Correct vector triangle. [1] Correct scale: 1 cm rep 1 ms ⁻¹ [1] (arrows must be correct for mark) Correct magnitude: 5.3 ms ⁻¹ [1] ± 0.3 Correct angle 53° [1] $\pm 2°$	
Man B would accelerate with an acceleration of 0.5X [1]. This is because the <u>force acting on</u> <u>the woman and man are the same magnitude</u> but since the <u>man is twice the mass</u> [1], his acceleration will be halved.	
The woman move with constant speed in a straight line (constant velocity) opposite to the direction of the man[1]. This is due to inertia/Newton's first law/ No net force[1].	
When a body is in equilibrium [1], the sum of clockwise moments about a point is equal to the sum of anticlockwise moments about the same point [1].	
$Fx = 2000 \times (1.1 - 0.25) [1]$	
6800 N [1]	
The perpendicular distance from the line of action of force at P to the pivot is smaller than that from the line of action of the weight to the the pivot.[1]	
Chemical potential energy[1]	
radiation [1]	
Shiny surface is a good reflector of infrared radiation [1]. Therefore infrared radiation that would have escaped to the surroundings otherwise, hits the shiny surface and is reflected to the man instead [1]. OR poor absorber of infrared radiation [1] infrared radiation that strikes the surface will not be absorbed by the hood which causes the air beneath the hood to remain warm to heat the man up. It is more efficient because infrared radiation could have escaped upwards to the surroundings, without the hood.	
Black surface is a good absorber of infrared radiation [1] from the heating source, allowing the man to gain more heat.[1] OR pullover traps air which is a poor conductor of heat[1]. This reduces rate of heat lost from the man to the surrounding[1].	
	Correct vector triangle. [1] Correct scale: 1 cm rep 1 ms ⁻¹ [1] (arrows must be correct for mark) Correct magnitude: 5.3 ms ⁻¹ [1] ± 2 . Man B would accelerate with an acceleration of 0.5X [1]. This is because the force acting on the woman and man are the same magnitude but since the man is twice the mass [1], his acceleration will be halved. The woman move with constant speed in a straight line (constant velocity) opposite to the direction of the man[1]. This is due to inertia/Newton's first law/ No net force[1]. When a body is in equilibrium [1], the sum of clockwise moments about a point is equal to the sum of anticlockwise moments about the same point [1]. Fx = 2000 × (1.1 - 0.25) [1] 6800 N [1] The perpendicular distance from the line of action of force at P to the pivot is smaller than that from the line of action of the weight to the the pivot.[1] Chemical potential energy[1] radiation [1] Shiny surface is a good reflector of infrared radiation [1]. Therefore infrared radiation that would have escaped to the surroundings otherwise, hits the shiny surface and is reflected to the the man instead [1]. OR poor absorber of infrared radiation [1] infrared radiation that strikes the surface will not be absorbed by the hood which causes the air beneath the hood to remain warm to heat the man up. It is more efficient because infrared radiation could have escaped upwards to the surroundings, without the hood. Black surface is a good absorber of infrared radiation[1] from the heating source, allowing the man to gain more heat.[1] OR pullover traps air which is a poor conductor of heat[1]. This reduces rate of heat lost from the man to the surrounding[1].

5a	sin(60)/sin(r)=1.6[1]							
	R=32.8°[1]	1						
b	1.6=1/sin(c)[1]	. <u></u>						
	c=38.7° [1]							
с	Total internal reflection[1]. The angle of incidence is greater than the critical angle (of glass-							
	air boundary) and the ray is going from a optically denser glass to optically less dense air.[1]							
D	Wavelength: decreases, frequency: remains the same.[1]							
6a	The electrons/negative charges in the metal sphere will move to the right as like charges							
	repel, leaving the left side positively charged.							
b	Connect the earth wire to the metal sphere[1]. Remove the earth connection before							
-	removing the charged rod [1].							
C	1 mark for correct direction (independent of pattern) 1 mark for correct shape(including stronger field between and weaker field further away Note: line has to be perpendicular to the surface of the charge.							
7a								
hi	R2 [1]							
bii	When the area gets dark, the resistance of an LDR will increase [1] this will increase the							
	output voltage as it is $R2/(R1+R2) \times 6.0$ / by potential divider principle [1].	1						
с	Thermistor[1]							
8a	13A, 0 A [1]							
Bi	The earth wire, being very low/(near) zero resistance, draws all/most current from the live							
	wire/metal casing. [1]	1						
	This prevents/reduces current from flowing through anyone touching the metal casing. [1]	1						
	The high current through the low resistance wire blows the fuse , cutting off current/	I						
-	opening circuit. [1]							
Bii	When the fuse is melted, it isolates the washing machine from high electric potential / the	1						
	washing machine is no longer 'live'. [1]							
9a	carbon brush /	1						
	split-ring commutator [1 for both correct]	1						
	zero marks if anything wrong or missing.							
b	taster [1]							

