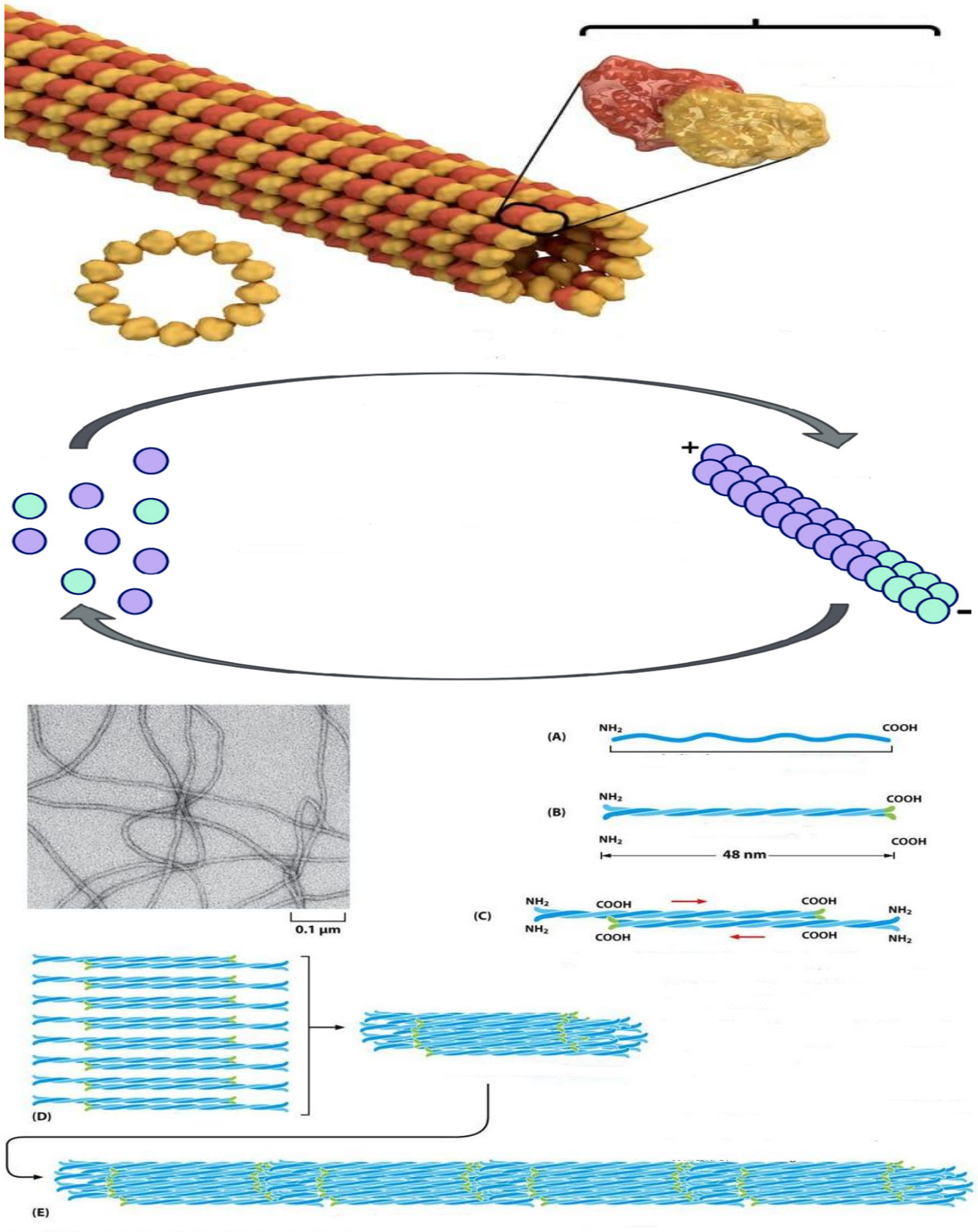


**TD N6****Exercise 1:** Fill in the blanks in the figures below.

**Exercise 2: Complete the table on the structure and function of the cytoskeleton.**

| <b>Protein<br/>Intermediate<br/>filament</b> | <b>Microtubule</b> | <b>Actin<br/>microfilament</b> | <b>Intermediate<br/>filament</b> |
|----------------------------------------------|--------------------|--------------------------------|----------------------------------|
| <b>Structure</b>                             |                    |                                |                                  |
| <b>Diameter</b>                              |                    |                                |                                  |
| <b>Protein subunits</b>                      |                    |                                |                                  |
| <b>Main functions</b>                        |                    |                                |                                  |

**Exercise 3: Answer this series of questions by placing a cross in front of the correct answer(s).****1) The components of the cytoskeleton**

- a) Are protein polymers.
- b) All have the same diameter.
- c) Maintain the overall shape of the cell.
- d) Form a static skeleton in the cell cytoplasm.
- e) In the case of microtubules, can participate in the intracellular movement of organelles.

