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15-12-22

Circular

The Department of physics initiate a Certificate Course on "Physics for Novel Diagnostics & Therapeutics" During the Academic year 2022-2023. The Course is for about 45 days. Interested candidates can join this course.

After completion of this course the will be given a certificate of their proficiency in the "Novel Diagnostics & Therapeutics.

Hence interested candidates are advised to meet Sri K. Srinivasa Rao or Sri J. Visweswara Rao in this regards the registration fee for each candidate is 50 Rupees.

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1.1. The discovery of X-Rays

As with many of mankind's monumental discoveries, X-ray technology was invented completely by accident. In 1895, a German physicist named Wilhelm Roentgen made the discovery while experimenting with electron beams in a gas discharge tube.

Roentgen noticed that a fluorescent screen in his lab started to glow when the electron beam was turned on. This response in itself wasn't so surprising -- fluorescent material normally glows in reaction to electromagnetic radiation -- but Roentgen's tube was surrounded by heavy black cardboard. Roentgen assumed this would have blocked most of the radiation.

Roentgen placed various objects between the tube and the screen, and the screen still glowed. Finally, he put his hand in front of the tube, and saw the silhouette of his bones projected onto the fluorescent screen. Immediately after discovering X-rays themselves, he had discovered their most beneficial application.

Roentgen's remarkable discovery precipitated one of the most important medical advancements in human history. X-ray technology lets doctors see straight through human tissue to examine broken bones, cavities and swallowed objects with extraordinary ease. Modified X-ray procedures can be used to examine softer tissue, such as the lungs, blood vessels or the intestines.

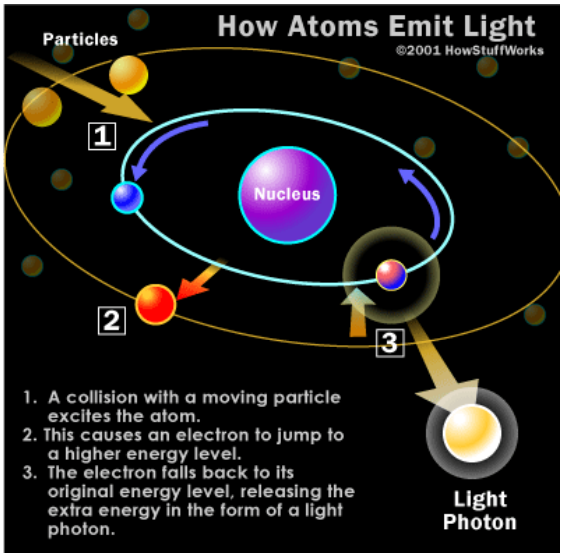
1.2. Introduction about X-Rays

X-rays are basically the same thing as visible light rays. Both are wavelike forms of electromagnetic energy carried by particles called photons. The difference between X-rays and visible light rays is the energy level of the individual photons. This is also expressed as the wavelength of the rays.

Our eyes are sensitive to the particular wavelength of visible light, but not to the shorter wavelength of higher energy X-ray waves or the longer wavelength of the lower energy radio waves.

Visible light photons and X-ray photons are both produced by the movement of electrons in atoms. Electrons occupy different energy levels, or orbitals, around an atom's nucleus. When an electron drops to a lower orbital, it needs to release some energy -- it releases the extra energy in the form of a photon. The energy level of the photon depends on how far the electron dropped between orbitals.

When a photon collides with another atom, the atom may absorb the photon's energy by boosting an electron to a higher level. For this to happen, the energy level of the photon has to match the energy difference between the two electron positions. If not, the photon can't shift electrons between orbitals.



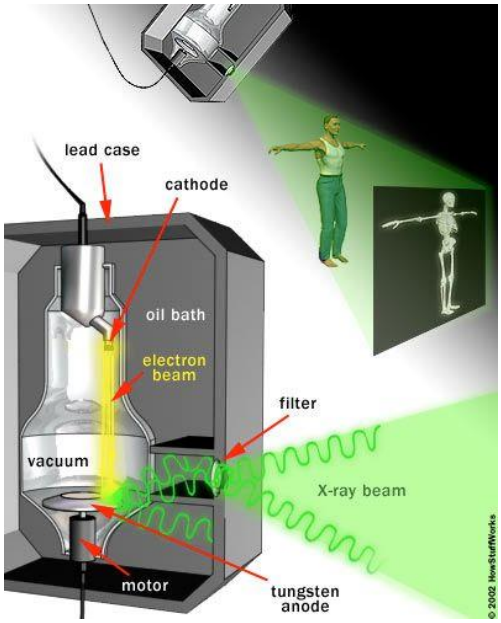
The atoms that make up your body tissue absorb visible light photons very well. The energy level of the photon fits with various energy differences between electron positions. Radio waves don't have enough energy to move electrons between orbitals in larger atoms, so they pass through most stuff. X-ray photons also pass through most things, but for the opposite reason: They have too much energy.

They can, however, knock an electron away from an atom altogether. Some of the energy from the X-ray photon works to separate the electron from the atom, and the rest sends the electron flying through space. A larger atom is more likely to absorb an X-ray photon in this way, because larger atoms have greater energy differences between orbitals -- the energy level more closely matches the energy of the photon. Smaller atoms, where the electron orbitals are separated by relatively low jumps in energy, are less likely to absorb X-ray photons.

The soft tissue in your body is composed of smaller atoms, and so does not absorb X-ray photons particularly well. The calcium atoms that make up your bones are much larger, so they are better at absorbing X-ray photons.

1.3. Working X-ray machine

The heart of an X-ray machine is an electrode pair -- a cathode and an anode -- that sits inside a glass vacuum tube. The cathode is a heated filament, like you might find in an older fluorescent. The machine passes current through the filament, heating it up. The heat sputters electrons off of the filament surface. The positively-charged anode, a flat disc made of tungsten, draws the electrons across the tube.



The voltage difference between the cathode and anode is extremely high, so the electrons fly through the tube with a great deal of force. When a speeding electron collides with a tungsten atom, it knocks loose an electron in one of the atom's lower orbitals. An electron in a higher orbital immediately falls to the lower energy level, releasing its extra energy in the form of a photon. It's a big drop, so the photon has a high energy level -- it is an X-ray photon.

Free electrons can also generate photons without hitting an atom. An atom's nucleus may attract a speeding electron just enough to alter its course. Like a comet whipping around the sun, the electron slows down and changes direction as it speeds past the atom. This "braking" action causes the electron to emit excess energy in the form of an X-ray photon.

The high-impact collisions involved in X-ray production generate a lot of heat. A motor rotates the anode to keep it from melting (the electron beam isn't always focused on the same area). A cool oil bath surrounding the envelope also absorbs heat.

The entire mechanism is surrounded by a thick lead shield. This keeps the X-rays from escaping in all directions. A small window in the shield lets some of the X-ray photons escape in a narrow beam. The beam passes through a series of filters on its way to the patient.

A camera on the other side of the patient records the pattern of X-ray light that passes all the way through the patient's body. The X-ray camera uses the same film technology as an ordinary camera but X-ray light sets off the chemical reaction instead of visible light.

1.4. Diagnosis with X-Rays

X-rays can help doctors diagnose things like:

- Broken bones

- Dislocated joints
- Arthritis
- Abdominal pain, in some instances
- Cancer
- Tooth decay

Doctors can also use X-rays to find an object that a child or adult swallowed. An X-ray can be used to check your lungs for signs of pneumonia or tuberculosis, to figure out why you have shortness of breath, or to see if you have heart failure.

Other ways doctors use specific X-ray procedures include:

- Mammography: This is an exam that puts your breast between a support plate and a second plate called a paddle, then a series of X-rays are taken. Doctors look closely at the images for signs of cancer or other issues.
- Computed tomography (CT) scan: A computer puts together a series of X-rays, taken from different angles, to make a 3D image and give your doctor a more detailed picture.
- Fluoroscopy: Sometimes called an "X-ray movie," this procedure shoots a continuous X-ray through a part of your body so doctors can see that part and how it moves. It's most commonly done to look at bones, muscles, joints, and organs like your heart, kidneys, and lungs.

1.5. The Process of X-Ray scanning

X-rays don't require any special preparation. The doctor may ask you to take off jewelry, eyeglasses, or any metal objects or clothing that could get in the way of the image. Doctors can take images while you stand up or lie down. It depends on the area of your body being examined. The X-ray tube hangs over the table. The film is in a drawer under the table.

The machine sends a beam of radiation through your body. Your hard, dense bones block that beam, so they show up as white on the film below you. The radiation also goes through softer tissue like muscle and fat, which appear in shades of gray in the X-ray. The air in your lungs will look black in the image.

You won't feel anything during an X-ray, but it can be hard to hold still, and the exam table might be uncomfortable. The technician may take images from a few different angles. They might use pillows or sandbags to prop up a body part to get a better view of the area. They'll probably ask you to hold your breath so the image doesn't blur.

Sometimes, the doctor needs more contrast on the image to clearly see what's going on. They might give you a contrast agent, like barium or iodine. You'll either swallow it or get it as a shot.

The machine makes clicks and buzzing sounds during the X-ray. The process could take just a few minutes for a bone X-ray or more than an hour for more complicated issues.

1.6. X-Ray Results

A radiologist will look at your X-rays. A radiologist is a medical doctor who is specially trained in reading and understanding the results of imaging scans like X-rays.

