Electric Fields Past Paper Questions

1. D

[2]

2. A

[2]

3. B

[2]

4. C

[2]

5. (a)

quantity	SI unit	
(gravitational potential)	J kg^{-1} or N m kg^{-1}	scalar
(electric field strength)	N C^{-1} or V m^{-1}	vector
(magnetic flux density	T or Wb m^{-2} or N A^{-1} m^{-1}	vector

6 entries correct **(1) (1) (1)**
4 or 5 entries correct **(1) (1)**
2 or 3 entries correct **(1)** 3

(b) (i) $mg = EQ$ **(1)**

$$E\left(\frac{mg}{Q} = \frac{4.3\times10^{-9}\times9.81}{3.2\times10^{-12}}\right) = 1.32 \times 10^4 \text{ (V m}^{-1}\text{)} \quad \textbf{(1)}$$

(ii) positive **(1)** 3

[6]

6. (a) (i) $E\left(=\frac{V}{d}\right) = \frac{1400}{15\times10^{-3}}$ **(1)** $\left(= 9.3\times10^4 \text{ Vm}^{-1}\right)$

(ii) $t\left(=\frac{l}{v}\right) = \frac{30\times10^{-3}}{3.2\times10^7} = 9.38\times10^{-10}$ s **(1)**

(iii) $ma_y = Ee$ **(1)**

$$ay = \frac{9.3\times10^4\times1.60\times10^{-19}}{9.11\times10^{31}} \textbf{(1)} \ (= 1.64 \times 10^{16} \text{ m s}^{-2})$$

acceleration is upwards [or towards + plate]**(1)** 5

(b) $vy\ (= a_y t) = 1.64 \times 10^{16} \times 9.38 \times 10^{-10}$ **(1)** $(= 1.54 \times 10^7 \text{ m s}^{-1})$

$v = \sqrt{(1.54\times10^7)^2 + (3.2\times10^7)^2}$ $= 3.55 \times 10^7 \text{m s}^{-1}$ **(1)**

at $\tan^{-1}\left(\frac{1.54}{3.2}\right) = 26^\circ$ above the horizontal **(1)** 3

[8]