1. **The possible differentials for lameness in horses**

* Wobbler syndrome
* Navicular syndrome
* Equine protozoal myeloencephalitis
* Lyme neuroborreliosis
* Trauma (muscle, tendon, bone or joint injury)
* Hoof or subsolar abscess
* Ataxia
* Laminitis
* Carpal Arthritis
* Caudal heel pain syndrome
* Degenerative joint disease

1. **What is the purpose of diagnostic imaging when investigating lameness?**

In most of the lameness investigations, diagnostic imaging is done to help determine the exact cause of the lameness. These include:

* **Digital radiography**: Radiographs capture ionizing energy (radiation) produced by a small machine on a plate of silver embedded in emulsion. The rays pass through soft tissue, but are stopped by bone, creating an image in which bony structures show up as white, while muscle, fatty tissue, ligaments, hooves, and tendons are invisible or show up as mere shadows.
* **Digital ultrasound**: Ultrasound uses harmless, high-frequency sound waves that bounce back at different intensities depending on the density of the tissues they encounter. It is also an instant gratification technique, displaying results on a computer screen in real time. Ultrasound allows us to look into the soft tissues of the horse, making it the modality of choice for suspected tendon and ligament problems as well as muscle abnormalities. To get a quality image, the veterinarian must clip and properly prepare the target area and have access to a dimly lit, quiet area for this examination. Ultrasound helps vets to diagnose moderate to severe injuries in the distal limbs and stifles but is less effective in very mild or subtle type lesions.
* **Fluoroscopy:** Fluoroscopy generally lacks the sharp detail that is achieved by high-end X ray units, but it makes up for that by providing instantaneous images that aren’t affected by slight movements by the horse.
* **Nuclear scintigraphy**: Nuclear scintigraphy uses very small, tracer amounts of radioactive molecules to diagnose diseases involving bone, soft tissues and vessels. These molecules attach to agents that bind to bone lesions, soft tissue tumors and sites of infection. Nuclear scintigraphy is most commonly used for bone scans in horses. A radiopharmaceutical is given IV that binds to areas of exposed hydroxyapatite in the bone. Bone scans are useful for horses with multiple limb lameness, subtle lameness or lameness of the proximal limb, back or pelvis. The radioactive isotope travels to bone and abnormal uptake is detected as “hot” or “cold” spots. Uptake of the isotope helps pinpoint sites of injury or problems. This very sensitive technique can often diagnose diseases not visible with other imaging methods.
* **Computed tomography**: In a CT scan, a rotating, focused X ray beam takes “sliced” images of the anesthetized patient as he is advanced through a gantry which is the frame housing the unit. It allows exquisite separation of the tissues, like a loaf of bread sliced up. So unlike a conventional X ray where everything is superimposed, a CT can reveal cross-sections one to 10 millimeters thick. One of the major advantages of CT over other types of diagnostic imaging is the superior resolution. With both magnification and three-dimensional capabilities, lesions too small or well-buried to detect with conventional radiography often jump out on the CT screen. It is an excellent way to look inside the hoof capsule, especially with the addition of some injected contrast dye. The dye ‘lights up’ the interior structures and shows up as a bright spot on the computer screen, which can generate a new image every second. CT is also most useful for fractures. In cross-section, you can see all the fracture lines and plan where you’ll need to insert screws or plates to make the repair.
* **Magnetic resonance imaging**: MRI uses a powerful magnetic field instead of radiation to create images, so no lead aprons are required. The black-and-white images that appear in sequence on the computer screen take only a couple of minutes each to generate, but it might take many “slices” in a 1 1/2-hour session to get a full diagnostic picture. MRI provides an infinite number of possibilities with regard to manipulating the images–they can be viewed dorsally (from the top of the horse), transversely (horizontal cross-section), sagittally (vertical cross-section), or in any other plane you desire. All of the tissues can be revealed at once–tendons, ligaments, bone. So instead of seeing just part of the anatomy, you’re getting the whole picture. Because of this, there is no question that MRI is the best imaging technique we have for foot problems. And it can also highlight bone chips or fractures that other techniques might miss.

5. What can be seen on a nuclear scintigraphy image specifically for horse lameness ?

 The technique offers the major advantage of increased sensitivity over standard radiographic imaging.  Most of the pathologic changes to the horse's musculoskeletal system that might cause lameness are detected on bone scans.  Many acute bone diseases can be diagnosed by scintigraphy that cannot be discerned by radiographs until the condition has become chronic. Because of their body size, these conditions may not be diagnosed at all in horses

Scintigraphy in horses offers the other major advantage of affording accurate imaging of the upper limbs, pelvis, and vertebral column without general anesthesia. Therefore, it has a final advantage of increased safety over conventional radiography. A second major benefit of scintigraphic imaging is to differentiate mixed lameness conditions in which the component of bone disease must be separated from that of soft tissues to arrive at a rational course of treatment or prognosis. Finally, for athletic horses suspected of having lameness due to localized myositis, scintigraphy not only allows confirmation of muscle inflammation but also identifies the muscle bellies injured reasonably accurately so that specific local treatment may be given. The technique is safe and comparatively inexpensive also.