叮嚀：解答僅寫出正確方式，在段考中若有類似題目，作答需有詳細計算過程才會完整給分，作業的解答會陸續更新，4/1 前會全數上傳，作業成績和出席也會在期中考後一周更新。

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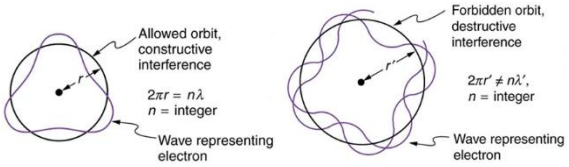
1. **de Broglie's relation states that** $\boldsymbol{\lambda = \frac{h}{p} = \frac{h}{mv}}$

   Bohr's angular momentum quantization: $\boldsymbol{l = rmv = \frac{nh}{2\pi}}$

   $\Rightarrow \boldsymbol{mv = \frac{nh}{2\pi r}}$

   So, $\boldsymbol{n\lambda = 2\pi r}$ **(which n = 1, 2, 3 …). It means that the matter wave must be standing wave, or the electron would fall into the nucleus when accelerating around nucleus.**



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1. **dv=d(**$\frac{c}{\lambda}$**)=** $\left|\frac{c}{\lambda^2}\boldsymbol{d\lambda}\right|$ **，代入(7)即可求得(9)**

2. $p(\lambda)d\lambda = \left(\frac{8\pi h}{\lambda^2}\right)\frac{1}{-1+e^{\frac{hv}{\lambda kT}}}d\lambda$

   Assume x= $\frac{hv}{\lambda kT}$ $, dx = \frac{-hc}{\lambda^2 kT}d\lambda = \frac{-kT}{hc}x^2 d\lambda$

$$\lambda \max \quad occurs \ \ when \ \ \frac{dp(\lambda)}{d\lambda} = \frac{dp(\lambda)}{dx}\frac{dx}{d\lambda} = 0$$

$$(\frac{-kTx}{hc})^2 \frac{d}{dx}\left[8\boldsymbol{\pi c}\left(\frac{-kTx}{hc}\right)^{\mathbf{5}}\frac{\mathbf{1}}{\boldsymbol{e^x - 1}}\right] = 0$$

$$(\frac{-kTx}{hc})^2 8\boldsymbol{\pi c}\left(\frac{-kTx}{hc}\right)^{\mathbf{5}}\frac{d}{dx}\left[\frac{x^5}{e^x - 1}\right] = 0$$

$$\frac{d}{dx}\left[\frac{x^5}{e^x - 1}\right] = 0$$

$$\frac{5e^4(e^x - 1) - x^5 e^x}{(e^x - 1)^2} = 0$$

$$5(e^x - 1) - xe^x = 5\left(1 - \frac{1}{e^x - 1}\right) = 0$$

By numerical method or other programs (mathematica) $x \approx 4.96$