**Year 11 Physics: Applications of Waves**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Notes: \_\_\_\_\_ /5 References \_\_\_/ 2**

**Ensure you use terminology such as wavelength, frequency, refraction, reflection, diffraction where relevant**

1. Medical applications of waves: Ultrasound imaging
2. Explain how ultrasound imaging works? (2 marks)

*Reflection of waves*

*Different structures reflect different intensities*

1. What are typical frequencies used for ultrasound imaging ( 1mark)

*2- 10 MHz*

1. Resolution relates to the size and the detail of the image that can be seen? Higher resolution means that smaller objects can be seen.

Explain how frequency/ wavelength affect the size of the image that can be resolved ,

how the same considerations affect penetration of the signal (ie how deep the ultrasound goes into the body) ( 4 marks) and how this affects the applications the ultrasound can be used for. ( 1 mark)

*The smaller the wavelength (and therefore higher the frequency), the higher the resolution, but lesser penetration. Therefore, higher frequency probes (5 to 10 MHz) provide better resolution but can be applied only for superficial structures and in children. Lower frequency probes (2 to 5MHz) provide better penetration albeit lower resolution and can be used to image deeper structures.*

1. **Geophysics:**
2. Name and describe (include a diagram) the two main types of body waves found in an earthquake. ( 4marks)

*P-wave – Primary wave – longitudinal wave – has compressions and rarefaction*

*S wave – Shear wave – transverse wave – oscillates perpendicular to the direction of motion*

1. How do geologists use the information from these waves to provide information about the structure of the Earth. Include 2 examples. ( 4 marks)

*The speed of the waves varies throughout the earth due to changes in elasticity and density*

*Refraction effects. Gives info on structure of the earth*

*S waves are unable to travel through liquid, therefore able to tell core is liquid*

1. Give one example of how waves are used for imaging by geologist in exploration for minerals, natural gas and petroleum? ( 2 marks)

*Shock waves are sent through the earth, different rock layers have different densities, elasticity , are refracted at boundaries. The time of arrival of the signal gives information about the different layers.*

1. Acoustic engineering: Describe two examples of how acoustic engineering is used to modify sound waves . Include a diagram where appropriate ( 3 marks each example, total 6 marks)

*Reducing road noise in housing estates*

*Increasing diffraction in a concert hall to spread the sound*

*Sound proof rooms.*