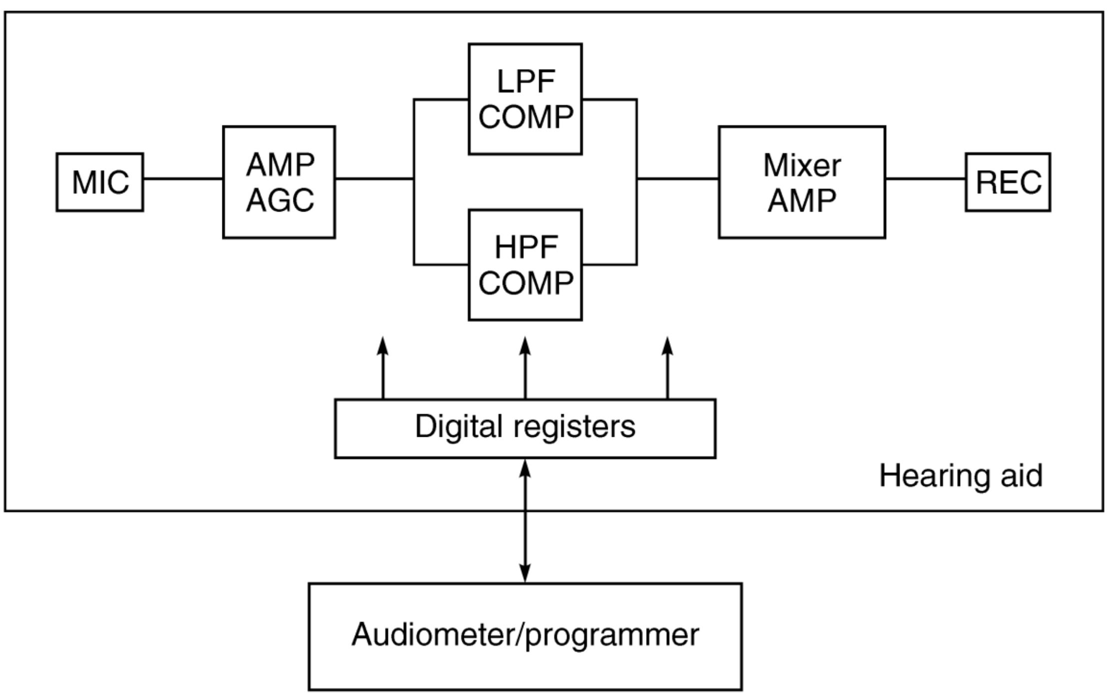


Fig. 8.1 Block diagram of the speech mode (channel) of a clinical audiometer. In this example the audiologist is using recorded speech from the CD player and is presenting that signal to the patient via the left earphone.

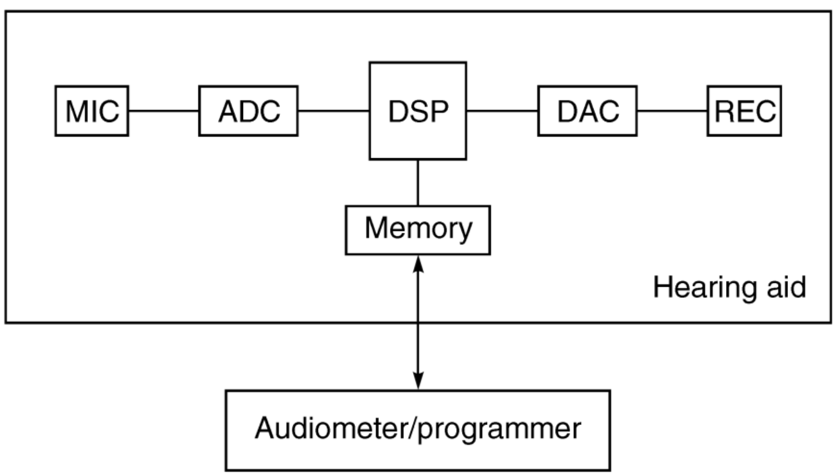
Q3 .Differentiate Conventional Hearing Aids from Digital Hearing Aids with suitable diagram

