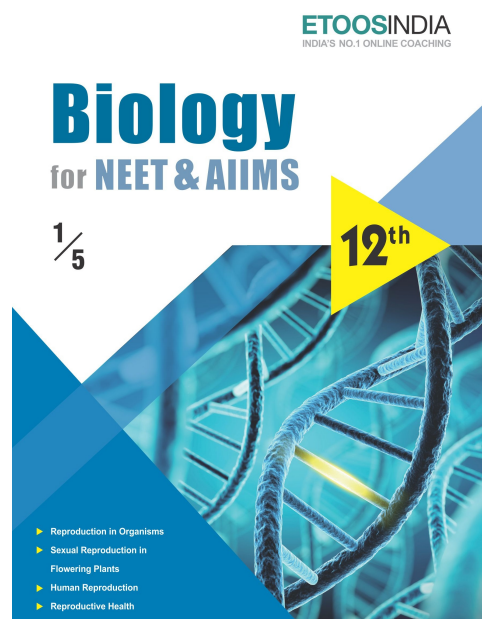
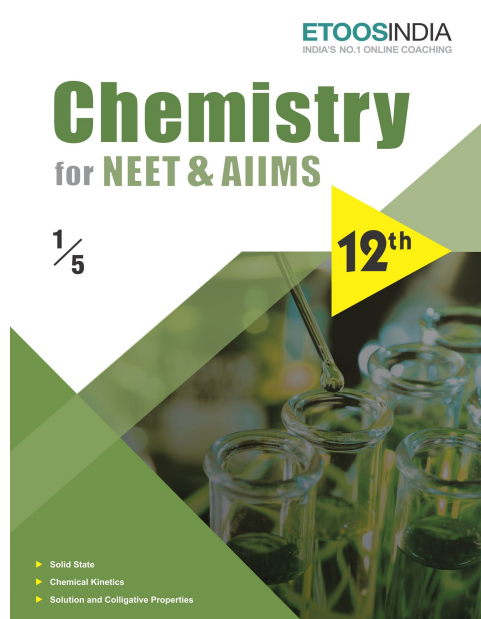
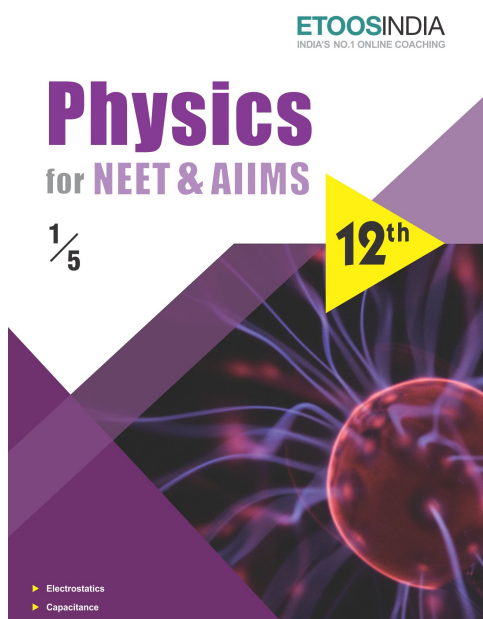
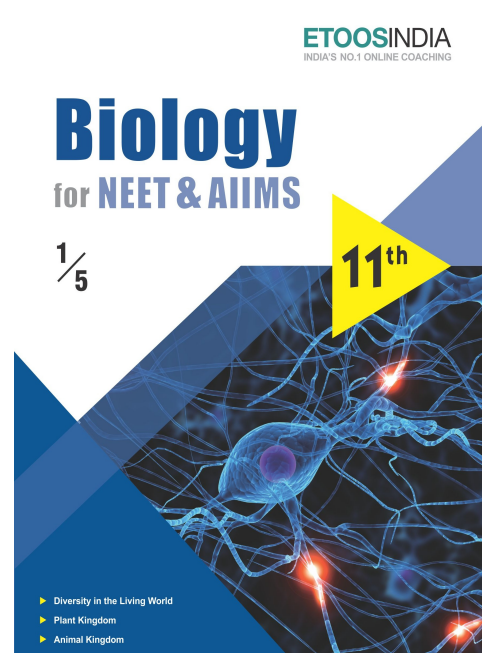
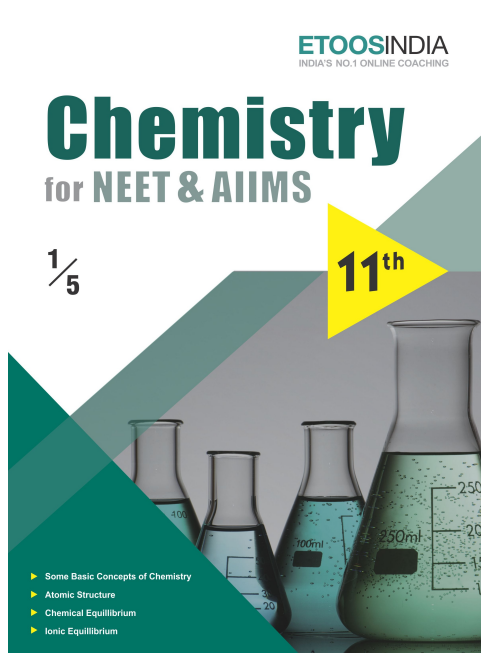
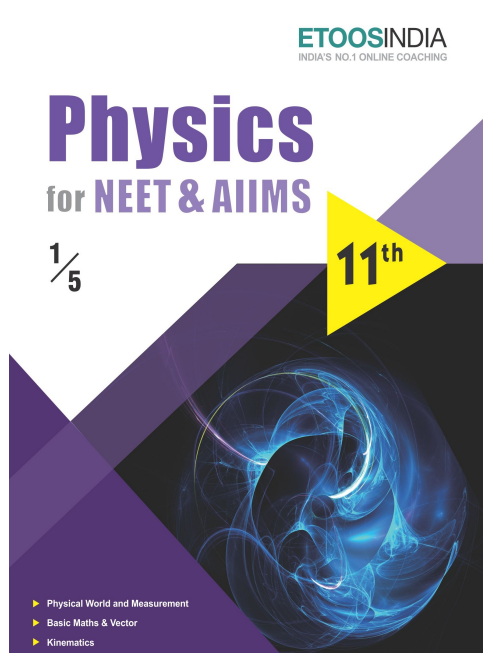