	slower [1]	
c	Anticlockwise [1] By Eleming' left hand rule, the left arm of the coil experiences a	
C	downward force given the direction of the current and magnetic field.[1]	
10ai	6.0 V [1]	
ii	40 ms [1]	
b	higher pitch implies higher frequency which means lower period.[1]	
	more waves/cycles/waveforms seen on screen[1] requires correct above interpretation	
	before mark can be awarded.	
	Cannot say more wavelengths seen. Any suggestion of amplitude change will result in 0	
	marks for this question.	
	Many did not answer question about what happens to trace on screen. Read question	
	carefully.	
11ai	F = ma	
	$190 \times 10^3 = 2.1 \times 10^5$ a	
	a = 0.90 or 0905 m s ⁻² [1]	
ii	a=6-0/t	
	t=6.67s[1]	
	0.5 x 6 x 6.67 [1]	
	= 20 m[1]	
111(1)	FV (at 40ms ⁻)= 105 kN x 40 = 4200 kW [1]	
	Fv(at 60ms ⁻¹)=70 kN x 60 = 4200 kW [1]	
	Requires proper unit. Some completely ignored units(or the prefix k), this will result in a loss	
	of 1 mark.	
bi	R (= ρ L/A) = 1.8 × 10 ⁻⁸ × 1500/1.1 × 10 ⁻⁴ R [1]	
	= 0.25 Ω [1]	
bii	R=0.25/19[1]= 0.013 Ω[1]	
12a	The alternating current supply produces a changing magnetic field[1] in the primary coil. This	
	causes the magnetic field/flux in the secondary coil to change. By Faraday's law, the changing	
	magnetic flux in the secondary coil induces an electromotive force[1] in the secondary coil.	
	Current flows[1] through the lamp as a result and it lights up.	
	ord word to a difficult condition of the second	
	3 rd mark is only scored if 2 rd mark is correct.	
	mention Faradays law without application (at secondary coll) will generally not score the 2 ^{me}	
	IIIdIK.	
h	Iron core concentrate the magnetic field lines within itself, improving the link between the	
U	nrimary and seocondary coils [1]	
	The changing magnetic field lines in the primary coil is linked to the secondary coil through	
	the iron core.	
	Iron is used as it is easily magnetised and demagnetised. [1] So it can respond quickly to	
	changing magnetic field of the ac current.	
с	Eventually magnetic flux (linkage) is constant[1], since there is no change in magnetic flux	
	linkage, therefore no emf.[1]	

	Marks are linked. No 2 nd mark if 1 st not scored. A quote of faraday's law will not be accepted as if is not directly applied to question.	
d	IV=0.9 IV	
	0.9* 240*150 m = (n*8/12) *12 [1]	
	N=4.05[1],	
	means 4 lamps[1]	
	If prefix is wrongly used. Max 1 mark for this question.	

13Ea	150*7=25/1000 *c *20 [1]	
	C=2100 J kg ⁻¹ K ⁻¹ [1]	
b	8400=Lx0.025 [1]	
	L=3.36/3.4 x10 ⁵ J kg ⁻¹ [1]	
с	Water has higher specific heat capacity [1]	
	Either Smaller gradient for water/ larger for ice OR	
	Longer time to heat water/short time to heat ice through same temperature [1]	
d	Molecules in X vibrate randomly about fixed postions[1]. Molecules in Z are free to move	
	randomly[1]	
	No mention of randomly at least once -1 mark.	
е	Y – KE constant, PE increase.[1]	
	Z – KE increase, PE constant/increase.[1]	

13Oa	It is energy as a by product of an object's movement.[1]									
Bi	0.15x10x210[1]									
	= 315 J[1]									
ii	Work done = 480-315[1]									
	=165 J[1]									
iii	Fx210= 165 [1]									
	F= 0.79N [1]									
ci	Curved from positive value on v axis to (T,0)									
	Less steep gradient [2 or 0 question]									
ii	10ms ⁻² [1]								
1	2	3	4	5	6	7	8	9	10	
D	С	D	В	А	А	В	С	А	D	
11	12	13	14	15	16	17	18	19	20	
С	С	С	В	А	С	А	С	С	В	
21	22	23	24	25	26	27	28	29	30	
В	А	В	В	В	В	С	В	А	В	
31	32	33	34	35	36	37	38	39	40	
D	D	С	В	D	С	В	С	Α	D	