**5.** A research company takes a sample of 120 students living in London and a sample of 80 students living in Birmingham. The company asks the students to state their favourite science subject from Biology, Chemistry and Physics.

The research company uses quota sampling rather than simple random sampling.

(a) (i) Give one advantage of using quota sampling.

(ii) Give one disadvantage of using quota sampling.

**(2)**

The results of the survey are shown in the table.

| | **Biology** | **Chemistry** | **Physics** | **Total** |
|---|---|---|---|---|
| **London** | 66 | 37 | 17 | 120 |
| **Birmingham** | 40 | 19 | 21 | 80 |

The data are to be used to determine whether or not a student's favourite science subject is independent of the place where they live.

(b) Calculate

(i) the expected frequency for the class Biology and London,

(ii) the expected frequency for the class Biology and Birmingham.

**(3)**

Before the two classes for Biology are included $\sum \frac{(O-E)^2}{E} = 4.549$

to 3 decimal places.

(c) Test at the 10% level of significance, whether or not a student's favourite science subject is independent of the place where they live.
Show your working clearly, stating your hypotheses, the degrees of freedom, the test statistic and the critical value used.

**(7)**

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

**Question 5 continued**

**Question 5 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

**Question 5 continued**

**(Total for Question 5 is 12 marks)**