EnterMedSchool.org

Cell Biology: Mitosis & Cell Cycle

Printable Flashcards — Pre-Med Biology

Cell cycle phases, mitotic stages, checkpoints, and chromosome behavior during cell division.

110 cards — Print double-sided, flip on long edge, then cut along dashed lines.

110 cards — Printable Flashcards

Free & Open-Source

Generated February 20, 2026

Scan to visit online

1

Mitosis: what's the point (one sentence)?

2

Mitosis vs cytokinesis: don't mix them up. What's the difference?

3

DNA replication happens during mitosis: true or false?

4

After S phase, each chromosome is made of what?

5

Chromosome number: does mitosis change it?

6

Sister chromatids separate in mitosis or meiosis I?

7

Homologous chromosomes separate in mitosis: true or false?

8

Centromere vs kinetochore: what's the difference?

2

Mitosis divides the nucleus/chromosomes. Cytokinesis divides the cytoplasm to make two cells.

1

Separate duplicated chromosomes so one cell becomes two genetically identical cells (same chromosome number).

4

Two sister chromatids joined at the centromere.

3

False. DNA replicates in S phase of interphase, before mitosis.

6

Mitosis (and meiosis II).

5

No. Mitosis keeps the chromosome number the same (2n -> 2n).

8

Centromere = DNA region. Kinetochore = protein complex built on it for spindle attachment.

7

False. Homologs separate in meiosis I, not mitosis.

9

Spindle fibers attach to chromosomes at the _____.

10

What is the mitotic spindle made of?

11

Order of mitosis phases (standard)?

12

Quick rule: when does the nuclear envelope break down?

13

When are chromosomes MOST condensed (useful for karyotyping)?

14

What's a metaphase plate?

15

Mitosis happens in animal AND plant cells: true or false?

16

Prophase: what's the key change to spot?

10

Microtubules.

9

Kinetochore

12

Prometaphase (or late prophase, depending on the book).

11

Prophase -> prometaphase -> metaphase -> anaphase -> telophase.

14

An imaginary plane at the cell equator where chromosomes line up.

13

Metaphase.

16

Chromosomes condense and become visible.

15

True.

17

Prometaphase: what's the key change to spot?

18

Metaphase: what's the key change to spot?

19

Anaphase: what is the defining event?

20

Telophase: what is the defining event?

21

Cytokinesis usually begins around when (animal cells)?

22

Quick diagram clue: chromosomes lined up in the middle = ?

23

Quick diagram clue: two groups of chromosomes moving apart = ?

24

Quick diagram clue: two nuclei forming + chromosomes fading = ?

18

All chromosomes are aligned at the metaphase plate with bi-orientation (each sister to opposite poles).

17

Nuclear envelope breaks down and microtubules attach to kinetochores.

20

Chromosomes arrive at poles and nuclear envelopes reform; chromosomes start decondensing.

19

Sister chromatids separate and move to opposite poles.

22

Metaphase.

21

Late anaphase into telophase.

24

Telophase.

23

Anaphase.

25

If the nuclear envelope is intact and chromosomes aren't visible, is the cell in mitosis?

26

Why do kinetochores matter so much?

27

Spindle checkpoint (metaphase checkpoint): what is it checking?

28

What happens if the spindle checkpoint fails?

29

Name the three functional spindle microtubule groups.

30

Anaphase A vs anaphase B (simple version)?

31

What is cohesin in one line?

32

What is the 'go' signal for anaphase (concept)?

26

They are the coupling points that let microtubules pull chromosomes accurately.

25

No, it's in interphase (G1, S, or G2).

28

Chromosomes can mis-segregate -> aneuploidy.

27

That every chromosome is attached to spindle microtubules from both poles and under tension.

30

A: chromosomes move toward poles.
B: spindle poles move farther apart.

29

Kinetochore microtubules, polar (interpolar) microtubules, astral microtubules.

32

Cohesin gets cleaved so sister chromatids can separate.

31

A protein complex that holds sister chromatids together until anaphase.

33

Centrosome: what does it do in animal mitosis?

34

Centrioles: required for mitosis in all eukaryotes?

35

Asters: what are they and where do you see them?

36

If a diagram shows asters, centrioles, and a cleavage furrow, animal or plant cell?

37

If a diagram shows a cell plate forming in the center, animal or plant cell?

38

Animal cytokinesis: what structure actually pinches the cell?

39

Plant cytokinesis: why can't they use a cleavage furrow?

