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BIOLOGY

CELLS

Level & Board	**AQA (A-LEVEL)**
TOPIC:	**CELLS & MITOSIS**
PAPER TYPE:	**SOLUTION - 1**
TOTAL QUESTIONS	6
TOTAL MARKS	34

Cell Cycle and Mitosis - 1

1.

(a) Binary fission in prokaryotic cells involves:

- Replication of the circular DNA and of plasmids.
- Division of the cytoplasm to produce two daughter cells, each with a single copy of the circular DNA and a variable number of copies of plasmids.

(b) 6.8×10^{-13}

(c) 660 fg

(d)

- Increased temperature => increased enzyme activity
- Increased concentration of glucose => increased respiration
- Increased concentration of oxygen => increased respiration
- Increased concentration of phosphate => increased ATP/ DNA
- Increased concentration of nucleotides => increase DNA synthesis

2.

(a)

- The DNA is condensing chromosomes become visible
- Chromosomes are arranged randomly because there is no spindle activity

(b) A

(c) A gene occupies a fixed position, called a locus, on a particular DNA molecule. A sequence of three DNA bases, called a triplet, codes for a specific amino acid.

3.

(a)

overall distance - overall time

19 - 4 = 15um

2500 -1800 =700s

700/60 = 6 mins

15/11.6 = 1.28µm minute^{-1}

(b)

C = Prophase: In this phase chromosomes (chromatin) condense

D = Metaphase: In this phase cells line up on the equator of the cell and spindle fibers attach to the centromere

E = Anaphase: In this phase centromeres divide, spindle fibers contract and the sister chromatids are pulled to opposite poles of the cell

4.

(a)

median fish mass = (m × days feeding) + 50

m = 5.00

feeding days = 195

median fish mass = (m × days feeding) + 50

median fish mass = (5.00 × 195) + 50

median fish mass = 975 + 50

median fish mass = 1025mg

(b)

Nucleus	Number of chromosomes	Mass of DNA / arbitrary units
At prophase of mitosis	80	50
At telophase of mitosis	80	25
From an egg cell	40	12.5

(c)

Independent segregation

OR

Crossing over

(d) A trout body cell contains 80 chromosomes. Farmed female trout are treated so that they produce diploid egg cells.Farmed female trout and untreated farmed male trout. 80+40 = 120 chromosomes.

(e) The offspring produced from farmed trout have extra copies of chromosomes. Their homologous chromosomes do not pair.

5.

(a) Chromosomes cannot attach to spindle so, no metaphase

OR

Chromosomes cannot line up on spindle so, no metaphase

OR,

Chromatids cannot separate on spindle so no anaphase

(b) It is because cancer cells divide more rapidly and healthy cells divide slowly.
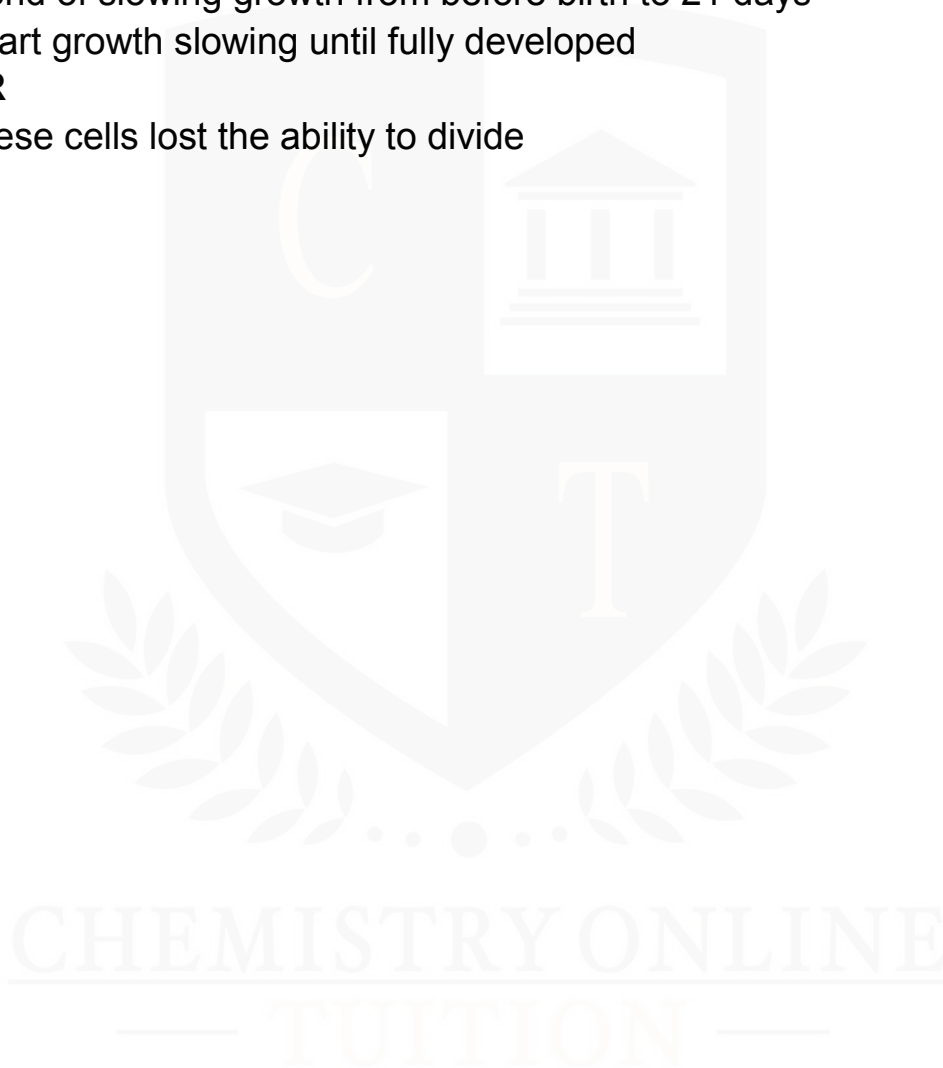
6.

(a)

- Trend of decreasing percentage undergoing mitosis from before birth to 21 days
  OR
- Trend of slowing growth from before birth to 21 days
- Heart growth slowing until fully developed
  OR
- These cells lost the ability to divide

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