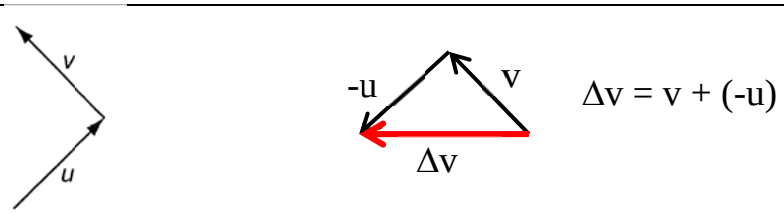
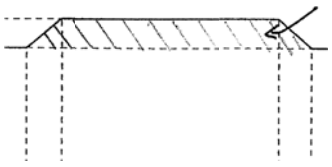
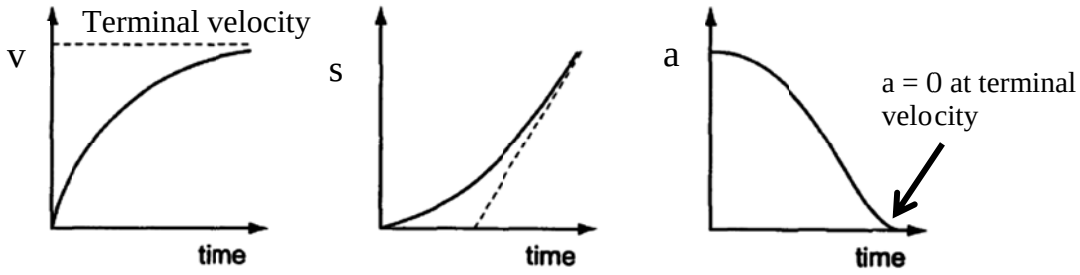
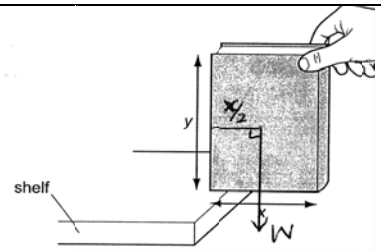
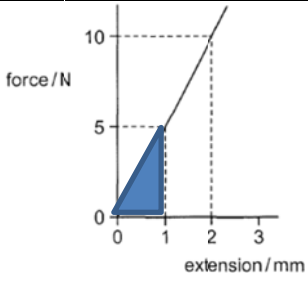
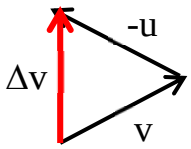
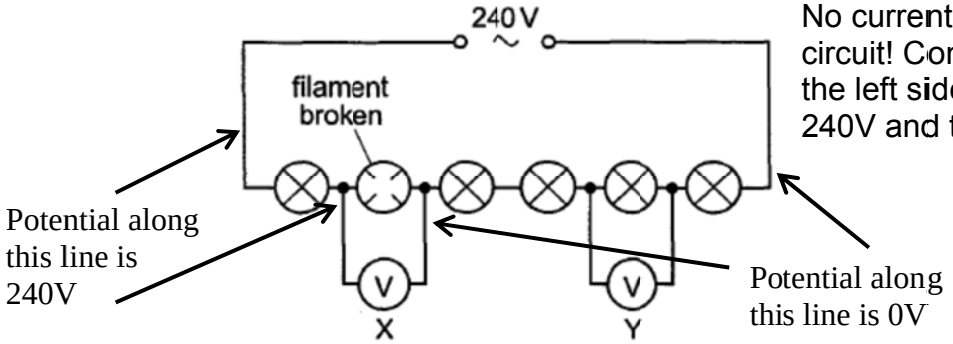
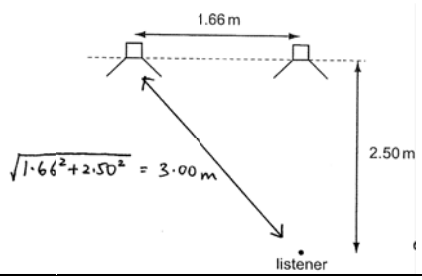
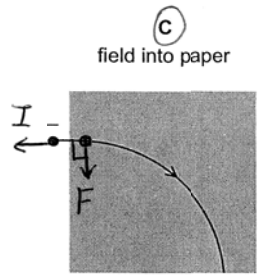
2015 MI H1 PHY P1
MARK SCHEME

(30 Marks)

