Liceo Scientifico Pier Paolo Pasolini - Potenza

Professor: Anna Lucia Massenzio

The cell cycle

Strategies – Before

- *Prerequisites*
- *Linking to Previous Knowledge and Predicting* con questionari basati su stimoli relativi alle conoscenze pregresse e alle ipotesi riguardanti i contenuti da affrontare
- *Italian/English Glossary*

Strategies – During

- Video con scheda grafica
- *Keywords* riferite al video attraverso esercitazioni mirate
- *Conceptual Map*

Strategies - After

- Esercizi:
  - *Multiple Choice*
  - *Matching*
  - *True or False*
  - *Cloze* o *Completion*
  - *Flow Chart*
  - *Think and Discuss*

- *Summary* per *abstract* e/o esercizi orali o scritti basati su un questionario e per esercizi quali traduzione e/o dettato

- ***Web References*** di approfondimento come input interattivi per test orali e scritti e per esercitazioni basate sul *Problem Solving*

Answer Sheets

The cell cycle

The complex life of a cell is divided into five phases: 1) Growth (Gap1) 2)Synthesis of a new DNA 3) Further growth (Gap2) 4) Cell division 5) Cytokinesis.

90% of the cell cycle concerns the **interphase**, which consists of three moments:

1) **G1 phase** - when new organelles are made and the cell carries out its various functions
2) **S phase** - when faithful copies of DNA cell are made
3) **G2 phase** – when the cell prepares for further cell division, condensing DNA into chromosomes

During the interphase the cell increases in size. The DNA of the chromosomes is replicated and the centrosome is duplicated.
Cell division can be by *mitosis* or *meiosis* depending on whether the chromosomes number is to be unchanged or halved.

Mitosis is a replication division which produces two daughter cells, each with the same number of chromosomes as the parent cell.
Mitosis is by far the most common method of cell division of all organisms, it maintains the chromosome number and produces identical copies of the parent cell DNA: diploid parent cells produce diploid daughter cells and haploid parent cells produce haploid daughter cells.
A diploid cell is a cell that contains two sets of chromosomes. This number is abbreviated as **2n**, where **n** stands for the number of chromosomes. A haploid cell is a cell that contains one complete set of chromosomes. Sex cells, named gametes, are haploid cells produced by meiosis: in organisms that reproduce sexually one gamete fuses with another gamete during fertilization.
Mitosis has three different functions:

- production of identical cells for the growth of an organism
- repairing of damaged cells
- asexual reproduction

All the organs of the human body are made up of cells. Normally, cells divide to reproduce more cells only when the body needs them. If cells divide when new ones are not needed, they form a mass of excess tissue, called tumour. Some tumour cells stay together and do not tend to spread. These groups of cells are called benign tumours. Other tumour cells invade nearby organs or travel through bloodstream to new body sites. These groups of cells are called malignant tumours or cancers. Cancer cells form new tumours in other parts of the body: the spread of cancer is called metastasis.

Meiosis is a reduction-division which produces four daughter cells, each with half the number of chromosomes of the original parent cell. It halves the chromosome number, producing haploid cells from diploid cells.

Meiosis produces sex cells and it maintains the original diploid parental chromosome number within the population: haploid cells, or gametes, unite in fertilization to restore the original diploid number.

Cytokinesis, or division of the cytoplasm, occurs when the cell separates into daughter cells. It usually initiates during the late stage of mitosis, and sometimes meiosis, splitting a binucleate cell into two, to ensure that the chromosome number is maintained from one generation to the next.

