Question 1

(a) (i) Wm^{-2} --- [B1]

(a) (ii) Vm^{-1} or NC^{-1} --- [B1]

(a) (iii) ½ $aCE_o^2 = [C / Vm] [m / s] [V^2 / m^2] = CV / sm^2 = J / sm^2$ --- [B1]

$I = W / m^2 = J / sm^2$

Since $[1/2aCE_o^2] = [I]$, the equation is homogenoeous --- [B1]

(b) $E_o = \sqrt{} (2I / aC) = 1.03 \times 10^3 Vm^{-1}$ --- [A1]

(c) $I \alpha 1/r^2$

$I_1r_1^2 = I_2r_2^2$ --- [C1]

$I_2 = 1400 / 20^2 = 3.5 Wm^{-2}$ --- [A1]

Question 2

(a) (i) $v^2 = u^2 + 2as$

$u = \sqrt{}(0^2 – 2 \times 0.85 \times 9.81 \times 15.4)$ --- [C1]

$= 16.0 ms^{-1}$ --- [A1]

(a) (ii) $s = ut$, $t = 32.5 / 16$ --- [C1]

$t = 2.03 s$ --- [A1]

(b) $16.0 ms^{-1} = 57.6 kmh^{-1}$ --- [B1]

Driver is driving within the speed limit --- [B1]

But the reaction time is longer / slow --- [B1]

Question 3

(a) Moment at C, --- [C1]

Y = (5.5 x 9.81 x 0.6) / 4.0 --- [C1]

= 8.09 N --- [A1]

(b) The bag is lowered such that the angle between the bag and the floor is smaller. The perpendicular distance from line of action of force, Y to the pivot is now increased, thus force Y can be reduced.

Repack the content of the case such that the center of gravity is closer to the pivot, C. Thus the clockwise moment due to the weight is now lesser, thus anti clockwise moment can also be reduced, thus force Y can be reduced as well.

Question 4

(a) The ultimate tensile stress is high, so that it can support large load before it breaks. -- [B1]

The Young Modulus is high, so that the cable is rigid / stiff and hence extension is very insignificant. –

[B1]

(b) Let average mass be 70 kg per person. (accept 40 – 120 kg) --- [B1]

UTS = mg / $area_{min}$

$Area_{min}$ = 70 x 9.81 x 15 / 4 x 10^{8} --- [C1]

= 2.45 x 10^{-6} m^{2} --- [A1]

(c) To give allowance to wear and tear of the material over a period of time. --- [B1]

Tension in cable will be greater than weight when lift is accelerating upwards / decelerating

Downwards, thus area has to be larger. --- [B1]

Actual weight may be larger than estimated. --- [B1]

Question 5

(a) The direction / plane of vibration of the particles in the medium --- [B1] is parallel to the direction of propagation of wave --- [B1]

(b) (i) Maximum intensity at point O --- [A1] Since path difference between waves at O is zero, thus they are in constructive interference. --- [M1]

(b) (ii) Wavelength is halved --- [B1]

so from $x = \lambda D / a$, the distance between consecutive maxima is halved --- [B1]

Minimum intensity at point O since destructive interference occurs. --- [B1]

Pattern remains the same except that the maxima & minima positions has been swapped --- [B1]

Question 6

(a) (i) Force per unit positive charge --- [B1]

(ii)

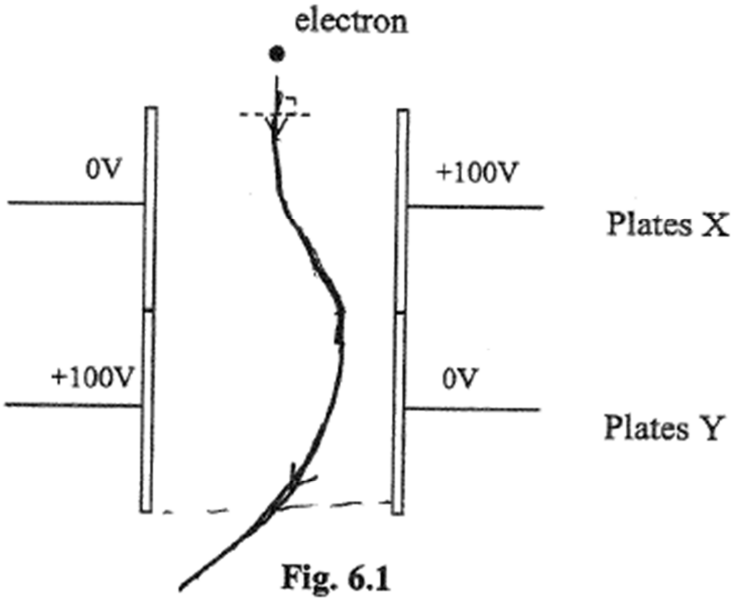

Fig. 6.1

(b) gain in KE = loss in PE

$\frac{1}{2} mv^2 = qV$ --- [B1]

$v = \sqrt{(2 \times 1.6 \times 10^{-19} \times 100 / 1.67 \times 10^{-27})}$ --- [C1]

$v = 1.38 \times 10^5 \text{ ms}^{-1}$ --- [A1]

Question 7

(a) $P = V^2 / R = 120^2 / 750$ --- [C1]

$= 19.2\ \Omega$ --- [A1]

(b) $R = \rho L / A$

$L = 19.2 \times 1.0 \times 0.05 \times 10^{-6} / 1.1 \times 10^{-6}$ --- [C1]

$= 0.87$ m --- [A1]

(c) another element is connected parallel to the 120 V source.

Question 8

(a) 1. First law states that the sum of current entering a junction is equals to the sum of current leaving that junction --- [B1]

2. Second law stated that in any closed loop, the sum of emfs is equals to the sum of pds --- [B1]

(b) (i) $(15 - 9) = 3.2 (R + 0.5 + 0.1)$ --- [C1]

$R = 1.28\ \Omega$ --- [A1]

(b) (ii) $P = VI = (15 \times 3.2) = 48$ W --- [A1]

(b) (iii) $P = I^2 (R + r_1 + r_2) = 3.2^2 (1.88)$ --- [C1]

$= 19.3$ W --- [A1]

(b) (iv) The difference in (ii) and (iii) is the power that is stored in the battery --- [B1]

Question 9

(a)		α – particles	β – particles	
Charge	:	+ 2e	- e	--- [B1]
Mass	:	6.64×10^{-27} kg	9.11×10^{-31} kg	--- [B1]
Penetration	:	stopped by thin sheet of paper	stopped by 5 mm of Al	--- [B1]

(b) $^{207}_{81}Tl \rightarrow {}^{207}_{82}Pb + {}^{0}_{-1}e$ --- [B2]