

**BIO · BIOLOGY**

12. Nervous Coordination

Official PMDC Solved Past Paper Topical Booklet · High-Yield Examination Series

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👤 2015 to 2024 Archive

📋 Boards: BUMHS, DUHS, KMU, MDCAT, NUMS, PMDC

📄 Weightage: 34% of MDCAT (68 MCQs)

Curated by Ibrahim for fellow bees. Every question in this chapter has been verified against official UHS, NUMS, SZABMU, DUHS, and KMU answer keys. Propolis cognitive autopsies are provided at the end of this booklet to explain core concepts and break down common distractor traps.

OFFICIAL SOLVED EDITION**Q1.**

UHS 2024

Taste receptor is an example of: **[UHS-2024]**

- (A) Chemo receptors
- (B) Photo receptors
- (C) Nociceptors
- (D) Mechanoreceptors

Q2.

SZABMU 2024

Nociceptors are concerned with sensation of: **[SZABMU-2024-Reconduct]**

- (A) Vibration
- (B) Pressure
- (C) Pain
- (D) Touch

Q3.

KMU 2024

A reflex action does not involve the: **[KMU-2024]**

- (A) Sensory neuron
- (B) Motor neuron
- (C) Brain
- (D) Spinal cord

Q4.

UHS 2024

Medulla Oblongata is a part of: **[UHS-2024]**

- (A) Mid brain
- (B) Hind brain
- (C) Hippocampus
- (D) Forebrain

Q5.

KMU 2024

Which part of the brain is controlling your sense of balance? **[KMU-2024]**

- (A) Cerebellum
- (B) Amygdala
- (C) Hippocampus
- (D) Medulla Oblongata

Q6.

SZABMU 2024

Which part of the brain is responsible for the sensation of pleasure, punishment, fear, rage and sexual arousal? **[SZABMU-2024]**

- (A) Hippocampus
- (B) Cerebellum
- (C) Hypothalamus
- (D) Amygdala

Q7.

NUMS 2024

During complex activity of flight, birds required the coordination of many skeletal muscles which part of their brain has to be well developed? **[NUMS-2024]**

- (A) Thalamus
- (B) Amygdala
- (C) Cerebrum
- (D) Cerebellum

Q8.

NUMS 2024

Which part of the brain is actively used by mathematician trying to formulate a new equation?
[NUMS-2024]

- (A) Pons
- (B) Cerebrum
- (C) Hippocampus
- (D) Amygdala

Q9.

SZABMU 2024

Sleep wake cycle is controlled by which part of brain?
[SZABMU-2024-reconduct]

- (A) Hippocampus
- (B) Thalamus
- (C) Hypothalamus
- (D) Amygdalae

Q10.

UHS 2024

Which of the following is **NOT** a feature of Autonomic Nervous System? [UHS-2024]

- (A) Regulate response of visceral organs
- (B) Regulate response of glands
- (C) Regulate response of skeletal muscles
- (D) Regulate response of smooth muscles

Q11.

KMU 2024

The following function/activity is **NOT** controlled by the autonomic nervous system: [KMU-2024]

- (A) Thoughts and emotions
- (B) Smooth muscles contraction
- (C) Cardiac muscles contraction
- (D) Salivation

Q12.

UHS 2024

In human myelinated fibers nerve impulse travels at ____ meters per second. [UHS-2024]

- (A) 130-150
- (B) 190-210
- (C) 100-120
- (D) 160-180

Q13.

UHS 2024

During non-conducting state, the neuron membrane is permeable to efflux of: [UHS-2024]

- (A) Ca⁺
- (B) K⁺
- (C) Na⁺
- (D) Cl⁻

Q14.

UHS 2024

Depolarization during conduction of nerve impulse is due to: [UHS-2024]

- (A) Inward movement of Na⁺
- (B) Outward movement of Na⁺
- (C) Inward movement of K⁺
- (D) Outward movement of K⁺

Q15.

SZABMU 2024

In a resting membrane, the concentration of K⁺ ions on inside of the membrane is ____ times greater than outside the membranes. [SZABMU-2024]

- (A) Twenty-five times
- (B) Fifteen times
- (C) Ten times
- (D) Twenty times

Q16.

NUMS 2024

Which immediate change is brought about in the postsynaptic membrane on binding with excitatory neurotransmitter? [NUMS-2024]

- (A) Calcium gates open
- (B) Sodium Potassium pump ceases to work
- (C) Sodium gates close
- (D) Sodium gates open

Q17.

