Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

(a) (i) A mutation of a tumour suppressor gene can result in the formation of a tumour.

Explain how.

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(2)

(ii) Not all mutations result in a change to the amino acid sequence of the encoded polypeptide.

Explain why.

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(1)

(b) Some cancer cells have a receptor protein in their cell-surface membrane that binds to a hormone called **growth factor**. This stimulates the cancer cells to divide.

Scientists have produced a monoclonal antibody that stops this stimulation.

Use your knowledge of monoclonal antibodies to suggest how this antibody stops the growth of a tumour.

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(3)
(Total 6 marks)

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Q2.

Oestrogen is a substance produced by the enzyme aromatase. In females, the main source of oestrogen is the ovaries but aromatase is produced by many other organs in the body, including the lungs. Oestrogen can stimulate the development of some lung tumours. In these tumours, binding of oestrogen to cell-surface receptors stimulates cell division.

Scientists investigated whether two drugs could prevent lung tumours in female mice. First, they removed the ovaries from these mice. They then injected the mice with a tumour-causing chemical found in tobacco twice a day for 4 weeks. The mice were then randomly allocated to one of four groups. Each group contained 10 mice.

- Group **Q** was given a placebo. This placebo did not contain either drug.
- Group **R** was given the drug anastrozole. This inhibits the enzyme aromatase.
- Group **S** was given the drug fulvestrant. This binds to oestrogen receptors.
- Group **T** was given both anastrozole and fulvestrant.

The mice were given these drugs each week during weeks 5−15 of the investigation.

(a) The scientists removed the ovaries from the mice for the investigation. They also gave the mice injections of the substrate of aromatase each day.

Explain why these steps were necessary.

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(2)

(b) The scientists predicted that fulvestrant would be more effective when given with anastrozole than when given alone.

Use the information provided to suggest why they predicted this.

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_____

(2)

At week 15, the lungs of the mice were removed and examined. The scientists then determined the number of tumours present and the mean tumour area for each group.

Figure 1 and **Figure 2** show the scientists' results.

Figure 1

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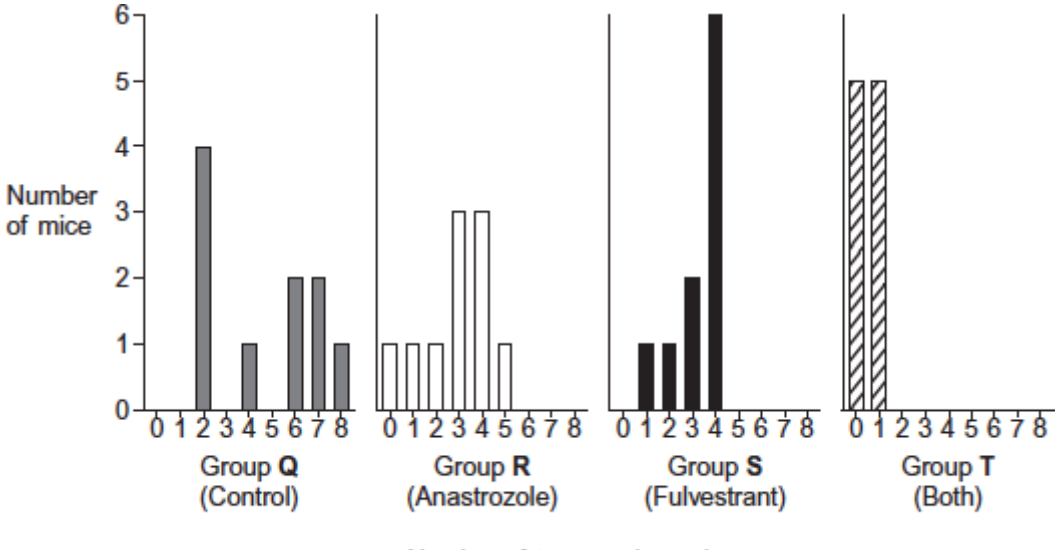
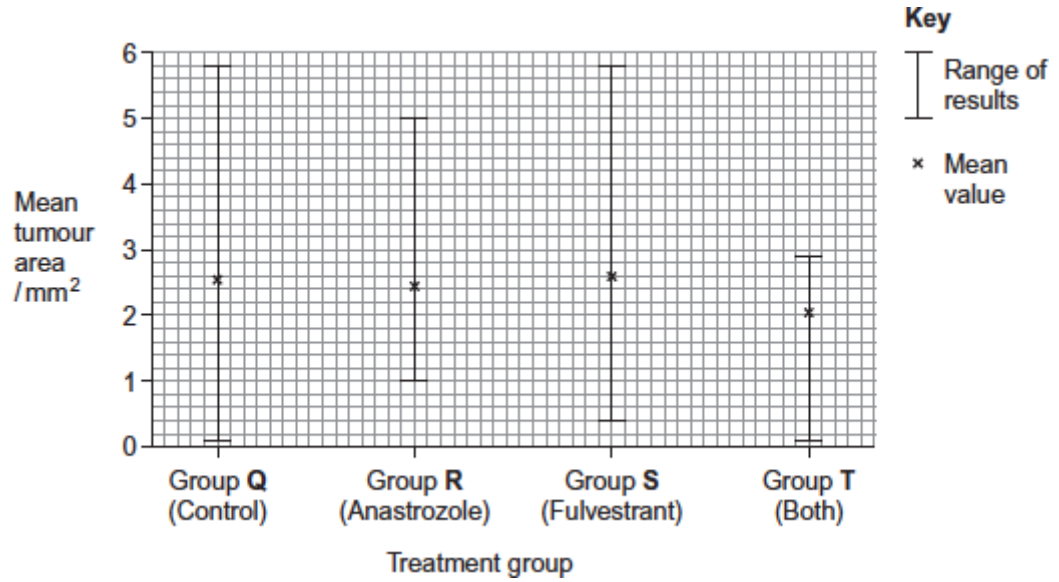


Figure 2



(c) The scientists concluded that both drugs should be used together to reduce the risk of lung cancer in women exposed to tobacco products.

Do you agree? Explain your answer.

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(5)

(d) The scientists used tumour area as an indicator of tumour size.

Explain why tumour area may **not** be the best indicator of tumour size and suggest a more reliable measurement.

(2)

(e) The scientists repeated the investigation but this time they did not give the drugs until week 9.

Suggest why they gave the drugs at week 9, rather than at week 5.

(2)

(f) Another group of scientists is currently using these drugs in human trials. However, the control group is **not** being given a placebo.

Suggest why a placebo is **not** being given and what is being given to this group instead.

(2)

(Total 15 marks)

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