X-ray images are digital, so a radiologist can see them on a screen within minutes in an emergency. For non-emergencies, it may take a day or so for them to review the X-ray and get back to you with the results.

1.7. X-Ray Risks

X-rays are one of the oldest and most common forms of medical imaging. Doctors say the benefit of making the correct diagnosis outweighs the risks. Still, there are a few safety issues to consider.

1. Slight cancer risk. Too much radiation exposure can cause cancer, but the amount in an X-ray is generally low. Adults are less sensitive to radiation than children.
2. Kids and X-rays. If your child needs an X-ray, the technician may restrain them to make sure they stay still. This will prevent the need for repeated tries. It won't hurt them. If you stay in the room with them, you'll get a lead apron to wear to prevent radiation exposure.
3. Pregnancy. Tell your doctor if you're pregnant or think you might be. They may use a different imaging test so your baby isn't exposed to radiation.
4. Reaction to contrast agent. There's a chance you could have an allergic reaction, but it's rare. Ask your doctor what symptoms to watch for. Let them know if you have pain, swelling, or redness at the site of the shot.

Chapter2. CT (Computed Tomography) Scan

- 2.1. Introduction about CT Scan
- 2.2. Working of CT Scan
- 2.3. Process of CT Scanning
- 2.4. Uses of CT Scan
- 2.5. CT Scan with Contrast
- 2.6. Risks & Side Effects of CT Scan

2.1. Introduction about CT scan

A computed tomography (CT or CAT) scan allows doctors to see inside your body. It uses a combination of X-rays and a computer to create pictures of your organs, bones, and other tissues. It shows more detail than a regular X-ray.You can get a CT scan on any part of your body. The procedure doesn't take very long, and it's painless.

2.2. Working of CT scan

They use a narrow X-ray beam that circles around one part of your body. This provides a series of images from many different angles. A computer uses this information to create a cross-sectional picture. Like one piece in a loaf of bread, this two-dimensional (2D) scan shows a “slice” of the inside of your body.

This process is repeated to produce a number of slices. The computer stacks these scans one on top of the other to create a detailed image of your organs, bones, or blood vessels. For example, a surgeon may use this type of scan to look at all sides of a tumor to prepare for an operation.

2.3. Process of CT Scanning

You'd probably get a scan at a hospital or radiology clinic. Your doctor might tell you not to eat or drink for a few hours before the procedure. You may also need to wear a hospital gown and remove any metal objects, such as jewelry.

A radiology technologist will perform the CT scan. During the test, you’ll lie on a table inside a large, doughnut-shaped CT machine. As the table slowly moves through the scanner, the X-rays rotate around your body. It’s normal to hear a whirring or buzzing noise. Movement can blur the image, so you’ll be asked to stay very still. You may need to hold your breath at times.

How long the scan takes will depend on what parts of your body are being scanned. It can take anywhere from a few minutes to a half-hour. In most cases, you'll go home the same day.

2.4. Uses of CT Scan

Doctors order CT scans for a long list of reasons:

- CT scans can detect bone and joint problems, like complex bone fractures and tumors.
- If you have a condition like cancer, heart disease, emphysema, or liver masses, CT scans can spot it or help doctors see any changes.
- They show internal injuries and bleeding, such as those caused by a car accident.
- They can help locate a tumor, blood clot, excess fluid, or infection.
- Doctors use them to guide treatment plans and procedures, such as biopsies, surgeries, and radiation therapy.
- Doctors can compare CT scans to find out if certain treatments are working. For example, scans of a tumor over time can show whether it's responding to chemotherapy or radiation.

2.5. CT Scan with Contrast

In a CT scan, dense substances like bones are easy to see. But soft tissues don't show up as well. They may look faint in the image. To help them appear clearly, you may need a special dye called a contrast material. They block the X-rays and appear white on the scan, highlighting blood vessels, organs, or other structures.

Contrast materials are usually made of iodine or barium sulfate. You might receive these drugs in one or more of three ways:

- **Injection**: The drugs are injected directly into a vein. This is done to help your blood vessels, urinary tract, liver, or gallbladder stand out in the image.
- **Orally**: Drinking a liquid with the contrast material can enhance scans of your digestive tract, the pathway of food through your body.
- **Enema**: If your intestines are being scanned, the contrast material can be inserted in your rectum.

After the CT scan, you'll need to drink plenty of fluids to help your kidneys remove the contrast material from your body.

2.6. Risks & Side Effects of CT scan

CT scans use X-rays, which produce ionizing radiation. Research shows that this kind of radiation may damage your DNA and lead to cancer. But the risk is still very small -- your chances of developing a fatal cancer because of a CT scan are about 1 in 2,000.

But radiation's effect adds up over your lifetime. So your risk increases with every CT scan you get. Talk to your doctor about the procedure's potential dangers and benefits, and ask why the CT scan is necessary.

Ionizing radiation may be more harmful in children. That's because they're still growing. They also have more years to get exposed to radiation. Before the procedure, you may want to ask the doctor or technician if the CT machine's settings have been adjusted for a child.

Tell your physician if you're pregnant. If you need imaging for your stomach area, your doctor may recommend an exam that doesn't use radiation, such as an ultrasound.

Side Effects:

Some people are allergic to the contrast materials. Most of the time, the reaction is mild. It can lead to itchiness or a rash. In very few cases, the dye may trigger a life-threatening reaction. For this reason, your health care provider may want to monitor you for a short period after your CT scan. Tell your doctor about any allergies you have to medications, seafood, or iodine.

Your doctor should know, too, if you have diabetes and are taking the drug metformin. They'll let you know if you should stop taking your medication before or after your procedure.

Although it's rare, contrast materials can lead to kidney problems. Let your doctor know if you have any kidney issues before the CT scan.

Chapter 3.Magnetic resonance imaging (MRI) scan

3.1. Introduction about MRI (magnetic resonance imaging)

3.2. Working of MRI

3.3.The Process of MRI scan

3.4. Image information of MRI scan

3.5. preparation before taking an MRI scan

3.6. The possible side-effects of an MRI scan

3.7. MRI scan Vs CT scan

3.1. Introduction about MRI (magnetic resonance imaging

An MRI or magnetic resonance imaging is a radiology techinque scan that uses magnetism, radio waves, and a computer to produce images of body structures. The MRI scanner is a tube surrounded by a giant circular magnet. The patient is placed on a moveable bed that is inserted into the magnet. The magnet creates a strong magnetic field that aligns the protons of hydrogen atoms, which are then exposed to a beam of radio waves. This spins the various protons of the body, and they produce a faint signal that is detected by the receiver portion of the MRI scanner. A computer processes the receiver information, which produces an image.

MRI image and resolution is quite detailed, and it can detect tiny changes of structures within the body. For some procedures, contrast agents, such as gadolinium, are used to increase the accuracy of the images.

3.2. Working of MRI

Your body contains millions of hydrogen atoms. When you are in an MRI scanner:

- A strong magnetic field aligns particles called protons which are within the hydrogen atoms. All the protons line up in parallel to the magnetic field, like tiny magnets. (Normally the millions of protons all lie in random directions.)
- Then short bursts of radio waves are sent from the scanner into your body. The radio waves knock the protons from their position.
- When the burst of radio waves stop, the protons realign back into place. As they do so they emit radio signals. The protons in different tissues of the body realign at different speeds. Therefore, the signal emitted from different body tissues varies. So, for example, softer tissues can be distinguished from harder tissues on the basis of the signals sent.
- These signals are detected by a receiving device in the scanner.
- The receiving device transmits the signals to a computer. The computer creates a picture based on the radio signals emitted from the body.

3.3. The Process of MRI scan

The MRI scanner is like a tunnel about 1.5 metres long, surrounded by a large circular magnet. You lie on a couch which then slides into the scanner. A 'receiving device', like an aerial, is placed behind, or around, the part of the body being examined. This detects the tiny radio signals emitted from your body. When each 'picture' is being taken you need to keep still for a few minutes, otherwise the scan picture may be blurred.

The scan itself is painless. The whole procedure can take 15-40 minutes. It may be a little uncomfortable lying still on the couch for this time. Small children may need a general anesthetic to keep them still long enough for the pictures to be taken. Where you lie is quite enclosed and some people may find this very unsettling.

If you have a fear of confined spaces (claustrophobia) you should discuss this with your doctor before you go for the scan. Some parts of the country have access to 'open' scan machines. However, they are not widely available.

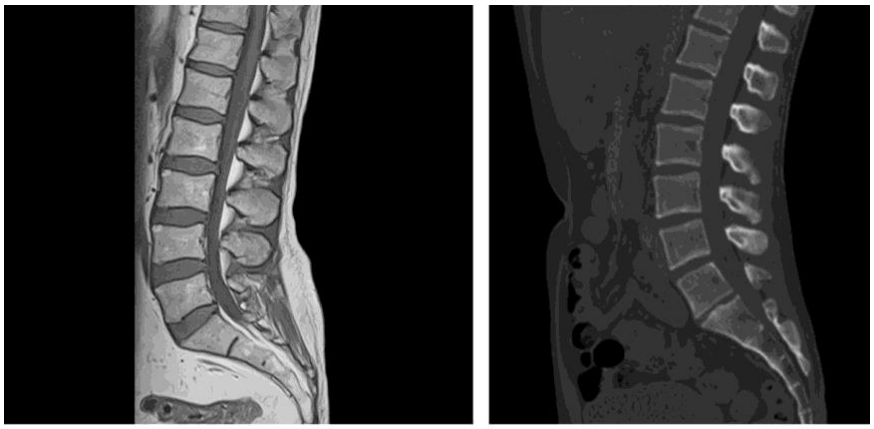
In some cases, an injection of a special contrast dye is given into the bloodstream via a vein on the arm. This helps to give clearer pictures of certain tissues or organs being examined. The radiographer sits in the control room next to the scanner and observes through the window. However, you can talk to them, usually via an intercom, and you will be observed at all times on a monitor.

