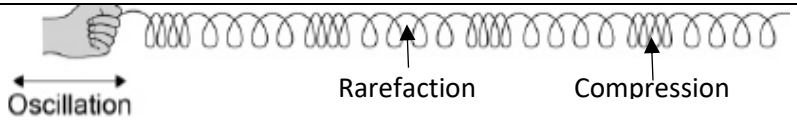
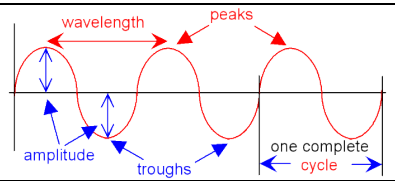
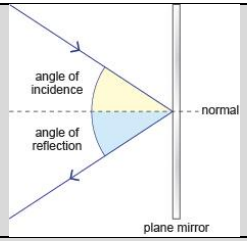
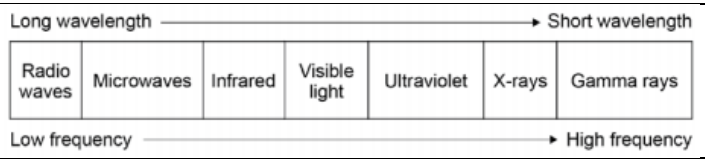
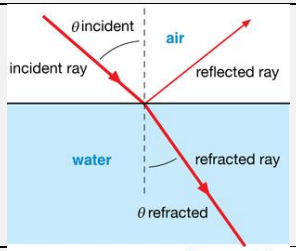
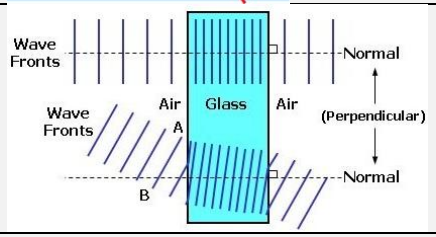
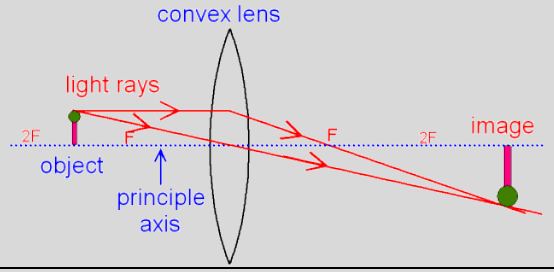
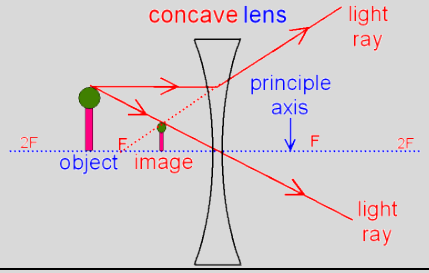
Core questions – Physics unit 6 - Waves

1	What is a wave?	Transfers energy from one place to another without transferring matter
2	What are the two types of waves?	Transverse and longitudinal
3	What is an example of a transverse wave?	Ripples on the surface of water
4	What is an example of a longitudinal wave?	Sound waves travelling through air
5	What direction are the oscillations of a transverse wave compared to the direction of the energy travel?	The oscillations (vibrations) are **perpendicular** (at 90°) to the direction of energy transfer
6	What direction are the oscillations of a longitudinal wave compared to the direction of the energy travel?	The oscillations (vibrations) are **parallel** to the direction of energy transfer
7	Draw a labelled diagram of a longitudinal wave?	
8	Draw a labelled diagram of a wave to demonstrate amplitude, wavelength, peaks, troughs and one complete cycle of a wave.	
9	What is the definition of amplitude?	The maximum displacement of a point on a wave away from its undisturbed position.
10	What is the definition of wavelength?	The wavelength of a wave is the distance from a point on one wave to the equivalent point on the adjacent wave.
11	What is the definition of frequency?	The frequency of a wave is the number of waves passing a point each second
12	What is the equation from the physics equation sheet that relates the period of one wave and frequency?	$\text{period} = \frac{1}{\text{frequency}}$
13	What is the symbol equation from the physics equation sheet that relates period and frequency?	$T = \frac{1}{f}$
14	What are the units and unit symbol of frequency?	Hertz, Hz
15	What is the wave speed?	The speed at which the energy is transferred through the medium.
16	What is the word equation for wave speed?	$\text{wave speed} = \text{frequency} \times \text{wavelength}$
17	What is the symbol equation for wave speed?	$v = f \lambda$
18	What are the unit and unit symbol of wave speed?	metres per second, m/s
19	What happens to waves at the boundary between materials? **(Triple only)**	They can be reflected, absorbed or transmitted.
20	What is a 'normal' line? **(Triple only)**	An imaginary line that's perpendicular to the surface at the point where the wave hits the surface
21	What is the relationship between the angles of incidence and reflection? **(Triple only)**	Angle of incidence = angle of reflection

