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 Paper : CR & DR

Qus:1

**Advantages of DR over screen film radiography:**

1. DR is more efficient in space , time and personal then screen film radiography.
2. **Spatial resolution:** spatial resolution of DR is better in respect of magnitude compared with screen film radiography.
3. **Reduce radiation:**solid state flat panel detector provide better quality with less radiation dose as compares with screen film radiography.
4. **Darkroom:** No darkroom is necessary.
5. **Dynamic range:** DR has wider or increase dynamic range.
6. **Teleradiology:** The digital image files can be transferred to colleagues for review.
7. **Storage:** images can be stored indefinitely and cheaply DR ROM can hold 30,000 images.
8. **Environmental friendly:**No chemicals processing are used in DR.
9. **Enhancement of images:** Grey scale resolution of 256 colours of grey as compares with 16t to 25 shades of grey on conventional film.
10. **Transfer of data:** There is electronic transfer od data in DR while in screen film radiography physical transfer of data occurs.
11. **Fewer retakes:** it means fewer exposure which results in decreasing patient dose.
12. **Cost saving:** reduced cost due to removal of chemical processors because it is expensive.
13. **Easy to use :** DR system is easy to used than film based systems.

Qus :2

Direct digital radiography	Indirect digital radiography
1. In DR use a photoconductor material ( amorphous selenium) applied on the top of thin transistor. <ul style="list-style-type: none"> <li>• Direct DR proces convert x ray direct to electronic signal.</li> </ul>	1. In indirect DR use an x-ray intensifying screen that converts x-ray to light which is then detected by flat pannel detector.
2. DR convert the x-rays directly into electronic charge.	2. Indirect DR convert the x-ray fist to light then electronic signals.
3. Capture element: <ul style="list-style-type: none"> <li>• Amorphous selenium</li> </ul>	3. Capture element: <ul style="list-style-type: none"> <li>• Csl _ Csl/CCD</li> <li>• Csl , GdOS _ Csl /a-si</li> </ul>
4. Coupling element: <ul style="list-style-type: none"> <li>• No</li> </ul>	4. Coupling element: <ul style="list-style-type: none"> <li>• Fiber optics _ Csl /CCD</li> </ul>

	<ul style="list-style-type: none"> <li>• Contact layer_ CsI /a-si</li> </ul>
5. Collecting element : <ul style="list-style-type: none"> <li>• TFT</li> </ul> 6. Flat panel detectors: for direct it is <ul style="list-style-type: none"> <li>• Selenium pannels.</li> </ul>	5. Collection element: <ul style="list-style-type: none"> <li>• CCD/ CMOS_ CsI /CCD</li> <li>• TFT_ CsI /a-si</li> </ul> 6.Flat pannel detectors: for indirect it is; <ul style="list-style-type: none"> <li>■ Cesium Iodide or</li> <li>■ Gadolinium oxysulphide</li> </ul>

### Qus:3

**Fill factor:** The fill factor is the ratio of the actual maximum obtainable power to the product of open circuit voltage and short circuit current.

#### Importance of fill factor:

- Fill factor is the Percentage of pixel face that is sensitive to x ray.
- Or**
- Fill factor is the percentage of the pixel that is unable to be affected by the incoming x-ray beam.
  - The fill factor is nearly 80% and 20% beam of x-ray does not participate in image.
  - In DR , pixel size is reduced , improves spatial resolution but at the cost of patient radiation dose.
  - Fill factor reduced with smaller pixels and x-ray intensity increased to maintain signal strength.
  - Nanotechnology promises that increased fill factor and improve spatial resolution at even lower patient radiation dose.
  - The best value of fill factor;
    - In static system, the ideal default fill factor is 100.
    - But if system has lots of OLTP transactions, fill factor in between 70 to 90 which provides better result.

### Qus:4

1. X-ray flat panel detector for DR work by converting x-ray into light that hit its surface and then turn light into electronic data that computer displays as high image quality digital image.
2. The consequences of producing flat panel digital image receptors with small pixels are "**noisy images**".

**NOISE** : The original meaning of " noise" was" unwanted signals " .or  
By analogy, "unwanted electrical fluctuations" are also called "noise".

#### Noisy image:

- Image noise is random variation of brightness or color information in images ,and is usually an aspect of electronic noise

- Image noise is an undesirable by product of image capture that obscures the desired information .
- Image noise can range almost indiscernible splotch on a digital photograph taken in good light , to optical images are almost noisy.
- Such a noise level would be exceptionable on photograph.

**Qus:5**

**Imaging plate:** is a new film like radiation image sensor made up of specifically designed phosphor that trap and store the radiation energy.

Imaging plate is placed under patient same as conventional film.

**Features of storage phosphor imaging plate:**

1. Features of storage phosphor make them attractive for any imaging application.
2. Computed radiography uses storage phosphor imaging plate for digital imaging.
3. The imaging plate is ideal for inspection and have excellent sharpness.
4. The digital characteristic of storage phosphor plates enable us to study the relationship between contrast and spatial resolution.
5. Storage phosphor are unique because they respond to wide range of x-ray exposure and exposure image displayed correctly.
6. After exposure, the imaging plate is runs through special scanners to read out the image.
7. Storage phosphor imaging plates have been used successfully in medical x-ray imaging.
8. The storage phosphor plates kept inside cassette and exposed to x-ray is stored on the plate in the form of latent energy.
9. The relation between storage phosphor plate physical characteristic and image quality is explained.
10. Photo stimulation phosphor luminescence mechanism of current storage phosphor ,BaFBr:Eu<sup>2+</sup> and CsBr:Eu<sup>2+</sup> is discussed.
11. It is demonstrated that the phosphor crystal in the CR Imaging plate has much significant impact on the performance.
12. The life of storage phosphor plate is depend on handling , it's properly and carefully handling will produce thousands of images.