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# NEURAL CONTROL AND COORDINATION

*“Appetite, craving for food, is a constant and powerful stimulator of the gastric glands.”*

**“IVAN PAVLOV (1849-1936)”**

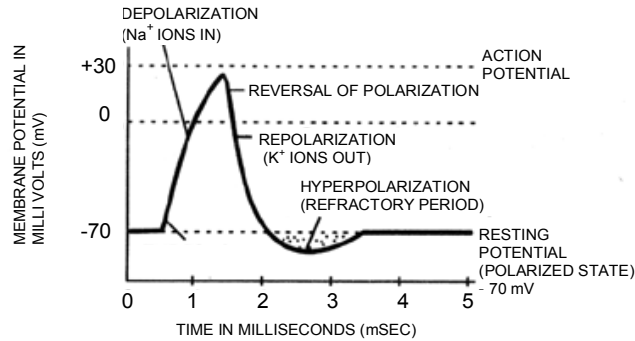
## INTRODUCTION

**T**here are various physiological processes that take place in the body of animals. Therefore the body needs to be controlled and regulated to maintain homeostasis. Coordination is the process through which two or more organs interact and complement the functions of one another. So regulation is the means by which adjustment of all variables that determine the nature of physiological function are done. The variables can be an amount, a concentration, a rate or so on. Thus, in our body the neural system and the endocrine system jointly coordinate and integrate all the activities of the organs so that they function in a synchronised fashion.

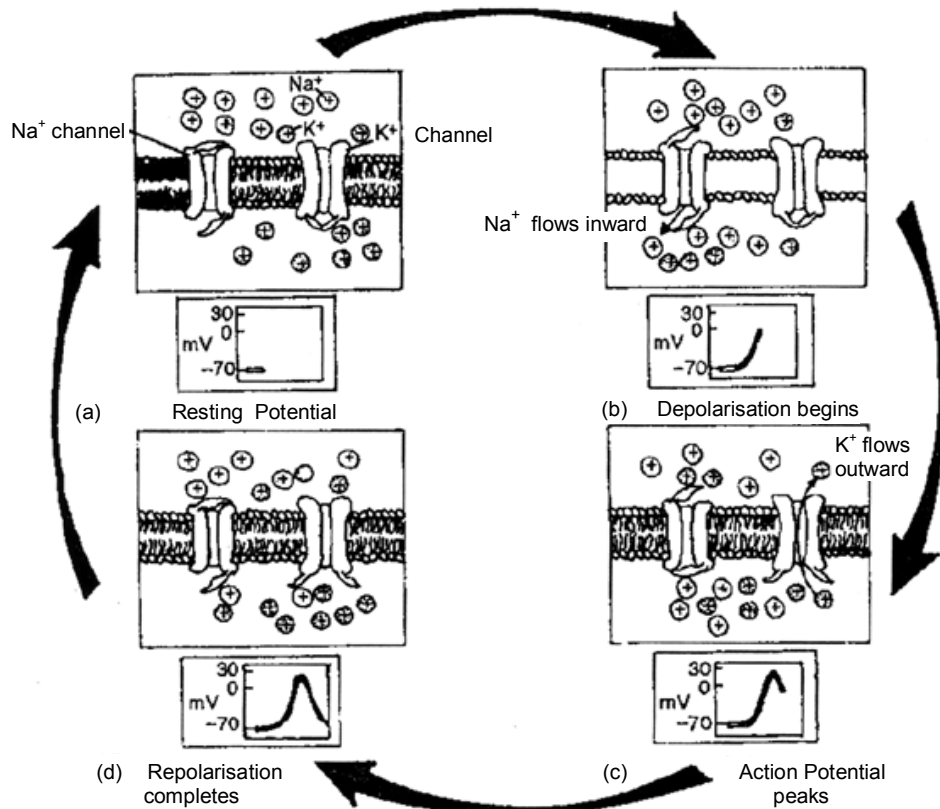
The neural system provides an organised network of point to point connections for a quick coordination. The endocrine system provides chemical integration through hormones. In this topic, you will learn about the neural system in humans like transmission of nerve impulse, impulse conduction across a synapse, physiology of reflex action, sensory reception and sense organs.