Modern hearing aids have evolved from single-transistor amplifiers to modern multi-channel designs containing hundreds and even thousands of transistors. A typical design is shown in Fig. 17.6. The basic functional parts include a microphone and associated preamplifier, an automatic gain control circuit (AGC), a set of active filters, a mixer and power amplifier, an output transducer or receiver. The total circuitry works on a battery. The use of multiple channels in this design provides different compression characteristics for different frequency ranges. Typically, the crossover frequencies of the channels and the compression characteristics can be adjusted with potentiometers. Most of the latest hearing aids are electronically programmable. The programmable parameters are downloaded from a computer-based system and stored in digital registers. The register outputs are used to switch resistor networks that control various analog circuitry. The active filters are adjusted to generally provide for low-frequency attenuation of up to 30–40 dB relative to the high-frequency response. This is because most hearing aid wearers require high frequency gain.



➤ **Fig.** 17.6 *Conventional analog type hearing aid*

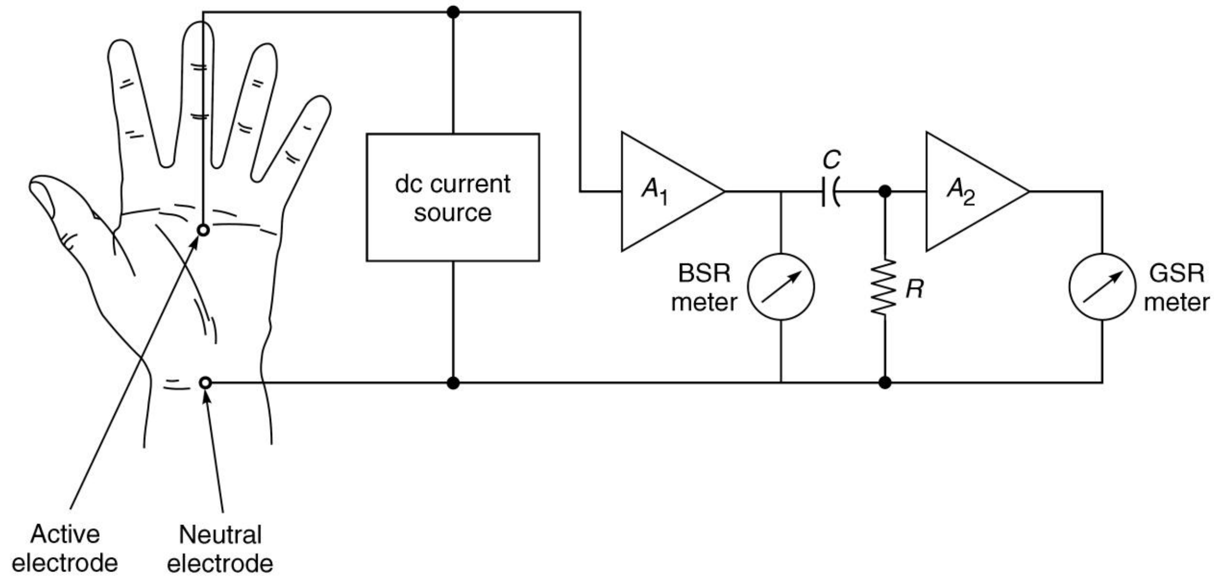
A typical digital hearing aid is illustrated in Fig.17.8. The major parts are the microphone, an analog-to-digital converter (ADC), the digital signal processor (DSP), the digital-to-analog converter (DAC), the receiver and a two port memory. Essentially, sound waves picked up by the microphone and transformed into electrical signals are converted into digital form by an A-D converter. A typical microphone will have an internal noise of 20 dB SPL (sound pressure level) when referred to the input and maximum undistorted output corresponding to a signal of about 90 dB SPL. Allowing some margin for peak performance, the total dynamic range required of the ADC is 80 dB. This requirement can be achieved with a 14 bit A–D converter. The DSP is a fixed (wired-program) digital processing device containing an array of adders, multipliers and registers which provide the fundamental operations necessary for implementing various digital algorithms. In a general-purpose DSP, considerable power is consumed in executing the programme instructions. Since power consumption is a major consideration in the design of hearing aids, the wired-program approach is followed. The DSP is associated with a two-port memory, which is used to store processing parameters that can be down loaded from the external programmer to the hearing aid while it is adjusted for the intended user.