The scanner is noisy so you will be given some headphones or earplugs to protect your ears from the noise. Quite often you can listen to the radio through the headphones or bring a CD to listen to.

3.4. Image information of MRI scan

An MRI scan can create clear pictures of most parts of the body. So, it is useful for all sorts of reasons where other tests (such as X-rays) do not give enough information required.

It is commonly used to obtain detailed pictures of the brain and spinal cord, to detect abnormalities and tumours. Even torn ligaments around joints can be detected by an MRI scan. So it is being used more and more following sports injuries.



MRI Scan Image CT Scan Image

3.5. preparation before taking an MRI scan

Usually very little. Your local hospital should give you information about what is required before you come for the scan**.** The MRI scanner uses an extremely strong magnet, so people with certain types of medical implant cannot be scanned. This is because the magnet can potentially move medical devices with metal in them, or affect their function.

Therefore, before you enter the scanning area you should be asked if you have any medical devices in your body. You may have to fill in a safety questionnaire that asks about things that may contain metal.

The following is not a definitive list but may help to remind you of the type of things radiographers need to know about:

- Internal (implanted) defibrillator or pacemaker.
- Ear (cochlear) implant.
- Surgical clips such as those used on brain aneurysms.
- Artificial heart valves.
- Implanted medicine infusion ports.
- Artificial limbs or metallic joints.
- Implanted nerve stimulators.
- Pins, screws, plates, stents or surgical staples.

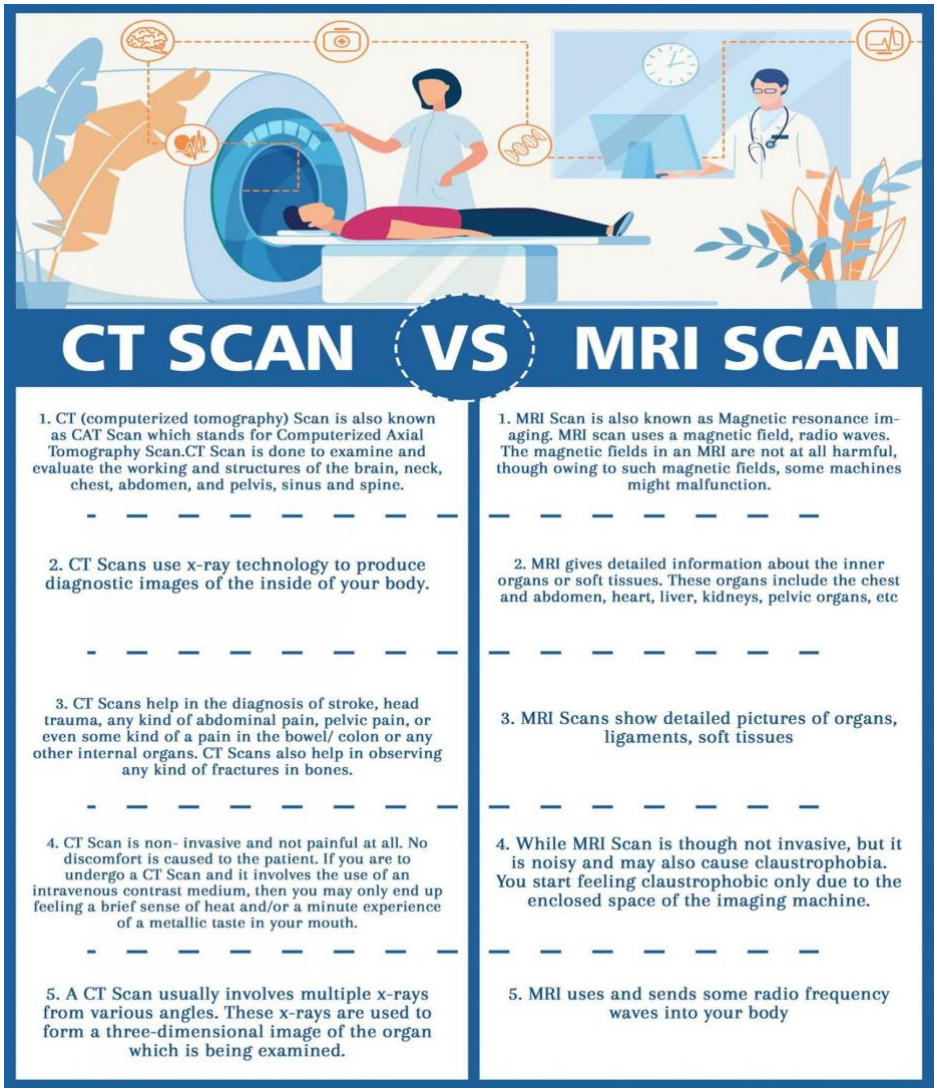
It is also important to tell the radiographer if you have ever had any metal fragments lodged in your eyes or your body. In some cases, you may need an X-ray before an MRI scan, to make sure you are safe to enter the scanner.

3.6. The possible side-effects of an MRI scan

MRI scans are painless and thought to be safe. MRI scans do not use X-rays so the possible concerns associated with X-ray pictures and CT scans (which use X-rays) are not associated with MRI scans. However:

- Rarely, some people have reactions to the contrast dye which is sometimes used.
- Pregnant women are usually advised not to have an MRI scan unless it is urgent. Although the scan is thought to be safe, the long-term effects of strong magnetic fields on a developing baby are not yet known.

3.7. MRI scan Vs CT scan



Chapter 4. Positron Emission Tomography (PET) Scan

4.1. Introduction about PET scan

4.2. working of PET scan

4.3. Preparation before taking a PET scan

4.4. Risks of a PET scan

4.5. PET scan is different from a CT or MRI scan

4.1. Introduction about PET scan

A positron emission tomography (PET) scan produces images of your organs and tissues at work. The test uses a safe injectable radioactive chemical called a radiotracer and a device called a PET scanner. The scanner detects diseased cells that absorb large amounts of the radiotracer, which indicates a potential health problem.

Your healthcare provider may order a PET scan to check for signs of:

- Cancer, including breast cancer, lung cancer and thyroid cancer.
- Coronary artery disease, heart attack or other heart problems.
- Brain disorders, such as brain tumors, epilepsy, dementia and Alzheimer's disease.

A PET scan can:

- Measure vital functions, such as blood flow, oxygen use and blood sugar (glucose) metabolism.
- Identify organs and tissues that aren't working as they should.
- Detect cancerous tumor cells to help gauge cancer spread (metastasis).
- Evaluate how well a treatment plan is working and help your healthcare provider adjust treatment, if needed.

4.2. working of PET scan

In a PET scan, a machine detects the radiation that a radiotracer emits. A radiotracer consists of radioactive material tagged to a natural chemical, such as glucose.

The radiologist injects this radiotracer into the person's body, where it travels to cells that use glucose for energy. The more energy a group of cells needs, the more the radiotracer will build up in that location. This will show up on images that a computer reconstructs.

The cells, or activity, will show up as "hot spots" or "cold spots." Active areas are bright on a PET scan. They are known as "hot spots." Where cells need less energy, the areas will be less bright. These are "cold spots."

Compared with healthy cells, cancer cells are very active in using glucose, so a radiotracer made with glucose will light up areas of cancer. The radiologist will examine the image that the computer produces and report the findings to a doctor.

The entire PET scan process takes about two hours. It can take up to 60 minutes for your body to absorb the injected radiotracer. During this time, you'll need to sit quietly and limit your movements. The actual PET scan takes about 45 minutes. After the test, you'll need to wait while the technologist reviews the scans to ensure the images are clear.

4.3. Preparation before taking PET Scan

PET scans are an outpatient procedure, which means you go home the same day. Your healthcare provider will give you detailed instructions on how to prepare for the scan. In general, you should:

- Make sure your provider has a current list of all medications and supplements you take.
- Alert your provider if you think you could be pregnant.
- Not eat anything for six hours before the test. Your healthcare provider may change this direction if you have diabetes.
- Drink only water.
- Avoid caffeine for 24 hours before the test if you're being tested for a heart problem.
- Wear comfortable clothes.

The following steps occur during a PET scan:

- You receive an IV injection of a radiotracer that contains a safe amount of a radioactive drug. The most commonly used radiotracer is fluorodeoxyglucose (FDG).
- You sit in a chair for about an hour while the radiotracer moves through your bloodstream. Too much activity can send the radiotracer to areas of your body that your healthcare provider isn't testing. You won't be able to feel the radiotracer.
- In approximately one hour, your organs and tissues absorb the radiotracer.
- If you are getting a PET/CT scan, you may also get an IV injection of a contrast dye. This dye helps produce sharper CT images.
- You lie on an exam table that slides in and out of the PET/CT scanner. This scanner is shaped like a doughnut. The doughnut or tunnel opening is about 30 inches in diameter.
- During the scan, you must remain still. Movement can blur the images.
- You'll hear buzzing and clicking sounds as the scanner takes images.
- Tell your healthcare provider if being in an enclosed space makes you anxious. You may be able to take a mild sedative to help you relax during the procedure.
- A technologist will review the scans before you leave to ensure the images are in focus.