**NEURAL CONTROL & COORDINATION**

**NERVE IMPULSE INDUCTION:**



**Record of potential changes of a nerve impulse**



**Stages in axon membrane potential during resting, depolarisation, action potential and repolarisation**

**THE RESTING MEMBRANE POTENTIAL IN RESTING PHASE :**

- The potential difference (a charge) which exists across the cell surface membrane of nerve cells is always, negative inside the cell with respect to the outside. The membrane is said to be **polarised**.
- The potential difference across the membrane at rest is called the **Resting membrane potential** and this is about  $-70\text{mV}$  (the negative sign indicates that inside the cell is negative with respect to the outside). (Range  $\rightarrow -60$  to  $-85\text{mV}$ )



### *Etoos Tips & Formulas*

- Co-ordination : It's the process through which two or more organs interact and complement the functions of one another.
- Integrated system : In Human's body the neural system and the endocrine system jointly coordinate and integrate all the activities of the organs so that they function in a synchronised fashion and interdependent to each other combinely called integrated system.
- Distinction in neural system and endocrine systems.
- The neural system provides an organised network of point to point connections for a quick response (Fast speed) and short span of coordination where as the endocrine system provides chemical integration, slow speed and long lasting effect.
- Neural system :
- Neurons : The neural system of all animals is composed of highly specialised cells called neurons also known as structural and functional unit of nervous system.
- Three major parts of neuron, are dendron, cyton and axon.
- Nissl's granules : The cell body contains cytoplasm with typical cell organelles and certain granular bodies called Nissl's granules which is also present in dendrites.
- Limbic system
- It is a complex structure which includes inner parts of cerebral hemisphere and associated deep structures like amygdala, hippocampus. Along with hypothalamus, it is involved in olfaction autonomous response, regulation of sexual behaviour, expression of emotional reaction (Excitement, pleasure, rage and fear) and motivation.
- Cranial meninges : Inside skull the brain is covered by cranial meninges, consisting of outer duramater, middle arachnoid, and inner piamater.
- Cerebral hemispheres : A deep cleft divides the cerebrum longitudinally into two halves, termed as the left and right cerebral hemisphere.
- Corpus callosum : The cerebral hemispheres are connected by a tract of nerve fibres called corpus callosum.
- Cerebral cortex : The layer of cells which covers the cerebral hemisphere is called cerebral cortex, thrown in to prominent folds.
- Gray matter : The cerebral cortex is referred as the gray matter due to grayish appearance and it is due to highly concentrated neuron cell bodies.
- White matter : Fibres of the tract are covered with myelin sheath which constitute the inner part of cerebral hemispheres and gives the opaque white appearance to the layer hence called the white matter.
- Association area : The cerebral cortex contains motor area, sensory area and large regions called association areas responsible for complex functions like intersensory association, memory and communication.
- The neural system coordinate and integrates function as well as metabolic and homeostatic activities of all the organs.
- Generation and conduction of nerve impulse
- Excitable cells : Neurons are excitable cells because their membranes are in a polarized state due to differential concentration gradient of ions across the membrane. Different types of ion channels are present on neuronal membrane for which this membrane is selectively permeable.

**SOLVED EXAMPLE**

- Ex.1** Mammalian brain differs from an amphibian brain in possessing  
(A) Olfactory lobe (B) Hypothalamus  
(C) Corpus callosum (D) Cerebellum
- Sol.** (C) : Corpus callosum is a thick whitish band of semicircular nerve fibres interconnecting two cerebral hemispheres (found only in mammals).
- Ex.2** Brain is  
(A) Ectodermal (B) Mesodermal  
(C) Endodermal (D) Mesendodermal
- Sol.** (A)
- Ex.3** The autonomic nervous system has control over  
(A) Reflex action (B) Skeletal muscles  
(C) Sense organs (D) Internal organs
- Sol.** (D) : Autonomic nervous system regulates and coordinates involuntary activities like heart beating, homeostasis, body temperature, breathing gut peristalsis and secretion of glands.
- Ex.4** The hind brain consists of  
(A) Pons + cerebellum  
(B) Hypothalamus + cerebellum  
(C) Medulla oblongata + cerebellum  
(D) Medulla oblongata + cerebellum + pons
- Sol.** (D) : Hind brain has two distinct parts (i) metencephalon (medulla oblongata) (ii) myelencephalon (cerebellum), transverse band of white matter called pons varoli.
- Ex.5** In a myelinated neuron, two adjacent myelin sheaths are separated by gaps called  
(A) Nodes of Ranvier (B) Synaptic cleft  
(C) Schwann cells (D) Synaptic knob  
(E) Neural plate
- Sol.** (A)
- Ex.6** Pituicytes are under the control of  
(A) Adenohypophysis (B) Hypothalamus  
(C) Neurohypophysis (D) Both (A) and (C)
- Sol.** (B)
- Ex.7** Parasympathetic ganglia are present in  
(A) Head and neck  
(B) Chains of lateral ganglia  
(C) Grey matter of thoracic and lumbar region of spinal cord  
(D) All of these
- Sol.** (A)
- Ex.8** Which of the following cranial nerves innervates heart, stomach and lungs  
Or  
Which of the cranial nerve is mixed  
(A) Vagus (B) Accessory  
(C) Trigeminal (D) Trochlear
- Sol.** (A)
- Ex.9** Integration of the visual, tactile and auditory inputs occurs in the  
Or  
Crura cerebrae is found in  
(A) Peripheral nervous system  
(B) Corpus callosum  
(C) Limbic system  
(D) Medulla oblongata  
(E) Midbrain
- Sol.** (E) : Crura cerebrae are thickened ventral portions of the mid-brain of a vertebrate consisting of nervous tracts linking the thalamencephalon with the hind brain.
- Ex.10** Which foramen is paired in mammalian brain  
(A) Foramen of Luschka  
(B) Foramen of Magendie  
(C) Foramen of Monro  
(D) Inter-ventricular foramen
- Sol.** (A)
- Ex.11** Among the following characteristics, indicate the correct combinations applicable to conditional reflex  
P. Acquired by practice or learning  
Q. Not acquired by birth  
R. Does not abolish by lack of practice  
S. Participation of cerebral cortex  
T. Originates spontaneously  
(A) P, Q, R (B) P, Q, R  
(C) P, R, T (D) Q, R, T
- Sol.** (B)
- Ex.12** Which is thickened to form organ of Corti  
(A) Reissner's membrane  
(B) Basilar membrane  
(C) Tectorial membrane  
(D) All of the above
- Sol.** (B)