DAC = Digital-to-analog converter
ADC = Analog-to-digital converter
MIC = Microphone
REC = Receiver
DSP = Digital signal processor

➤ **Fig. 17.8** ***Block dragram of a digital hearing aid (after Engebreston 1994)***

Q4.



➤ **Fig. 5.18** ***Block diagram for measurement and record of Basal Skin Resistance (BSR) and Galvanic Skin Response (GSR)***

Electrodermal activity is measured in two ways: BSR (basal skin response) and GSR (galvanic skin response) is a measure of the average activity of the sweat glands and is a measure of the phasic activity (the high and low points) of these glands. BSR gives the baseline value of the skin resistance where as GSR is due to the activity of the sweat glands. The GSR is measured most conveniently at the palms of the hand, where the body has the highest concentration of sweat glands. The measurement is made using a dc current source. Silver-silver electrodes are used to measure and record the BSR and GSR. Figure 5.18 shows the arrangement for measuring these parameters. The BSR output is connected to an RC network with a time constant of 3 to 5 seconds which enables the measurement of GSR as a change of the skin resistance.

Biofeedback instrumentation for the measurement of EMG, temperature and pulse/heart rate is not different from other instruments used for the measurement of physiological variables. Transducers and amplifiers are employed to measure the variable that is to be controlled by the feedback process. The magnitude of the measured variable or changes in the magnitude are converted into a suitable visual or auditory stimulus that is presented to the subject. Based on the stimulus, the subject learns to control the abnormal conditions. Reports have appeared in literature regarding applications of biofeedback to control migraine headaches, to slow down heart rate, etc. Biofeedback techniques have been greatly refined and computerized biofeedback training and psychological computer-assisted guidance programs in the privacy of one’s home are now a reality.

Q5 .Application and Uses of Ultrasound in Medicine

Here is a detailed breakdown of the use cases of ultrasound scanning in medicine:

Abdominal

- An ultrasound device is ideal for diagnosing the cause of any abdominal pain or discomfort. It can scan and identify problems with soft tissues in the abdomen that are not functioning correctly.

Nephrology

- Ultrasound scanning is the only technology applied to detect the presence of kidney stones. It can even detect the number and size of each stone in real time.
- A renal lithotriptor using ultrasonic waves can also break kidney stones. This process is known as lithotripsy. With lithotripsy, pulses of ultrasound break large kidney stones into smaller fragments. The smaller fragments can easily pass through the urinary tract.

Musculoskeletal

- Ultrasound examinations allow doctors to see the blood vessels, muscles, and joints inside the body. The images help investigate muscle pulls, tears, nerve problems, and ailments such as arthritis and osteoporosis.
- Ultrasound is used to treat soft tissue ailments, bursitis, collagen diseases, and soft tissue injuries. Decreasing pain and reducing soft-tissue stiffness results in a shorter healing time.

Cancer

- With the help of ultrasound elastography, medical professionals can detect tumors in patients that are not visible with other medical imaging technologies. Ultrasound-guided biopsies are normal.
- One of the extensive applications of ultrasonic waves is breast examinations and the study of breast cancer. Medical ultrasound imaging help detect the lumps in the breast and guide the needle in taking the sample of this lump for further analysis.
- Apart from ultrasound elastography, the ongoing development of using ultrasonic hyperthermia to treat cancer is also promising. Ultrasonic hyperthermia increases the temperature of the target area above a particular level. At this high temperature, halting the malignancy of cancer is expected.

