

Most of a Cell's DNA is NOT Translated

These practice questions can be used by students and teachers and is

Suitable for AQA A Level 7402 Biology Topic Question

Level: AQA A LEVEL 7402

Subject: Biology

Exam Board: AQA A Level 7402

Topic: Most of a Cell's DNA is NOT Translated



1

the effects of different concentrations of two plant growth factors on small pieces of the stem tip from a papaya plant. Their results are shown in the table.

Concentration of auxin / $\mu\text{mol dm}^{-3}$	Concentration of cytokinin / $\mu\text{mol dm}^{-3}$		
	5	25	50
0	No effect	No effect	Leaves produced
1	No effect	Leaves produced	Leaves produced
5	No effect	Leaves produced	Leaves and some plantlets produced
10	Callus produced	Leaves and some plantlets produced	Plantlets produced
15	Callus produced	Callus and some leaves produced	Callus and some leaves produced

Callus is a mass of undifferentiated plant cells. Plantlets are small plants.

(a) Explain the evidence from the table that cells from the stem tip are totipotent.

(2)

(b) Calculate the ratio of cytokinin : auxin that you would recommend to grow papaya plants by this method.

Answer _____

(2)

- (c) (i) Papaya plants reproduce sexually by means of seeds. Papaya plants grown from seeds are very variable in their yield. Explain why.

(2)

- (ii) Explain the advantage of growing papaya plants from tissue culture rather than from seeds.

(1)

(Total 7 marks)

2

SCID is a severe inherited disease. People who are affected have no immunity. Doctors carried

out a trial using gene therapy to treat children with SCID. The doctors who carried out the trial obtained stem cells from each child's umbilical cord.

- (a) Give **two** characteristic features of stem cells.

1. _____



2. _____

(2)

The doctors mixed the stem cells with viruses. The viruses had been genetically modified to contain alleles of a gene producing full immunity. The doctors then injected this mixture into the child's bone marrow.

The viruses that the doctors used had RNA as their genetic material. When these viruses infect cells, they pass their RNA and two viral enzymes into the host cells.

(b) One of the viral enzymes makes a DNA copy of the virus RNA. Name this enzyme.

(1)

The other viral enzyme is called integrase. Integrase inserts the DNA copy anywhere in the DNA of the host cell. It may even insert the DNA copy in one of the host cell's genes.

(c) (i) The insertion of the DNA copy in one of the host cell's genes may cause the cell to make a non-functional protein. Explain how.

(2)

(ii) Some of the children in the trial developed cancer. How might the insertion of the DNA have caused cancer?

(2)

(d) Five out of the 20 children in the trial developed cancer. Although the cancer was treated successfully, the doctors decided to stop the trial in its early stages. They then reviewed



the situation and decided to continue. Do you agree with their decision to continue?
Explain your answer.

(2)

(Total 9 marks)

Essay

3

You should write your essay in continuous prose.

Your essay will be marked for its scientific accuracy.

It will also be marked for your selection of relevant material from different parts of the specification and for the quality of your written communication.

The maximum number of marks that can be awarded is

Scientific	16
Breadth of knowledge	3
Relevance	3
Quality of written communication	3

Write an essay on the following topic:

Using DNA in science and technology

(Total 25 marks)

Mark schemes

1

- (a) 1. Gives rise to new plants / plantlets;
2. So must be able to develop into different tissues / other specialised cell types / differentiate;
1. Ignore references to leaves / callus 2
- (b) Two marks for 5 : 1/50 : 10/1 : 0.2;;
One mark for ratio correctly identified but expressed incorrectly as 1 : 5 / 10 : 50 / 0.2 : 1; 2
- (c) (i) 1. Meiosis / independent assortment / crossing over;
2. (Fusion of) genetically different gametes / random fertilisation; 2
- (ii) Will be clones / produced by mitosis / will be genetically identical / less variation / all plants will have desired characteristics;
If the reference is to identical must be genetically identical, but allow less variation without the reference to genetical. 1
- [7] (a) Will replace themselves / keep dividing / replicate;

2

- Undifferentiated / can differentiate / develop into other cells / totipotent / multipotent / pluripotent;
Accept tissues 2
- (b) Reverse transcriptase;
Allow phonetic spelling 1
- (c) (i) Alters base / nucleotide sequence / causes frame shift;
- Different sequence of amino acids in polypeptide / protein / primary structure alters the tertiary structure;
*Accept any reference, such as adding bases, to changing the base sequence of the gene. Reject deletion / substitution.
 Idea of sequence essential so not makes different amino acids.
 Accept answers involving stop / start codons and effect on protein.*

(ii) Affects tumour suppressor gene;

Inactivates (tumour suppressor) gene;

Rate of cell division increased / tumour cells continue to divide;

Ignore answers relating to oncogenes. May gain third point.

2 max

(d) Yes

SCID patients unlikely to survive / quality of life poor unless treated;

Cancer that develops is treatable / only affects 25% / five children;

No

Risk of developing cancer is high / 25%;

Cancer may recur / may not be treated successfully in future / only short time scale so more may develop cancer;

No mark for yes or no. Marks are for supporting argument based on biological reasoning.

Accept any points

2 max

[9]

Essay Using DNA in science and technology

3

DNA and classification

2.2 Structure of DNA

2.3 Differences in DNA lead to genetic diversity

2.9 Comparison of DNA base sequences

Genetic engineering and making useful substances

2.5 Plasmids

5.8 The use of recombinant DNA to produce transformed organisms that benefit humans

Other uses of DNA

2.5 Cell cycle and treatment of cancer

5.8 Gene therapy;

Medical diagnosis and the treatment of human disease;

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