Observing wave pulses essay sample

Q1 – As the pulse travels down through the spring, its, size and amplitude is reduced – the sizes of the waves are much smaller as the forces become weaker (losing energy) as the distance from the point of initiation is increased.

Q2 – Pulses do not ‘ catch up’ with one another in transverse waves. They either meet at a certain point momentarily or pass through each other and continue on their way as if nothing has happened.

Q3 – As the tension of a spring is increased, the speed of the pulse is also increased meaning that the pulse will travel through the spring quicker if the spring is held more taut. A tighter spring also may also decrease the amplitude (dependent of the force).

Q4 – When a pulse reaches a fixed end, the wave is reflected or bounced back on the opposite side to which it came down on, so if it travelled down on the left-hand side, it would go back on the right-hand side (starting with a crest would mean returning with a trough).

Q5 – When a pulse is sent down from both sides of the spring, a single large crest is produced momentarily (the ‘ component’ waves’ amplitudes are added together). Superposition only occurs if the two waves have identical wavelengths as well as having the same phase (their crests and troughs are perfectly aligned). The wave created will have twice the normal amplitude of the component wave. Once this state is achieved, the wave will ‘ dissolve’ and the component waves will re-appear but travelling, this time in the opposite direction to which they came. If one pulse is sent down the spring and as it is reflected from the fixed end a second pulse is sent, the results

will vary greatly from the ones obtained when a pulse is simultaneously sent from both ends of a spring. The results are critically dependent the relative phases of the two waves.

Q6 – By oscillating the spring from side to side at a higher frequency, the number of waves increase as well as the amplitude while the wavelength will decrease as there are moves waves to be accounted for. On the other hand, if the spring is consistently producing lower frequency waves, there will be less waves with smaller amplitudes. Because there will be less waves (lower frequency,) the wavelengths will be greater.

Q7 – When a series of wave pulses are sent through a medium and then reflected back upon themselves which is when one end of a spring is moved up and down while the other end is fixed – standing wave occur. These distinctive waveforms have places where the medium does not vibrate at all (nodes) and other places where the medium vibrates the most (anti-nodes). Standing waves form as a combination of two waves moving in opposite directions with the same amplitude and frequency. The phenomenon is the result of interference (and reflection) which is when waves are superimposed, and their energies are either added together or cancelled out. In such a wave, the reflected waves interfere constructively with the incident waves on the condition that constructive interference is dependent on the reversing phase after reflecting.

PART 2 – Longitudinal waves

Q8 – This type of wave is called longitudinal because it is a wave in which particles of the medium move parallel to the direction of wave movement

and velocity. It moves lengthwise, forwards and backwards along a fixed ‘ line’.

Q9 – Pulses in longitudinal waves are unable to catch up with one another as they travel singularly and parallel to the direction of wave motion. If pulses are sent at the same time from both ends of a spring, the pulses will pass each other undisturbed.

Q10 – In a longitudinal wave, a tighter spring (increased tension) causes the speed of the pulse to increase as there is less resistance, making it much easier for one to send the pulse through the spring quickly. Tension is increased if the distances between the two ends of the springs are increased.

PART 3 – Waves at a boundary

Q11 – For a fixed end, the pulse will exert a force on the fixture which is rigid and unable to move. It will therefore exert an equal and opposite force on the string. This causes an ‘ upside-down’ pulse to form, travelling back as a reflected pulse. So if it’s a crest which is to be reflected from the fixed of the string, there is a phase change the pulse will initiate with a trough. From a free end, in which the spring is free to slide up and down the taut string, the pulse will exert a force on the end of the string causing it to ‘ overshoot’ the normal height reached by the pulse. This motion exerts a force on the string. The reaction to it causes the end of the string to move down while setting up a pulse which travels back along the string the ‘ right way up’. This means that if it’s a crest that is sent down an open ended spring, it will return also as a crest and a trough, as a trough.

Q12 – There are now three mediums in the whole composition of the coil – there is a discontinuity in the wave medium as there is a heavier coil surrounded by two lighter ones (light – dense – light).

A pulse sent from one end of the coil will reach the denser medium or the discontinuity and reflect back in reverse. The first pulse will decrease in both size and velocity the dense at the site of the discontinuity, while becoming stronger and more rapid as it enters the lighter third medium.

Q13 – When sending the pulse from the denser medium to the lighter one, the pulse will return at the boundary without its phase changing (sent as a trough, reflected as a trough). However, the initial or transmitted pulse, will travel faster than the un-inverted, reflected pulse.

If the pulse begins by going from the lighter medium spring to the denser one, on the other hand, the pulse will be reflected inversely at the boundary with the transmitted pulse being smaller than the inverted pulse.

Q14 – If the case is light – dense – fixed, the pulse, after reaching the boundary will return becoming inverted. The transmitted pulse will reduce in size and then reflect inverted at the fixed end. If the arrangement of the spring is going from dense to light, then the pulse will not be inverted when it is reflected at the boundary with the transmitted wave being larger and quicker.