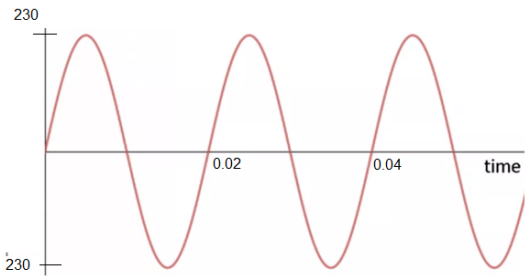
1	2	3	4	5	6	7	8	9	10
C	C	C	B	B	A	C	B	D	B
11	12	13	14	15	16	17	18	19	20
B	A	B	B	D	A	A	C	C	A

1a)	From 0 to x, it is moving at constant deceleration from x to 2.5, it is moving at constant acceleration	[1] [1]
b)	10 = 10/x x = 1.00 s	 [1]
c)	dist = ½ x 1 x 10 = 5.00 m	[1] ecf [1]
d)	½ x 1.5 x 15 – 5 = 6.25 m	[1] ecf [1]
2a)	Draw a correct scaled diagram Correct resultant force with label and double arrow magnitude = 1160 kN (1040 – 1280) direction= 15 degree from 600N (14 – 16)	[1] [1] [1] [1]
b)	a = F/m = 1160000/50379000 = 0.0230	 [1] [1]
3a)	GPE = 500 x 10 x 30 = 150000 J	 [1]
b)	KE = ½ x 500 x 2^2 = 1000 J	 [1]
c)	½ (500)v^2 = 151000 v = 24.6 m/s	[1] [1]
d)	E = 15100 – (500)(10)(25) = 26000 F = 26000/150 = 173 N	[1] [1]
4a	As d1 is much smaller than d2, force F will be greater than W at equilibrium position.	 [1]
b)	W x 35 = 1000 x 2 W = 57.1 N	[1] [1]

5a)	The transverse wave move perpendicular to the vibration of wave particle while longitudinal wave move parallel to the vibration of wave particle.	[1]
(b)	v = 5 x 3 = 15 cm/s	[1] [1]
(c)	The speed will increase. Since v = fλ, the frequency is constant while the wavelength in the deeper region increase. So the speed increases.	[1] [1]
6(a)	Magnified, inverted and real (Any two)	[1]
(b}	Correct lens position Correct F Correct ray with arrow	[1] [1] [1]
(c)	The image become more magnified as it shift towards the lens. After the distance is lesser than F, the image become virtual, magnified and upright	[1] [1]
7(a)	The angle of incidence is 0	[1]
b)	$c = \sin^{-1}(1/1.51)$ = 41.5	 [1]
c)	the angle of incidence is 45 which is greater than the critical angle, total internal reflection will occur	[1] [1]
8a)	Liquid molecules have strong forces of attraction and the molecules can slide pass each other.	[1]
b)	The internal kinetic energy remain the same while the internal potential energy increase	[1] [1]
c)	Air/vapour is not a good conductor of heat	[1]
9a)	A is negative terminal B is positive terminal	[1]
b)	$(1 + ½)^{-1} + 7 = 7.67\ \Omega$	[1m for parallel circuit calculation] [1]
c)	$P = 9^2/7.67$ = 10.6 W	[1] [1]

d)	the current will decrease	[1]
10a	P = 3.3 x 230 = 759 W	 [1]
b	cost = 0.759 x 4 x 365 x 0.195 = $216	[1] ecf [1]
c(i)	4 or 5A	[1]
(ii)	On the live wire. So that the air conditioner is disconnected from the live voltage and prevent electric shock	[1] [1]
(d)	Earth wire. or any relevant answer In case there is a fault, the current will flow through the earth wire which has low resistance into the earth.	[1] [1]
(e)		correct label and value of x-axis [1] correct label and value of y-axis [1]
11a)	The wave will propagate through a series of compression and rarefaction The wave transfer energy as a longitudinal wave and it will move parallel to the vibration of wave particles.	 [1] [1]
b)	(7.5 – 4.0) x 60 = 210 km	[1] [1]
c)	Human hearing frequency is 20 to 20kHz. P wave frequency is lower than 20 Hz	 [1]
d)	λ = 4/10 = 0.4 km	 [1]
e)	1.5 cm^2 = 0.00015 m^2 P = 15/0.00015	[1]

	= 100000 Pa	[1]
f)	half amplitude double frequency	[1] [1]
12a)(i)	the Perspex rod loses electrons to the cloth. As there are more positive charges than negative charges, the rod becomes positively charged.	[1]
(ii)	The gold leaf will move away/deflect from the brass plate The electrons will be attracted and move to the top as unlike charges attract. The brass plate and gold leaf will become positively charged. Since like charges repel, the gold leaf deflect away	[1] [1] [1]
b)(i)	$I = 0.025/ (0.01 \times 10^{-3})$ $= 2.5 \times 10^{-3}$ A	[1] [1]
(ii)	V = 10/ 0.025 = 400 V	[1]
c)(i)	Resistance of B will be 4 times of A	[1]
(ii)	Since V remains the same, the current through B will be ¼ of A	[1]