AS Level Biology A

H020/01 Breadth in Biology

Question Set 15

1. The downy birch tree, *Betula pubescens*, produces varying numbers of leaf hairs.

These hairs are between 200 µm and 500 µm long in response to different environmental conditions.

(a) State the **pattern** of variation shown by leaf hair density.

..... **[1]**

(b) Leaf hair density can be measured in the laboratory.

Outline a practical method that could be used to determine the density of hairs on theunderside of a leaf.

[3]

(c) A group of students investigated the relationship between the distance of different trees froma river and the mean leaf hair density.

Table 25 shows the results of their investigation.

Distance from river (m)	Rank of distance	Mean leaf hair density (number mm^{-2})	Rank of hair density	Difference in ranks (d)	Difference squared (d^2)
9.1	4	33.1			
13.7	1	34.8			
5.5	7	11.3			
0.3	10	3.4			
5.4	8	27.3			
11.5	3	30.3			
1.7	9	6.3			
6.0	6	22.9			
11.9	2	5.7			
6.8	5	23.2			

Table 25

(i) Complete Table 25 by calculating the difference between the ranks and then squaring the difference.

[Answer on Table 25]

[2]

(ii) Use the formula below to calculate Spearman's rank correlation coefficient for this data.

$$r_s = 1 - \frac{6\Sigma d^2}{n(n^2-1)}$$

..... **[2]**

(d) The students concluded that there is a positive correlation between distance of the tree from the river and mean leaf hair density.

(i) Suggest reasons for this positive correlation.

[2]

(ii) For this investigation, the students randomly selected leaves from ten downy birch treesat varying distances from the river.

Suggest **three** ways in which the students could improve the validity of their sampling method.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(e) Another group of students repeated this investigation and calculated r_s = 0.589. The criticalvalue of r_s at the 5% level for 9 degrees of freedom is 0.600.

They concluded that their results showed a weak positive correlation between leaf hair densityand distance of the tree from the river.

Evaluate the conclusion of this group of students.

[2]

Total Marks for Question Set 15: 15