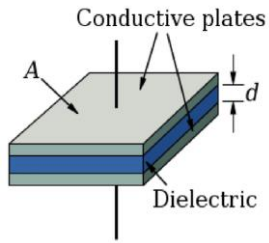
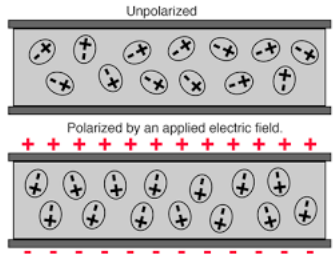
Subject: A-level Physics	Topic: Capacitance	Year Group: 13

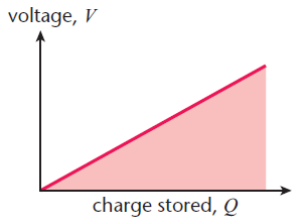
Capacitance introduction

1	Definition	The charge stored per volt (measured in Coulombs)
2	Equation	$C = \frac{Q}{V}$

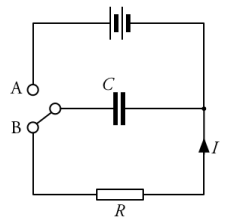
Parallel plate capacitor

1	Basic structure of a parallel plate capacitor:	
2	Factors that affect the capacitance:	1 – Surface area 2 – Separation of the plates 3 – Relative permittivity of the dielectric material
3	Equation:	$C = \frac{A\varepsilon_0\varepsilon_r}{d}$
4	Dielectrics have polar molecules inside which rotate to line up with the field. This increases the charge stored	

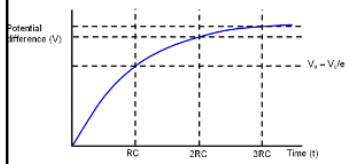
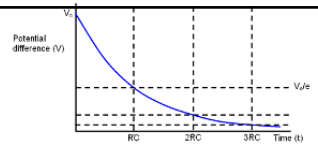
Energy stored by a capacitor

1	Energy =	$= \frac{1}{2}QV$ $= \frac{1}{2}CV^2$ $= \frac{1}{2}\frac{Q^2}{C}$
2	Area under a Charge-pd graph is the energy stored	

Capacitor charging and discharging circuit

1	Circuit for charging and discharging a capacitor though a resistor:	
2	Capacitors must be connected with the correct leg attached to the positive terminal of the power supply:	

Equations and graphical analysis

1	Charging equation: (same for I and V)	$Q = Q_0\left(1 - e^{-\frac{t}{RC}}\right)$
2	Discharge equation: (same for I and V)	$Q = Q_0 e^{-\frac{t}{RC}}$
3	Time constant:	RC is the 'time constant' for the circuit
4	Time to halve, $T_{1/2}$	= 0.69RC
5	Capacitor charging graph:	
6	Capacitor discharging graph:	
7	Area under a current-time graph represents the charge stored by the capacitor	

Required practical

1	Link to video showing method for the Capacitors required prac:	https://www.youtube.com/watch?v=bVVw6S1uqYM