4.4. Risks of PET Scan

The amount of radiation in the radioactive tracer is very low. It doesn't stay in your body for long. You should drink lots of water after a PET scan to help flush the radioactive drug from your body. In general, PET scans are safe and rarely cause problems. Exceptions include:

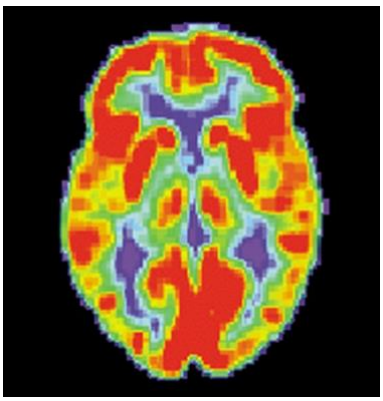
- Women who are pregnant or breast feeding should not get PET scans. The radiation may be harmful to an unborn baby and can pass to an infant in breast milk.
- Some people have an allergic reaction to PET scan radioactive tracers or CT scan contrast dyes. Your medical team can give you medication to quickly slow and stop this response.
- People with diabetes may not absorb the sugar in the radiotracer, which can affect scan results. Your healthcare provider will offer suggestions to modify your diet and medications before the test.

4.5. PET scan different from a CT or MRI scan

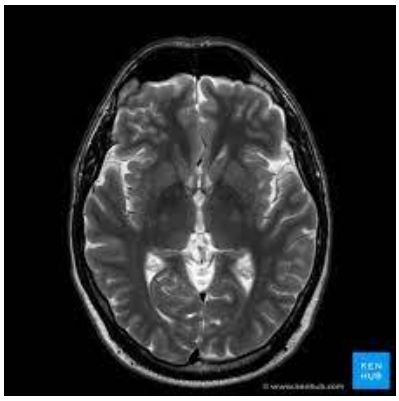
Computed tomography (CT) scans use X-rays. Magnetic resonance imaging (MRI) scans use magnets and radio waves. Both produce still images of organs and body structures.

PET scans use a radioactive tracer to show how an organ is functioning in real time. PET scan images can detect cellular changes in organs and tissues earlier than CT and MRI scans. Your healthcare provider may perform a PET scan and CT scan at the same time (PET-CT). This combination test produces 3D images that allow for a more accurate diagnosis.

Some hospitals now use a hybrid PET/MRI scan. This new technology creates extremely high-contrast images and can primarily be used for diagnosing and monitoring cancers of the soft tissues (brain, head and neck, liver and pelvis).



PET Scan of brain



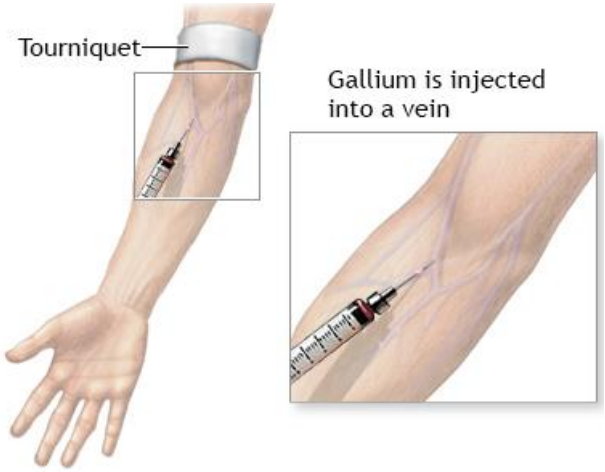
MRI Scan of brain

Chapter 5. Gallium Scan

- 5.1. Introduction about gallium scan
- 5.2. Working of the gallium scan
- 5.3. Preparation before taking a gallium scan
- 5.4. Procedure for testing by the gallium scan
- 5.5. The risks of a gallium scan

5.1. Introduction about gallium scan

A gallium scan is a nuclear medicine test. It can find cancer, infection and inflammation in the body.During a gallium scan, a healthcare provider injects a small amount of radioactive material into your bloodstream. Then a special camera takes pictures of the gallium inside your body.



A gallium scan can help diagnose:

- Cancer, such as Hodgkin lymphoma.
- Infection, such as an abscess (collection of pus) or osteomyelitis (bone infection).
- Inflammatory conditions (for example, pulmonary fibrosis or sarcoidosis).

The test is often used when a person has a fever for an unknown reason. It also frequently looks for remaining cancer cells after a person has had treatment. A gallium test isn't dangerous. It uses a minimal amount of radiation, often the same amount as a few X-rays.

5.2. Working of the gallium scan

When gallium is injected into your body, it attaches to proteins in your blood. Then it travels through your body and gathers in places where there is inflammation or infection. It takes a couple of days for the gallium to circulate and settle.

Gallium sends out radioactive gamma rays, which a gamma camera can detect. A gamma camera takes pictures and sends them to a computer. The computer images show different colors (for example, red may mean a lot or gallium and blue may mean none). Then a radiologist can examine the images to find problems.

5.3. Preparation before taking a gallium scan

A gallium test usually doesn't require any special preparation, but your healthcare provider will give you instructions if needed. Tell your healthcare provider if you're pregnant or might be pregnant before having a gallium scan. Exposure to radiation can hurt an unborn baby. Also, tell your healthcare provider if you're breastfeeding. You may have to use formula until the gallium is out of your body.Your healthcare provider may ask you to take a laxative before the test. It will make you go to the bathroom to clear waste (poop) out of your bowel. Emptying your bowel can help make the pictures clearer.

5.4. Procedure for testing by the gallium scan

A gallium test usually requires two or three visits to the nuclear medicine department. During the first visit, the radiologist will inject gallium into a vein in your arm.During the second visit, one or two days later, the nuclear medicine team will:

- Have you remove your clothes and wear a hospital gown.
- Ask you to take off any metal, such as jewelry.
- Instruct you to lie down on a table.
- Move the camera around your body slowly and closely to take pictures. (The camera doesn't release radiation; it just searches for radiation from the gallium in your body.)
- Tell you to move into different positions and hold still.

The process usually takes about an hour.The team may ask you to come back again in a day or two for a third visit to repeat the pictures.

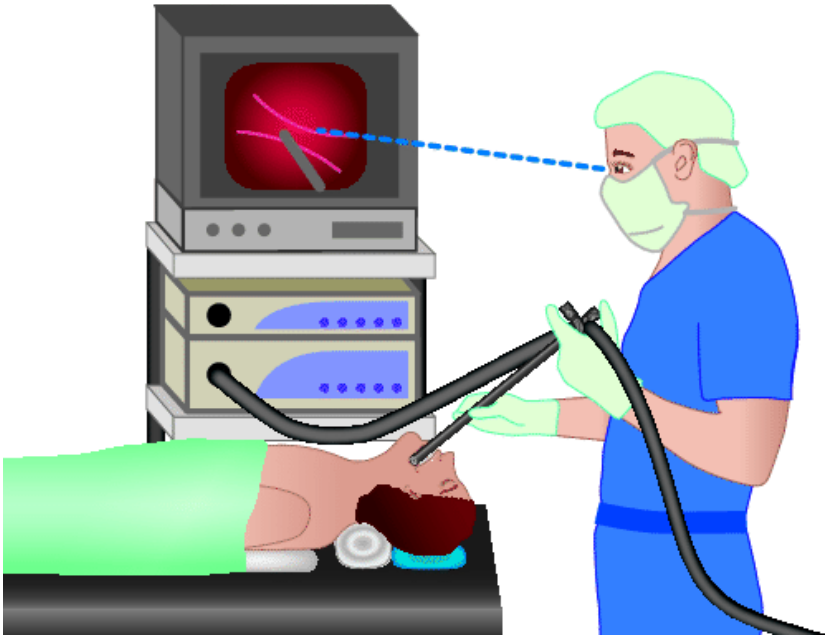
The risks of a gallium scan

A gallium scan is a very safe procedure. But it does have some risks. These include:

- Allergic reaction, which rarely might cause trouble breathing
- Rash
- Nausea

Your risks might differ depending on your age and other medical conditions. Talk with your healthcare provider about any concerns. Pregnant women should avoid the scan if possible. It may not be safe for the developing child. The scan uses a small amount of radiation. Although large amounts of radiation can increase your risk of cancer, the exposure from a gallium scan is very small. It's less than what is used for many types of X-rays. Your body naturally clears the gallium from your system over several days. The radioactive material is not a danger to anyone around you. You also don't need to take any special precautions.

