

35606
Q.P. Code ~~35600~~ (01)

QUESTION PAPER SOLUTION
B.E SEM VI BIOMEDICAL ENGG.
SUB: BIOLOGICAL MODELING AND SIMULATION
EXAM : May' 18

- Q.1 (a) List of Biophysics Tools [01]
Each biophysics tools, explanation and equation [01]
- (b) Explanation of Thermogenesis [2.5]
Thermolysis [2.5]
- (c) Explanation of Spindle receptor [2.5]
Golgi tendon organ [2.5]
- (d) Parallel conductance equation [03]
Explanation [02]
Equation.
- Q.2 (a) Derivation of Nernst equation for K⁺ ions [06]

(b)

$$V_{rest} = \frac{KT}{2} \ln \left[\frac{P_K [K^+]_{out} + P_{Na^+} [Na^+]_{out}}{P_K [K^+]_{in} + P_{Na^+} [Na^+]_{in}} \right]$$

Substitute the given values

$$-52 \text{ mV} = 26 \text{ mV} \ln \left[\frac{1 \times 4 + 0.017 \times 276}{1 \times x + 0.017 \times 41} \right]$$

$$x = 63.68 \text{ mM}$$

K⁺ cytoplasmic concentration is 63.68 mM.

- (c) Electrical model of cell membrane: Diagram [03]
Explanation [05]

Q.3 (a) Thermoregulatory system	
Block Diagram	[04]
Explanation	[04]
(b) Complete derivation of cable equation	[12]
Q.4 (a) Anatomical sketch and block diagram	[05]
Explanation	[05]
(b) Derivation of peak velocity	[05]
Derivation of peak time	[05]
Q.5 (a) Immune system diagram	[03]
Block diagram	[03]
Explanation	[04]
(b) i) Definition and differentiation	[05]
ii) Modeling definition	[01]
steps in modeling	[04]
Q.6 (a) Five points of Glissades	[05]
(b) Five points of Rigour Mortis	[05]
(c) Respiratory system model	
Block diagram	[02]
Explanation	[03]
(d) Length Tension Diagram	[02]
Explanation	[03]
(e) Strech Reflex	
Block diagram	[02]
Explanation	[03]