

## ANSWERS

### 2.2 Epithelium

40.  $a + b - c + d - e +$

41.  $a - b - c + d + e -$

Epithelium is a tissue composed of cells that are tightly joined to each other. There is almost no intercellular substance in epithelium. Epithelium can develop from all the embryonic germinal layers, though it never develops from mesenchyme. Epithelium is a lining tissue that at some stage in development is found on the border separating the external environment and the internal environment. Epithelial cells show both structural and physiological polarity. They usually have distinct apical, lateral and basal regions. Epithelia never contain blood vessels (the sole exception being the stria vascularis of the inner ear). All nutrition and necessary metabolites are derived by diffusion from blood vessels of the underlying connective tissue. Epithelia have remarkable power of regeneration and this is essential to any lining tissue. Many types of cancer are formed from epithelial cells.

42.  $a + b + c - d - e -$

Epithelium, which serves a mainly protective role, is typically stratified. Epithelia that have mucus-secreting goblet cells can also to a degree be considered to have a protective role.

43.  $a - b + c - d + e +$

44.  $a - b - c - d + e +$

Ion-transporting epithelia are found in the ducts of the salivary glands, tubules of the nephron and in the choroids plexus. Epithelia specialized for ion-transport are typically non-stratified with cells that commonly possess invaginations of the basal plasmalemma with associated concentrations of mitochondria. This arrangement increases the surface area of the transporting membrane and ensures adequate energy sources for the ion-transport process. The apical surface of ion-transporting epithelial cells typically is coated with microvilli.

45.  $a - b - c - d + e -$

Transitional epithelium, which is found lining the urinary bladder and most of the urinary passages, can be identified in histological sections cut vertically through the epithelium, in that the surface cells of this stratified epithelium, are larger and more rounded than those of the deeper underlying layers. Transitional epithelium allows fluid-filled hollow structures to undergo large changes in volume.

46.  $a + b + c + d - e -$   
Epithelium develops from the three basic embryonic germinal layer: the ectoderm, mesoderm and the endoderm. Mesenchyme is the source of connective tissue and epithelium is never derived from mesenchyme.
47.  $a + b - c - d + e +$   
Microvilli, cilia, stereocilia and flagella may all be found on the free surface of simple epithelial cells.
48.  $a + b + c + d + e +$   
A basal lamina is found under all epithelium and separates it from the underlying connective tissue. The basal lamina is believed from experimental studies to be formed by the epithelial cells themselves. The basal lamina is composed of a non-fibrous form of collagen (sometimes referred to as type IV collagen) and contains PAS-positive glycol-proteins.
49.  $a - b - c - d + e -$   
Epithelial cells are tightly joined together and often have a typical 'junctional complex' between adjacent cells. Only the tight junction (zonulae occludens) prevent the passage of unwanted materials into the body between adjacent epithelial cells. The intimate relationship between adjacent epithelial cells has a functional significance in that all the materials entering or leaving the body from the external environment must pass through epithelial cells, which thus play an important role in physiological homeostasis.
50.  $a - b - c - d + e +$   
On the border separating epithelial cells from the underlying connective tissue are found basal laminae and in some instance hemidesmosomes.
51.  $a - b - c + d + e +$   
The so-called 'brush border' found on the apical surface of some epithelial is formed from large numbers of microvilli. These 'brush borders' are found on the proximal tubules of the nephron, on intestinal absorptive cells and on floating chorionic villi. The purpose of the 'brush border' is to increase the surface area of the cells and permit more effective absorption.
52.  $a + b + c - d + e +$   
Epithelium has an important role in maintaining physiological homeostasis of the body. This is connected with its strategic location on the border separating the external environment from the internal 'milieu'. Blood vessels are not found in epithelia and all the nutrition is derived from nutrients that diffuse from blood vessels of the underlying connective tissue. Epithelium participates in the exchange of all the materials that enter or leave the body. In some sites epithelium contains sensory cells and nerve endings.

53.  $a + b + c - d + e -$   
Epithelium whose function is mainly protective is typically stratified with a rapid turnover of cells from undifferentiated cells of the basal layers to replace the surface cells that are subjected to mechanical 'wear and tear'. Epithelium regenerates easily and may be, as in the case of skin, keratinized.
54.  $a + b + c + d + e -$   
Simple squamous or 'pavement' epithelium is found lining the pericardium, pleura and peritoneum. Thyroid epithelial cells lining the follicles are squamous when hypoactive, when TSH-levels are low, or after hypophysectomy.
55.  $a - b - c + d + e +$
56.  $a + b + c - d - e +$   
Mucus is secreted by goblet cells and by mucus cells such as those lining the stomach. Mucus provides lubrication, prevents desiccation and may have a protective role in the trapping of foreign particles. In the respiratory passage mucus from goblet cells traps dust particles, which are moved towards the oral or nasal cavities by cilia. Mucus is a typical component of the mucous membranes.
57.  $a - b - c + d + e -$   
Exocrine glands secrete via ducts to the external environment. They are epithelial in origin and their cells show marked polarity, often with a basal area of rough endoplasmic reticulum and an apical area with secretory droplets or granules. Typical exocrine glands have a secretory unit and a secretory duct, though this lacking in the unicellular goblet glands.
58.  $a + b + c - d - e +$   
Merocrine secretion is synonymous with eccrine secretion and is the most common sort of exocrine secretion. It involves exocytosis via the apical membrane of cells. Apocrine secretion involves the secretion of the apical cytoplasm of cells. Holocrine secretion involves the secretion of whole cells and their contents. The terms 'merocrine', 'apocrine' and 'holocrine' were widely used in the days of the 'classical histologists', though today they have much less significance as so much more is understood concerning the processes of secretion since the advent of electron microscopy.
59.  $a - b + c - d - e +$   
Compound exocrine glands have branched secretory ducts that allow the passage of secretions to the body surface of external environment.
60.  $a - b + c + d + e +$

61.  $a + b + c + d - e +$   
Mesothelium is derived from mesoderm and is in the form of a simple squamous epithelium. It lines the serous cavities of the body (pleura, pericardium, peritoneum) and gives a smooth covering to those organs that need a degree of freedom of movement.
62.  $a - b - c + d - e -$   
Serous exudates is the fluid found in the serous cavities. It is normally present in small amounts and is usually acellular. It is not secreted by the mesothelium, but reaches the serous cavities passively. In pathological cases the volume of serous exudates may be greatly increased.
63.  $a + b + c + d + e +$   
Fibronectin, which is sometimes referred to as a molecular glue, is found on cell surfaces and is believed to play a role in cell adhesion. Fibronectin forms a bridge between cells and the surrounding matrix and is present in abundance in basal laminae. Fibronectin is found in an insoluble form on cell surface and in connective tissue, though it is also found in a soluble form in blood plasma. There is a considerable current interest in fibronectin and its adhesive properties. Malignant cells may exhibit different fibronectin features from more normal cells.