INVESTIGATION MRI

ANSWER (1)

Nuclear Magnetic Resonance : In layman's terms, when a magnetic dipole (nuclei) is kept in effect of an external magnetic field , the magnetic field exerts a torque on the magnetic dipole in the direction of the magnetic field. A magnetic dipole can be created by any charged atom moving in a circular path , in a particular area. since we know the atom has two spins , one will gain energy(anti parallel to magnetic field) and other one will loose energy(parallel to the magnetic field).

In **NMR**, an unknown molecule is kept in high magnetic field. Then we will hit the molecule with an electro magnetic pulse. If the frequency -pulse of the electro-magnetic field is just right, it will cause a transition from spin up to spin down or vice versa in the atoms of the molecule and there will be shift in the frequency (chemical shift i.e. they will resonate). Different atoms have different resonating frequencies that will allow us to discover their chemical composition. **[1]**

ANSWER (2)

This the relation between the magnetic field (external) and the frequency of resonance.

$$n = mHo/2p$$

As its clear from the equation, n= frequency of resonance.
m= magnetogyric ratio.

Thus, the field and the frequency is directly proportional to each other, if the external field is having an higher magnitude, then the frequency that will be needed for the shift should be larger. The transition would require higher frequencies for the spin . **[2]**

ANSWER (3)

'Drift' in imaging is regarded as the anomaly from the actual image presented by the noise while capturing the image. There could several possible ways in which we can witness drifts in imaging, as its just noise that we are assuming.
Application to MRI: While performing MRI, we need to do the ' signal drift correction' for all the regions of interest. Then we calculate various linear and quadratic variables in order to correct the drift . The rescaling factor is determined and the applied to every image with is in series to get drift corrected image. **[3]**

ANSWER (4)

In order to obtain 3-dimensional image of the brain, MRI uses voxels. Voxels are tiny cubical geometries which are use extensively in MRI and fMRI to get more detailed image of the brain. It is similar to 2D pixels in normal screens. Voxels are very efficient in representing large volumetric data precisely. The size of the tumour which is in the brain can be accurately estimated by voxels technology.

[4]

ANSWER (5)

Respiratory Artefacts can occur while taking the MR imaging (the spin wrap method). Some of the false images(ghost images) might appear of the moving structures of the patient . These images

are generally displayed in phase with respect to the real image. These artefacts mostly degraded the parts of the images which are not moving. **[5]**

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[4] Lewitt, R.M., 1992. Alternatives to voxels for image representation in iterative reconstruction algorithms. *Physics in Medicine and Biology*, *37*(3), p.705.

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