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# Cell Biology: Cytoskeleton

**Printable Flashcards — Pre-Med Biology**

Microfilaments, intermediate filaments, and microtubules. Motor proteins, cell movement, and structural support explained.

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**80 cards — Printable Flashcards**

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Generated February 20, 2026

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1

Cytoskeleton: what's the point in one sentence?

2

Name the 3 main cytoskeleton systems.

3

Quick trap: are cytoskeleton structures membrane-bound?

4

Which cytoskeleton element is most about resisting pulling/stretching (tensile strength)?

5

Which cytoskeleton element is most about intracellular transport tracks + mitotic spindle?

6

Which cytoskeleton element is key for cell crawling + the contractile ring in cytokinesis?

7

Microtubules are built from what subunits?

8

Microtubules are hollow or solid?

2

Microfilaments (actin), microtubules (tubulin), intermediate filaments.



1

It's the cell's internal framework for shape, movement, transport, and cell division.



4

Intermediate filaments.



3

No. They are protein filaments in the cytoplasm, not organelles with membranes.



6

Actin (microfilaments), with myosin.



5

Microtubules.



8

Hollow tubes.



7

Alpha/beta tubulin dimers.

9

Microtubules have polarity. What does that mean?

10

Microtubules are polarized: the {{c1::plus}} end usually grows faster than the {{c2::minus}} end.

11

What nucleotide is used for microtubule polymerization?

12

Dynamic instability: what does it mean for microtubules?

13

What stabilizes a growing microtubule end? (high-yield concept)

14

What's the main microtubule-organizing center (MTOC) in animal cells?

15

Centrosome vs centriole: what's the difference?

16

Centrioles are made of microtubules arranged how?

10

Microtubules are polarized: the plus end usually grows faster than the minus end.



9

They have a plus end and a minus end, and they don't behave the same.



12

They can rapidly grow and then suddenly shrink (catastrophe), then regrow.



11

GTP (on tubulin).



14

The centrosome.



13

A GTP cap on the plus end.



16

9 triplets in a ring (9x3).



15

Centrosome is the whole microtubule-organizing center. Centrioles are the barrel-shaped structures inside it (typically a pair).

17

Do most plant cells have centrioles?

18

What protein complex helps nucleate microtubules at the centrosome?

19

Kinesin moves cargo toward which end of a microtubule (usually)?

20

Dynein moves cargo toward which end of a microtubule?

21

Motor proteins like kinesin/dynein use what for energy?

22

In a neuron axon, which direction is anterograde transport?

23

Microtubule motor for retrograde axonal transport (terminal -> cell body)?

24

Cilia/flagella core structure (axoneme) in motile eukaryotic cells?

18

Gamma-tubulin ring complex (gamma-TuRC).



17

Usually no (in higher plants), but they still organize microtubules and form a spindle.



20

Toward the minus end.



19

Toward the plus end.



22

From the cell body to the axon terminal (usually kinesin on microtubules).



21

ATP.



24

9+2 arrangement: 9 microtubule doublets around 2 central microtubules.



23

Dynein

25

What actually makes a cilium/flagellum bend?

26

Basal body: what is it?

27

Microvilli vs cilia: what's the key cytoskeleton difference?

28

Primary cilium (9+0): what is it usually for?

29

Actin filaments are built from what?

30

Actin uses what nucleotide for polymerization?

31

Actin filament polarity: which end usually grows faster?

32

What's actin treadmilling?

26

The anchoring structure at the base of a cilium/flagellum, basically a modified centriole.



25

Dynein arms sliding microtubule doublets past each other.



28

Sensing/signaling (often non-motile).



27

Microvilli are actin-based; cilia are microtubule-based.



30

ATP (actin binds ATP when it adds).



29

Actin monomers (G-actin) polymerized into F-actin.



32

Actin adds at the plus end and comes off at the minus end, so the filament seems to "move" even if its length stays similar.



31

The plus (barbed) end.

33

Where is actin especially concentrated in many cells?

34

Myosin moves along what filament?

35

Most myosin (like myosin II) walks toward which end of actin?

36

Cytokinesis (animal cells): which cytoskeleton system pinches the cell in two?

37

Lamellipodia and filopodia: what are they made of?

38

Microvilli (intestine): what's the main cytoskeleton inside them?

39

Intermediate filaments are built from tubulin, actin, or many different proteins?

40

Do intermediate filaments have polarity (+/- ends) like actin and microtubules?

34

Actin.



33

Just under the plasma membrane (cell cortex).



36

Actin + myosin contractile ring.



35

Toward the plus end.



38

Actin bundles.



37

Actin.



40

No, they are not polarized.



39

Many different proteins (keratin, vimentin, desmin, lamins, neurofilaments...).

41

Do intermediate filaments use ATP or GTP to assemble?

42

Give one example of an intermediate filament protein in skin cells.

43

Give one example of an intermediate filament in neurons.

44

Nuclear lamina: what is it made of?

45

The nuclear lamina is made of {{c1::lamins}}, which are {{c2::intermediate filaments}}.

