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BIOLOGY

THE CONTROL OF GENE EXPRESSION

Level & Board	AQA (A-LEVEL)
TOPIC:	CANCER
PAPER TYPE:	SOLUTION - 3
TOTAL QUESTIONS	7
TOTAL MARKS	47

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Cancer - 3

1.

(a)

Different mice produce different amounts of oestrogen.

Allows oestrogen to be controlled / oestrogen to be made by aromatase only.

(b)

Anastrozole prevents / reduces oestrogen production.

Fulvestrant stops remaining oestrogen binding / less oestrogen binds to receptors.

(c)

Yes for Group T

Least tumors per animal from fig. 1

Lowest mean tumor area / size from fig. 2

Lowest top of range

But means (tumor area) are similar

Ranges overlap / share values so differences may not be real /treatments may be just effective in reducing tumor

Range affected by outliers / SD's would be better

Done on mice / not done on women / humans

Only 10 mice used per group / small sample size so may not be representative / reliable

Might be side effects

Only did for 15 weeks so maximum effect of drugs may not have been seen.

(d)

Tumors may be different depths / area does not take depth into account / tumors are 3-D / are not 2-D.

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Measure tumor volume / mass / weight.

(e) Unethical not to treat patients / may increase probability of patients dying / getting more ill.

Use normal cancer drugs / treatment.

2.

(a) For the first part, a mutation in the genetic code of the tumor suppressor gene can inactive the gene. Inactivation of the gene will prevent the protein produced from slowing down cell division. An increased rate in cell division can become too fast for the body and cause a tumor.

OR

Tumor suppressor gene is inactivated / not able to control / slow down cell division.

Rate of cell division too fast / out of control.

(**b)** Not all mutations change the amino acid sequence of the encoded polypeptide because multiple codons can code for the same amino acid redundancy of the genetic code. Consequently, a mutation in a codon doesn't always change the amino acid it encodes, hence, the polypeptide sequence remains the same.

3.

(a) Antibody has specific tertiary structure / binding site / variable region.

Complementary shape to receptor protein/ binds to receptor protein.

Prevents GF binding to receptor.

4.

(a) Alterations to tumor suppressor genes such as their increased methylation, mutation in the genes, or an instance where the tumor suppressor genes are not being transcribed or expressed, results in rapid and uncontrollable cell division and the subsequent development of tumors.

OR

Methylation prevents transcription of gene.

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Protein that prevents cell division is not produced, therefore it causes cell death / apoptosis. So, no control of mitosis.

(b)

Scatter graph

Fat on x axis and death rate on y axis

Because looking at relationship between two discrete/independent variables

(c) Trend shows positive correlation/shows the more fat in diet, the higher death rate from breast cancer but number of points off line/anomalies

5.

(a)

Rank all STs in ascending order

Find value with same number of people above and below

(b) Not ethical to fail to treat cancer

(c) Yes since with ipilimumab

Median ST increased by 2.1 months

Percentage of patients showing reduction in tumours increased from 10.3% to 15.2%

No because:

No standard errors shown/no student t-test/no statistical test carried out

So not able to tell if differences are statistically significant/due to chance alone

Improvement might only be evident in some patients/no improvement in some patients

Quality of extra time alive not reported

(d) The immune system can recognize abnormal proteins on multiple myeloma (MM) tumor cells due to a faulty receptor protein. This recognition triggers an immune response, enabling the immune system to destroy the MM cells.

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OR

faulty protein recognized as an antigen/as a 'foreign' protein

T cells will bind to faulty protein/to (this) 'foreign' protein

Sensititised T cells will stimulate clonal selection of B cells

Resulting in release of antibodies against faulty protein

6.

(a)

To allow comparison

Because different number of cells in samples/different times for incubation/numbers become easier to manipulate

(b)

[(32.5-10.7)/10.7]x100

=203.7%

7.

(a)

At every concentration) uptake is faster at 37 C/at higher temperature

Due to faster respiration/ATP production

(b)

Uptake at 37 C only small increase/leveling off/almost constant as carrier proteins full

Concentration of imatinib is not the limiting factor

I am Sorry !!!!!

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