**Exercise # 1**

**SINGLE OBJECTIVE**

**NEET LEVEL**

1. Posterior choroids plexus in brain is found in the -  
 (A) Diencephalon  
 (B) Cerebrum  
 (C) Cerebellum  
 (D) Space b/w pons & medulla (anteriorly) & cerebellum (Posteriorly)
2. Menings surrounding the brain of Human from outside to inside are -  
 (A) Duramater, arachnoid, piamater  
 (B) Piamater, arachnoid, duramater  
 (C) Duramater, piamater, arachnoid  
 (D) Piamater, duramater, arachnoid
3. Corpus callosum connects -  
 (A) Two cerebral hemisphere  
 (B) Two optic lobes  
 (C) Two olfactory lobes  
 (D) Optic chiasma
4. Cerebellum is concerned with -  
 (A) Co-ordination of muscular movement  
 (B) Memory  
 (C) Vision  
 (D) Reflex action
5. Crura cerebri is located in -  
 (A) Fore brain (B) Hind brain  
 (C) Mid brain (D) None
6. How many lobes are present in cerebellum-  
 (A) 1 (B) 3  
 (C) 5 (D) 7
7. Piamater is -  
 (A) Inner most meninge (B) Middle meninge  
 (C) Outer meninge (D) None
8. Leptomenix of brain is formed by the joining of-  
 (A) Piamater and arachnoid layer  
 (B) Piamater and duramater  
 (C) Duramatter and arachnoid layer  
 (D) Grey matter and white matter
9. Which one of the following menix is present only in mammalian brain -  
 (A) Duramater (B) Arachnoid  
 (C) Piamater (D) None of them
10. The function of cerebrospinal fluid surrounding CNS is to -  
 (A) Protect the brain from external jerks  
 (B) Provide nourishment and O<sub>2</sub> to the brain  
 (C) Take away unwanted substance from the brain  
 (D) All of the above
11. Septum lucidum is part of the -  
 (A) Pseudocoel (B) Metacoel  
 (C) Diocoel (D) Rhinocoel
12. Hypothalamus is situated on the -  
 (A) Upper lateral surface of diencephalon  
 (B) Lower lateral surface of diencephalon  
 (C) Ventral side of optic lobes  
 (D) Dorsal side of optic lobes
13. Epithalamus is situated on the -  
 (A) Roof of diencephalon  
 (B) Lateral wall of diencephalon  
 (C) Dorsal side of optic lobes  
 (D) Floor of diencephalon
14. Which of the following is not an organ of the central nervous system -  
 (A) Brain (B) Spinal cord  
 (C) Medulla oblongata (D) Vagus
15. Intelligency quotient value of Normal person is -  
 (A) 60 – 70% (B) 90 – 100%  
 (C) 80 – 90% (D) > 100%
16. Which is correct about pons varolii -  
 (A) Situated between midbrain & M.O.  
 (B) Pons regulated pneumotaxic centre  
 (C) Inner gry, outer white matter  
 (D) All of the above
17. Parkinson's disease is present due to lesion in -  
 (A) Corpus striatum  
 (B) RAS  
 (C) Limbic system  
 (D) Analysis centre of cerebrum
18. The cavity of brain is lined by -  
 (A) Neural epithelium  
 (B) Ependymal epithelium  
 (C) Cerebrospinal fluid  
 (D) Glandular epithelium
19. Third ventricle is found in -  
 (A) Heart of rabbit (B) Brain of rabbit  
 (C) Heart of frog (D) Kidney of frog

