Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech (PHMB/PHMC)/SEM-2/PHMB/PHMC-202/2011

2011

NEUROBIOLOGY & DEVELOPMENTAL BIOLOGY

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

NEUROBIOLOGY

(Marks – 35)

Answer Question No. 1 and any *three* from the rest.

1. Fill in the blanks : 5 × 1 = 5

   i) In neuromuscular junction, acetylcholine binds to ..... (type of receptor), but in cardiac muscle, it binds to ..... (type of receptor) to exert its effect.

   ii) In mammalian brain, the most abundant excitatory neurotransmitter (workhorse) is ..... and the most common inhibitory neurotransmitter is .....

   iii) The resting membrane potential of a neuron is about 70 millivolts. Depolarization causes ..... whereas hyperpolarization results in ..... .

iv) Acetylcholine esterase inhibitors are commonly used as drugs in ..... (name the disease) to improve the ..... of patients.

v) Tranquilizers or sedatives mediate their effect by modulating the activity of ..... (name the neurotransmitter) whereas stimulants like amphetamine do that by modulating the activity of ..... .

2. What are the critical events of synaptic transmission in which calcium is known to play an important role ? Can you describe any one of these events in some detail ? 10

3. Name the enzymes and the products (without formulae) involved in the formation of catecholamine neurotransmitters from tyrosine and indicate the rate limiting step. Describe the principal dopamine circuits in mammalian brain and state how they differ functionally. 10

4. Stat the procedure(s) employed for the localization of GABA circuits in mammalian brain. Draw a schematic diagram of the GABA receptor indicating the binding sites of different drugs which mediate their effects by modulating GABA activity. 10

5. State the mechanism of action of the following agents indicating the neurotransmitter/receptor system involved : 10

a) Tetanus toxin

b) Barbiturates

c) Nerve gases

d) Atropine

e) L-DOPA.

GROUP – B

DEVELOPMENTAL BIOLOGY

(Marks – 35)

Answer Question No. 1 and any *two* from each module.

1. Answer any *five* of the following : $5 \times 1 = 5$

   i) What is exocytosis ?

   ii) What is the function of Resact ?

   iii) What is the difference between totipotent and pluripotent ?

   iv) What is cavitation ?

   v) What is tubal pregnancy ?

   vi) What is the difference between maternal genes & zygotic genes ?

Module – I

(Answer any *two*)

2. What is compaction ? Explain the development of human embryo from fertilization to implantation with suitable figures. $2+5\frac{1}{2}$

3. What is the difference between cytotrophoblast and syncytotrophoblast ? Explain the functions of placenta. $3+4\frac{1}{2}$

4. What is biochemical mechanism of species-specific recognition ? Explain different steps of sperm-zona pellucida binding in mammals. $2\frac{1}{2}+5$

Module – II

(Answer any *two*)

5. State the difference between maternal genes and zygotic genes. Explain the functions of important maternal and zygotic genes in *Drosophila.* $3 + 4\frac{1}{2}$

6. What is stem cell ? How could you obtain embryonic stem cells ? What are the sources of multipotent adult stem cells and pluripotent adult stem cells ? $2 + 1 + 4\frac{1}{2}$

7. Describe the ultrastructure of sperm. Explain the biochemical mechanism responsible for flagellar function. $3 + 4\frac{1}{2}$