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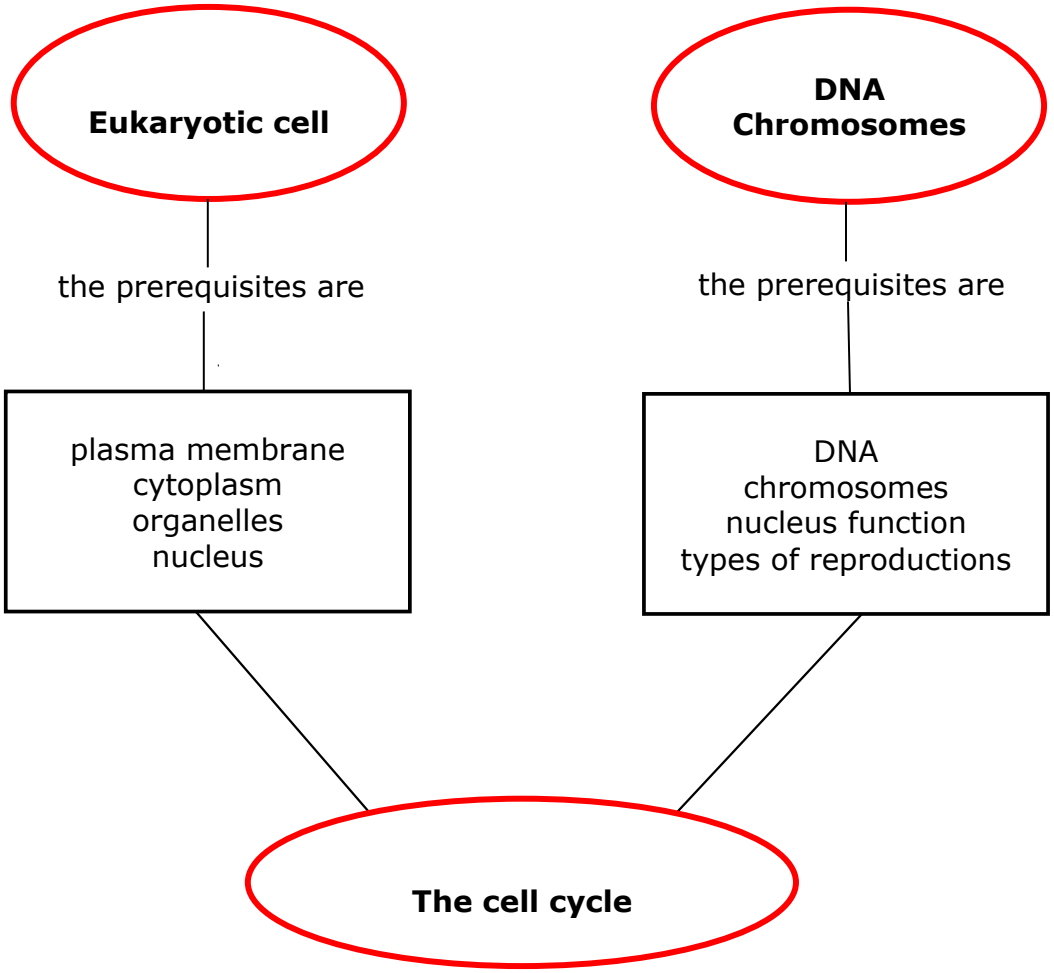
Strategies Before
Prerequisites



2

Strategies Before
Linking to Previous Knowledge and Predicting

1. What is a eukaryotic cell?

2. Which parts does a eukaryotic cell consist of?

3. What is the plasma membrane?
4. What is the cytoplasm?
5. What are the organelles?
6. What is the cell nucleus?
7. What are the centrosomes?
8. What is the function of the nucleus?
9. What is the DNA?
10. What are the chromosomes?
11. Which reproductive processes do you know?
12. What generates a new cell?

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Strategies Before
Italian / English Glossary

Aploide	Haploid
Benigno	Benign
Cancro	Cancer
Cellula eucariote	Eukaryotic cell
Cellula binucleata	Binucleate cell
Cellula sessuale	Sex cell
Centrosoma	Centrosome
Ciclo cellulare	Cell cycle
Citodieresi	Cytokinesis
Citoplasma	Cytoplasm
Crescita	Growth
Cromosoma	Chromosome
Diploide	Diploid
Divisione cellulare	Cell division
Fecondazione	Fertilization
Gameti	Gametes
Interfase	Interphase
Maligno	Malignant