1.	**B**	Base units of p = Base units of F/A =(kg m s^{-2}) / m^2 = kg m^{-1} s^{-2}
2.	**D**	1. an incorrectly set zero is zero error = systematic 2. <u>always</u> gives a reading which is 5% lower than the true current = systematic 3. <u>not always</u> vertically above the ammeter needle = random
3.	**A**	 $\Delta v = v + (-u)$
4.	**B**	 Area of trapezium = ½ [T + (T+10)] x 5 = 5T + 25 So 5T + 25 = 100 ⇒ T = 15 s
5.	**D**	
6.	**A**	The total area under the speed-time graph is the distance covered. At time Q, it is the same value for both cars.
7.	**B**	 use edge of book as pivot, moment due to weight of book = W (x/2) clockwise To prevent rotation, provide an anti-clockwise moment of (Wx / 2)
8.	**B**	125 mm of paraffin has the same pressure as 100 mm of water. By ratio, 150 mm of paraffin will have the same pressure as 120 mm of water. Hence, the difference is 30 mm.
9.	**C**	 Area of trapezium = 3 x area of the triangle. Hence the ratio is 3

10.	**C**	Using conservation of momentum, $mu + m(0) = 2mv \Rightarrow v = u/2$ Initial ke = ½ m u^2 = E_k Final ke = ½ (2m) $(u/2)^2$ = ½ E_k Ke lost in the collision = E_k - ½ E_k = ½ E_k
11.	**C**	deep in space = no external force, so there is conservation of momentum. inelastic collision = total kinetic energy not conserved
12.	**C**	using trigonometry, $\Delta v = 0.080$ m s^{-1} Force, F = $(m\Delta v) / t$ = (0.40 x 0.080) /0.20 = 0.16 N 
13.	**B**	The increase in the kinetic energy of the mass = work done by the force = 10 x 2.5 = 25 J
14.	**C**	work done on the gas = - P (V_{final} – $V_{initial}$) = - P (V_2 – V_1) = P(V_1 - V_2)
15.	**A**	From power, P = W / t 20% of input power = mgh / t = mgv 0.20 x 9.6 = (0.50) (9.81) v $\Rightarrow$ v = 0.39 m s^{-1}
16.	**B**	For a filament lamp, when temperature increases, vibration of the atoms is more significant than the increase in number of free electrons. Hence the net effect is an increase in resistance.
17.	**C**	From power, P = I^2 R $\Rightarrow$ I = $(P/R)^{1/2}$ = $(0.25/1000)^{1/2}$ = 0.0158 A and I = Ne / t $\Rightarrow$ N / t = I / e = 0.0158 / 1.60 $\times$ 10^{-19} = 1.0 x 10^{17} s^{-1}
18.	**A**	Using R = ρL/A $\Rightarrow$ R $\propto$ L /A = L / d^2 (¼ L) /(d/2)^2 = L / d^2 = R
19.	B	From V = IR $\Rightarrow$ R = V / I = 240 / 4.00 = 60 Ω Using R = ρL/A = 4ρL / πd^2 $\Rightarrow$ L = πRd^2 / 4ρ = [π x 60 x (4.00 x 10^{-4})^2] / 4 x 1.10 x 10^{-6} $\Rightarrow$ L = 6.85m
20.	**D**	 No current flows through the circuit! Consider an instant when the left side of the battery is at 240V and the right side is at 0V
21.	**C**	For A, combination resistance = 1.67 Ω For B, combination resistance = 1.67 Ω For C, combination resistance = 1.5 Ω For D, combination resistance = 1.6 Ω
22.	**C**	For A = fundamental mode for one end closed pipe. For B = fundamental mode for both end open pipe. For C = cannot occur For D = second harmonics for both end open pipe.

23.	**A**	Using $\lambda = v / f \Rightarrow \lambda = 324 / 200 = 1.62$ m Using $\phi = \frac{\Delta x}{\lambda} 2\pi \Rightarrow \Delta x = (\phi / 360^0) \times 1.62 = 0.135$ m
24.	**C**	Only transverse wave can be polarized.
25.	**C**	D must be much greater than a for the equation to be a good approximation.
26.	**C**	 λ = 330 m s^{-1} / 330 Hz = 1.0 m path difference = 3 – 2.50 = 0.50 m ≡ ½ λ $\phi = \frac{\Delta x}{\lambda} 2\pi$ = (½ λ /λ) 2π = π rad = 180^0
27.	**A**	From x =λD/a, Decrease D and decrease a could be made without altering the fringe separation *x*
28.	**C**	 Using Fleming left hand rule, the induced force is always acting perpendicular to the motion.
29.	**B**	Intensity = Nhf / t A =Nhc / λtA N/t = (intensity) x λtA /hc, so when new λ = ½ λ, N/t is also halved.
30.	**C**