**DOUBLE HELIX STRUCTURE OF DNA**

**TASK B1: Diffraction of light on the hair**

**Question B1.1. (3 points)**

Equation for the diffraction minima:

Equation for the diffraction maxima:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Order of maximum | Left Side | Right Side | Mean |  | [] |
|  |  |  | 7,65 mm | 0,4570 | 80,22 |
|  |  |  | 15,15 mm | 0,9051 | 81,03 |
|  |  |  | 23,1 mm | 1,3798 | 79,73 |

(5 points)

**Question B1.2. (2 points)**

The final value of as the arithmetic mean of the all three values is = \_\_\_80,3 μm\_\_\_\_

(correct value + unit)

**TASK B2: Diffraction of light on the helix**

**Question B2.1. (16 points)**

\_910 mm\_\_

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  | | --- | --- | --- | --- | | Nr, of  measurement |  | (mm) | (mm) | | 1 | 3,0 | 0,194 | 0,0199 | | 2 | 2,8 | 0,208 | 0,0060 | | 3 | 2,8 | 0,208 | 0,0060 | | 4 | 2,7 | 0,216 | 0,0017 | | 5 | 2,8 | 0,208 | 0,0060 | | 6 | 2,9 | 0,201 | 0,0132 | | 7 | 2,7 | 0,216 | 0,0017 | | 8 | 2,5 | 0,233 | 0,0189 | | 9 | 2,6 | 0,224 | 0,0100 | | 10 | 2,5 | 0,233 | 0,0189 | |  |  | 0,2140  mm | 0,0102 mm | | |  |  |  | | --- | --- | --- | | Nr. of  measurement | (°) | (°) | | 1 | 23,4 | 1,98 | | 2 | 23,3 | 2,08 | | 3 | 25,1 | 0,28 | | 4 | 27,6 | 2,22 | | 5 | 29,0 | 3,62 | | 6 | 24,1 | 1,28 | | 7 | 26,2 | 0,82 | | 8 | 24,9 | 0,48 | | 9 | 25,3 | 0,08 | | 10 | 24,9 | 0,48 | |  | 25,4 ° | 1,33 ° | |  |  | (8 points) | |

The final values of and for the helical spring sample:

°

(8 points)

(correct values 1+1, units 1.5+1.5, right precision 1.5+1.5)

**Question B2.2 (6 points)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(0.5 points)

Number of the minima of the fine structure that are present between two neighbouring minima of the coarse structure:

\_\_\_\_\_\_\_\_\_4\_\_\_\_\_\_\_\_\_\_

(0.5 points)

Distance between the used minima of the coarse structure:

\_\_\_\_\_\_\_\_2,73 mm\_\_\_\_\_\_

(1 points)

Distance between the minima of the fine structure

\_\_\_0,57 mm\_\_\_\_\_\_\_\_

(2 points, value + units)

Perpendicular distance of wires:

\_\_0,0010 m = 1,0 mm\_\_

(2 points, value + units)

**TASK B3: Diffraction of the X-rays on the double helix**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | Number of  measurement | (nm) | (nm) | | 1 | 3,980 | 0,1148 | | 2 | 3,362 | 0,5027 | | 3 | 3,679 | 0,1856 | | 4 | 4,063 | 0,1977 | | 5 | 4,149 | 0,2841 | | 6 | 3,980 | 0,1148 | | 7 | 4,149 | 0,2841 | | 8 | 3,679 | 0,1856 | | 9 | 4,063 | 0,1977 | | 10 | 3,545 | 0,3194 | |  | 3,865  nm | 0,2386  nm | | |  |  |  | | --- | --- | --- | | Number of  measurement | (°) | (°) | | 1 | 79,6 | 0,677 | | 2 | 78,7 | 0,235 | | 3 | 78,1 | 0,797 | | 4 | 79,8 | 0,918 | | 5 | 75,3 | 3,627 | | 6 | 79,5 | 0,580 | | 7 | 79,0 | 0,120 | | 8 | 82,5 | 3,567 | | 9 | 77,8 | 1,131 | | 10 | 78,9 | 0,073 | |  | 78,9 ° | 1,17° | |

(8 points)

**Question B3.1. (8 points)**

The final values of and for the DNA helix:

(8 points)

(correct values 1+1, units 1.5+1.5, right precision 1.5+1.5)

**Question B3.2. (2 points)**

Why the X-rays have to be used to examine the structure of the DNA instead of light?

Anything like and so on.

(2 points)