Beagle 2 and the electromagnetic spectrum – worksheet

1. How long will signals take to get from Mars to Beagle 2?

Radio waves carrying information from Beagle 2 will travel about 60 million kilometres from Mars to Earth.
Radio waves travel at the speed of light. Calculate how long it will take for radio waves from Beagle 2 to reach a receiver on Earth, using the equation Speed = distance ÷ time.
(Speed of light = 300 000 000m/s or 3×10^8m/s)

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There are additional factors, which increase the time between transmission and reception of the signal to as much as 4 days. For example, the signal must be sent from Beagle to orbiter, and then from orbiter to Earth. The orbiter may be on the other side of Mars to Earth and to Beagle and unable to receive signals from Beagle or transmit them to Earth, so there is a delay in receiving the signal from the Martian surface. Also, the distance from Mars to Earth varies up to a maximum of 398 million km when the planets are their maximum distance apart, although this delay is always of the order of minutes or tens of minutes.

Problems of delay
You cannot control the instruments on Beagle 2, as they gather samples and test them in "real time". It is not like driving a model aeroplane by remote control, where you press the controls, and the plane responds immediately. Instead, a stereoscopic camera takes pictures of the view from Beagle 2 and sends them back to Earth. Scientists can then see where to direct the corer/grinder, or where to let the mole burrow, for example. Then the instruments will be operated using pre-programmed sequences of command, which will be transmitted from Earth to the lander.