**Exercise # 2****SINGLE OBJECTIVE****AIIMS LEVEL**

1. GABA (gama amino butyric acid) is a -  
(A) Inhibitory neurohormone  
(B) Transmitter neuro hormone  
(C) Anti coagulant  
(D) None
2. Nissl's bodies found in neurons are -  
(A) Made of DNA  
(B) Masses of ribosome and RER  
(C) Help in formation of neurofibrils  
(D) Masses of mitochondria
3. "Nodes of Ranvier" are found in -  
(A) Brain (B) Heart  
(C) Axon (D) Eye
4. Afferent nerve fibre conducts impulse from-  
(A) C.N.S. to effector (B) Receptor to C.N.S.  
(C) Receptor to effector (D) Effector to receptor
5. Chemical substance which take part in synaptic transmission is -  
(A) Adrenaline (B) Epinephrine  
(C) Colchicine (D) Acetylcholine
6. When a nerve fibers is stimulated the inside of the membrane becomes -  
(A) Filled with acetyl choline  
(B) Negatively charged  
(C) Positively charged  
(D) Neutral
7. The parts of the neurons that perform basic cellular functions such as protein synthesis etc. -  
(A) Axons (B) Dendrites  
(C) Synaptic knobs (D) Soma
8. The nerves leading to the central nervous system are called  
(A) Afferent (B) Efferent  
(C) Motor (D) None
9. Nerve impulses are initiated by nerve fibers only when the membrane shall become more permeable to -  
(A) Adrenaline (B) Phosphorus  
(C) Sodium ions (D) Potassium ions
10. Power of regeneration is lowest in -  
(A) Brain cell (B) Liver cell  
(C) Bone cell (D) Muscle cell
11. Speed of impulse on nerves in mammals is-  
(A) 1 meter/sec. (B) 100 meter/sec.  
(C) 1000 meter/sec. (D) None of these
12. The functional connection between two neurons is called -  
(A) Synapse (B) Synapsis  
(C) Chiasma (D) Chiasmata
13. Conduction of nerve impulse is -  
(A) Faster in none-myelinated fibres  
(B) Faster in myelinated fibres  
(C) No difference in the rate of conduction in myelinated & non myelinated fibres  
(D) None of the above
14. Enzyme acetyl cholinesterase is concerned with -  
(A) Digestion of protein  
(B) Synthesis of protein  
(C) Digestion of polypeptide  
(D) Conduction of nerve impulse
15. During refractory period -  
(A) Nerve transmits impulse very slowly  
(B) Nerve can not transmit impulse  
(C) Nerve transmits impulses very rapidly  
(D) None of the above
16. The schwann sheath is -  
(A) A non myelinated nerve fibres  
(B) Associated with myelin sheath  
(C) A connective tissue cell  
(D) Associated with myelinated & non myelinated nerve fibre
17. A short period during which a nerve is unable to conduct nerve impulse is called  
(A) Synaptic delay (B) Refractory period  
(C) Resting potential (D) Critical period
18. Which cell-organelle synthesises acetyl choline -  
(A) Golgi complex (B) Ribosome  
(C) Mitochondria (D) Lysosome



**Exercise # 3**

**PART - 1**

**MATRIX MATCH COLUMN**

- Match Column - I with Column II and select the correct option from the codes given below.

<b>Column I</b>	<b>Column - II</b>
A. Cerebrum	i. Controls the pituitary
B. Cerebellum	ii. Controls vision and hearing
C. Hypothalamus	iii. Controls the rate of heart beat
D. Midbrain	iv. Seat of intelligence
	v. Maintains body posture
(A) A-v, B-iv, C-ii, D-i	(B) A-iv, B-v, C-ii, D-i
(C) A-v, B-iv, C-i, D-ii	(D) A-iv, B-v, C-i, D-ii
  
- Match Column - I with Column - II and select the correct option from the codes given below.

<b>Column I</b>	<b>Column - II</b>
A. Medulla oblongata	i. Involuntary breathing movements
B. Floor of mid brain	ii. Accurate voluntary movements
C. Thalamus	iii. Seat of memory
D. Cerebral hemispheres	
E. Cerebellum	
(A) A-i, C-ii, D-iii	(B) A-i, E-ii, B-iii
(C) A-i, E-ii, D-iii	(D) E-i, C-ii, B-iii
  
- Match Column - I with Column -II and select the correct option from the codes given below.

<b>Column I</b>	<b>Column - II</b>
A. Cornea	i. Provides opening for light to enter
B. Iris	ii. Transduces blue, green and red light
C. Lens	iii. Controls the amount of light that enters
D. Optic nerves	iv. Alters the shape of lens
E. Pupil	v. Transmit information to the CNS
F. Ciliary muscles	vi. Focus light directly on retina
G. Fovea	vii. Bends light and protects inner eye
(A) A-vii, B-iii, C-vi, D-v, E-i, F-iv, G-ii	(B) A-i, B-ii, C-iii, D-iv, E-v, F-vi, G-vii
(C) A-vii, B-vi, C-v, D-iv, E-iii, F-ii, G-i	(D) A-vii, B-iv, C-vi, D-v, E-i, F-iii, G-ii
  
- Match Column - I with Column - II and select the correct option from the codes given below.