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Urology

- Ultrasound exams are used to examine the urinary tract for any defects. It can also detect urinary tract infections and problems with voiding.
- Many dedicated types of equipment have been developed utilizing ultrasound technology. These are very successful in the treatment of Meniere's disease, which causes improper inner ear functioning and makes the patient feel vertigo.
- Conventional surgery has a high-risk factor of deafness when treating Meniere's disease. Ultrasound eliminates this risk, stops vertigo, and decreases the risk of facial nerve paralysis.

Gynecology

- An ultrasonography examination is used to study the female pelvic organs, mainly the ovaries, fallopian tubes, uterus, bladder, adnexa, and recto-uterine pouch.
- It can detect inflammation of the appendix (appendicitis). Ultrasonography can also detect endometriosis, ovarian cysts, lesions, and gynecological cancer.

Ophthalmology

- A phacoemulsifier is used for surgically treating cataracts in the eyes. This surgical instrument uses a needle vibrating at an ultrasonic frequency. The high energy released by the vibrations acts as an emulsifier for the dead lens. A phacoemulsifier also contains a suction chamber that removes the debris created in the process, providing a faster surgery time and recovery period.

Anesthesiology

- Critical Care Ultrasound is used while administering anesthesia to study the blood flow. Doctors use Transesophageal Echocardiography (TEE) to determine the depth of epidural space in patients with difficult anatomy.

Endocrine

- Using an ultrasonic beam to create 3D images can help identify abnormalities, such as thyroiditis, in thyroid and parathyroid glands. The 3D images show the dimensions of the glands to identify any swelling.

Gastroenterology

- In gastroenterology, an ultrasonic endoscope helps diagnose problems with the digestive tract and soft tissues and organs in proximity. Evaluating the digestive organs and diseases in them does not require incisions with this method, making it a minimally invasive procedure.

Obstetrics and Pregnancy

- Obstetrics is one of the most common applications. It is one of the primary reasons that many people are familiar with ultrasound imaging examinations.
- During pregnancy, fetal ultrasounds provide a high-quality two-dimensional image of the embryo or the fetus in real-time. Since X-rays are dangerous for the fetus, fetal ultrasounds offer a safer method to monitor a pregnancy.
- Within 18 to 22 weeks of gestation, fetal ultrasounds can detect any abnormalities in the growth or any other problems associated with the pregnancy.

- Many different types of obstetrics sonograms exist. Some common ones are 3D sonography which creates a 3D visual of the fetus, and Doppler ultrasounds which enable hearing a child's heartbeat.

Vascular

- Ultrasounds used for vascular patient examination help evaluate the direction of blood flow and the condition of the blood vessels. A cerebrovascular examination can measure blood flow velocity in the brain using a small sample volume.
- Carotid ultrasounds detect any arteries that are blocked or narrowed. This data helps in detecting the possibility of a stroke before any mishap.

Pulmonology

- The study of thoracic diseases uses pulmonary ultrasounds. In emergency departments, pulmonary ultrasounds also monitor respiratory diseases.
- Imaging lungs can be somewhat challenging because ultrasounds work on the passage of sound waves. In the case of the lungs, air pockets can alter the behavior of sound waves and hinder the formation of optimal imaging.

Cardiology

- Echocardiography uses standard or Doppler ultrasound to produce an image. The image is usually called an echocardiogram, echo, or cardiac echo.
- With a cardiac ultrasound, it is possible to diagnose any heart disease in a patient. Echocardiograms help monitor those already suffering from heart diseases.
- The information provided by a cardiac ultrasound is extensive, so much so that this is usually the sole imaging test required for an in-depth study of the patient's heart. It provides details about the size of the heart, its shape, any possible tissue damage with its location and size of the damage, pumping capacity, jet of blood flow, and a lot more.
- With a cardiac ultrasound, doctors can diagnose myocardial infarction early and see the regional wall motion abnormality. For patients with heart failure, it is one of the most essential tools used in the treatment.
- An echocardiogram can diagnose cardiomyopathy, dilated cardiomyopathy, and hypertrophic cardiomyopathy. Doctors also use echocardiography to identify if heart disease is the cause of chest pain in a patient.
- Technicians require training in echocardiography. Such technicians are called echo sonographers or cardiac physiologists.

