**Waves booklet revision answers**

1.

| Waves | Mechanical | Electromagnetic |
|---|---|---|
| Definition | Transfer of energy through a physical medium without transfer of the medium itself. | Transfer of energy as oscillating electric and magnetic fields. |
| Differences | Requires a medium | Does not require a medium |
| Similarities | Transfers energy without transferring matter, takes the form of an oscillation, speed varies with medium, exhibits wave behaviour (reflection, refraction, etc.) | |
| Examples | Sound, earthquake waves, ultrasound, ocean waves | Light, radio waves, microwave radiation, X-rays, γ-rays, IR light, UV light |

2. A time graph can show period but not wavelength while a distance graph can show wavelength but not period
3. Definitions
    a. Amplitude: maximum variation in the displacement of individual particles in a the medium of a wave or maximum variation in the density/pressure of particles in the medium of a wave
    b. Frequency- f (Hz): the number of oscillations per second/number of complete wave cycles per second
    c. Wavelength - λ (m): length of one complete wave
    d. Period – T (s): time for one complete oscillation/wave cycle
    e. Speed – v (m $s^{-1}$): rate of change of position of the wave(fronts)
4. In longitudinal waves the direction of the oscillations is parallel to the direction of wave propagation, while in transverse waves the direction of oscillation is perpendicular to the direction of wave propagation. Sound is a longitudinal wave while light is a transverse wave.
5.

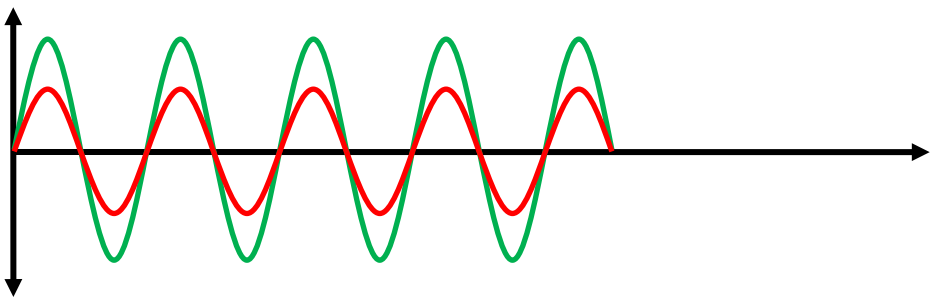
| | P waves or primary waves | S waves or secondary waves | Surface waves (Rayleigh and Love waves) |
|---|---|---|---|
| Speed | Fastest | Medium | Slowest |
| Type | Longitudinal | Transverse | Transverse and/or |

| | | | |
|---|---|---|---|
| | | | Longitudinal |
| Damage | Lowest | Moderate | Highest |
| Special | | Only travel through solids | Only travel along surface |

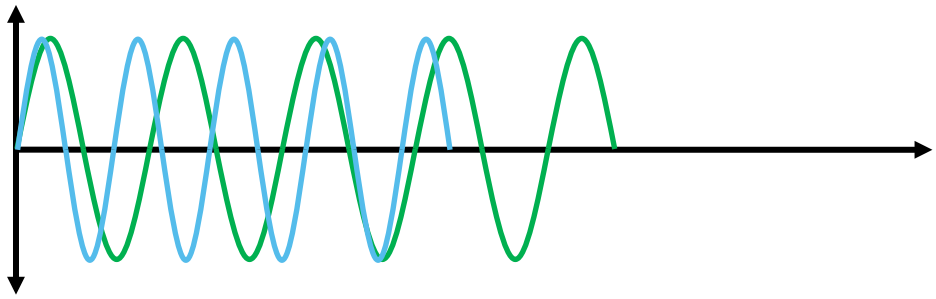
6.
7. v=velocity, s=displacement, t=time, T=period, λ=wavelength, f=frequency

$$v = \frac{s}{t}$$
$$if\ t = T\ ,then\ s = \lambda$$
$$v = \frac{\lambda}{T}$$
$$T = \frac{1}{f}$$
$$v = f\,\lambda$$

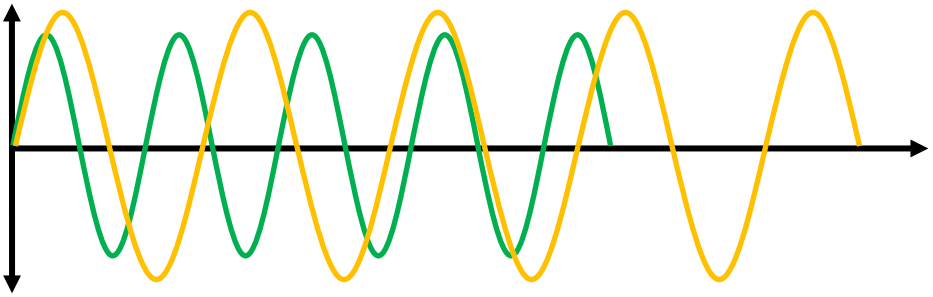
8. frequency is the inverse of period and vice versa
9. At the peaks and troughs
10. Greater distance = greater amplitude
11. 3.53 s
12. 332 m $s^{-1}$
13.
    a. Transverse mechanical
    b. Transverse mechanical
    c. Longitudinal mechanical
    d. Transverse electromagnetic
    e. Longitudinal mechanical
14. Longitudinal mechanical
15. Easiest is as a pressure/distance, pressure/time, displacement/distance or displacement/time graph – all of these will look like a transverse wave
16.
    a.



b.



c.



17.

a. Each string has a different resonant frequency (caused by different mass of string and different tension) so each string creates sound waves of a different pitch. Additionally each string can effectively be shortened incrementally by placing a finger between frets. This increases the resonant frequency for the string, increasing the pitch of sound created.

b. The column of air in the trombone has its own resonant frequency, the valves and slide function to change the length of the air column, changing the resonant frequency so changing the pitch of sound created.