<b>Column - I</b>	<b>Column - II</b>
A. Pinna	i. Collects vibrations in the air which produces sound
B. Ear canal	ii. Passage for sound wave from pinna to ear drum
C. Tympanic	iii. Transfers sound wave to eardrum ossicles
D. Ear ossicles	iv. Increases the efficiency of transmission of sound waves to the inner ear
E. Cochlea	v. Has hearing receptors
F. Eustachian	vi. Equalizes the pressure on tube both sides of ear drum
G. Auditory nerves	vii. Impulse transfer from organ of Corti to auditory cortex in temporal lobe of cerebrum
(A) A-i, B-ii, C-iii, D-iv, E-v, F-vi, G-vii	(B) A-vii, B-vi, C-v, D-iv, E-iii, F-ii, G-i
(C) A-i, B-ii, C-iv, D-iii, E-v, F-vi, G-vii	(D) A-i, B-ii, C-iii, D-iv, E-v, F-vii, G-vi

**Exercise # 4****PART - 1****PREVIOUS YEAR (NEET/AIPMT)**

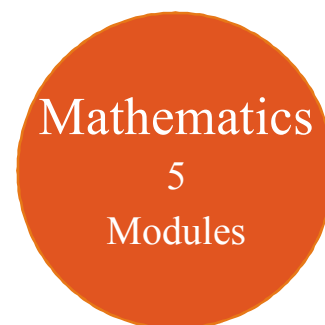
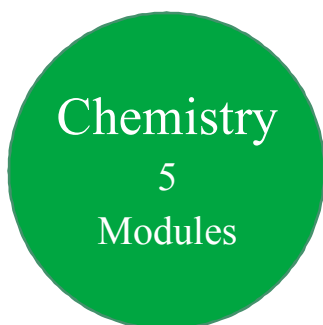
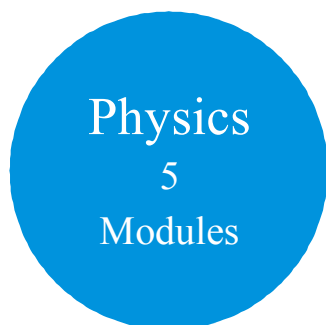
1. A person suffering from the deficiency of the visual pigment rhodopsin is advised to take more  
[CBSE AIPMT-2000]  
(A) radish and potato  
(B) apple and grapes  
(C) carrot and ripe papaya  
(D) guava and ripe banana
2. An action potential in the nerve fibre is produced when positive and negative charges on the outside and the inside of the axon membrane are reversed, because  
[CBSE AIPMT-2000]  
(A) more potassium ions enter the axon as compared to sodium ions leaving it.  
(B) more sodium ions enter the axon as compared to potassium ions leaving it  
(C) all potassium ions leave the axon  
(D) All sodium ions enter the axon
3. When we migrate from dark to light, we fail to see for some time but after a time visibility becomes normal. It is an example of [CBSE AIPMT-2001]  
(A) accommodation (B) adaptation  
(C) mutation (D) photoperiodism
4. Characteristic feature of human cornea is that  
[CBSE AIPMT-2001]  
(A) it is secreted by conjunctive and glandular tissue  
(B) it is lacrimal gland which secretes tears  
(C) blood circulation is absent in cornea  
(D) in old age it become hard and white layer deposits on it which causes the cataract
5. What is the intensity of sound in normal conversation ?  
[CBSE AIPMT-2001]  
(A) 10-20dB (B) 35-60 dB  
(C) 70-90 dB (D) 120-150dB
6. In which animal nerve cell is present but brain is absent ?  
[CBSE AIPMT-2002]  
(A) Sponge (B) Earthworm  
(C) Cockroach (D) *Hydra*
7. Which of the following statements is correct about node of Ranvier ? [CBSE AIPMT-2002]  
(A) Axolemma is discontinuous  
(B) Myelin sheath is discontinuous  
(C) Both neurilemma and myelin sheath are discontinuous  
(D) Covered by myelin sheath
8. What used to be described as Nissl's granules in a nerve cell are now identified as [CBSE AIPMT-2003]  
(A) ribosomes (B) mitochondria  
(C) cell metabolites (D) fat granules
9. In the resting state of the neural membrane, diffusion due to concentration gradients, if allowed, would drive [CBSE AIPMT-2004]  
(A)  $K^+$  into the cell  
(B)  $K^+$  and  $Na^+$  out of the cell  
(C)  $Na^+$  into the cell  
(D)  $Na^+$  out of the cell
10. Injury to vagus nerve in human is not likely to affect [CBSE AIPMT-2004]  
(A) tongue movements  
(B) gastrointestinal movements  
(C) pancreatic secretion  
(D) cardiac movements
11. Four healthy people in their twenties got involved in injuries resulting in damage and death of a few cells of the following. Which of the cells are least likely to be replaced by new cells?  
[CBSE AIPMT-2005]  
(A) Osteocytes  
(B) Malpighian layer of the skin  
(C) Liver cells  
(D) neurons
12. Parkinson's disease (characterised by tremors and progressive rigidity of limbs) is caused by degeneration of brain neurons that are involved in movement control and make use of neurotransmitter  
[CBSE AIPMT-2005]  
(A) acetylcholine (B) norepinephrine  
(C) dopamine (D) GABA
13. One of the examples of the action of the autonomous nervous system is [CBSE AIPMT-2005]  
(A) knee-jerk response  
(B) pupillary reflex  
(C) swallowing of food  
(D) peristalsis of the intestine