46

Mitosis: what forms the spindle that separates chromosomes?

47

Where do microtubules attach on chromosomes?

48

What happens if spindle attachment is wrong? (concept)

42

Keratin.



41

Neither (no nucleotide required).



44

Lamins (intermediate filaments) lining the inside of the nuclear envelope.



43

Neurofilaments.



46

Microtubules.



45

The nuclear lamina is made of lamins, which are intermediate filaments.



48

The spindle checkpoint can halt the cell cycle to prevent chromosome mis-segregation.



47

The kinetochore (on the centromere).

49

Actin vs microtubules in cell division: who does what?

50

Desmosomes connect to which cytoskeleton element?

51

Hemidesmosomes (cell to basement membrane) anchor what?

52

Tight junctions are mainly about what, compared to desmosomes?

53

High-yield drug concept: what happens if microtubules can't polymerize properly?

54

Colchicine/nocodazole type drugs do what (conceptually)?

55

Taxol (paclitaxel) does the opposite: what's the concept?

56

Actin inhibitors like cytochalasin do what (conceptually)?

50

Intermediate filaments (like keratin).



49

Microtubules separate chromosomes (mitosis). Actin/myosin pinches the cell (cytokinesis).



52

Barrier/sealing (control paracellular flow), not mechanical strength.



51

Intermediate filaments inside the cell.



54

They disrupt microtubule polymerization (microtubules fall apart).



53

Mitosis fails (spindle can't form), so cells can't divide normally.



56

They block actin polymerization and mess up cell crawling and cytokinesis.



55

It stabilizes microtubules so they can't depolymerize properly, which also blocks mitosis.

57

Which cytoskeleton element is the most dynamic overall?

58

Which cytoskeleton element is best for long-distance transport inside cells?

59

Which cytoskeleton element is strongest against mechanical stress?

60

If a stem says "cell has lots of beating hair-like projections moving mucus", which cytoskeleton is doing the work?

61

If a stem says "increase surface area for absorption", which cytoskeleton is the main support?

62

Spindle microtubules come in 3 functional groups: name them.

63

What does the term "astral microtubules" hint at?

64

Branched actin networks (lamellipodia) are mainly built by what complex?

58

Microtubules (with kinesin/dynein).



57

Actin and microtubules are highly dynamic; intermediate filaments are more stable.



60

Microtubules (cilia).



59

Intermediate filaments.



62

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



61

Actin (microvilli).



64

Arp2/3 complex.



63

Microtubules radiating from centrosomes toward the cell cortex, helping position the spindle.

65

Bundled actin (filopodia, microvilli): what's the general idea vs lamellipodia?

66

If intermediate filaments are faulty in skin, what's the kind of problem you expect?

67

If dynein in cilia doesn't work, what's a predictable outcome (concept)?

68

Common trap: are bacterial flagella built like eukaryotic flagella?

69

Another trap: is the spindle made of actin?

70

Does the cytoskeleton only exist in animal cells?

71

Cytoplasmic streaming in plant cells is mainly powered by what?

72

Where are microtubule minus ends usually anchored in animal cells?

66

Cells tear easily under stress
-> fragile/blistering skin.



65

Bundles are parallel and stiff (spikes).
Lamellipodia are branched and broad (sheets).



68

No. Eukaryotic flagella are microtubule-based (9+2). Bacterial flagella are different protein structures (flagellin) and work differently.



67

Cilia can't beat properly -> problems moving mucus/fluids (and can affect fertility due to sperm flagella).



70

No. All eukaryotic cells have it (plants too). The details differ (e.g., plants often lack centrioles).



69

No. The mitotic spindle is microtubules.



72

At the centrosome (MTOC) near the nucleus.



71

Actin filaments with myosin motors.

73

In many animal cells, microtubule {{c1::minus}} ends are anchored at the {{c2::centrosome}}, while {{c3::plus}} ends extend toward the cell periphery.

74

Actin is best at pushing or pulling membranes?

75

Cytoskeleton element: long-distance transport tracks + mitotic spindle.

76

Cytoskeleton element: cell cortex, microvilli, and cytokinesis ring.

77

Cytoskeleton element: strongest mechanical support, anchored at desmosomes.

78

Actin polymerization uses {{c1::ATP}}, while microtubule polymerization uses {{c2::GTP}}.

79

Kinesin generally moves toward the microtubule {{c1::plus}} end, while dynein moves toward the {{c2::minus}} end.

80

If you had to memorize ONE cilia fact for traps, what is it?

74

Both: polymerization pushes the membrane outward; myosin pulls actin for contraction.



73

In many animal cells, microtubule minus ends are anchored at the centrosome, while plus ends extend toward the cell periphery.



76

Actin (microfilaments)



75

Microtubules



78

Actin polymerization uses ATP, while microtubule polymerization uses GTP.



77

Intermediate filaments



80

Cilia = microtubules. Microvilli = actin. Don't swap them.



79

Kinesin generally moves toward the microtubule plus end, while dynein moves toward the minus end.