4 **(a)** A telescope consisting of a satellite dish of diameter 250 m is used to scan the sky for sources that emit electromagnetic waves.

Two distant sources that are 1.8×10^{12} m apart are emitting radio waves of wavelength 1.2 m. If the telescope is just able to resolve the two sources, calculate the distance of the sources from the telescope.

distance = ………………. m   [3]

(b) In order to measure the depth of a well, an engineer uses a sonar with variable frequency at the opening of the well. Successive maximum signals are detected at 30.0 Hz and 42.0 Hz.

(i) The depth of the well, d, can be expressed as $d = \dfrac{n\lambda}{4}$, where λ is the   wavelength of the soundwave formed in the well when a maximum signal is heard and n is an integer.

State and explain the values that n can take.

………………………………………………………………………………………..

…………………………………………………………………………………………

…………………………………………………………………………………   [2]

(ii) The speed of sonar sound is 330 m s^{-1}.

Calculate the depth of the well.

depth of well = ………………. m   [3]

(iii)   Sketch the wave formed in the well at 30.0 Hz.

[2]