**MOCK TEST**

- Read the statements about human neural system and find the wrong one.
  - The CNS includes the brain and the spinal cord.
  - The PNS is divided into somatic and autonomic neural system.
  - The somatic neural system is classified into sympathetic and parasympathetic neural system.
  - The autonomic neural system transmits impulses from the CNS to the involuntary organs and smooth muscles.
  - The somatic neural system relays impulses from the CNS to the skeletal muscles.
- The pneumotaxic centre and respiratory rhythm centres are respectively present in
  - pons and medulla oblongata
  - corpus callosum and pons
  - medulla oblongata and hypothalamus
  - diencephalona and pons
- Which area of cerebral cortex is responsible for the interpretation of speech?
  - Broca's area
  - Wernicke's area
  - Premotor area
  - Association area of sensory cortex
- Which of the following statements are true for "Motor cortex"?
  - It is located in the frontal lobe of cerebral cortex.
  - It contains pyramidal cells.
  - It is responsible for all visual functions.
  - It is essential for our thought processes.
  - It stimulates wakefulness.
  - It regulates voluntary muscular movements.
  - (i), (ii), (iii) and (iv)
  - (ii), (iii), (iv) and (v)
  - (ii), (iv), (v) and (vi)
  - (i), (ii), (iv) and (vi)
- Parasympathetic ganglia are present in
  - head and neck
  - chains of lateral ganglia
  - grey matter of thoracic and lumbar region of spinal cord
  - all of these
- Select the answer with correct matching of the structure, its location and function.
 

Structure	Location	Function
(A) Eustachian tube	Anterior part of internal ear	Equalises air pressure on either sides of tympanic membrane
(B) Cerebellum	Midbrain	Controls respiration and gastric secretions
(C) Hypothalamus	Forebrain	Controls body temperature, urge for eating and drinking
(D) Blind spot	Near the place where optic nerve leaves the eye	Rods and cones are present but inactive here
- The myelin sheath around the axon is produced by which type of neuroglial cells?
  - Satellite glial cells
  - Radial glial cells
  - Dendrocytes
  - Schwann cells
- Which of the following statements are correct and incorrect?
  - Synaptic cleft of neurons secrete adrenaline.
  - Myelinated nerve fibres are enveloped with Schwann cells, which form a myelin sheath around the axon.
  - Non-myelinated nerve fibre is enclosed by a Schwann cell that does not form a myelin sheath.
  - Spinal cord and cranial nerves are made of non-myelinated nerve fibres. Of the four statements.
  - 1, 2 are correct but 3 and 4 are incorrect
  - 1, 2 are 3 are correct but 4 is incorrect
  - 3 and 4 are correct but 1 and 2 are incorrect
  - 1 and 4 are correct while 2 and 3 are incorrect
  - 2 and 3 are correct while 1 and 4 are incorrect.

# 11<sup>th</sup> Class Modules Chapter Details



PHYSICS	CHEMISTRY	BIOLOGY
<p><b>Module-1</b></p> <ol style="list-style-type: none"> <li>1. Physical World &amp; Measurements</li> <li>2. Basic Maths &amp; Vector</li> <li>3. Kinematics</li> </ol> <p><b>Module-2</b></p> <ol style="list-style-type: none"> <li>1. Law of Motion &amp; Friction</li> <li>2. Work, Energy &amp; Power</li> </ol> <p><b>Module-3</b></p> <ol style="list-style-type: none"> <li>1. Motion of system of particles &amp; Rigid Body</li> <li>2. Gravitation</li> </ol> <p><b>Module-4</b></p> <ol style="list-style-type: none"> <li>1. Mechanical Properties of Matter</li> <li>2. Thermal Properties of Matter</li> </ol> <p><b>Module-5</b></p> <ol style="list-style-type: none"> <li>1. Oscillations</li> <li>2. Waves</li> </ol>	<p><b>Module-1(PC)</b></p> <ol style="list-style-type: none"> <li>1. Some Basic Concepts of Chemistry</li> <li>2. Atomic Structure</li> <li>3. Chemical Equilibrium</li> <li>4. Ionic Equilibrium</li> </ol> <p><b>Module-2(PC)</b></p> <ol style="list-style-type: none"> <li>1. Thermodynamics &amp; Thermochemistry</li> <li>2. Redox Reaction</li> <li>3. States Of Matter (Gaseous &amp; Liquid)</li> </ol> <p><b>Module-3(IC)</b></p> <ol style="list-style-type: none"> <li>1. Periodic Table</li> <li>2. Chemical Bonding</li> <li>3. Hydrogen &amp; Its Compounds</li> <li>4. S-Block</li> </ol> <p><b>Module-4(OC)</b></p> <ol style="list-style-type: none"> <li>1. Nomenclature of Organic Compounds</li> <li>2. Isomerism</li> <li>3. General Organic Chemistry</li> </ol> <p><b>Module-5(OC)</b></p> <ol style="list-style-type: none"> <li>1. Reaction Mechanism</li> <li>2. Hydrocarbon</li> <li>3. Aromatic Hydrocarbon</li> <li>4. Environmental Chemistry &amp; Analysis Of Organic Compounds</li> </ol>	<p><b>Module-1</b></p> <ol style="list-style-type: none"> <li>1. Diversity in the Living World</li> <li>2. Plant Kingdom</li> <li>3. Animal Kingdom</li> </ol> <p><b>Module-2</b></p> <ol style="list-style-type: none"> <li>1. Morphology in Flowering Plants</li> <li>2. Anatomy of Flowering Plants</li> <li>3. Structural Organization in Animals</li> </ol> <p><b>Module-3</b></p> <ol style="list-style-type: none"> <li>1. Cell: The Unit of Life</li> <li>2. Biomolecules</li> <li>3. Cell Cycle &amp; Cell Division</li> <li>4. Transport in Plants</li> <li>5. Mineral Nutrition</li> </ol> <p><b>Module-4</b></p> <ol style="list-style-type: none"> <li>1. Photosynthesis in Higher Plants</li> <li>2. Respiration in Plants</li> <li>3. Plant Growth and Development</li> <li>4. Digestion &amp; Absorption</li> <li>5. Breathing &amp; Exchange of Gases</li> </ol> <p><b>Module-5</b></p> <ol style="list-style-type: none"> <li>1. Body Fluids &amp; Its Circulation</li> <li>2. Excretory Products &amp; Their Elimination</li> <li>3. Locomotion &amp; Its Movement</li> <li>4. Neural Control &amp; Coordination</li> <li>5. Chemical Coordination and Integration</li> </ol>