22	Draw a ray diagram to show how light is reflected by a plane mirror. **(Triple only)**	
23	What is specular reflection? **(Triple only)**	When a wave is reflected in a single direction by a smooth surface (e.g. a mirror) and you get a clear reflection
24	What is diffuse reflection? **(Triple only)**	When a wave is reflected by a rough surface (e.g. a piece of paper) and the rays are scattered in lots of different directions
25	How do sound waves travel through solids? **(Triple only)**	Vibrations in the solid cause the sound wave to travel
26	How do humans hear sounds? **(Triple only)**	The sounds waves cause the ear drum and other parts of the ear to vibrate, causing a sensation of sound
27	Why can humans hear only a limited range of sounds? **(Triple only)**	Human hearing is limited by the size and shape of our ear drum as well as the structure of all the parts in the ear that vibrate
28	What is a reflected sound called? **(Triple only)**	An echo
29	What is the range of normal human hearing? **(Triple only)**	20 Hz to 20 kHz
30	What are ultrasound waves? **(Triple only)**	Ultrasound waves have a frequency higher than the upper limit of hearing for humans (frequencies above 20, 000 Hz)
31	What happens when ultrasound waves meet a boundary between two different media? **(Triple only)**	They are partially reflected
32	What does it mean when an ultrasound is described as ‘partially reflected’? **(Triple only)**	Some of the wave is reflected off the boundary between the two media, and some is transmitted (and refracted)
33	How can partial reflection be used in ultrasound to determine how far away a boundary between one substance and another is? **(Triple only)**	By the time taken for the reflections to reach a detector
34	What can ultrasound waves be used for? **(Triple only)**	Medical and industrial imaging
35	What are seismic waves? **(Triple only)**	Waves produced by earthquakes
36	What are P-waves? **(Triple only)**	P-waves are longitudinal, seismic waves. P-waves travel at different speeds through solids and liquids.
37	What are S-waves? **(Triple only)**	S-waves are transverse, seismic waves
38	Which type of media are S-waves unable to travel through? **(Triple only)**	Liquids
39	What do P-waves and S-waves provide evidence for? **(Triple only)**	The structure and size of the Earth’s core, which are not easily observable
40	How are waves used to detect objects in deep water and measure water depth? **(Triple only)**	Echo sounding, using high frequency sound waves
41	What are electromagnetic waves?	Transverse waves that transfer energy from the source of the waves to an absorber

42	What are the groups of waves in the electromagnetic spectrum? Label increasing wavelength and frequency?	
43	What is the velocity of all electromagnetic waves through a vacuum?	300 000 000 m/s (3.0×10^8 m/s)
44	What is the only electromagnetic waves our eyes are able to detect?	Visible light
45	What is a practical application for radio waves?	Television and radio
	What is a practical application for microwaves?	Satellite communications, cooking food
46	Why are microwaves used for satellite communications?	They are able to pass through the Earth's atmosphere
47	What is a practical application for infrared?	Electrical heaters, cooking food, infrared cameras
48	What is a practical application for visible light?	Fibre optic communications
49	What is a practical application for ultraviolet?	Energy efficient lamps, sun tanning
50	What is a practical application for x-rays and gamma rays?	Medical imgaing and treatments
51	What happens when a wave crosses a boundary between different materials at an angle and what is this called? **(HT only)**	They speed up or slow down and it changes directions – called refraction
52	Why do waves refract when they enter different substances? **(HT only)**	They speed up of slow down
53	What does the size of refraction depend on? **(HT only)**	How much the wave speeds up or slows down
54	What happens to a wave if it crosses a boundary at an angle and slows down? **(HT only)**	It bends towards the normal
55	What happens to a wave if it crosses a boundary at an angle and speeds up? **(HT only)**	It bends away from the normal
56	Draw a ray diagram to show how light is refracted at a surface between two materials. **(HT only)**	
57	Draw a **<u>wave front</u>** diagram to explain how refraction is related to the change of speed that happens when a wave travels from one medium to another. **(HT only)**	
58	What happens to the wavelength and frequency of a wave when it is refracted? **(HT only)**	The wavelength changes, but the frequency stays the same
59	How can radio waves be produced? **(HT only)**	Oscillations in electrical circuits