Meiosi	Meiosis
Membrana cellulare	Plasma membrane
Metastasi	metastasis
Mitosi	mitosis
Nucleo	Nucleus
Organo	Organ
Organuli	Organelles
Riproduzione asessuta	Asexual reproduction
Riproduzione sessuata	Sexual reproduction
Sintesi DNA	Synthesis DNA
Tessuto	Tissue

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Strategies During
Keywords

1) Circle which of the following phases of cell cycle:

Calvin cycle – cytokinesis – glycolysis – synthesis DNA – interphase – fermentation reaction – growth – crossing-over - cell division – aerobic respiration – further growth – cell respiration

2) Circle which of the following functions are associated to mitosis or meiosis:

Cell replicate– production of gametes – protection – sexual reproduction – energy storage – asexual reproduction – immune defence – production of diploid cells - repairing of damaged cells – muscle contraction – condensation and hydrolysis

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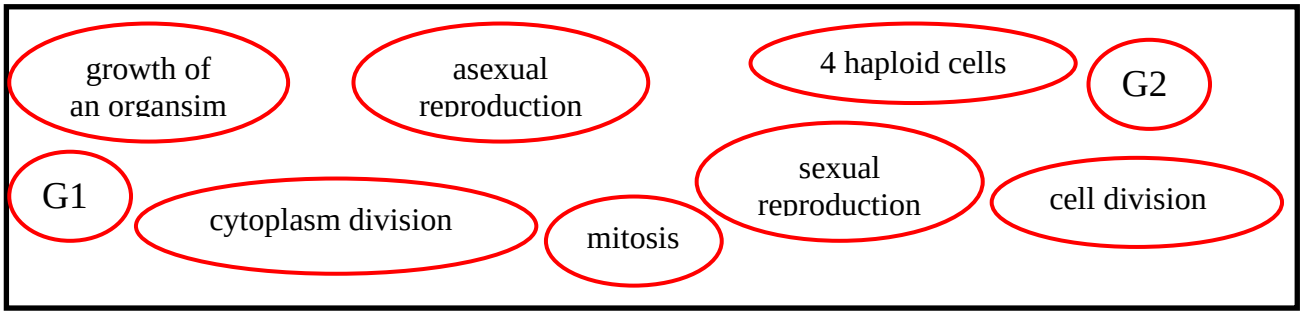
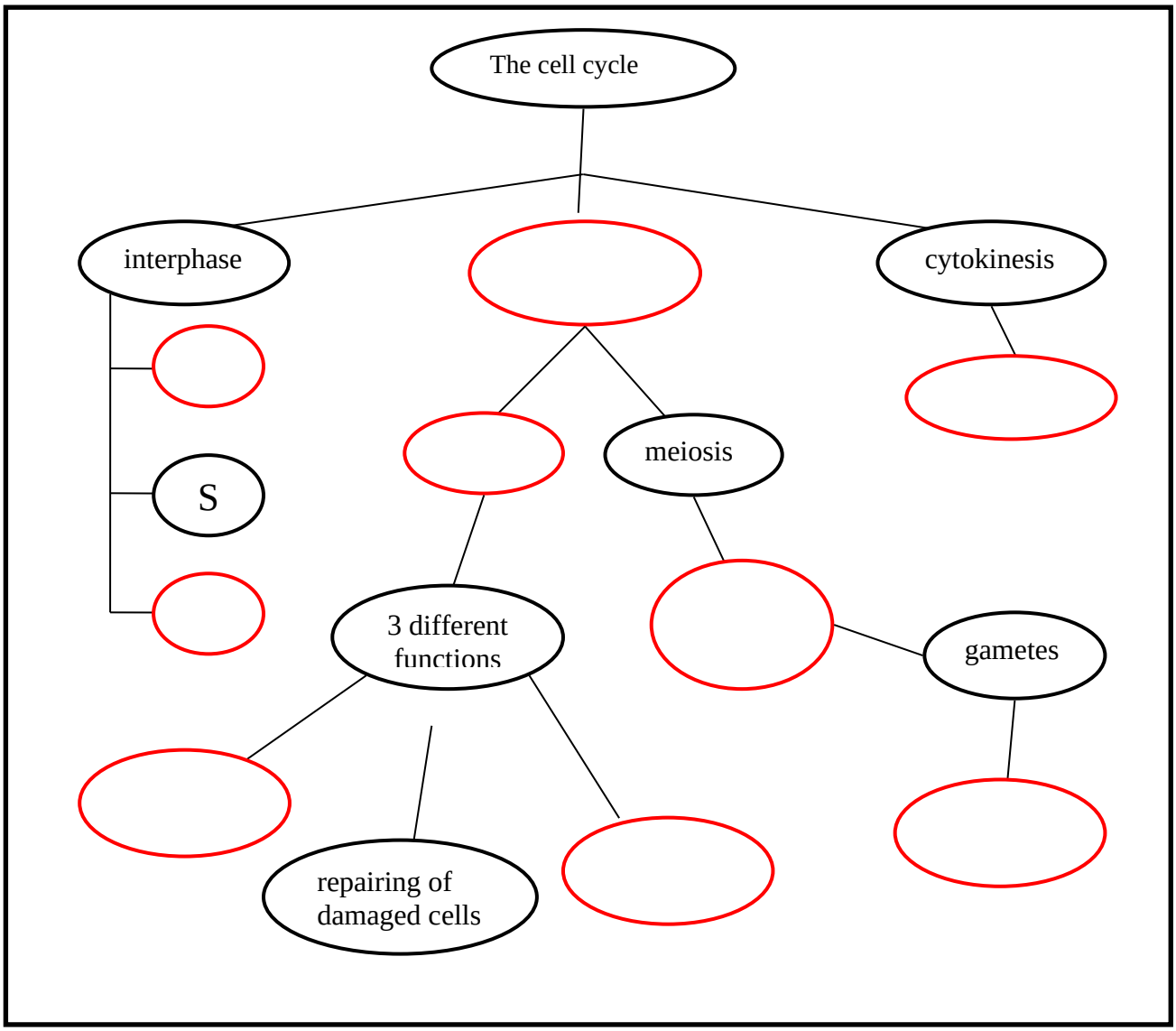
Strategies During
Conceptual Map