NUMS 2024

During the conduction of nerve impulse, hyperpolarization would not occur if: [NUMS-2024]

- (A) Sodium Potassium pump stopped working
- (B) Sodium gates did not close in time
- (C) Potassium gates were not so lousy
- (D) Calcium gets open instantly

Q18.

NUMS 2024

Which option given below characterizes refractory period? [NUMS-2024]

- (A) Change in the type of ions across the membrane
- (B) Membrane potential +50mV
- (C) Reversal of charges across neural (neuronal) membrane
- (D) Next impulse can be conducted

Q19.

SZABMU 2024

Nerve impulse conducted from one node of Ranvier to another skipping the myelinated regions moves up to ____ times faster than unmyelinated axons:

[SZABMU-2024-Reconduct]

- (A) 30
- (B) 100
- (C) 120
- (D) 50

Q20.

UHS 2024

Which of the following neurotransmitters is lying outside the central nervous system? **[UHS-2024]**

- (A) Gamma - aminobutyric acid
- (B) Acetylcholine
- (C) Endorphins
- (D) Dopamine

Q21.

KMU 2024

The neurotransmitter ____ is hydrolyzed by monoamine oxidase. **[KMU-2024]**

- (A) Adrenaline
- (B) Acetylcholine
- (C) Glutamate
- (D) Serotonin

Q22.

KMU 2024

Diffusion of ____ across the post synaptic membrane causes it to depolarize. **[KMU-2024]**

- (A) Chloride ions
- (B) Potassium ions
- (C) Calcium ions
- (D) Sodium ions

Q23.

SZABMU 2024

The neurotransmitters bind to the receptors on the postsynaptic membrane, triggering an action potential in the postsynaptic membrane by causing changes in: **[SZABMU-2024]**

- (A) Permeability of calcium ions
- (B) Concentration of certain ions
- (C) Permeability of certain ions
- (D) Concentration of calcium ions

Q24.

NUMS 2024

What is the fate of our neurotransmitter after the transmission of nerve impulse across synapse?

[NUMS-2024]

- (A) Remains bound to post synaptic membrane
- (B) It is taken into post synaptic neuron
- (C) Broken down by enzyme
- (D) Remains stray in the synaptic cleft

Q25.

SZABMU 2024

Which sequence will be followed when impulse travel from receptor to effector? **[SZABMU-2024-Reconduct]**

- (A) Motor neuron -> Inter neuron -> Sensory neuron
- (B) Inter neuron -> Sensory neuron -> Motor neuron
- (C) Sensory neuron -> Motor neuron -> Inter neuron
- (D) Sensory neuron -> Inter neuron -> Motor neuron

Q26.

UHS 2024

Nissl's granules are groups of: **[UHS-2024]**

- (A) Mesosomes
- (B) Lysosomes
- (C) Ribosomes
- (D) Chromosome

Q27.

KMU 2024

A motor neuron: **[KMU-2024]**

- (A) Carries impulse from effectors to CNS
- (B) Carries impulse from receptors to CNS
- (C) Connects sensory nerves to ganglions.
- (D) Carries impulse from CNS to muscles

Q28.

SZABMU 2024

The groups of ribosomes associated with rough endoplasmic reticulum and Golgi apparatus in the cell body of neuron is called: **[SZABMU-2024]**

- (A) Soma
- (B) Axofibrils
- (C) Neuroglia
- (D) Nissl's Granules

Q29.

KMU 2024

Most of the neurons in the CNS are: **[KMU-2024]**

- (A) Bipolar
- (B) Multipolar
- (C) Pseudounipolar
- (D) Unipolar

Q30.

NUMS 2023

Endorphins are produced in: [NUMS–2023]

- (A) Brain
- (B) Adrenal gland
- (C) Stomach
- (D) Thymus

Q31.

KMU 2023

The activities like sleeping, walking and dreaming are controlled by which part of the brain: [ETEA–2023]

- (A) Pons
- (B) Cerebellum
- (C) Olfactory bulb
- (D) Hippocampus

Q32.

KMU 2023

A shallow groove in cerebrum is called and deep groove is called [ETEA–2023 Retake]

- (A) Sulcus fissure
- (B) Fissure sulcus
- (C) Gyrus fissure
- (D) Fissure gyrus

Q33.

KMU 2023

The cerebellum is primarily concerned with: [ETEA–2023 Retake]

- (A) Thinking and reasoning
- (B) Balancing during active movement
- (C) Temperature regulation
- (D) Initiation of muscular contraction

Q34.

KMU 2023

The total number of cranial nerves in human body are: [ETEA–2023 Retake]

- (A) 12 pairs
- (B) 24 pairs
- (C) 31 pairs
- (D) 62 pairs

Q35.