60	What is the object called in which charges oscillate to create the radio waves? **(HT only)**	A transmitter
61	What is the frequency of the waves produced by a transmitter the same as? **(HT only)**	The frequency of the alternating current in the electrical circuit
62	What happens when transmitted radio waves reach a receiver? **(HT only)**	They are absorbed
63	What happens to the energy that is being carried by the radio waves when it reaches a receiver? **(HT only)**	It is transferred to the electrons in the material of the receiver and causes them to oscillate at the same frequency as the radio wave that generated it
64	How are electromagnetic waves related to atoms and nuclei?	Changes in atoms and the nuclei of atoms can result in electromagnetic waves being generated or absorbed
65	Where do gamma rays originate from?	Changes in the nucleus of an atom
66	What is radiation dose?	Radiation dose is a measure of the risk of harm resulting from an exposure of the body to the radiation.
67	What are the units of radiation dose?	Sieverts, Sv
68	How many millisieverts (mSv) make up 1 sievert (Sv)?	1000 millisieverts (mSv) = 1 sievert (Sv)
69	What effect do ultraviolet waves have on skin?	They can cause it to age prematurely and they increase the risk of skin cancer.
70	Which types of EM radiation are ionising?	X-rays and gamma rays
71	What effects can ionising radiation have on the body?	They can cause mutation of genes and cancer
72	What are the two different types of lens? **(Triple only)**	Convex and concave
73	What is the definition of converging and which lens does this apply to? **(Triple only)**	Brought together, convex
74	What is the definition of diverging and which lens does this apply to? **(Triple only)**	Spread out, concave
75	How do convex lenses form an image? **(Triple only)**	Parallel rays of light are brought together (converge) at the principal focus
76	Where is the principle focus of a convex lens? **(Triple only)**	Where rays hitting the lens parallel to the axis all meet
77	Where is the principle focus of a concave lens? **(Triple only)**	The point where rays hitting the lens parallel to the axis appear to all come from. You have to trace them back until they appear to meet up.
78	What is the focal length? **(Triple only)**	The distance from the lens to the principal focus
79	What is a real image? **(Triple only)**	One that can be shown on a screen
80	What is a virtual image? **(Triple only)**	One that does not exist, and only appears to
81	What can you not do with a virtual image? **(Triple only)**	Project it onto a screen
82	What type of image does a convex (converging) lens produce? **(Triple only)**	Real or virtual
83	What type of image does a concave (diverging) lens produce? **(Triple only)**	Virtual only
84	What is the equation from the Physics equation sheet for magnification? **(Triple only)**	Magnification = image height / object height
85	What are the units for image height and object height? **(Triple only)**	mm or cm
86	What are the units of magnification? **(Triple only)**	Magnification is a ratio and so has no units

87	How is a convex lens represented in ray diagrams? **(Triple only)**	
88	How is a concave lens represented in ray diagrams? **(Triple only)**	
89	What would a ray diagram look like for an image through a convex lens? **(Triple only)**	
90	How does the distance the object is from a convex lens affect the image? **(Triple only)**	An object at 2F will produce a **real**, inverted image the same size as the object An object between F and 2F will produce a **real**, inverted image that is bigger than the object An object nearer than F will make a **virtual** image the right way up, bigger than the object
91	What would a ray diagram look like for an image through a concave lens? **(Triple only)**	
92	What is the difference between the colours in the visible light spectrum? **(Triple only)**	They each have their own narrow band of wavelength and frequency
93	What is the word for reflection from a smooth surface in a single direction? **(Triple only)**	Specular reflection
94	What is the word for reflection from a rough surface? **(Triple only)**	Diffuse reflection
95	How do colour filters work? **(Triple only)**	By absorbing certain wavelengths (and colour) and transmitting other wavelengths (and colour)
96	What is an opaque object? **(Triple only)**	An object in which no light is transmitted
97	What determines the colour of an opaque object? **(Triple only)**	By which wavelengths of light are more strongly reflected
98	What happens to the colours hitting an opaque object that are not reflected? **(Triple only)**	They are absorbed
99	When does an object appear white? **(Triple only)**	When all wavelengths of light are reflected equally

100	When does an object appear black? **(Triple only)**	When all wavelengths of light are absorbed
101	What is the definition of transparent? **(Triple only)**	An object that is see through
102	What is the definition of translucent? **(Triple only)**	An object that is partially see through
103	What words are used to describe objects which transmit light? **(Triple only)**	Transparent or translucent
104	What radiation do all objects, no matter what temperature, emit & absorb? **(Triple only)**	Infrared
105	What can be said about the amount of radiation a hot body emits? **(Triple only)**	The hotter the body, the more infrared radiation it radiates in a given time
106	What is a perfect black body? **(Triple only)**	An object that absorbs all of the radiation incident on it. No radiation is reflected or transmitted.
107	What type of object is the best possible emitter of radiation? **(Triple only)**	A perfect black body
108	What can be said about the rate that an object absorbs and emits radiation? **(Triple only)**	A body at constant temperature is absorbing radiation at the same rate as it is emitting radiation.
109	When does the temperature of a body increase? **(Triple only)**	The temperature of a body increases when the body absorbs radiation faster than it emits radiation
110	What factors affect the temperature of the Earth? **(Triple only)**	The rates of absorption and emission of radiation; Reflection of radiation into space