

**Physiology Exam for Nursing Students**

**January, 2016**

**(Model Answer)**

**A) Answer the following questions:**

**(5 marks each)**

**1- Define the resting membrane potential (RMP). What are the causes of resting membrane potential?**

\* **Definition:** The potential difference between the outer & inner surfaces of the cell membrane during rest.

\* **Causes:**

A) Selective permeability of the cell membrane.

B)  $\text{Na}^+$  -  $\text{K}^+$  pump.

**2- Define erythropoiesis. Enumerate the factors affecting erythropoiesis?**

\* **Definition:** Formation of new RBCs.

\* **Factors affecting erythropoiesis:**

The following factors are essential for Hb synthesis, and production & release of RBCs. from the bone marrow (erythropoiesis).

I- Hypoxia:  $\text{O}_2$  lack stimulates erythropoietin hormone secretion.

II- Diet:

1. Protein.

2. Iron.

3. Vitamins: Vit. B12, folic acid and Vit. C.

4. Trace elements: Copper (Cu) and Cobalt (Co). \

III- Hormones: thyroxin, cortisol and testosterone,

IV- Liver: for synthesis and storage.

V- Kidney: that secretes erythropoietin hormone.

VI- Bone marrow: The site of RBCs. formation.

**3- Enumerate the properties of neuromuscular transmission.**

\* **Properties of neuromuscular transmission:**

1) **Unidirectional transmission:** from the nerve to the muscle & not the reverse.

2) **Delay:** of about 0.5 msec. which represents the time needed for the release of A.Ch. and the generation of the EPP to the firing level.

3) **Fatigue:** as repeated stimulation causes depletion of the chemical transmitter.

4) **Effect of drugs on the MEP:**

A) Blocking drugs: These drugs block the nicotine – like action of A.Ch. by:

- Competitive inhibition: e.g. curare & flaxidel.

- Persistent depolarization: e.g. succinyl choline.

B) Anticholinestrases: these drugs combine with choline esterase enzyme preventing its hydrolyzing effect on A.Ch.:

- Reversible combination: e.g. eserine, prostigmine and neostigmine.
- Irreversible combination: e.g. D.F.P. and parathion.

5) Effect of ions on the MEP:

- a. Stimulants:
  - $\text{Ca}^{2+}$  → stimulates A.Ch. release.
  - $\text{K}^{+}$  → anticurare action.
- b. Inhibitors:
  - $\text{Mg}^{2+}$  → prevents the release of A.Ch.

**4- Enumerate the different organelles inside body cell, giving one function for each type?**

<i>Organelles</i>	<i>Functions</i>
<b>Rough endoplasmic reticulum</b>	<ol style="list-style-type: none"> <li>1. Synthesis of proteins.</li> <li>2. Degradation of worn out organelles.</li> </ol>
<b>Smooth endoplasmic reticulum</b>	<ol style="list-style-type: none"> <li>1. Synthesis of lipids and steroids.</li> <li>2. Storage and metabolism of calcium.</li> <li>3. Degradation of toxic substances.</li> </ol>
<b>Golgi apparatus</b>	<b>Processing, packaging, labeling &amp; delivery of proteins and lipids</b>
<b>Lysosomes</b>	<ol style="list-style-type: none"> <li>1. Degradation of macromolecules like bacteria.</li> <li>2. Degradation of worn out organelles.</li> <li>3. Secretory function.</li> </ol>
<b>Peroxisomes</b>	<ol style="list-style-type: none"> <li>1. Degradation of toxic substances like hydrogen peroxide.</li> <li>2. Oxygen utilization.</li> <li>3. Breakdown of excess fatty acids.</li> </ol>
<b>Centrosome</b>	<b>Movement of chromosomes during cell division.</b>
<b>Mitochondria</b>	<ol style="list-style-type: none"> <li>1. Production of energy.</li> <li>2. Synthesis of ATP.</li> <li>3. Initiation of apoptosis.</li> </ol>
<b>Ribosome</b>	<b>Synthesis of proteins.</b>
<b>Cytoskeleton</b>	<ol style="list-style-type: none"> <li>1. Determination of shape of the cell.</li> <li>2. Stability of cell shape.</li> <li>3. Cellular movements.</li> </ol>

**B) Answer the following questions:**

*(5 marks each)*

Put true (√) or false (X) for each of the following sentences and rewrite it again:

**1- About the functions of plasma proteins:**

- a- Albumin is responsible for blood viscosity. ( X )
- b- Gamma globulins are essential for immunity. ( √ )
- c- Fibrinogen is an important factor for blood clotting. ( √ )
- d- Prothrombin is not a plasma protein. ( X )
- e- Buffering action is one of plasma proteins. ( √ )

**2- About transport across the cell membrane:**

- a-  $\text{Na}^+$  -  $\text{K}^+$  pump is an example of secondary active transport. ( X )
- b- Phagocytosis is an example of exocytosis. ( X )
- c- Diffusion is indirectly proportional with thickness of the membrane. ( √ )
- d- Diffusion is directly proportional with concentration gradient of the substance across the cell membrane. ( √ )
- e-  $\text{Na}^+$  - Glucose is an example of secondary active transport. ( √ )

**3- About the skeletal muscle contraction:**

- a- During isotonic muscle contraction, the muscle length is shortened. ( X )
- b- Isometric contraction can perform work. ( X )
- c- The mechanical efficiency in isotonic contraction is about 30%. ( √ )
- d- During isometric contraction, the muscle consumes more energy. ( X )
- e- During isotonic contraction, there is much sliding of actin over myosin. ( √ )

**4- About white blood cells:**

- a- The total leucocytic count ranges between 4000 and 11000 / cumm. ( √ )
- b- Eosinophils increase in allergic condtions. ( √ )
- c- Monocytes are granular and are highly phagocytic cells. ( X )
- d- Neutrophils are phagocytic cells and have defensive function. ( √ )
- e- Lymphoctes are agranular cells and of three types. ( √ )