

## PHYS1022 Summary Sheet 4

### Electrostatic Energy and Capacitance

Chapter 23

#### 23.2 Capacitors and Capacitance

$$C = \frac{Q}{V}$$

Deriving capacitance of eg concentric spheres or cylinders

#### 23.3 Capacitors in series and parallel (revise)

Parallel plate capacitor

#### 23.4 The Storage of Electrical Energy

e.g.  $U = \frac{1}{2}CV^2$  and  $U = \frac{1}{2} \frac{Q^2}{C}$  Derivation of  $U$  (using integration)

Electrostatic Field Energy

Energy density – obtain the next equation from one above

$$u_e = \frac{1}{2} \epsilon_0 E^2$$

### Electric Current and Direct-Current Circuits

Chapters 24 and 25

Refer to **laboratory notes** and to **handout sheets**, as well as textbook.

#### 24.1 Electric current, drift velocity and current density

$$I = \frac{\Delta Q}{\Delta t} = qnAv_d \quad \underline{J} = nq\underline{v}_d$$

#### 24.2 Conductivity $\sigma$ and Resistivity $\rho = \frac{E}{J}$

#### 24.3 Resistance and Ohm's Law $V = IR$

#### 24.4 Electric power

$$P = IV = I^2R = \frac{V^2}{R}$$

#### 25.1 Electromotive force and circuits

#### 25.3 Kirchhoff's Rules

#### 25.5 R-C circuits: discharging and charging a capacitor

$$V_C = E(1 - e^{-t/RC}) + V_0 e^{-t/RC}$$