40

Plant cytokinesis: what is the cell plate?

34

No. Animal cells use them, but most higher plant cells don't have centrioles and still divide.

33

It nucleates/organizes microtubules and forms the spindle poles.

36

Animal cell.

35

Star-like arrays of astral microtubules at animal spindle poles (usually absent in higher plants).

38

An actin-myosin contractile ring -> cleavage furrow.

37

Plant cell.

40

A growing membrane/vesicle structure that becomes the new plasma membranes + new cell wall between daughter cells.

39

A rigid cell wall prevents pinching in, so they build a new wall (cell plate) instead.

41

Where do the vesicles for the plant cell plate mainly come from?

42

Plant cytokinesis: which structure guides cell plate formation?

43

Preprophase band (plants): what does it do?

44

Which cell type uses a preprophase band?

45

Animal cytokinesis uses a {{c1::cleavage furrow}}; plant cytokinesis uses a {{c2::cell plate}}.

46

Plant cell plate vesicles mainly come from the {{c1::Golgi apparatus}} and are guided by the {{c2::phragmoplast}}.

47

Animal mitosis: where do spindle poles come from?

48

Plant mitosis: if they don't have centrosomes/centrioles, how do they form a spindle?

42

The phragmoplast.

41

Golgi apparatus.

44

Plant cells (especially higher plants).

43

Marks the future division plane before mitosis starts.

46

Plant cell plate vesicles mainly come from the Golgi apparatus and are guided by the phragmoplast.

45

Animal cytokinesis uses a cleavage furrow; plant cytokinesis uses a cell plate.

48

Microtubules are organized from dispersed MTOCs (often around the nuclear envelope/cortex) to build an anastral spindle.

47

From duplicated centrosomes that move to opposite sides of the cell.

49

Does spindle formation require centrioles?

50

Astral microtubules: what do they mainly do in animal cells?

51

Which spindle type is typical for higher plant cells: astral or anastral?

52

In prophase, what happens to the nucleolus?

53

In prometaphase, what changes about microtubules and chromosomes?

54

Metaphase: what's the 'correct attachment' called?

55

Common wrong idea: chromosomes line up because the spindle 'pushes them there.' What's the real reason?

56

Anaphase starts when what happens at the centromere region?

50

Help position and orient the spindle by interacting with the cell cortex.

49

No.

52

It disappears.

51

Anastral (no asters).

54

Bi-orientation: each sister chromatid attached to opposite poles.

53

Microtubules capture kinetochores and chromosomes start moving toward the middle.

56

Cohesin holding sister chromatids is removed so chromatids can separate.

55

It's the balance of pulling forces from opposite poles once attachments are correct.

57

During anaphase, do chromosomes move because microtubules grow or shrink?

58

Telophase: what happens to the spindle?

59

After telophase, what must still happen to make two separate cells?

60

In animals, where does the cleavage furrow form?

61

In plants, where does the cell plate start?

62

What does the plant cell plate turn into when it finishes?

63

Spot the clue: 'contractile ring' in a stem. Animal or plant cytokinesis?

64

Spot the clue: 'phragmoplast' in a stem. Animal or plant?

58

It disassembles.

57

Mainly shrink at the kinetochore end (anaphase A).

60

At the cell equator, aligned with the spindle midzone.

59

Cytokinesis.

62

New plasma membranes + the new cell wall (partition) between daughter cells.

61

In the center of the cell and grows outward to the existing cell wall.

64

Plant.

63

Animal.

65

Spot the clue: 'preprophase band' in a stem. Animal or plant?

66

Spot the clue: 'aster' in a stem. Animal or plant?

67

Spot the clue: 'cell plate' in a stem. Animal or plant?

68

Spot the clue: 'cleavage furrow' in a stem. Animal or plant?

69

If a chromosome is still duplicated (two chromatids), does it count as one chromosome or two?

70

During anaphase, chromosome number temporarily does what inside the cell?

71

During metaphase, are sister chromatids separated?

72

During telophase, are chromosomes still condensed?

66

Animal (typically).

65

Plant.

68

Animal.

67

Plant.

70

It doubles (because sister chromatids become separate chromosomes).

69

One chromosome (until the chromatids separate).

72

They start decondensing.

71

No, they are still joined.

73

If a stem says 'spindle fibers attach to chromosomes and nuclear envelope is gone,' which stage is best?

74

If a stem says 'chromosomes aligned and checkpoint active,' which stage is best?

75

If a stem says 'two new nuclear envelopes forming,' which stage is best?