Chapter 6.Endoscopy



6.1. Endoscopy introduction

6.2. Parts of an Endoscope

6.3. Working of the Endoscope

6.4. Types of endoscopies

6.5. Preparation before taking an endoscopy

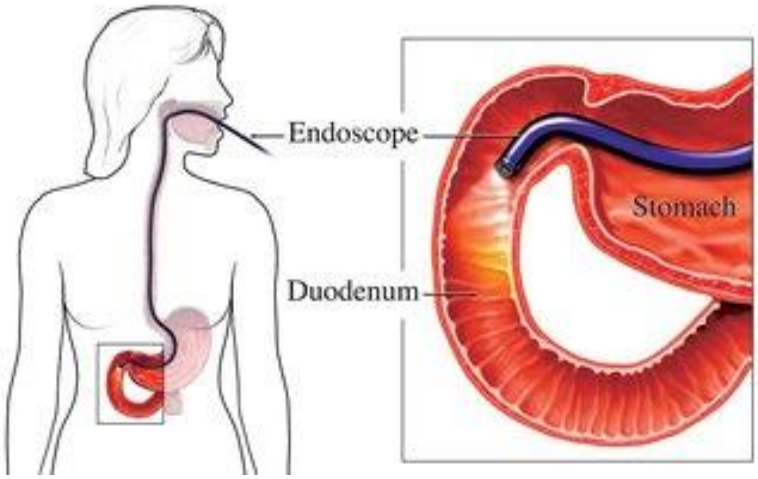
6.6. Side effects after the procedure

6.7. Advances in endoscopy

6.1. Endoscopy introduction

The term *endoscope* was first used on February 7, 1855, by engineer-optician Charles Chevalier,An endoscopy is a procedure where organs inside your body are looked at using an instrument called an endoscope.

An endoscope is a long, thin, flexible tube that has a light and camera at one end. Images of the inside of your body are shown on a television screen.



6.2. Parts of an Endoscope

A standard endoscope in composed of the following parts:

A thin, long flexible tube

- A lens or lens system
- A light transmitting system
- The eyepiece
- Control system

6.3. Working of the Endoscope

Basically, a typical endoscope uses fiber optics, which allow for effective transmitting of light. In this technique (fiber optics) light is transmitted through a flexible fiber of glass (transparent) known as optical fiber(s).

The optical fiber allows for light to travel through curved paths, which makes one of the best systems to view spaces that would normally be difficult to reach. Here, total internal reflection makes it possible for light to travel along the fibers with the light rays hitting the fiber walls at an angle (minimum angle of 82 degree).

Given that individual fibers can be thinner than human hair, fiber optics is one of the best techniques to enter and view different areas of the body.

There are typically two sets of the fibers. These include the outer fiber that functions to supply light and an inner coherent ring that serves to transmit the image.

***The outer fiber* –**

This fiber contains a number of fibers that have been bundled together in no particular order. It is for this reason that the outer fiber is commonly referred to as the incoherent bundle. The fiber is entirely enclosed with a sleeve to protect it. Typically, it is coated with either plastic or steel which protects it from water or moisture (making it waterproof).

Inner fiber –

Like the outer fiber, the inner bundle is also composed of a bundle of fibers. However, unlike the outer bundle, the inner fiber is in perfect order, which is why it is referred to as the coherent bundle. The tiny lens connected to the end of this bundle allows for light to be effectively focused so that reflected light from the object of interest can be collected and transmitted for viewing.

6.4. Types of endoscopies

Arthroscopy – Used when joints are affected. The tube is inserted through a small cut close to the joint.

Bronchoscopy– Used to examine infection or growth in the lungs. The endoscopic tube will be inserted through an opening like the mouth or nose.

Colonoscopy– Used for the examination of your colon or tailbone. The tube will be inserted through the anal cavity.

Cystoscopy– Used to assess damage to the bladder. The scope will be inserted through the urethra.

Enterostomy– Used when there is a problem with the small intestine. For this, the scope can be introduced through either the mouth or the anus.

Hysteroscopy– Used to check the inside of the uterus in women and the tube is inserted through the vagina.

Laparoscopy– Used to scan your abdominal or pelvic area. A small incision will be made close to the area and the tube will be inserted.

Laryngoscopy– used to inspect the larynx. The camera tube is inserted through the nose or mouth.
Mediastinoscopy– The area between the lungs is called mediastinun and this kind of endoscopy is the examination of that area. A small incision is made above the breastbone for the tube.

Upper gastrointestinal endoscopy– Used to investigate the esophagus and upper intestinal tract. The scope is inserted through the mouth.
Ureteroscopy– Used to check the ureter in men. The tube will be put in through the urethra.

6.5. Preparation before taking an endoscopy

Your health care team will give you detailed instructions on how to prepare before your appointment. For example, you may need to take these steps:

- Avoid eating or drinking anything for several hours before the procedure.
- Stop taking blood-thinning medications several days before the procedure. This reduces the risk of bleeding. Ask your doctor about which medications to stop taking. And ask when you should start taking the medications again.
- Take a laxative or use an enema to remove stool from your bowels. You will only need to do this for certain types of endoscopy.

6.6. Side effects after the procedure

After the endoscopy, you will rest in a recovery area. You may have mild side effects. Side effects depend on the type of endoscopy and may include a sore, dry throat, or bloating and gas. Depending on the type of anesthesia you receive, you may need to have someone drive you home.

6.7. Advances in endoscopy

New techniques continue to make endoscopy more comfortable for people. They also make it easier for doctors to diagnose diseases.

New endoscopic techniques include:

Virtual endoscopy. Unlike a standard endoscopy, the doctor does not insert an endoscope into the body. These tests involve computed tomography (CT) scans of thin segments of the body. A computer combines these images to create a more complete view.

Researchers continue to study these and other types of virtual endoscopy:

- **Virtual colonoscopy.**

This procedure looks at the inside of the colon. People having this test still need to follow the same bowel-cleansing preparations. They will also need a traditional colonoscopy if polyps are found.

- **Virtual bronchoscopy**. This procedure looks at the inside of the lungs.

- **Capsule endoscopy.** A patient swallows a small, vitamin-sized capsule with a camera. The camera takes pictures of the inside of the esophagus, stomach, and small intestine. A device that you wear for approximately 8 hours records the pictures. Then, the doctor reviews them.

Chapter 7. Ultrasonography

7.1. Introduction about Ultrasound

7.2. working of ultrasound machine

7.3. Procedure for ultrasound test

7.4. Ultrasound Uses

7.5. Types of Procedures Are Used with an Ultrasound

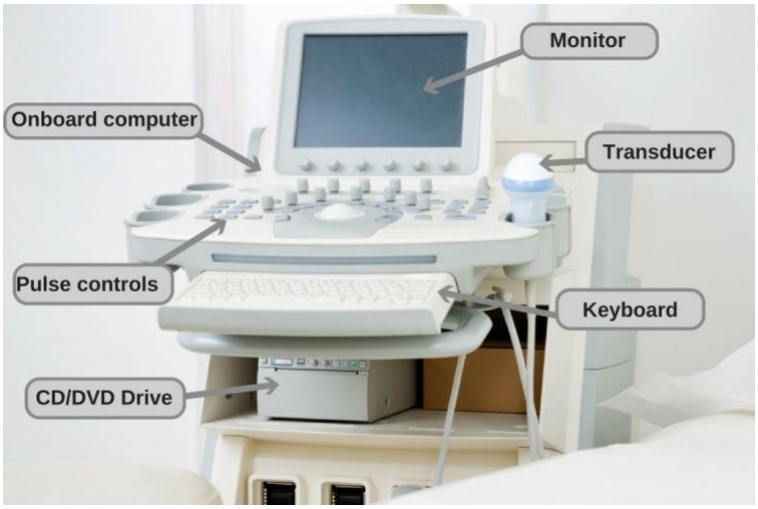
7.1. Introduction about Ultrasound

Ultrasound or **ultrasonography** is a medical imaging technique that uses high frequency sound waves and their echoes. The technique is similar to the echolocation used by bats, whales and dolphins, as well as SONAR used by submarines. In ultrasound, the following events happen:

1. The ultrasound machine transmits high-frequency (1 to 5 megahertz) sound pulses into your body using a probe.
2. The sound waves travel into your body and hit a boundary between tissues (e.g. between fluid and soft tissue, soft tissue and bone).
3. Some of the sound waves get reflected back to the probe, while some travel on further until they reach another boundary and get reflected.
4. The reflected waves are picked up by the probe and relayed to the machine.
5. The machine calculates the distance from the probe to the tissue or organ (boundaries) using the speed of sound in tissue (5,005 ft/s or1,540 m/s) and the time of each echo's return (usually on the order of millionths of a second).
6. The machine displays the distances and intensities of the echoes on the screen, forming a two-dimensional image like the one shown below.

Ultrasound image of a growing fetus (approximately 12 weeks old) inside a mother's uterus. This is a side view of the baby, showing (right to left) the head, neck, torso and legs.

7.2. working of ultrasound machine



Sound energy is a vibratory disturbance that moves forward in a wave through a substrate, whether that's air when you're talking to a friend or human tissue absorbing ultrasound energy. Sound can travel well in air, solid, and liquid mediums.

The human ear can detect the sound frequency between 20 Hz and 20,000 Hz. The waves having a frequency higher than 20,000 Hz (20 K Hz) are called ultrasound waves. Ultrasound is not different from "normal" (audible) sound in its physical properties, except that human cannot hear it.

7.3. Procedure for ultrasound test

Using an ultrasound machine (ultrasonography), a technician or doctor moves a device called a transducer (probe) over part of your body. The transducer emits sound waves which bounce off the internal tissues, and creates images from the waves that bounce back.

Different densities of tissues, fluid, and air inside the body produce different images that can be interpreted by a physician, typically a radiologist (a physician who specializes in imaging technologies). Many studies are done by a trained technologist (sonographer) and then interpreted by a radiologist.

