

OCR AS GCE Biology (14 pages)

F211 Cells, Transport and Exchange

Exam questions from January 2009-June 2012

Topics:

**1.1.3 Cell Division**

State that mitosis occupies only a small percentage of the cell cycle and that the remaining percentage includes the copying and checking of genetic information;

Describe, with the aid of diagrams and photographs, the main stages of mitosis (behaviour of the chromosomes, nuclear envelope, cell membrane and centrioles);

Explain the meaning of the term *homologous pair of chromosomes*;

Explain the significance of mitosis for growth, repair and asexual reproduction in plants and animals;

Outline, with the aid of diagrams and photographs, the process of cell division by budding in yeast;

State that cells produced as a result of meiosis are not genetically identical (details of meiosis are not required);

Define the term *stem cell*;

3 The division of stem cells by mitosis produces cells that are genetically identical.

(a) (i) State what is meant by the term *stem cell*.

.....  
.....  
.....  
..... [2]

(ii) Name **one** tissue in **plants** that contains stem cells.

..... [1]

(b) State **three** reasons why mitosis is important to organisms.

1 .....  
2 .....  
3 ..... [3]

(c) Traditionally, stem cells from bone marrow have been used to treat patients with leukaemia.

Recent studies have shown that stem cells taken from umbilical cord blood may be more effective in treating leukaemia than stem cells taken from bone marrow.

Table 3.1 shows the probability of a patient remaining leukaemia-free for five years after being treated with stem cells from different sources.

**Table 3.1**

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- (i) Describe, using the information in Table 3.1, the evidence that **perfectly matched** umbilical cord blood stem cells are more effective than bone marrow stem cells in treating leukaemia.

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..... [2]

- (ii) Suggest **two** advantages, **other than an increased probability of survival**, of using umbilical cord blood stem cells instead of bone marrow stem cells in transplant procedures.

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..... [2]

[Total: 10]

5 (a) Fig. 5.1, on the insert, shows some drawings of a cell during different stages of mitosis.

Place stages P, Q, R, S and T in the correct sequence.

The first stage has been identified for you.

S

..... [4]

(b) Mitosis is part of the cell cycle.

Fig. 5.2 shows a diagram of the cell cycle.

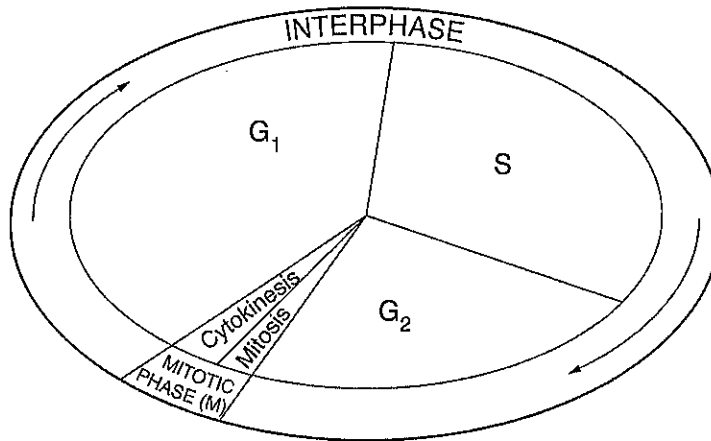


Fig. 5.2

(i) Name **one** process that occurs during stages G<sub>1</sub> and G<sub>2</sub>.

..... [1]

(ii) During stage S, the genetic information is copied and checked.

Suggest what might happen if the genetic information is not checked.

.....  
.....  
.....  
..... [2]

(c) During **meiosis** a cell undergoes two divisions.

Suggest how cells produced by meiosis may differ from those produced by mitosis.

.....

.....

.....

.....

.....

.....

..... [2]

[Total: 9]

Answer all the questions.

1 (a) Name the type of nuclear division that produces two genetically identical nuclei.  
 ..... [1]

(b) There are a number of stages during cell division.

The list, **J** to **N**, describes some processes that occur during the division of an animal cell.