76

Plant cells have a cell wall. What extra problem does that create during division?

77

Does the spindle exist in plant mitosis?

78

Do plant cells have centrosomes like animal cells?

79

Plant mitosis vocabulary: anastral spindle means...

80

Animal mitosis vocabulary: astral spindle means...

74

Metaphase.

73

Prometaphase.

76

They must build a new wall between daughter cells, not just split the membrane.

75

Telophase.

78

Not typically (in higher plants).

77

Yes.

80

A spindle with asters (astral microtubules) at poles.

79

A spindle without asters.

81

If you block microtubule function, which part of cell division breaks first?

82

If you block actin/myosin contraction in an animal cell, what fails?

83

In plants, if vesicle fusion is blocked during cytokinesis, what fails?

84

Mitosis is called 'equational division' because...

85

Most common stage cells are found in when you look at a random tissue sample?

86

Mitotic index: what does a high mitotic index suggest about a tissue?

87

If a cell has 46 chromosomes in G1, how many chromosomes does it have in metaphase of mitosis?

88

Same setup: 46 chromosomes in G1. How many chromosomes are in anaphase (inside the same cell, briefly)?

82

Cytokinesis (cleavage furrow), not chromosome separation.

81

Chromosome separation (mitosis) because the spindle can't work.

84

It keeps chromosome number the same in daughter cells.

83

Cell plate formation, so cytokinesis fails.

86

Lots of cells are dividing (high proliferation).

85

Interphase.

88

92 (because sister chromatids separate and count as chromosomes).

87

46 (but 92 chromatids).

89

During {{c1::metaphase}}, chromosomes align at the {{c2::metaphase plate}}.

90

During {{c1::anaphase}}, {{c2::sister chromatids}} separate and move to opposite poles.

91

Animal cells form a {{c1::cleavage furrow}} using an {{c2::actin-myosin}} ring.

92

Plant cells form a {{c1::cell plate}} that grows {{c2::from the center outward}}.

93

In animal cells, spindle poles are organized by the {{c1::centrosomes}}; higher plant cells usually form spindles without {{c2::centrioles}}.

94

If you answered 'DNA replication' for prophase, what did you confuse?

95

If you answered 'homologous chromosomes separate' for anaphase, what did you confuse?

96

If you answered 'cell plate' for animal cytokinesis, what did you mix up?

90

During anaphase, sister chromatids separate and move to opposite poles.

89

During metaphase, chromosomes align at the metaphase plate.

92

Plant cells form a cell plate that grows from the center outward.

91

Animal cells form a cleavage furrow using an actin-myosin ring.

94

You confused S phase (interphase) with mitosis.

93

In animal cells, spindle poles are organized by the centrosomes; higher plant cells usually form spindles without centrioles.

96

Plant vs animal cytokinesis.

95

You confused mitosis with meiosis I.

97

If you answered 'cleavage furrow' for plant cytokinesis, what did you mix up?

98

If you answered 'centrioles are required for mitosis' what did you miss?

99

In plant mitosis, what's the name of the microtubule structure that appears during cytokinesis?

100

In plant cells, the division plane is largely predicted early by...

101

Why is division plane control extra important in plants?

102

Stage where nuclear envelope is gone and chromosomes are moving but not aligned yet?

103

Stage where sister chromatids are still attached but fully lined up?

104

Stage where chromatids are already separate and moving to poles?

98

Most higher plant cells do mitosis without centrioles.

97

Plant vs animal cytokinesis.

100

The preprophase band.

99

Phragmoplast.

102

Prometaphase.

101

Because cells are stuck in place by walls, so the orientation of division affects tissue shape and growth patterns.

104

Anaphase.

103

Metaphase.

105

Stage where two nuclei are forming and the cell is finishing the split?

106

Mini boss: You see condensed chromosomes, no nuclear envelope, and some chromosomes not yet aligned. Stage?

107

Mini boss: You see two groups of V-shaped chromosomes moving apart and a cleavage furrow starting. Stage?

108

Mini boss: You see a straight line of chromosomes at the center and spindle fibers from both sides. Stage?

109

Mini boss: You see a forming cell plate in the middle and two nuclei reappearing. What's happening?

110

Mini boss: A cell has no centrioles visible but has a spindle and a cell plate. Animal or plant?

106

Prometaphase.

105

Telophase (with cytokinesis).

108

Metaphase.

107

Anaphase (animal cell).

110

Plant.

109

Plant telophase + cytokinesis.