

1. A cell is 20 μm across. How many 4 μm sections does it take to cut all the way through it?
_____ sections

2. Why does the alveolus use simple squamous epithelium?

- ☐ It must resist abrasion
- ☐ Gas exchange needs the shortest possible diffusion path
- ☐ It needs many layers for protection
- ☐ It secretes large amounts of mucus

3. Which band keeps the same width when a sarcomere contracts?

- ☐ The distance between Z-lines
- ☐ The I-band
- ☐ The A-band
- ☐ The H-zone

4. Which layer is much thicker in an artery than in its companion vein?

- ☐ Tunica media
- ☐ Tunica intima
- ☐ Tunica adventitia
- ☐ The endothelium

5. Why does the proximal tubule have a brush border?

- ☐ To make hormones
- ☐ To sweep urine along
- ☐ Microvilli give the large surface needed to reabsorb about 65% of the filtrate
- ☐ To protect against abrasion

6. Which part of the blastocyst becomes the embryo itself?

- ☐ The zona pellucida
- ☐ The fluid-filled cavity
- ☐ The trophoblast
- ☐ The inner cell mass

7. A harmful drug first taken in week 20 of pregnancy is most likely to cause a major structural malformation such as a cleft palate.

- ☐ True ☐ False

8. A frozen section gives the same quality of detail as a paraffin section, only faster.

- ☐ True ☐ False

9. Blood is a connective tissue.

- ☐ True ☐ False

10. A sarcomere with a 1.6 μm A-band contracts to 2.0 μm . What is the total width of its I-band (both halves), in μm ?

_____ μm

1. **5 sections**

$20 / 4 = 5$, so any one section shows only a fifth of the cell; a nucleus may be missing from a cell's section.

2. **Gas exchange needs the shortest possible diffusion path**

One flat layer, about 0.5 μm , keeps the path for O_2 and CO_2 as short as possible.

3. **The A-band**

The A-band is the length of the myosin filaments, which never changes; the I-band and H-zone narrow as actin slides in.

4. **Tunica media**

The smooth-muscle media handles the high, pulsing arterial pressure; veins carry low pressure and have thin walls.

5. **Microvilli give the large surface needed to reabsorb about 65% of the filtrate**

Bulk reabsorption needs area, and microvilli multiply the cell's surface.

6. **The inner cell mass**

The inner cell mass forms the embryo; the trophoblast forms the fetal part of the placenta.

7. **False**

By week 20 the palate and other major structures have formed; later exposures more often affect growth and function.

8. **False**

Ice crystals tear the tissue and detail is blurred; the frozen section trades quality for an answer within minutes.

9. **True**

It has cells in a matrix, as every connective tissue does; its matrix is fluid plasma.

10. **0.4 μm**

$2.0 - 1.6 = 0.4 \mu\text{m}$, down from 0.9 μm at rest: the I-band takes all the shortening.