- **A two-dimensional (2D)** is the most common type of ultrasound exam.
- **Three-dimensional and 4-dimensional ultrasounds** are possible due to the advances in computerized analysis of sound waves at different angles. Three-dimensional images are compiled from the sound waves coming back at different angles and the images are easier to understand and show more details.
- **The difference** between a 3D and 4D ultrasound is that the 4D is like a video showing motion of a 3 dimensional object.

7.4. Ultrasound Uses

- **Obstetrics:** Pregnancy ultrasound (fetal ultrasound or baby ultrasound) is used to assess the progression of a fetus. It is used to find out the number of fetuses in the womb, the age of the fetus, the location of the placenta, the fetal position, movement, breathing and heart rates, and the amount of amniotic fluid in the uterus.
    - Most women have at least one ultrasound during pregnancy. The exams can be done trans-vaginally (early in a pregnancy), but most are done trans-abdominally.
    - 3D and 4D ultrasound have limited medical uses, such as when a specific problem is suspected. Currently 3D and 4D ultrasounds are popular for "keepsake" sonogram pictures of the baby in the womb. The best time for a 3D ultrasound for fetal photos is when the baby is about 26 weeks.
    - The FDA warns against the use of ultrasound for nonmedical reasons. Although there has been no proof of risk, the long-term effects of these ultrasounds have not been studied. Doppler ultrasounds are used to measure blood flow and may be used if there is a suspicion that the fetus is not growing properly.
- **Gynecology:** Vaginal ultrasound, pelvic ultrasound, or transvaginal ultrasound is used to diagnose growths or tumors of the ovary, uterus, and Fallopian tubes. It can be used to assess non-pregnancy related issues as well:
    - lower abdominal pain
    - ovarian cysts
    - uterine fibroids
    - uterine growths
    - endometriosis
- **Cardiology:** Echocardiography (heart ultrasound) is a common way to evaluate the overall function of the heart. It is used to evaluate the flow of blood through the chambers and valves of the heart. It also assesses the strength of the heart beat and the volume of blood pumped through. Doppler ultrasound echocardiography is often used for the following:
    - heart valve problems, such as mitral valve prolapse or aortic stenosis;
    - congestive heart failure;
    - blood clots due to irregular heart beats such as in atrial fibrillation;
    - abnormal fluid collections around the heart, such as pericardial effusions; and
    - pulmonary artery hypertension.
- **Blood vessels:** Ultrasound is useful in detecting problems with most of the larger blood vessels in the body. Using Doppler ultrasound technology, the flow of blood through the vessels can be observed and measured. Narrowing of vessels (stenosis) or widening of vessels (dilatation, also referred to as aneurysms) can be detected. Ultrasound testing of blood vessels includes:
    - carotid ultrasound,

- abdominal aorta ultrasound for abdominal aortic aneurysm, and
- blood clots in veins (superficial or deep venous thrombosis, or DVT).

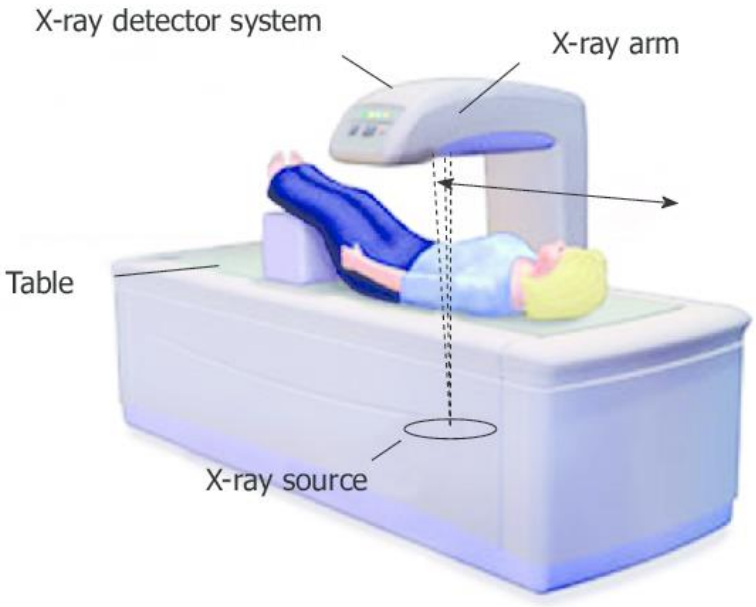
- **Abdominal structures:** Abdominal ultrasound is used to evaluate the solid organs within the abdominal cavity, including the liver, gallbladder, pancreas, kidneys, and bladder.
  - Renal ultrasound is used to evaluate the function and structure of the kidneys. Swelling around the kidney with blockage in the urinary tract can be seen with ultrasound, making abdominal ultrasound useful in detecting kidney stones.
  - Liver ultrasound is used to find abnormalities in the liver tissue and ducts.
  - Gallbladder ultrasound can screen for gallstones or an infected gallbladder.
  - Appendix ultrasound is used in children or pregnant women, where it is necessary to avoid radiation from aCT scan (computerized tomography).
- **Testicular ultrasound:** Used to diagnose testicular torsion, epididymitis (testicle infection), and testicular masses.
- **Neck ultrasound:** The thyroid and parathyroid glands can be imaged to detect nodules, growths, and tumors.
- **Breast ultrasound:** Used to image the breasts and to guide biopsy of breast masses in order to evaluate for breast cancer.
- **Knee ultrasound:** Ultrasound can be used to evaluate the structures in the back of the knee to determine if a Baker's cyst is present.
- **Eye ultrasound:** An eye ultrasound is used to look at the back of the eye (retina). It is often used when a patient hascataracts that make looking into the eye difficult. The test may help diagnose retinal detachment. It can also assist in cataract surgery.
- **Skin ultrasound:** Ultrasound can be used to help find certain types of foreign bodies that may become lodged in the skin.

7.5. Types of Procedures Are Used with an Ultrasound

- **Ultrasound-guided needle biopsy:** Ultrasound helps medical professionals guide needles into specific areas of the body to extract cells for laboratory testing.
- **Ultrasound-guided needle aspiration:** Ultrasound may be used to guide a needle into pockets of fluid accumulated in the body that need to be drained (for example, an abscess, pleural effusions, or ascites).
- **Ultrasound-assisted intravenous access:** When an intravenous (IV) line is required and veins are difficult to access, ultrasound may be used to assist in finding larger veins in the neck, chest wall, or groin.

Chapter 8.Dual-Energy X-ray Absorptiometry

(DEXA or DXA) Scan



8.1. Introduction about DXA scan
8.2. Working of the DXA scan
8.3. Procedure of DXA Scan
8.4. DXA Scan Results
8.5. The benefits vs. risks of DXA Scan

8.1. Introduction about DXA scan

DXA stands for 'dual-energy X-ray absorptiometry'. DXA (also sometimes known as DEXA) is a test that measures the density of bones. Density means how much of something there is in a certain amount of

space. The denser the tissue, the less X-rays pass through. Air and water are less dense than solid things such as bone. This is because the particles which make air and water are not held closely together. In general, the more dense the bone, the stronger it is, and the less likely it is to break (fracture).

There are two different types of DXA scanning devices:

- Central DXA devices are large machines that can measure bone density in the centre of your skeleton, such as your hip and spine.
- Peripheral DXA devices are smaller, portable machines that are used to measure bone density on the periphery of your skeleton, such as your wrist, heel or finger. These are mainly to get an idea about whether further tests are needed, as they are not as accurate as the larger DXA machines.

Peripheral DXA devices

8.2. Working of the DXA scan

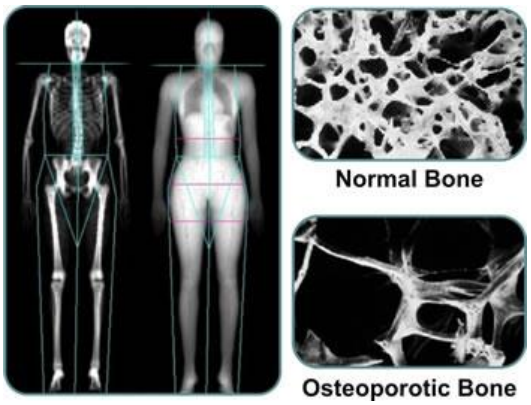
A DXA scan uses low-energy X-rays. A machine sends X-rays from two different sources through the bone being tested. Bone blocks a certain amount of the X-rays. The more dense the bone is, the less X-rays get through to the detector. By using two different X-ray sources rather than one it greatly improves the accuracy in measuring the bone density.

The amount of X-rays that comes through the bone from each of the two X-ray sources is measured by a detector. This information is sent to a computer which calculates a score of the average density of the bone. A low score indicates that the bone is less dense than it should be, some material of the bone has been lost and it is more prone to fracture.

8.3. Procedure of DXA Scan

The scan generally takes 10 to 20 minutes. It's painless, and the amount of radiation you get from the X-rays the scan uses is low. Unlike some other types of tests, like MRIs or CT scans, you won't have to lie inside a closed tunnel or ring. Instead, you'll lie on an open X-ray table and try to stay still as the scanner passes over your body. When the test is over, you'll be able to go home.