Mammography

- X-rays used to screen for breast cancer in examinations of women is a process called mammography. However, the high radiation of X-rays causes a health concern for women, especially during pregnancy.
- Breast ultrasounds provide a better and safer way to examine breasts for unusual masses that could be cancerous. These are becoming the preferred method for such examinations.
- Biopsy of the breast is almost always ultrasonic-guided, guiding the probe to remove the portion of the soft tissue to examine.

Q6. Applanation tonometry

The intraocular pressure (IOP) of the eye is determined by the balance between the amount of aqueous humor that the eye makes and the ease with which it leaves the eye.

The Goldmann equation states:

$$Po = (F/C) + Pv$$

Po is the IOP in millimeters of mercury (mmHg), F is the rate of aqueous formation, C is the facility of outflow, and Pv is the episcleral venous pressure. [1]

Applanation tonometry is based on the Imbert-Fick principle, which states that the pressure inside an ideal, dry, thin-walled sphere equals the force necessary to flatten its surface divided by the area of flattening ($P = F/A$, where P = pressure, F = force and A = area). In applanation tonometry, the cornea is flattened, and the IOP is determined by varying the applanating force or the area flattened. [1]

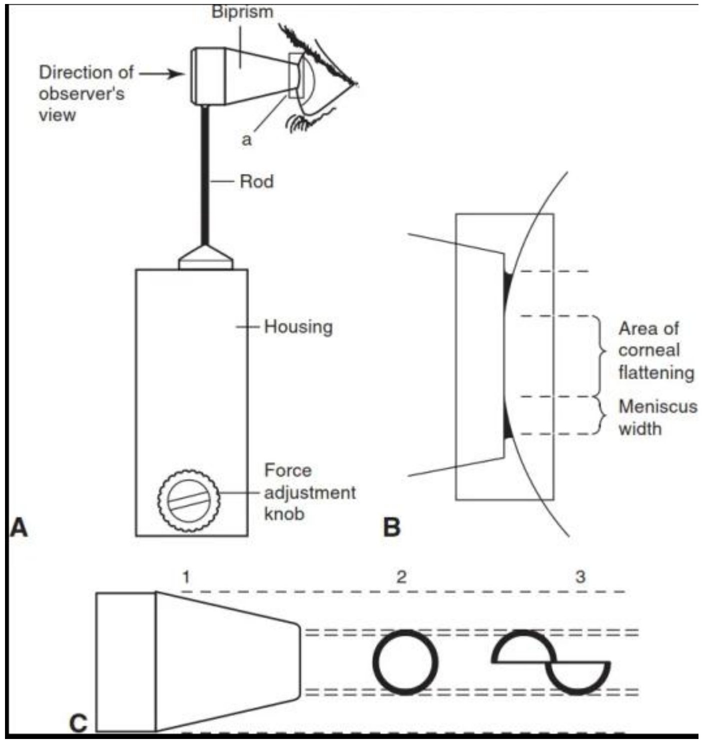
Goldmann applanation tonometry

The Goldmann applanation tonometer measures the force necessary to flatten a corneal area of 3.06mm diameter. At this diameter, the resistance of the cornea to flattening is counterbalanced by the capillary attraction of the tear film meniscus for the tonometer head. The IOP (in mm Hg) equals the flattening force (in grams) multiplied by 10. Fluorescein dye is placed on the patient's eye to highlight the tear film. A split-image prism is used to divide the image of the tear meniscus into a superior and an inferior arc. The intraocular pressure is taken when these arcs are aligned such that their inner margins just touch.

Applanation tonometry measurements are affected by the central corneal thickness (CCT). When Goldmann designed his tonometer, he estimated an average corneal thickness of 520 microns to cancel the opposing forces of surface tension and corneal rigidity to allow indentation. It is now known that a wide variation exists in corneal thickness among individuals. Thicker CCT may give an artificially high IOP measurement, whereas thinner CCT can give an artificially low reading.