<b>J</b>	the cell surface membrane is constricted
<b>K</b>	the nuclear envelope reforms
<b>L</b>	sister chromatids are pulled apart
<b>M</b>	the chromosomes condense
<b>N</b>	the chromosomes move to the equator

Match each letter, **J** to **N**, with a stage of cell division in the list below.

The first one has been completed for you.

prophase ..... **M** .....

metaphase .....

anaphase .....

telophase .....

cytokinesis .....

[4]

(c) During interphase the genetic material is copied.

State **two** other processes that occur during interphase.

.....  
 .....  
 .....  
 ..... [2]

(d) Suggest **two** ways that cell division in plants differs from cell division in animals.

.....

.....

.....

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.....

.....

..... [2]

[Total: 9]

4 In plants, dividing cells can be found in meristematic tissue.

(a) Name **two** parts of a plant where meristematic tissue can be found.

.....  
..... [2]

(b) In an investigation, a student observed the cells in a stained section of meristematic tissue. The student counted how many cells could be seen in each stage of the cell cycle.

Table 4.1 shows the results.

Table 4.1

stage of cell cycle	percentage cells in stage (%)
interphase	82.00
prophase	4.34
metaphase	3.23
anaphase	3.23
telophase	7.20

(i) Explain why the meristematic tissue needed to be stained for this investigation.

.....  
.....  
.....  
.....  
.....  
..... [2]

(ii) Name the type of nuclear division that occurs in a plant meristem.

..... [1]



- (c) Using the results shown in Table 4.1, calculate the percentage of the cell cycle taken up by nuclear division.

Show your working.

Answer = ..... % [2]

- (d) State **one** way in which the products of **meiosis** are different from the products of nuclear division in meristematic tissue.

.....  
.....  
..... [1]

[Total: 8]

Answer **all** the questions.

1 (a) Yeast reproduces asexually by a process called budding. During this process, cell division occurs.

(i) Name the type of cell division that occurs in asexual reproduction.

..... [1]

(ii) Before the division of the nucleus of a cell, the genetic material must replicate.

Explain why this is essential.

.....  
.....  
.....  
.....  
.....  
..... [2]

(b) Unlike yeast, the nuclei of most eukaryotic organisms contain homologous pairs of chromosomes.

Explain what is meant by a *homologous pair of chromosomes*.

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.....  
..... [3]

- (b) Fig. 4.2 shows drawings of the six chromosomes inside an animal cell viewed during late prophase of mitosis.

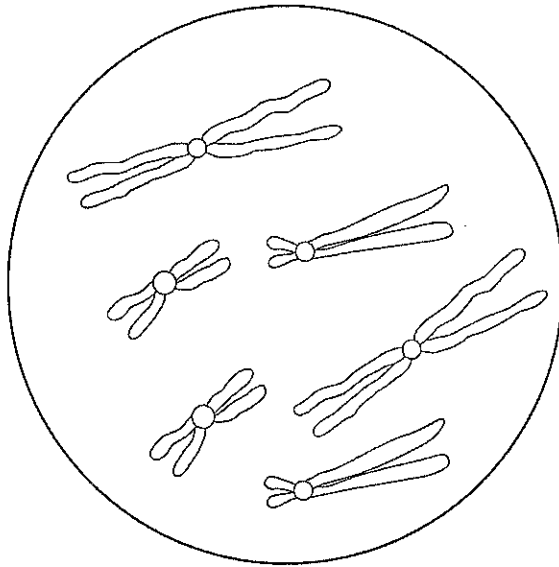
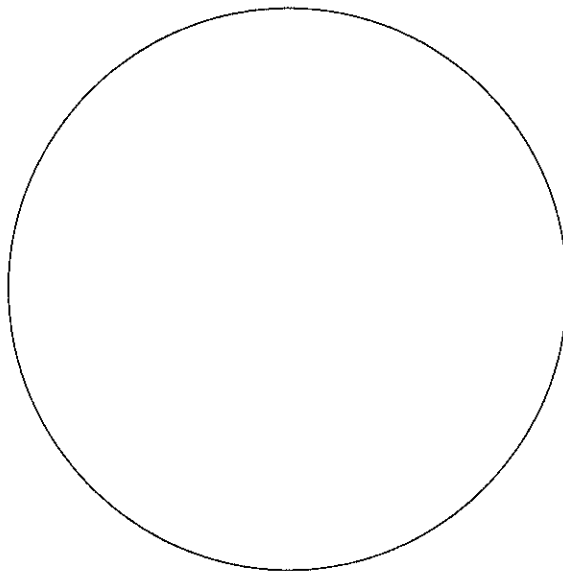