A DXA scanner is a machine that produces two X-ray beams. One is high energy and the other is low energy. The machine measures the amount of X-rays that pass through the bone from each beam. This will vary depending on how thick the bone is. Based on the difference between the two beams, your doctor can measure your bone density.



8.4. DXA Scan Results

Your test results will be in the form of two scores:

T score — This number shows the amount of bone you have compared with a young adult of the same gender with peak bone mass.

A score of -1 and above is considered normal.

A score between -1.1 and -2.4 is classified as osteopenia (low bone mass).

A score of -2.5 and below is defined as osteoporosis.

The T score is used to estimate your risk of developing a fracture and also to determine if treatment is required.

Z score — This number reflects the amount of bone you have compared with other people in your age group and of the same size and gender. If this score is unusually high or low, it may indicate a need for further medical tests.

Small changes may normally be observed between scans due to differences in positioning and usually are not significant.

8.5. The benefits vs. risks of DXA Scan

Benefits:

- DXA bone densitometry is a simple, quick and noninvasive procedure.
- No anesthesia is required.
- The amount of radiation used is extremely small—less than one-tenth the dose of a standard chest x-ray, and less than a day's exposure to natural radiation.
- DXA bone density testing is currently the best standardized method available to diagnose osteoporosis and is also considered an accurate estimator of fracture risk.
- DXA is used to make a decision whether treatment is required and it can be used to monitor the effects of the treatment.
- DXA equipment is widely available making DXA bone densitometry testing convenient for patients and physicians alike.
- No radiation stays in your body after an x-ray exam.
- X-rays usually have no side effects in the typical diagnostic range for this exam.

Risks:

- There is always a slight chance of cancer from excessive exposure to radiation. However, given the small amount of radiation used in medical imaging, the benefit of an accurate diagnosis far outweighs the associated risk.

Women should always tell their doctor and x-ray technologist if they are pregnant.

Chapter 9. Fluoroscopy

- 9.1. fluoroscopy Introduction
- 9.2. Procedures including different fluoroscopy tests
- 9.3. The risks of fluoroscopy test
- 9.4. Preparation before taking for fluoroscopy test
- 9.5. The procedure before fluoroscopy test
- 9.6. The Risks after fluoroscopy test

9.1 Fluoroscopy Introduction

Fluoroscopy is a type of imaging tool. It looks at moving body structures. It’s much like an X-ray "movie." It is often done while a contrast dye moves through the part of the body being examined.

A continuous X-ray beam is passed through the body part and sent to a video monitor. The body part and its motion can then be seen in detail. Fluoroscopy lets healthcare providers look at many body systems. These include the skeletal, digestive, urinary, cardiovascular, respiratory, and reproductive systems.

Fluoroscopy may be used to look at certain parts of the body. These include the bones, bowel, muscles, heart vessels, and joints.

9.2. Procedures including different fluoroscopy tests

Fluoroscopy is used in many types of tests and procedures including:

- **Barium X-rays.** In barium X-rays, fluoroscopy used alone lets the healthcare provider see the movement of the intestines as the barium moves through them.
- **Cardiac catheterization.** In cardiac catheterization, fluoroscopy is used to help the healthcare provider see the flow of blood through the coronary arteries. It can check for arterial blockages.
- **Electrophysiologic procedures.** During these procedures, fluoroscopy is used to treat people with heart rhythm problems (arrhythmias).
- **Arthrography.** This imaging test uses X-rays to see a joint or joints.
- **Placement of IV (intravenous) or arterial catheters.** Catheters are thin, hollow tubes. For catheter insertion, fluoroscopy is used to guide the catheter into a specific vessel inside the body.
- **Hysterosalpingogram.** This test is an X-ray of the uterus and fallopian tubes.
- **Percutaneous vertebroplasty/kyphoplasty.** This procedure treats compression fractures of the bones (vertebrae) of the spine.
- **Retrograde urethrogram, micturating cysto-urethrogram.** This test assesses problems of the urinary system.
- **Fistulography.**This test assesses an abnormal connection (fistula) between 2 organs.

Fluoroscopy may also be used for:

- Lumbar puncture
- Biopsies
- Locating foreign bodies
- Guided injections into joints or the spine

Fluoroscopy may be used alone. Or it may be used along with other diagnostic procedures.

There may be other reasons for your healthcare provider to advise fluoroscopy.

9.3. The risks of fluoroscopy test

You may want to ask your healthcare provider about the amount of radiation used during the procedure and the risks related to your particular situation. It is a good idea to keep a record of your radiation exposure, such as previous CT scans and other types of X-rays, so that you can tell your healthcare provider. Risks linked with radiation exposure may be related to the cumulative number of X-ray exam or treatments over a long time.

If you are pregnant or think you may be, tell your healthcare provider. Radiation exposure during pregnancy may lead to birth defects.

If contrast dye is used, there is a risk for allergic reaction to the dye. Tell your healthcare provider if you are allergic to or sensitive to medicines, contrast media, iodine, or latex. Also tell your healthcare provider if you have kidney failure or other kidney problems.

There may be other risks depending on your specific health problem. Be sure your healthcare provider knows about all your medical conditions.

Certain factors or conditions may interfere with the accuracy of a fluoroscopy procedure. For instance, a recent barium X-ray procedure may interfere with exposure of the stomach or lower back area. Make sure your healthcare provider knows about your medical history and any recent tests or treatments you have had.

9.4. Preparation before taking for fluoroscopy test

- Your healthcare provider will explain the procedure to you and give you a chance to ask questions. Make a list of questions and concerns to discuss with your healthcare provider before the procedure. Consider bringing a family member or trusted friend to the appointment to help you remember your questions and concerns and to take notes.
- You will be asked to sign a consent form that gives your permission to do the procedure. Read the form carefully and ask questions if anything is not clear.
- The specific type of procedure or exam being done will determine whether you have to do any preparation before the procedure. Your healthcare provider will give you any preprocedure instructions.
- Tell your healthcare provider, the radiologist, or the technologist if you have ever had a reaction to any contrast dye, or if you are allergic to iodine.
- Tell your healthcare provider if you are pregnant or think you may be.
- Tell your healthcare provider if you are breastfeeding and ask if you need to pump and save milk to use after the procedure.

- Make sure your healthcare provider has a list of all medicines (prescribed and over-the-counter) and all herbs, vitamins, and supplements that you are taking.
- Based on your health problem, your healthcare provider may give you other instructions on what to do before the procedure.

9.5. The procedure before fluoroscopy test

Fluoroscopy may be done on an outpatient basis or as part of your stay in a hospital. Procedures may vary depending on your condition and your healthcare provider's practices.

Generally, fluoroscopy follows this process:

1. You will be asked to remove any clothing or jewelry that may get in the way of the body part to be examined. A bracelet with your name and an identification number may be put on your wrist. You may get a second bracelet if you have allergies.
2. If you are asked to remove your clothing, you will be given a gown to wear.
3. A contrast substance or dye may be given, depending on the type of procedure that is being done. You may get the contrast by swallowing it, as an enema, or in an IV (intravenous) line in your hand or arm. It's used to better see the organs or structures being studied.
4. You will be positioned on the X-ray table. Depending on the type of procedure, you may be asked to move into different positions, move a certain body part, or hold your breath for a short time while the fluoroscopy is being done.
5. For procedures that require catheter insertion, such as cardiac catheterization or catheter placement into another body part, a needle may be put into the groin, elbow, or other site.
6. A special X-ray machine will be used to make the fluoroscopic images of the body structure being looked at or treated.
7. In the provider is looking at the joint (arthrography), they may remove (aspirate) any fluid in the joint with a needle and syringe before injecting the contrast dye. After the contrast is injected, you may be asked to move the joint for a few minutes to spread the contrast throughout the joint.
8. The type of procedure being done and the body part being examined or treated will determine the length of the procedure.
9. If a catheter is placed, it will be removed after the procedure is finished.

Fluoroscopy itself is not painful. But the particular procedure being done may be painful, such as the injection into a joint or accessing of an artery or vein for angiography. In these cases, the radiologist will take all comfort measures possible. Depending on the procedure, that may include local anesthesia (numbing medicines), conscious sedation (medicines to make you sleepy), or general anesthesia (medicines to put you into a deep sleep and not feel pain).

9.6. The Risks after fluoroscopy test

The type of care needed after the procedure will depend on the type of fluoroscopy that is done. Certain procedures, such as cardiac catheterization, will need a recovery period of several hours with immobilization of the leg or arm where the catheter was inserted. Other procedures may need less time for recovery.

If you notice any pain, redness, or swelling at the IV site after you go home, tell your healthcare provider. It may be a sign of infection or other type of reaction. Your healthcare provider will give more specific instructions about your care after the procedure.

Model Question Paper

Dr. V. S. Krishna Govt. Degree College(A), Visakhapatnam

Paper: Physics for novel diagnostics & Therapeutics

Time:1-hour Total Marks:25

PART-A

Answer **Any three** of the following. 3 X 5 = 15 M

1.Explain the process of X-Ray scanning?