Other errors that may affect the accuracy of readings from a Goldmann tonometer include excessive or insufficient fluorescein in the tear film affecting the thickness of the overlapping arcs, high astigmatism, irregular or scarred cornea, pressure from a finger on the eyelid while taking the measurement, and breath holding or Valsalva maneuver by the patient during measurement.

The Perkins tonometer is a portable Goldmann applanation tonometer that can be used with the patient in either the upright or supine positions



Goldmann applanation tonometer

Q7. Application Clinical thermography

Some of the common applications of Thermography are in:

- Breast pathologies
- Extra-Cranial Vessel Disease
- Neuro-Musculo-Skeletal
- Vertebrae (nerve problems/arthritis)
- Lower Extremity Vessel Disease

Breasts pathologies

Probably the most applied area of Medical Thermography - breast cancer, benign tumours, mastitis, and fibrocystic breast disease.

Thermography measures the heat coming from your body. Metastatic cancers create heat which can be imaged by digital infrared imaging. This is due to two separate yet connected factors.

The first is the metabolic activity of the tumour tissue as compared with the temperature of tissue adjacent to the tumour, and in the opposite breast. By comparing the breast in question with the normal breast which acts as the patients own control, abnormal heat signatures associated with the metabolism of the tumour can be detected easily. These differences in temperature are referred to as a Delta T.

The second method of detection is due to the angiogenesis of the tumour. i.e. Cancerous tumours produce a chemical which actually promotes the development of blood vessels supplying the area where the tumour resides. Also, normal blood vessels which are under the control of the sympathetic nervous system are essentially paralyzed, causing vaso-dilation, or an increase in size of the blood vessel. The increase in blood in the region due to angiogenesis and combined with the vaso-dilation simply means more heat, recordable with thermal imaging procedures.

As thermal imaging has been demonstrated in numerous studies to be capable of measuring these heat signatures years before conventional technologies can see a mass, and as the procedure uses no radiation, compression of breast tissue and as it is totally safe, thermography or DITI provides for a safe early warning detection system.

Extra-Cranial Vessel Disease

In a similar way, a variety of conditions which relate to flow of blood through the vessels of the neck and head are readily accessed with thermal imaging. As the blood vessels in the face and skull are coursing through very thin tissue between the bones of the skull and the skin covering the skull, they are readily and easily visualized with thermal imaging.

As the vessels of the neck are very large calibre vessels, they too are very easily visualized with thermography and clues to the potential of developing vascular disease which might lead to stroke are a consideration when performing thermography.

The use of thermography in differentiation of various types of headache (migraine, cluster, cervical spine related), facial nerve injury as in the case of a blow to the face or a car accident where the face contacts a windshield or the steering wheel, the visualization of TMJ disorders (tempero-mandibular joint) are commonly used aspects of thermographic diagnosis and analysis of the head and neck.

The ability of thermal imaging to safely indicate the heat from sources in the jaw and teeth is providing a very exciting opportunity to screen individuals for dental decay and cavitations without routine screening x-rays. Also, a number of patients have been seen with heat signatures in the jaw related to amalgam fillings which might be toxic for that particular patient. This area of thermal imaging is very promising.

Neuro-Musculo-Skeletal

This is one of the clearest examples of thermography's ability to accurately diagnose patients with a host of back, neck and extremity disorders. In fact, it was the use of thermography by chiropractors, neurologists and orthopaedists in the late 70's to the late 80's in spinal injury cases from car accidents and work injuries, which really launched the clinical interest in this diagnostic tool.

When muscle tissue is strained or torn, it releases chemicals which cause increased heat. This can be seen as intense patterns of hyperthermia in the region of the muscle, or trigger point, as in the case of fibromyalgia. Heat patterns can also be seen in the legs and soles of the feet which indicate altered gait or weight bearing mechanics, which might relate to a low back or foot condition.

