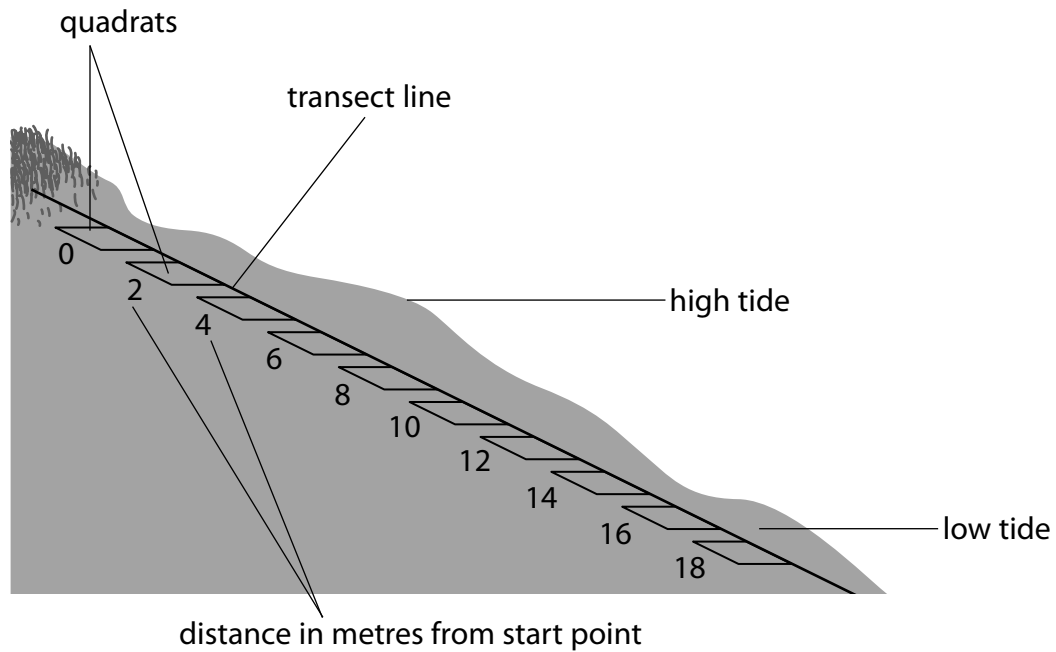


11 The distribution and abundance of species on a rocky shore were investigated using a systematic sampling technique.

(a) The diagram shows the placing of the transect and quadrats on a rocky shore.



Not to scale

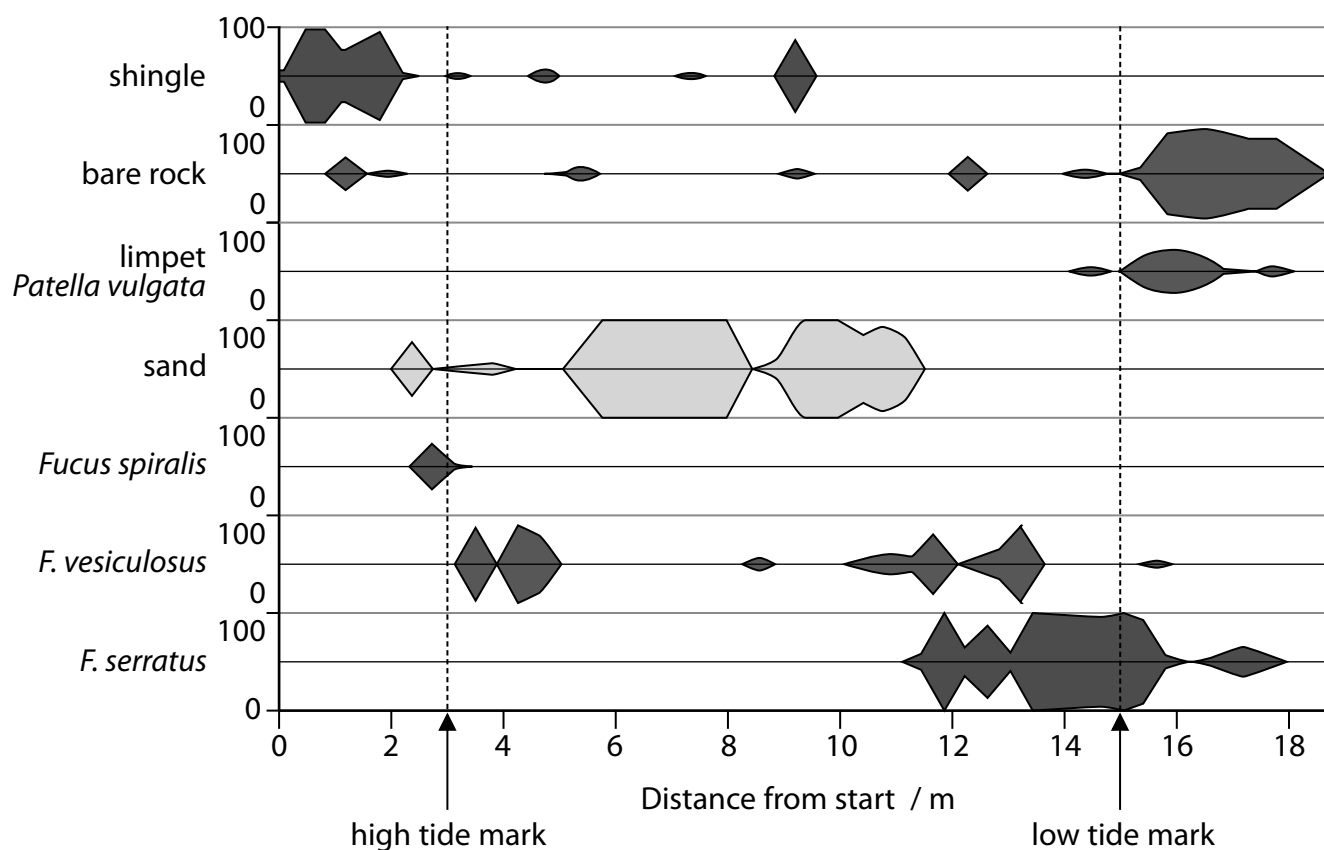
(i) Give a reason why systematic sampling, rather than random sampling, was used in this investigation.

(1)

.....

.....

*(ii) The diagram shows the distribution of some of the abiotic and biotic components of a sea shore. There are three species of seaweed (*Fucus*) and one species of limpet (*Patella vulgata*). Limpets feed on seaweed.



Analyse the data to explain how the distribution patterns of *Fucus spiralis*, *Fucus vesiculosus* and *Fucus serratus* are affected by abiotic and biotic factors.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) (i) Another study compared the diversity of species at different places on the shore. On the upper shore the following data were obtained.

Species	Number of individuals found
<i>Pelvetia canaliculata</i>	10
<i>Enteromorpha</i> sp.	3
<i>Patella vulgata</i>	3
<i>Littorina littorea</i>	15
<i>Gibbula</i> sp.	14
Lichens	15

Calculate an index of diversity (D) for this site using the formula below.

(3)

$$D = \frac{N(N - 1)}{\sum n(n - 1)}$$

n = total number of organisms of a particular species

N = total number of organisms of all species

Answer.....

(ii) On the middle shore the index was found to be 7.74 with a total individual count of 37.

Comment on the relationship between diversity and the total number of individuals on these two parts of the shore.

(2)

.....

.....

.....

.....

(Total for Question 11 = 12 marks)