2. What Is a CT scan with Contrast?

3. How is a PET scan different from a CT or MRI scan?

4. What Types of Procedures Are Used with an Ultrasound?

5. How should I prepare for an endoscopy?

PART-B

Answer **ALL** the following MCQ 10 X 1 = 10 M

1. Fluoroscopy cannot be done without a dye.
   a) True
   b) False

2. Drinking radioactive Barium solution helps look at the _____
   a) Respiratory Tract
   b) Gastrointestinal Tract
   c) Neural Tract
   d) Thorax

3. Which another method can be used to look in the compete for GI tract?
   a) Endoscopy
   b) Capsule Endoscopy
   c) Colonoscopy
   d) Laryngoscopy

4. What does the ‘P’ in PET stand for?
   a) Positron
   b) Photon
   c) Proton
   d) P – orbital

5. In a normal X-Ray machine, X – Rays are produced by _____
   a) bombardment of cathode rays on a radioactive material
   b) nuclear fission
   c) nuclear fusion
   d) super heating of an element

6.CT scan stand for_____?

a. Computed Tomography Scan

b. Computer Topography Scan

c. Computed Topography Scan

d. Computer Tomography Scan

7. The commonly used MRI's have a magnetic strength of _____
   a) 1.5 – 3 Tesla
   b) 3 – 6 Tesla
   c) 6 – 12 Tesla
   d) 12 – 24 Tesla

8. Capsule endoscope has a _____ for taking images.
   a) CCD camera
   b) LED camera
   c) X-Ray camera
   d) US camera

9. None of the endoscopic procedures require any cuts.
   a) True
   b) False

10. A growing application of MRI is "MRA", which stands for:

a] Magnetic Resonance Amplication

b] Magnetic Resonance Angiography

c] Minimal Radiology Applications

d] Medical Research Assistance

Registrations

S.N	Reg. No	Name of the Student	Year & Group	Address of the college.
1.	NDT 2022001	D. Bhavani	2nd BSC	GDC Palakonda
2.	NDT 2022002	R. Kumari	2nd BSC	GDC Palakonda
3.	NDT 2022003	V. Kanchana	3rd BSC	GDC Palakonda
4.	NDT 2022004	B. Sravanthi	3rd BSC	GDC Palakonda
5,	NDT 2022005	A. pradeep	3rd BSC	GDC Palakonda
6	NDT 2022006	M. Kavya	3rd BSC	GDC Palakonda
7	NDT 2022007	K. Hemanth	3rd BSC	GDC Palakonda
8	NDT 2022008	Y. AnanthaRao	3rd BSC	GDC Palakonda
9,	NDT 2022009	V. Swathi	3rd BSC	Sri Krishna sai DC
10	NDT 2022010	N lavanya	3rd BSC	Sri Krishnasai DC
11	NDT 2022011	G. Urmila	3rd BSC	GDC Palakonda
12	NDT 2022012	P. Anjali	3rd BSC	GDC Palakonda
13	NDT 2022013	R. Bhavani	3rd BSC	GDC Palakonda
14	NDT 2022014	S. Bhagyalaxmi	3rd BSC	GDC Palakonda
15	NDT 2022015	A Lokesh	3rd BSC	GDC Palakonda
16	NDT 2022016	V. Chandrasekhar	3rd BSC	GDC Palakonda
17	NDT 2022017	M. Durgaprasad	3rd BSC	GDC Palakonda
18	NDT 2022018	M. Gavrisankar	3rd BSC	GDC Palakonda
19,	NDT 2022019	T Anil Kumar	3rd BSC	GDC Palakonda
20	NDT 2022020	G. Rupa	3rd BSC	GDC Palakonda
21	NDT 2022021	P. Uma Venkata Ramana	3rd BSC	GDC Palakonda
22	NDT 2022022	G Rukmini	3rd BSC	GDC Palakonda
23	NDT 2022023	P. Sivaprasad	3rd BSC	GDC Palakonda
24	NDT 2022024	L. Janardhana Rao	3rd BSC	GDC Palakonda
25	NDT 2022025	B. Ramakrishna	3rd BSC	GDC Palakonda
26	NDT 2022026	A. Mamatha	3rd BSC	GDC Palakonda
27	NDT 2022027	G. Eswara Rao	3rd BSC	GDC Palakonda
28	NDT 2022028	K. Pavan Bhaskar	3rd BSC	GDC Palakonda
29	NDT 2022029	M. Triveni	3rd BSC	GDC Palakonda
30	NDT 2022030	B. Sailaja	3rd BSC	GDC Palakonda
			3rd BSC	GDC Palakonda

Attendence

Roll No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	P	P	P	P	a	P	P	P	P	P	a	P	P	P	P	P	P	P	P	P
	P	P	a	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
	P	P	P	P	P	P	P	a	P	P	P	P	P	P	P	P	P	P	P	P
	P	P	P	P	P	P	P	P	P	P	P	P	a	P	P	P	P	P	P	P
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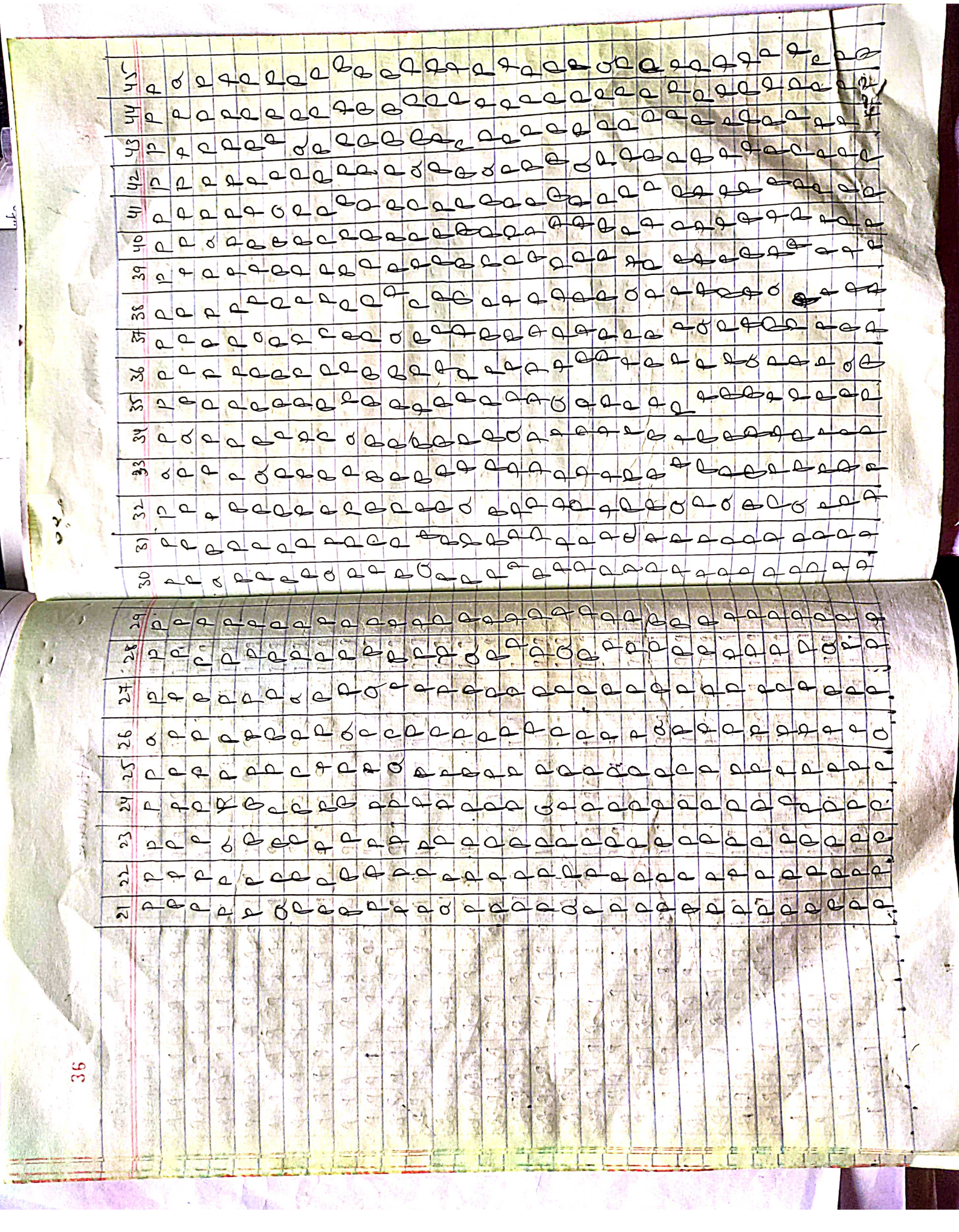

Government Degree College

Palakonda.

Department of Physics

Certificate

This is to certify that Mr/ Ms B. SRAVANTHI Student of _____ Year _____ Regd ID _____ has under gone Four Weeks training on Physics for Noval diagnostics from 15-12-2022 to 04-02-2023 during the academic year 2022-2023.

In Charge of the Dept

IQAC Coordinator

IQAC
GDC PALAKONDA
Parvathipuram Manyam Dt.

Principal

PRINCIPAL
GOVT. DEGREE COLLEGE
PALAKONDA
Parvathipuram Manyam Dist.

Marks & Issue of Certificates

S.N	Reg No	Name of the Student	Marks obtained	Certificate Received sign
1.	NDT2022001	D. Bhavani	22	D. bhavani
2.	NDT2022002	R Kumari	20	R. Kumari
3.	NDT2022003	V. Kanchana	22	V. Kanchana
4.	NDT2022004	B. Sravanthi	24	B. Sravani
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7	NDT2022007	K. Hemanth	23	K. Hemanth
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