Further, back strain produces very consistent heat patterns which not only tell us about the source of probable spinal injuries, but can also tell us about areas of spinal compensation, In effect, a low back might be being treated by a chiropractor, when the mid back or neck is actually the source of the problem.

Nerve damage, as occurs in disc herniation and spinal nerve root compression displays on the thermographic map in exactly the opposite direction as muscle injury by revealing cool areas of hypothermia in the nerve tracts coming from the spine. In this way, thermography can demonstrate and document permanency of spinal injuries which are causing a person disability. This documentary, not diagnostic aspect of thermography has been used for many years in the trial courts to prove injury and assist in the rating of permanent impairment.

Lower Extremity Vessel Disease

The ability of thermography to detect the presence of deep vein thrombosis and other circulatory disorders of the lower extremities is a very exciting application of this procedure as it allows us to painlessly and safely detect possible disease that if unchecked, could cause the loss of a limb, or in some cases add to the possibility of stroke.

Another aspect of thermal imaging which has gone largely unnoticed is in developing diabetic neuropathies of the feet, before the foot becomes insensate.

For example we often see individuals who have extremely cold feet thermographically, although they have no other symptoms.

The feet demonstrate thermographically as 1-2 degrees centigrade colder than the lower leg, and usually the toes are not visible to the camera as they have become so hypothermic. This can occur several years before routine blood tests indicate diabetes, and as such, can give the patient time to treat the condition before permanent nerve damage occurs to the foot.

Respiratory dysfunctions

Infrared Thermography was applied during the last epidemic of atypical pneumonia (SARS) at airports and is useful for monitoring asthma, allergies, bronchitis, influenza etc.

Digestive disorders

Infrared Thermography has demonstrated excellent results in helping in the diagnosis of urgent gastrointestinal pathology, especially appendicitis, irritable bowel syndrome (IBS), colitis, ulcerative colitis and hyper and hypo gastric secretions.

Urinary diseases

infrared Thermography helps to save patient's and doctor's time in waiting for laboratory data and is successfully used to monitor Urinary tract infections, kidney pathology etc.

Cardiovascular and circulatory disorders

Infrared Thermography is periodically applied for differential diagnostics and is useful in preventing heart disease and serious circulatory problems such as varicose veins. Specific valvular points can be located for surgical purposes as well as treatment suggestions.

Lymphatic dysfunctions

Infrared Thermography tests therapy effectiveness in severe cases of lymphoma, leukaemia and reliable to monitor lymphatic involvement in breast cancer patients.

Reproductive disorders

Infrared Thermography has its own specific application in gynaecological problems, uterus, prostate and polycystic ovaries, endometriosis and fibroids.

Nervous dysfunctions

Infrared Thermography analyses the brain, spinal cord and nerves, gives doctor a reliable and safe method of problem location and for monitoring improvements.

Endocrine Disorders

Infrared Thermography helps to evaluate hormonal changes, thyroid disorders such as hypo and hyperthyroidism, and diabetes

Locomotors Disorders

Infrared Thermography helps in the clinical evaluation and detection of serious and difficult disorders such as musculo-skeletal syndromes, neuropathy, neurovascular compression, nerve injury, soft tissue injury, arthritis, carpel tunnel syndrome, myofascial syndromes, inflammatory pain, and disk injury.

Surgical Assistance

Surgeries can be assisted safely before and after using Medical Thermography- helps to locate tumours size and locates surgical area and monitors the healing process after surgery.

Skin Problems

Infrared thermography gives a more precise level of information - skin tumours and skin cancers, and wound healing.

Ear, Nose, and Throat dysfunction

Infrared thermography can assist in identifying areas with disorders when radiation should not be used such as tonsillitis, swelling of the lymphatic glands, rhinitis, teething problems, sinusitis, and otitis.

Dentistry

Dentists recommend the use of Medical Thermography in monitoring control in the inflammation process into oral cavity and reaction of the regional lymphatic nodes, maxillary joint disease and other chronic diseases of the bones, nerves, located in the maxilla facial area. Medical Thermography can also measure temperature changes in the application of new methods and dental materials applied by dentists.