Complete the conceptual map using the following words:





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Strategies After
Multiple Choice

1) The last phase of the cell cycle is:
a. cell division
b. synthesis of DNA
c. cytokinesis
d. growth

2) The interphase consists of:
a. G1 – S - G2
b. G2 – mitosis - cytokinesis
c. G2 – meiosis - cytokinesis
d. S – G2 – cell division

3) Mitosis produces:
a. two diploid cells
b. four haploid cells
c. gametes
d. two haploid cells

4) Meiosis produces:
- four diploid cells
- gametes
- two diploid cells
- two haploid cells

5) The DNA of chromosomes is replicated during:
a. phase G1
b. phase G2
c. phase S
d. mitosis

6) Asexual reproduction originates:
- a new organism by fertilization
- a mass of excess tissue
- cells without nucleus
- a new organism by mitosis

7) The spread of cancer is called:
a. benign tumour
b. metastasis
c. malignant tumour
d. daughter cells

8) The fertilization unites:
a. two gametes
b. two diploid cells
c. two tumour cells
d. four set of chromosomes

9) The growth of an organism is a function of:
a. meiosis
b. G2 phase
c. mitosis
d. interphase

10) Cytokinesis splits:
a. the nucleus membrane
b. a nucleus into two
c. two sets of chromosomes

d. a binucleate cell into two

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Strategies After
Matching

Match the words on the left with the correct definition on the right:

1) cell cycle	a) a mass of excess tissue
2) cell division	b) sexual cells
3) cytokinesis	c) a cell containing one complete set of chromosomes
4) mitosis	d) reproduction by gametes
5) meiosis	e) process in which a cell originates new cells
6) cancer	f) replication-division
7) sexual reproduction	g) a cell containing two sets of chromosomes
8) gametes	h) phases of cell life
9) haploid cell	i) reduction-division
10) diploid cell	l) division of cytoplasm

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Strategies After
True or False

State if the sentences are true or false.