KMU 2023

Which part of the brain plays a key role in long term memory? [ETEA–2023 Retake]

- (A) Thalamus
- (B) Hippocampus
- (C) Hypothalamus
- (D) Amygdala

Q36.

UHS 2023

In a typical nerve, the action potential duration is: [UHS–2023]

- (A) 1 millisecond
- (B) 1 microsecond
- (C) 1 second
- (D) 1 minute

Q37.

UHS 2023

During resting membrane potential condition: [UHS–2023]

- (A) Outer surface of neuron is more positive
- (B) Inner surface of neuron is more positive
- (C) Both of these surfaces are equally positive
- (D) Both of these surfaces are equally negative

Q38.

UHS 2023

The value of active membrane potential of the neuron is: [UHS–2023]

- (A) 0.01 volts
- (B) 0.02 volts
- (C) 0.05 volts
- (D) 0.07 volts

Q39.

UHS 2023

The chemical messengers that transmit action potential across the synapse in the form of chemicals are? [UHS–2023]

- (A) Synaptic knob of synapse
- (B) Reflex actions
- (C) Neurotransmitters
- (D) Acetylcholinesterase

Q40.

SZABMU 2023

The junction between the axon ending of a neuron and the dendrites of another neuron is called: [SZABMU–2023]

- (A) Synapse
- (B) Nissl's body
- (C) Neuroglia
- (D) Myelin sheath

Q41.

SZABMU 2023

During non-conducting state, the neuron membrane is permeable to efflux of: [SZABMU–2023]

- (A) K^+
- (B) Na^+
- (C) Ca^{++}
- (D) Cl^-

Q42.

SZABMU 2023

GABA is an example of: [SZABMU-2023]

- (A) Enzyme
- (B) Inhibitory neurotransmitter
- (C) Excitatory neurotransmitter
- (D) Hormone

Q43.

SZABMU 2023

What is the fate of neurotransmitters after provoking impulse in postsynaptic membrane? [SZABMU-2023]

- (A) Stay in synaptic cleft indefinitely
- (B) Recycled in synaptic cleft
- (C) Degraded by enzyme
- (D) Taken up by postsynaptic membrane

Q44.

KMU 2023

The size of synaptic cleft in electrical synapse is: [ETEA-2023]

- (A) 20nm
- (B) 2nm
- (C) 0.2nm
- (D) 200nm

Q45.

KMU 2023

Which type of nerve impulse occurs in non-myelinated neuron fibers? [ETEA-2023]

- (A) Saltatory impulse
- (B) Jumping impulse
- (C) Rapid impulse
- (D) Continuous impulse

Q46.

KMU 2023

The neuron is said to be polarized when the: [ETEA-2023 Retake]

- (A) Inside of the plasma membrane has a positive energy compared to the outside
- (B) Inside of the plasma membrane has same energy compared to the outside
- (C) Inside of the plasma membrane has a negative energy compared to the outside
- (D) Positive charge moves inside the neuron

Q47.

KMU 2023

What brings membrane potential to threshold? [ETEA-2023 Retake]

- (A) Outflow of sodium ions across the post synaptic membrane
- (B) Influx of sodium ions across the post synaptic membrane
- (C) Outflow of calcium ions across the post synaptic membrane
- (D) Influx of potassium ions the post synaptic membrane

Q48.

NUMS 2023

Site of the production of neurotransmitter is: [NUMS-2023]

- (A) Dendrite
- (B) Post synaptic neurons
- (C) Synaptic cleft
- (D) Presynaptic neuron

Q49.

NUMS 2023

The junction between two neurons is: [NUMS-2023]

- (A) Axon
- (B) Cleft
- (C) Synapse
- (D) Impulse

Q50.

UHS 2023

The pressure receptors that receive deep pressure stimulus in human body are called: [UHS-2023]

- (A) Cholesterol
- (B) Meissner Corpuscles
- (C) Red blood Corpuscles
- (D) Pacinian Corpuscles

Q51.

NUMS 2022

Touch receptors are: [NUMS-2022]

- (A) Pacinian's corpuscles
- (B) Olfactory receptors
- (C) Meissner's corpuscles
- (D) Nociceptors

Q52.

DUHS 2022

They detect pain and tissue damage: [DUHS-2022]

- (A) Baroreceptors
- (B) Chemoreceptors
- (C) Nociceptors
- (D) Mechanoreceptor

Q53.