Fig. 4.2

- (i) Identify **one pair of homologous chromosomes** in Fig. 4.2 by drawing around each chromosome in the pair **on the diagram**. [1]
- (ii) The nucleus of a sperm cell is produced by **meiosis**.

Draw a diagram in the space below to represent the chromosomes that are present in the nucleus of a sperm cell from **the same animal**.



[2]

[Total: 7]

3 A student carried out an investigation involving uptake of the stain methylene blue by yeast cells.

The investigation involved adding methylene blue to a suspension of yeast cells. Samples of the stained yeast cells were heated to different temperatures.

The student then observed the cells at high power under a light microscope.

The results are shown in Table 3.1.

Table 3.1

temperature (°C)	cells observed stained blue (%)	colour of solution surrounding cells
10	98	colourless
20	96	colourless
30	97	colourless
40	96	colourless
50	73	colourless
60	12	light blue
70	2	blue
80	0	blue

(a) (i) Yeast cells take up methylene blue by active transport.

Using **only** the information provided in Table 3.1, outline the evidence that supports this statement.

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.....  
.....  
.....  
..... [2]

(ii) Suggest why some cells did **not** stain blue at 20°C.

.....  
..... [1]

(b) (i) Suggest **one** change that occurred to the plasma (cell surface) membranes of the yeast cells at temperatures above 60°C.

.....  
.....  
..... [1]

(ii) Explain why the stained yeast cells lost their colour at higher temperatures.

.....  
.....  
.....  
.....  
..... [2]

(c) The student concluded that yeast cells are killed between 50°C and 70°C.

Suggest **one** way in which the student could have improved the **accuracy** of this experiment and **one** way in which he could have improved the **reliability**.

*accuracy* .....  
.....  
.....  
*reliability* .....  
.....  
..... [2]

- (d) The student placed a small sample of the yeast suspension on a microscope slide and observed it under high power.

Fig. 3.1 shows what the student observed.

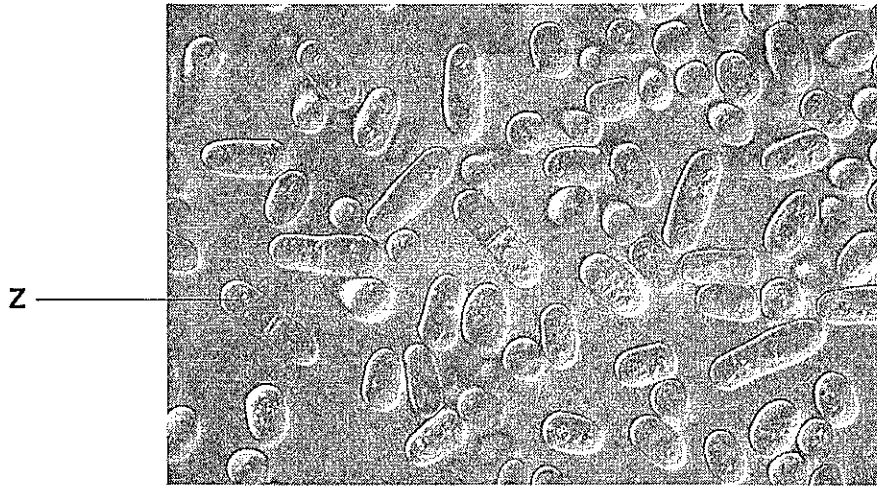


Fig. 3.1

Cell Z is undergoing a process called *budding*.

Outline the process of budding in yeast.

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..... [2]

[Total: 10]