18. Electric Fields

18.1 Electric fields and field lines

Paper 4

Marking Scheme

Q1.

(a)	force per unit charge	**B1**
	force on positive charge	**B1**
(b)(i)	four straight vertical parallel lines, approximately evenly spaced	**B1**
	arrows downwards	**B1**

Q2.

(b)	at least four straight, radial lines to/from surface of sphere	**B1**
	at least four straight radial lines drawn, approximately equally spaced	**B1**
	arrows pointing away from the surface of the sphere	**B1**

Q3.

(a)(ii)	force per unit positive charge	**B1**
(c)(ii)	same (direction)	**B1**

Q4.

(c)(i)	negative	**B1**
(c)(ii)	four straight lines perpendicular to the plates, starting on one plate and finishing on the other	**B1**
	lines equally spaced	**B1**
	arrows indicating direction downwards	**B1**

Q5.

(b)	$mg = Eq$	**C1**
	$E = (1.6 \times 10^{-10} \times 9.81) / (0.27 \times 10^{-9})$ $= 5.8\ \text{N C}^{-1}$	**A1**

Q6.

(a)	(field line indicates) direction of force	**B1**
	force on a positive charge	**B1**
(b)(i)	one straight line perpendicular to plates, starting on one plate and finishing on the other	**B1**
	five straight lines perpendicular to plates between the plates, uniformly spaced	**B1**
	downwards arrows on lines	**B1**

Q7.

(a)	force per unit charge	**M1**
	(force on) positive charge	**A1**
(c)	At 8.0 cm, $E = 5.75 \times 10^5\ \text{V m}^{-1}$	**C1**
	$F = Eq$ **and** $a = F / m$	**C1**
	$F = (5.75 \times 10^5 \times 2 \times 1.6 \times 10^{-19}) / (4 \times 1.66 \times 10^{-27})$ $= 2.8 \times 10^{13}\ \text{m s}^{-2}$	**A1**

Q8.

(b)(i)	arrow showing field direction down the page	**B1**

Q9.

(a)(i)	region (of space)	**B1**
	where a particle experiences a force	**B1**

Q10.

(a)	force per unit charge	**B1**
	(force on) positive charge	**B1**

Q11.

(c)	force = field strength × charge **and** force = mass × acceleration **or** acceleration is proportional to field strength	**B1**
	(from x = 3.0 cm) to x = 5.0 cm: acceleration decreases	**B1**
	at x = 5.0 cm: acceleration is a minimum	**B1**
	from x = 5.0 cm (to x = 7.0 cm): acceleration increases	**B1**