Physics Summer Work

Task 1

Watch all the videos from the following play list about waves

https://www.alevelphysicsonline.com/waves

Task 2

The following are the definitions from the waves topic. Please learn these for a test at the beginning of the first lesson.

Progressive wave	A pattern of disturbances travelling through a medium and carrying energy with it, involving the particles of the medium oscillating about their equilibrium positions.
Transverse wave	A transverse wave is one where the particle oscillations are at right angles to the direction of travel (or propagation) of the wave.
Longitudinal wave	A longitudinal wave is one where the particle oscillations are in line with (parallel to) the direction of travel (of propagation) of the wave.
Polarised wave	A polarised wave is a transverse wave in which particle oscillations occur in only one of the directions at right angles to the direction of wave propagation.
Wavelength of a progressive wave	The wavelength of a progressive wave is the minimum distance (measured along the direction of propagation) between two points on the wave oscillating in phase.
Frequency of a wave	The frequency of a wave is the number of cycles of a wave that pass a given point in one second, [or equivalently the number of cycles of oscillation per second performed by any particle in the medium through which the wave is passing.]
Velocity of a wave	The velocity of a wave is the distance that the wave profile moves per unit time.
Diffraction	Diffraction is the spreading out of waves when they meet obstacles, such as the edges of a slit. Some of the wave's energy travels into the geometrical shadows of the obstacles.

The principle of superposition.	The principle of superposition states that if waves from two sources [or travelling by different routes from the same source] occupy the same region then the total displacement at any one point is the vector sum of their individual displacements at that point.
In phase	Waves arriving at a point are said to be *in phase* if they have the same frequency and are at the same point in their cycles at the same time. [Wave *sources* are in phase if the waves have the same frequency and are at the same point in their cycles at the same time, as they leave the sources.]
Phase difference	Phase difference is the difference in position of 2 points within a cycle of oscillation. It is measured as a fraction of the cycle or as an angle, where one whole cycle is 2 or 360°]
Coherence	Waves or wave sources, which have a constant phase difference between them (and therefore must have the same frequency) are said to be coherent.
Stationary (or standing) wave	A stationary wave is a pattern of disturbances in a medium, in which energy is not propagated. The amplitude of particle oscillations is zero at equally-spaced *nodes*, rising to maxima at *antinodes*, midway between the nodes.
Snell's law	At the boundary between any two given materials, the ratio of the **sine** of the angle of incidence to the **sine** of the angle of refraction is a constant.
Critical angle	The angle of incidence at which the angle of refraction is 90 degrees
Diffraction grating	A slide or other thin object that contains lots of equally spaced slits very close together, used to show diffraction patterns of waves.
First Harmonic	The lowest frequency at which a stationary wave is formed where the wavelength is double the length of the vibrating medium

Task 3

Find out what it means it a wave is polarised and where polarisation of waves is useful – write one paragraph

Task 4

Complete the following questions

Frequency and Time Period

Consider one point on a wave.

If it has a time period of 0.2 seconds, i.e. it takes 0.2 seconds to complete one full oscillation, then in one second it will complete 5 full oscillations.

It has a frequency of 5 hertz.

The number of oscillations of one point on a wave every second is called the frequency of the wave. It has the symbol f and is measured in hertz (symbol, Hz).

1) If you know the time period T you can work out the frequency using the equation $f = 1/T$.
2) If you know the frequency f you can work out the time period using the equation $T = 1/f$.

Examples:

1) One coil of a spring oscillates with a time period of 0.008 seconds. What is the frequency of the wave passing along that spring?

   $f = 1/T = 1 / 0.008\ s = 125\ Hz$

2) A wave has a frequency of 350 Hz. What is the period of oscillation of one point on that wave?

   $T = 1/f = 1 / 350\ Hz = 0.0029\ s$

Now you try these questions:

1) Ripples on the surface of a pond have a frequency of 12 Hz. What is the time period of oscillation of particles in the water?
2) One turn of a slinky spring takes 0.45 seconds to complete one full oscillation. What is the frequency of the wave on the spring?
3) A radio signal has a frequency of 8×10^5 Hz (800 kHz). What is the time period of oscillations of the electromagnetic field?
4) Oscillations in a sound wave have a time period of 0.002 seconds. What is the frequency of the sound?

Task 5

Learn the symbols and what they mean.

Symbol	Name	What it means		How to convert	
P	peta	10^{15}	1000000000000000		↓ x1000
T	tera	10^{12}	1000000000000	↑ ÷ 1000	↓ x1000
G	giga	10^{9}	1000000000	↑ ÷ 1000	↓ x1000
M	mega	10^{6}	1000000	↑ ÷ 1000	↓ x1000
k	kilo	10^{3}	1000	↑ ÷ 1000	↓ x1000
			1	↑ ÷ 1000	↓ x1000
m	milli	10^{-3}	0.001	↑ ÷ 1000	↓ x1000
μ	micro	10^{-6}	0.000001	↑ ÷ 1000	↓ x1000
n	nano	10^{-9}	0.000000001	↑ ÷ 1000	↓ x1000
p	pico	10^{-12}	0.000000000001	↑ ÷ 1000	↓ x1000
f	femto	10^{-15}	0.000000000000001	↑ ÷ 1000	

Task 6

Learn all the units below

Quantity	Name of unit	Symbol
Time period	seconds	S
Power of a lens	dioptre	D
Focal length	Metre	m
Momentum	Kilogram metres per second	kgm/s
Extension	metres	m
Spring constant	newtons per metre	N/m
Wavelength	metre	m
Frequency	hertz	Hz
Unit for electrical energy (when working out the cost of the energy)	kilowatt hours	kWh
Temperature	Degrees Celsius or Kelvin	^{o}C or K

Specific heat capacity	Joules per kg degrees Celsius	J/kg^{o}C
Efficiency	1. if given as a percentage %, if given as a decimal no units	
Current	Ampere	A
distance	Metres	m
area	Metres Squared	m^2
volume	Metres Cubed	m^3
Force / **weight**	Newtons	N
Pascals	pressure	Pa
frequency	Hertz	Hz
resistance	Ohms	**Ω**
speed	Metres per Second	m/s
velocity	Metres per Second	(m/s) (with direction)
acceleration	Metres per Second Squared	**m/s^2**
Power	Watts	W
Please note also IW= IJ/s		
moment	Newton Metres	Nm
Kilograms per Metre Cubed	density	kg/m^3
time	Seconds	s
mass	Kilograms	Kg
energy/ gravitational potential energy/ kinetic energy/ electrical energy/ workdone	Joules	J
charge	Coulombs	C
Voltage/ potential difference	volts	V
radioactivity	Bequerels	bq