



A. Key Concepts

1. What is quantum Physics?
2. What is de Broglie wavelength? State the equation for calculating de Broglie wavelength.
3. Why is angular momentum of electron said to be 'quantised'? Show this with an equation.
4. What is the Heisenberg Uncertainty Principle? Refer to the **two** equations.
5. Explain the terms 'Black Body Radiation' and 'UV Catastrophe'.

B. Past Paper Practice

1.
 - a) Electrons exhibit wave-like behaviour. Give **one** example of evidence which supports this statement. **1**
 - b) The Bohr model of the hydrogen atom suggests a nucleus with an electron occupying one of a series of stable orbits.
A nucleus and the first two stable orbits are shown in Figure 6.
 - i. Calculate the angular momentum of the electron in the second stable orbit. **3**
 - ii. Starting with the relationship

$$mvr = \frac{nh}{2\pi}$$
 Show that the circumference of the second stable orbit is equal to two electron wavelengths. **2**
 - iii. The circumference of the second stable orbit is $1 \cdot 3 \times 10^{-9}m$.
Calculate the speed of the electron in this orbit. **2**
2. In 1928 Davisson and Germer fired a beam of electrons through a very thin layer of nickel in a vacuum, which resulted in the production of a diffraction pattern
 - a)
 - i. What did they conclude from the results of their experiment? **1**
 - ii. Give **one** example of experimental evidence that photons of light exhibit particle properties. **1**
 - b) Calculate the de Broglie wavelength of an electron travelling at $4 \cdot 4 \times 10^{-6}ms^{-1}$. **3**
 - c) A 20g bullet travelling at $300 ms^{-1}$ passes through a 500 mm gap in a target.
Using the data given, explain why no diffraction pattern is observed. **1**
 - d) Describe the Bohr model of the hydrogen atom. **1**