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# 12<sup>th</sup> Class Modules Chapter Details

Physics  
5  
Modules

Chemistry  
5  
Modules

Mathematics  
5  
Modules

PHYSICS	CHEMISTRY	BIOLOGY
<p><b>Module-1</b></p> <ol style="list-style-type: none"> <li>1. Electrostatics</li> <li>2. Capacitance</li> </ol> <p><b>Module-2</b></p> <ol style="list-style-type: none"> <li>1. Current Electricity</li> <li>2. Magnetic Effect of Current and Magnetism</li> </ol> <p><b>Module-3</b></p> <ol style="list-style-type: none"> <li>1. Electromagnetic Induction</li> <li>2. Alternating Current</li> </ol> <p><b>Module-4</b></p> <ol style="list-style-type: none"> <li>1. Geometrical Optics</li> <li>2. Wave Optics</li> </ol> <p><b>Module-5</b></p> <ol style="list-style-type: none"> <li>1. Modern Physics</li> <li>2. Nuclear Physics</li> <li>3. Solids &amp; Semiconductor Devices</li> <li>4. Electromagnetic Waves</li> </ol>	<p><b>Module-1(PC)</b></p> <ol style="list-style-type: none"> <li>1. Solid State</li> <li>2. Chemical Kinetics</li> <li>3. Solutions and Colligative Properties</li> </ol> <p><b>Module-2(PC)</b></p> <ol style="list-style-type: none"> <li>1. Electrochemistry</li> <li>2. Surface Chemistry</li> </ol> <p><b>Module-3(IC)</b></p> <ol style="list-style-type: none"> <li>1. P-Block Elements</li> <li>2. Transition Elements (d &amp; f block)</li> <li>3. Co-ordination Compound</li> <li>4. Metallurgy</li> </ol> <p><b>Module-4(OC)</b></p> <ol style="list-style-type: none"> <li>1. HaloAlkanes &amp; HaloArenes</li> <li>2. Alcohol, Phenol &amp; Ether</li> <li>3. Aldehyde, Ketone &amp; Carboxylic Acid</li> </ol> <p><b>Module-5(OC)</b></p> <ol style="list-style-type: none"> <li>1. Nitrogen &amp; Its Derivatives</li> <li>2. Biomolecules &amp; Polymers</li> <li>3. Chemistry in Everyday Life</li> </ol>	<p><b>Module-1</b></p> <ol style="list-style-type: none"> <li>1. Reproduction in Organisms</li> <li>2. Sexual Reproduction in Flowering Plants</li> <li>3. Human Reproduction</li> <li>4. Reproductive Health</li> </ol> <p><b>Module-2</b></p> <ol style="list-style-type: none"> <li>1. Principles of Inheritance and Variation</li> <li>2. Molecular Basis of Inheritance</li> <li>3. Evolution</li> </ol> <p><b>Module-3</b></p> <ol style="list-style-type: none"> <li>1. Human Health and Disease</li> <li>2. Strategies for Enhancement in Food Production</li> <li>3. Microbes in Human Welfare</li> </ol> <p><b>Module-4</b></p> <ol style="list-style-type: none"> <li>1. Biotechnology: Principles and Processes</li> <li>2. Biotechnology and Its Applications</li> <li>3. Organisms and Populations</li> </ol> <p><b>Module-5</b></p> <ol style="list-style-type: none"> <li>1. Ecosystem</li> <li>2. Biodiversity and Conservation</li> <li>3. Environmental Issues</li> </ol>

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