**2) Actin**

- a) Is a dimeric protein formed from G-actin and F-actin
- b) Is capable of polymerizing to form cylinders
- c) Polymerizes only in its ATP-binding form
- d) Is also present in the cell nucleus in contact with the nuclear membrane, which it stabilizes.
- e) Polymerizes into filaments that exhibit dynamic instability at their ends in vivo

**3) Intermediate filaments**

- a) Are produced by the polymerization of globular proteins
- b) Vary depending on the cells involved
- c) Are located exclusively in the cytoplasm of eukaryotic cells
- d) Of the lamina type are extracellular
- e) Are not part of the cytoskeleton

**4) Tubulin**

- a) Is a component of a filament known as an intermediate filament.
- b) Is a globular protein that assembles into protofilaments.
- c) Forms a microtubule by assembling 13 protofilaments.

- d) Interacts with a motor protein such as dynein.
- e) Forms microtubule doublets in cilia and flagella.

#### **5) Microtubules**

- a) Use dynein to transport components to the cellular organizing center
- b) Serve as rails to guide the elements to be transported
- c) Move transport vesicles forward according to the principle of polymerization and depolymerization
- d) Are responsible for transport across the nuclear envelope
- e) Use kinesin to transport secretory vesicles to the synapse

#### **6) Microtubules**

- a) Are produced by the polymerization of tubulin dimers
- b) Originate in an organizing center (centrosome)
- c) Bind actin to form contractile sarcomeres
- d) Are composed of protofilaments
- e) Exhibit dynamic instability at their (-) ends in vivo

#### **7) Which protein(s) enable(s) vesicles to attach to microtubules?**

- a) clathrin
- b) kinesin
- c) kinase
- d) integrin
- e) dynein

#### **8) Concerning intracellular transport**

- a) The cytoskeleton acts as both the support and the motor for cytoplasmic vesicular movements.
- b) Motor proteins possess ATPase activity.
- c) The molecular mechanisms responsible for vesicular movement in the cytoplasm are similar to those involved in chromosome movement during mitosis.
- d) Similar to the role played in intracellular transport by microfilaments and microtubules in eukaryotes, intermediate filaments in prokaryotes ensure the movement of vesicles from one internal membrane compartment to another.

#### **9) Cytoskeletal proteins**

- a) Microtubules are composed of actin.
- b) Intermediate filaments are composed of tubulin.
- c) Microfilaments can be composed of keratin.
- d) The cytoskeleton enables cell motility.
- e) The cytoskeleton participates in the positioning of organelles.

#### **10) During contraction, we see**

- a) A decrease in the I band and the H zone.
- b) The A band remains the same length.
- c) The myosin and actin myofilaments do not change in length.
- d) The thin actin filaments slide between the thick myosin filaments.
- e) A decrease in sarcomere length.

#### **11) Concerning sarcomeres**

- a) The sarcomere is the unit of contraction in striated and smooth muscle fibers.
- b) A sarcomere is bounded by two Z lines.
- c) Thin filaments are composed of myosin.
- d) The myosin head has ATPase activity.
- e) Sarcomere contraction requires the presence of  $\text{Ca}^{+2}$

#### 12) Regarding sarcomeres

- a) The sarcomere is the unit of contraction in striated and smooth muscle fibers.
- b) A sarcomere is delimited by two Z lines.
- c) Thin filaments are made up of myosin
- d) The troponin-tropomyosin complex is closely linked to actin filaments
- e) The change in conformation of the troponin-tropomyosin complex requires the binding of  $\text{Ca}^{+2}$

#### Exercise 4: Consider the figure below.

1. Give the name of the structure in Figure 2 below and fill in the blanks.
2. Indicate the cell type that has this type of structure.
3. Give a definition of sarcomere.

