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BIOLOGY

THE CONTROL OF GENE EXPRESSION

Level & Board	AQA (A-LEVEL)
TOPIC:	EPIGENETICS AND RNA INTERFERENCE
PAPER TYPE:	SOLUTION - 2
TOTAL QUESTIONS	4
TOTAL MARKS	28

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Epigenetics and RNA interference - 2

1.

(a)

The detergent dissolves the phospholipid bilayer

Cell membrane made from phospholipid

(b) Ultracentrifugation is a technique used to separate molecules based on their size and density. In the case of CENP-W, it can be separated from other molecules using ultracentrifugation by sedimenting the larger, denser molecules.

OR

Centrifuge spins liquid at a high speed.

Molecules separate depending on molecular mass.

(c)

siRNA destroys mRNA for CENP-W.

This prevents translation of CENP-W.

As CENP-W reduces so does tubulin.

2.

(a) Your genes play an important role in your health, but so do your behaviors and environment, such as what you eat and how physically active you are. Epigenetics is the study of how your behaviors and environment can cause changes that affect the way your genes work.

OR

Heritable changes in gene function without changes to the base sequence of DNA.

(b)

Control element	Binds with DNA	Binds with protein
Oestrogen		✓
Methyl groups	✓	
Acetyl groups		✓

(c) Dysregulation of DNA methylation can, therefore, lead to inappropriate silencing of tumor suppressors or expression of oncogenes, thus contributing to the development of disease states including cancer.

OR

Methyl groups added to tumour suppressor gene.

The transcription of tumour suppressor genes is inhibited.

Leading to uncontrolled cell division.

3.

(a) Cytosine with Guanine and Adenine with Uracil

(b)

Only infected cells have HIV protein present on surface, so carrier only attacks to these cells

siRNA base sequence complementary and only infected cells contain mRNA of HIV

(c) Carrier binds to protein on HIV, prevents HIV binding to receptor on human cell

4.

(a) RNA polymerase

(b) The activated estrogen receptor binds to the promoter region of the specific gene. It then stimulates RNA polymerase to transcribe the gene, thus increasing transcription.

OR

Stimulates RNA polymerase

Increases transcription

(c) Other cells do not have the oestrogen receptors

5.

(a) Similar shape to oestrogen

Binds receptor / prevents oestrogen binding

Receptor not activated / will not attach to promoter / no transcription



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