PIPADOR REVISION

MRCOG Part 1 Revision Notes

Cell Junctions

BIOCHEMISTRY • LECTURE 210

VISUAL EXAMINATION REVISION NOTES

2026 Edition

210

MRCOG PART 1 REVISION NOTES | BIOCHEMISTRY

Cell Junctions

Tight, adherens, desmosome, gap junctions and hemidesmosomes — structure, reproductive roles and disorders

Tight	Adherens	Desmosome	Gap
Seal & polarity (claudins, occludin)	Cadherins + actin	Cadherins + keratin (strength)	Connexins — communication

■ **KEY FACTS: Learning objectives**

- Describe the structure, proteins and functions of tight, adherens, desmosome, gap junctions and hemidesmosomes.
- Describe junctions in barrier tissues of reproduction: blood–testis barrier, placenta, endometrium.
- Describe gap junctions in the myometrium and ovary, and junctional disorders.

210.1 Junction types

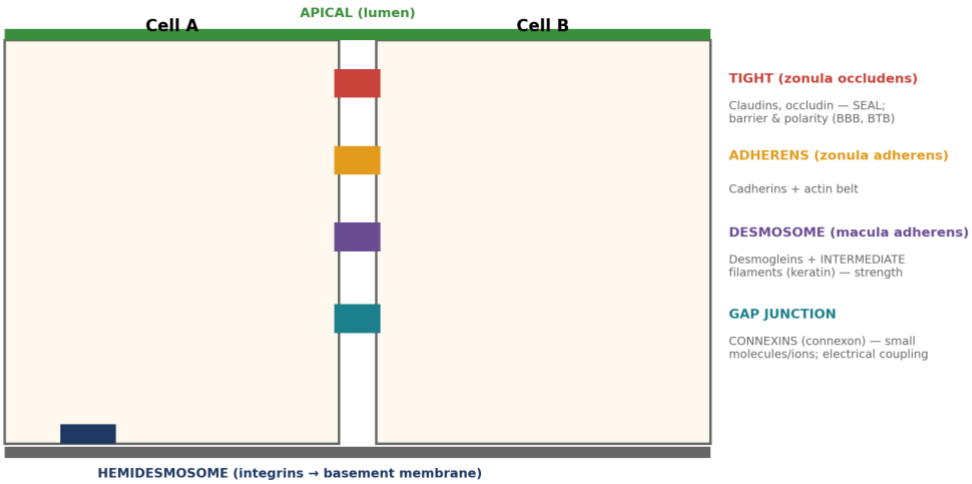


Figure 210.1 — Epithelial cell junctions

Junction	Proteins	Cytoskeletal link	Functions
Tight (zonula occludens)	Claudins, occludin, ZO-1/2	Actin	Seal paracellular pathway; fence separating apical/basolateral membranes (polarity); blood–brain, blood–testis barriers
Adherens (zonula adherens)	E-cadherin, catenins	Actin belt	Cell–cell adhesion, tissue morphogenesis, contact inhibition
Desmosome (macula adherens)	Desmogleins, desmocollins, plakoglobin, desmoplakin	Intermediate filaments (keratin; desmin in heart)	Mechanical strength (skin, myocardium, cervix)
Gap junction	Connexins (6 → connexon; 2 connexons → channel)	—	Direct passage of ions and small molecules (< 1 kDa) — cAMP, Ca^{2+}, IP_3; electrical coupling
Hemidesmosome	Integrin α6β4, BP180 (collagen XVII), plectin	Intermediate filaments	Anchors basal cells to basement membrane
Focal adhesion	Integrins, talin, vinculin	Actin	Cell–matrix adhesion and migration signalling

210.2 Junctions in reproductive physiology

Site	Junction role
Blood–testis barrier	Tight junctions between Sertoli cells create an adluminal compartment protecting haploid germ cells from immune attack; breach → anti-sperm antibodies (vasectomy, trauma)
Ovarian follicle	Gap junctions (Cx37 oocyte–granulosa; Cx43 granulosa–granulosa) transfer cGMP/cAMP to maintain meiotic arrest; LH surge closes them → meiosis resumes; also supply nutrients to the oocyte
Myometrium	Connexin-43 gap junctions ↑ markedly at term (oestrogen; ↓ by progesterone) → electrical synchrony of contractions; part of the 'contraction-associated proteins'
Placenta	Syncytiotrophoblast lacks lateral junctions (true syncytium) — the barrier is the syncytium itself; cytotrophoblast fusion requires syncytins; fetal endothelial tight junctions
Endometrium/cervix	Tight junction loosening at implantation; cervical epithelial barrier (preterm birth, infection)

210.3 Junctional disorders

Disorder	Target
Pemphigus vulgaris	IgG autoantibodies to desmoglein 3 (± 1) — intraepidermal flaccid blisters; Nikolsky positive
Bullous pemphigoid / pemphigoid gestationis	Antibodies to BP180 (collagen XVII) in hemidesmosomes — subepidermal tense blisters (Lecture 157); neonatal transient blistering
Epidermolysis bullosa	Inherited defects of keratins (simplex), laminin/collagen XVII (junctional), collagen VII (dystrophic)
Arrhythmogenic cardiomyopathy	Desmosomal protein mutations (plakophilin-2)
Connexin mutations	Cx26 (GJB2) — commonest genetic non-syndromic deafness; Cx32 — X-linked Charcot–Marie–Tooth
Cholera / C. difficile toxins, coeliac disease	Tight junction disruption → leak
Cancer	Loss of tight junctions/polarity; ↓ E-cadherin (EMT)

210.4 Must-know summary

■ EXAM TIP

- Apical → basal: **tight → adherens → desmosome**; gap junctions lateral; hemidesmosomes basal.
- Tight: claudins/occludin (seal, polarity, blood–testis barrier). Adherens: cadherin–actin. Desmosome: cadherin–**keratin**. Gap: **connexins**.
- **Cx43** gap junctions ↑ in term myometrium (oestrogen); granulosa–oocyte gap junctions maintain meiotic arrest.
- Pemphigus = desmoglein (intraepidermal); pemphigoid (gestationis) = BP180 hemidesmosome (subepidermal).

■ MNEMONIC / MEMORY AID

Junctions top to bottom — 'TAD-G-H': Tight, Adherens, Desmosome, Gap, Hemidesmosome.