1) The interphase is the last phase of the cell cycle
2) Cytokinesis is the nucleus division
3) Meiosis produces four haploid cells
4) A benign tumour is called cancer
5) Gametes are sexual cells
6) Mitosis produces faithful copies of the parent cell
7) Diploid number of chromosomes is abbreviated as 2n
8) A gamete contains two sets of chromosome

9) Metastasis is a benign tumour

10) S phase is the synthesis of DNA

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Strategies After
Cloze

Complete the text.

A diploid cell is a cell that contains two … [1] of chromosomes. The diploid number of a cell is the number of … [2] in the cell. This number is commonly abbreviated as … [3] , where n stands for the number of chromosomes. For human beings this equation would be 2n=46. Human beings have two sets of … [4] chromosomes. A haploid cell is a cell that contains … [5] complete set of chromosomes. Gamete haploid cells are produced by … [6]: in organisms that reproduce … [7] one gamete fuses with another gamete during … [8] . Meiosis maintains the original diploid parental chromosome number within … [9] The fertilization by gametes restores the … [10] diploid number .

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Strategies After
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Strategies After
Think and Discuss

The following activity can be performed in a written or oral form. The teacher will choose the modality, depending on the ability (writing or speaking) that needs to be developed.
The contexts in which the task will be presented to the students are:
A) the student is writing an article about the cell cycle
B) the student is preparing for an interview on a local TV about the cell cycle

The student should:

1) Choose one of the following topics:
- Compare asexual reproduction to sexual reproduction
- Similarities and differences between cancer cells and normal body cells

2) Prepare the article or the debate, outlining the main points of the argument, on the basis of what has been studied.

3) If the written activity is the modality chosen by the teacher, the student should provide a written article, indicating the target of readers to whom the article is addressed and the type of magazine / newspaper / school magazine where the article would be published.

4) If the oral activity is the modality chosen by the teacher, the student should present his point of view on the topics to the whole class and a debate could start at the end of his presentation.

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Strategies After
Summary

The complex life of a cell is divided into five phases: 1) Growth (Gap1) 2)Synthesis of a new DNA 3) Further growth (Gap2) 4) Cell division 5) Cytokinesis. The **interphase** consists of three moments:

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Cell division can be by *mitosis* or *meiosis* depending on whether the chromosomes number is to be unchanged or halved.

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Mitosis maintains the chromosome number and produces identical copies of the parent cell DNA: diploid parent cells produce diploid daughter cells and haploid parent cells produce haploid daughter cells.
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Mitosis has three different functions:

- production of identical cells for the growth of an organism
- repairing of damaged cells
- asexual re production

If cells divide when new ones are not needed, they form a mass of excess tissue, called tumour. Some tumour cells stay together and do not tend to spread: benign tumours. Other tumour cells invade nearby organs or travel through bloodstream to new body sites: malignant tumours or cancers. Cancer cells form new tumours in other parts of the body: metastasis.

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Cytokinesis, or division of the cytoplasm, occurs when the cell separates into daughter cells.

1) Answer to the following questions. The questions could be answered in a written or oral form, depending on the teacher's objectives.

a) Which are the phases of the cell cycle?
b) What is cell division?
c) Which are the functions of mitosis?
d) What is the difference between haploid cells and diploid cells?
e) Which is the function of fertilization ?
f) What is cytokinesis?
g) What is cancer?

2) Write a short abstract of the summary (max 150 words) highlighting the main points of the video.

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Activities Based on Problem Solving

The following activities can be performed at school, if a computer room is available, or at home. Students are invited to use the web references listed above.

1) Small group activity.
Choose one of the following topics related to *cancer*, use the web references listed above, prepare a powerpoint presentation and present it to your classmates.

Topics:

a. mitosis and cancer
b. principal cause of cancer
c. nutrition and cancer

2) Class project.
Elaborate a poster and a brochure indicating a correct nutrition for provent cancer. You can pin up the poster in your school and distribute the brochures to your schoolmates and friends.