1. Physical Quantities and Units

1.2 SI units

Paper 2

Marking Scheme

Q1.

(a)	units of F_D: kg m s^{-2}	**M1**
	units of ρ: kg m^{-3} **and** units of A: m^2 **and** units of v: m s^{-1} **or** units of v^2: m^2 s^{-2}	**M1**
	kg m s^{-2} = C kg m s^{-2} **and** comment '(so) C has no units' / unit terms cancelled **or** C = kg m s^{-2} / (kg m^{-3} m^2 m^2 s^{-2}) **and** comment '(so) C has no units' / unit terms cancelled	**A1**

Q2.

(a)	charge underlined (and no others)	**B1**

Q3.

(b)(i)	SI base units of D: kg m s^{-2}	**C1**
	SI base units of r: m **and** v: m s^{-1}	**C1**
	base units of η: kg m s^{-2} / (m × m s^{-1}) = kg m^{-1} s^{-1}	**A1**

Q4.

(a)(ii)	($P = W / t$ gives) units: kg m^2 s^{-2} / s = kg m^2 s^{-3}	**B1**
(b)	($I = P / A$ so) units of I: kg m^2 s^{-3} / m^2 or kg s^{-3}	**C1**
	units of f: s^{-1} **and** units of A: m **and** units of v: m s^{-1}	**C1**
	units of k: kg s^{-3} / [(s^{-1})^2 m^2 m s^{-1}] = kg m^{-3}	**A1**

Q5.

(a)(ii)	($p = F / A$ so units are) kg m s^{-2} / m^2 = kg m^{-1} s^{-2}	**A1**
(b)	unit of R: m **and** unit of t: s **and** unit of L: m	**C1**
	unit of ρ: kg m^{-3} **or** $\rho = m / V$	**C1**
	base units of k: (kg m^{-1} s^{-2} × m^4 × kg m^{-3} × s) / (kg × m) = kg m^{-1} s^{-1}	**A1**

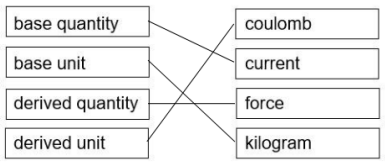
Q6.

(a)	only electric current **and** time underlined	**B1**

Q7.

(a)	only ampere and kilogram underlined	**B1**

Q8.

(a)	 any two joined correctly	C1
	all four joined correctly	A1

Q9.

(b)	$P = Fs / t$ $= (\text{kg m s}^{-2} \times \text{m}) / \text{s}$	C1
	$= \text{kg m}^2 \text{ s}^{-3}$	A1

Q10.

(c)(i)	$\text{kg m}^{-3} = \text{kg} \times \text{m}^n / \text{m}$ **or** $\text{kg m}^{-3} = \text{kg} \times \text{m}^n \times \text{m}^{-1}$	M1
	$-3 = n - 1$ and (so) $n = -2$	A1

Q11.

(a)	10^{12}	B1
	pico (p)	B1
(b)	ampere and metre both underlined (and no other units underlined)	B1

Q12.

(a)	(work =) force × displacement	C1
	units: $\text{kg m s}^{-2} \times \text{m} = \text{kg m}^2 \text{ s}^{-2}$	A1
(b)(i)	units of Q: As	C1
	units of C: $\text{kg}^{-1} \text{ m}^{-2} \text{ A}^2 \text{ s}^4$	A1

Q13.

(b)	units of F: kg m s^{-2}	C1
	units of k: $\text{kg m s}^{-2} / [\text{m}^2 \times (\text{m s}^{-1})^2]$ $= \text{kg m}^{-3}$	A1

Q14.

(a)(ii)	units: $\text{kg m s}^{-2} \text{ m}$ $= \text{kg m}^2 \text{ s}^{-2}$	A1

Q15.

(b)(ii)	$b = Q / x^2 E$ $= \text{A s} / \text{m}^2 \text{ kg m A}^{-1} \text{ s}^{-3}$	C1
	$= \text{A}^2 \text{ s}^4 \text{ kg}^{-1} \text{ m}^{-3}$	A1

Q16.

(b)	$kg\,m\,s^{-2}$	**A1**
(c)	units for Q: A s **and** for r: m	**C1**
	units for ε = (A s × A s)/(kg m s^{-2} × m^2) = $A^2 kg^{-1} m^{-3} s^4$	**A1**

Q17.

(a)	ampere kelvin (**allow** mole, candela) *any two correct answers, 1 mark each*	**B2**