

NEATH PORT TALBOT COLLEGE COLEG CASTELL NEDD PORT TALBOT

School of Maths & Science Science Practical

Determination of the Planck Constant

◆ Aim

To determine the Planck constant using a range of different coloured Light Emitting Diodes (LEDs).

◆ Introduction

You will design and perform an experiment to determine the Planck constant using a set of LEDs.

◆ Safety

Control Measures

- You are reminded of the need of good laboratory practice in order to maintain a safe working environment.

Hazards

Electrical hazard.

Take care with circuits. Switch off power before connecting and disconnecting the circuit.



◆ **Procedure**

1. Draw a diagram of the electrical circuit you will use to vary the voltage across an LED.
2. Once your diagram has been checked set up the circuit.
3. Adjust the variable resistor until the blue LED just lights up. Make a note of this potential difference, V_{\min} , in the table.
4. You have been provided with three other coloured LEDs. Each LED emits a different wavelength of light as shown in the table. Replace the blue LED with each of the others in turn and complete the table.

Colour	Wavelength/nm	$V_{\min 1}$ /V	$V_{\min 2}$ /V	$V_{\min Av}$ /V
Blue	470			
Green	568			
Yellow	589			
Red	660			

5. Plot a suitable graph to show that V_{\min} is inversely proportional to wavelength.
6. The equation linking V_{\min} and wavelength is shown below;

$$V_{\min} = \frac{h c}{e \lambda}$$

$$c = 3.0 \times 10^8 \text{ ms}^{-1}$$
$$e = 1.6 \times 10^{-19} \text{ C}$$

7. Use the graph to find a value for the Planck constant.

8. Determine the percentage difference in the value of h from your results compared with the accepted value of $h = 6.63 \times 10^{-34} \text{ Js}$.

9. Suggest one way in which you could improve the reliability of your results.
