What is Glycocalyx? Enumerate four important functions of carbohydrate moieties attached to outer surface of cell. 1,2

Key:

Loose carbohydrate coat on outer surface of cell. ¼
Composed of
Glycoproteins ¼
Glycolipids ¼
Proteoglycans ¼

Functions
Negative charge repels other negative charges ½
Attached cells with each other ½
Act as receptor ½
Immune reactions ½

Reference: Text Book of Medical Physiology 11th Ed Guyton & Hall Page 14
Q2. Draw and Label the Action Potential in a large myelinated nerve fiber. Which ion channels are involved in its different stages?

Key:

- Draw
- Label
- Ion Channels
- Depolarization: sodium channels (½)
- Repolarization: potassium channels (½)

Reference: 
Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 61
Q3. What is walk-Along theory of skeletal muscle contraction?  3

Key:
1/3 for each  (2)
1 diagram

Activation of actin filament by ca ions
Attachment of myosin cross bridges with active sites
Power stroke  head tilt towards arm
Actin filament drags
Head breaks away
Head returns to extended direction Combines with new active sites

Reference:  Text Book of Medical Physiology 11th Ed.
Guyton & Hall Page 77
Q4. Define Cardiac Cycle. How the Pressure changes in left ventricle during different phases of cardiac cycle?  

**Key:**

Cardiac events from beginning of one heart beat to the beginning of next.  
Duration 0.8 sec  
Rate 72/min  

**Pressure changes**

Diagram  
Changes during systole  
Changes during diastole  

Reference: Text Book of Medical Physiology 11th Ed  
Guyton & Hall Page 107
Q5. Enumerate four rapidly acting mechanisms for Blood Pressure regulation. How Renin Angiotensin mechanism regulates Blood Pressure?

Key: (any four ¼ each)

- Baroreceptor reflex
- Chemoreceptor reflex
- CNS ischemic response
- Bain bridge reflex
- Atrial reflex

Renin angiotensin mechanism 2

¼ each

Low BP
Renin (kidney)
Renin substrate (angiotensinogen)
Angiotensin 1
Angiotensin 11
Salt water retension by kidney
Vasoconstriction
Increased arterial pressure

Reference: Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 209, 223
Q6. Define Micturition. What is micturition reflex? 1, 2

Key:

Def 1 (¼ each)
Process by which urinary bladder empties when it becomes filled with blood
Bladder fills progressively
Tension in its walls rises above threshold level
Nervous reflex initiated to empties the bladder

Reflex 2 (¼ each)
Receptors stretch receptors in bladder wall
Aff pelvic nerve
Center sacral segment
Eff parasympythetic through same nerve
Response bladder contractions
Powerfull micturition reflex
Throughg pudendal nerve inhibit external sphincter
More inhibition than voluntary constrictor signals

Reference: Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 311,313
Q7. Classify various white Blood Cells. What are the functions of neutrophils?  

Key:

Classification

A  Granulocytes  ½
    Neutrophils  
    Eosinophils  
    Basophils  

B  Agranulocytes  ½
    Lymphocytes  
    Monocytes  

Functions

Phagocytosis
Killing of bacteria by bactericidal agents
Oxidizing agents to kill bacteria
Second line of defence during inflammation

Reference:  Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 430 _34
Q8. Enumerate four common types of anemia. What are the effects of Anemia on circulatory system?

KEY

Types: ¼ each
Blood lose anemia
Aplastic anemia
Megaloblastic anemia
Hemolytic anemia

Effects 2 (¼)
Dec blood viscosity
Dec resistance to blood flow
Inc venous return
Inc cardiac output
Dec oxygen transport
Hypoxia
Dilated peripheral blood vessels
Inc pumping load on heart

Reference: Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 426-27
Q9. What is the role of oxygen, carbon dioxide and hydrogen ions in control of respiration?

Key:

**Oxygen** 1

Peripheral chemoreceptors in aortic and carotid bodies
PO$_2$ when fall 60 to 30 mmHg
Dec Hb saturation with O$_2$ rapidly
Signals to respiratory center inc rate of respiration

**CO$_2$ and hydrogen ions** 2 (¼ each)

Directly on respiratory center
H ions primary stimulus
CO$_2$ cross BBB enter into
Cerebral interstitial fluid reacts with water
CO$_2$ + H$_2$O $\leftrightarrow$ H$_2$CO$_3$ $\leftrightarrow$ H + HCO$_3$  
H Ions on central chemosensitive area
Increasing RR
Weak effect on peripheral chemoreceptors

Reference: Text Book of Medical Physiology 11$^{th}$ Ed
Guyton & Hall Page 516_18
Q10. Define Lung Compliance. How the Surfactant increases lung compliance?

Key:

Extent to which lungs expand for each unit increase in transpulmonary pressure ½
Normal value 200ml/cmH2O ½

Surfactant 2 (½ each)
Surface active agent
Mixture of phospholipids, ions and proteins

Phospholipids esp Dipalmitoylphosphatidylcholin spread over water surface in alveoli

Dec surface tension among water molecules one twelveth to one half the surface tension of pure water surf.

Reference: Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 473_74
Q11. What is endogenous pain control mechanism? 3

Key:

Analgesia system in brain and spinal cord
Periaqueductal gray
Periventricular areas of mesencephalon and upper pons (Enkephalin) 1

Raphe Magnus nucleus in lower pons and upper medulla (serotonin) 1

Pain inhibitory complex in dorsal horn of spinal cord (enkephalin) 1

Reference: Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 602
Q12. Enumerate the parts of Basal Ganglia. What is their role in motor control? 1,2

KEY
Names 1 (1/5 each)
Caudate nucleus
Putamen
Globus pallidus
Substantia nigra
Subthalamie nucleus

Functions
Cognitive control of sequence of motor pattern 1
Change the timing of movement ½
Scale the intensity of movement ½

Reference: Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 707-8
Q13. Draw and Label Dorsal Column Medial Lemniscal Tract. Which Sensations are transmitted by this pathway?

Key:

Draw and Label 2 (1 Draw, 1 Label)
Sensations 1 (1/5 each)
Fine touch
Vibration
Position
Pressure
Move against skin

Reference: Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 588
Q14. Enumerate the Hormones of Adrenal Cortex. What are the effects of cortisol on protein metabolism? 1, 2

Key:

Enumerate 1 (1/3 each)
- Glucocorticoids (cortisol)
- Mineralocorticoid (aldosteron)
- Adrenal androgens

Effects 2 (1/3 each)
- Dec cellular proteins
- Dec muscle proteins
- Inc liver and plasma proteins
- Inc blood amino acids
- Dec AA transport to extrahepatic tissues
- Inc AA transport to hepatic cells

Reference: Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 952
Q15. Which changes occur during Pharyngeal stage of swallowing? 3

KEY (1/3 each)

Soft palate pulled upwards to close posterior nares
Palatopharyngeal folds approximated
Vocal cords approximate
Larynx pulled upwards and anteriorely by neck muscles
Upper esophageal sphincter relax
Contraction of pharyngeal muscles
Trachea closed
Esophagus opened
Peristaltic wave of pharynx occurs

Reference: Text Book of Medical Physiology 11th Ed
Guyton & Hall Page 782