UHS 2022

There is no clear difference between dendrites and axons in sensory neurons, **except**: [UHS-2022]

- (A) Thickness
- (B) Length
- (C) Terminal portions
- (D) None of above

Q54.

NUMS 2022

A long extension of nerve cell is called: [NUMS-2022]

- (A) Axon
- (B) Auxins
- (C) Schwann cells
- (D) Dendrites

Q55.

SZABMU 2022

Which axon would transmit an action potential most rapidly? [SZABMU-2022]

- (A) 1 mm diameter neuron lacking myelin
- (B) 1 mm diameter neuron with myelin
- (C) 2 mm diameter neuron lacking myelin
- (D) 2 mm diameter neuron with myelin

Q56.

KMU 2022

The type of neuron that carries nerve impulse from tissue and organ to the spinal cord and brain is: [ETEA-2022]

- (A) Sensory neuron
- (B) Motor neuron
- (C) Intermediate neuron
- (D) Associative neuron

Q57.

NUMS 2022

An automatic, involuntary response to any change external or internal is called: [NUMS-2022]

- (A) Reflex
- (B) Instinct
- (C) Taxis
- (D) Tropism

Q58.

BUMHS 2022

During an involuntary action, nerve impulse is passed through a pathway called: [BUMHS-2022]

- (A) Reflex action of nerve impulse
- (B) Reflex action of glands
- (C) Reflex arc and reflex action
- (D) Reflex arc

Q59.

KMU 2022

The resting membrane potential of neuron is measured about: [ETEA-2022]

- (A) -30 millivolts
- (B) 50 millivolts
- (C) -70 millivolts
- (D) 100 millivolts

Q60.

UHS 2022

The neurotransmitter active outside CNS (Central Nervous System) is: [UHS-2022]

- (A) Acetylcholine
- (B) Dopamine
- (C) Glutamate
- (D) Serotonin

Q61.

NUMS 2022

Molecules responsible for conveying message from one neuron to the next are called: [NUMS-2022]

- (A) Hormones
- (B) Activators
- (C) Neurotransmitters
- (D) Enzymes

Q62.

NUMS 2022

The gap between neurons at a synapse is: [NUMS-2022]

- (A) Synaptic knob
- (B) Synaptic cleft
- (C) Synaptic delay
- (D) Synaptic vesicle

Q63.

UHS 2022

The part of brain which guides smooth and accurate motions and maintains body position is: [UHS-2022]

- (A) Cerebrum
- (B) Cerebellum
- (C) Pons
- (D) Medulla

Q64.

SZABMU 2022

The feelings and emotions of love and hate are controlled by: [SZABMU-2022]

- (A) Amygdala
- (B) Hippocampus
- (C) Thalamus
- (D) Hypothalamus

Q65.

KMU 2022

The hind brain is comprised of all of the following **except**: [ETEA-2022]

- (A) Pons
- (B) Cerebellum
- (C) Cerebrum
- (D) Medulla oblongata

Q66.

DUHS 2022

It is the site of all conscious activity: [DUHS-2022]

- (A) Hind brain
- (B) Cortex
- (C) Spinal cord
- (D) Mid brain

Q67.

DUHS 2022

Spinal cord comes out from the cranium through an opening known as: [DUHS-2022]

- (A) Foramen magnum
- (B) Lumen
- (C) Ganglion
- (D) Acetabulum

Q68.

KMU 2022

Those nerves that originate from or lead to the brain are called cerebral nerves. These are ____ pairs of cerebral nerves in human. [ETEA-2022]

- (A) 6
- (B) 12
- (C) 14
- (D) 31

Q69.

PMDC 2020

Which one of the following is common to **all** neurons? [PMC-2020]

- (A) A cell body which contains a nucleus
- (B) Presence of node of Ranvier
- (C) A thick myelin sheath
- (D) Presence of Schwann cells

Q70.

PMDC 2020

Neurons are cells adapted for the rapid transmission of electrical impulses. To do this, they have long thin processes called: [PMC-2020]

- (A) Axons
- (B) Myelin sheath
- (C) Dendrites
- (D) Schwann cell

Q71.

PMDC 2020

Which of the following neurotransmitters function, both as neurotransmitter and hormones, decreasing our perception of pain? [PMC-2020]

- (A) Epinephrine
- (B) Dopamine
- (C) Serotonin
- (D) Endorphins

Q72.

KMU 2019

_____ is considered as chief structural and functional unit of nervous system. [ETEA-2019]

- (A) Cell
- (B) Neuron
- (C) Nephron
- (D) Brain

Q73.

MDCAT 2019

The reflex action is the phenomena which **only** involves: [MDCAT-2019]

- (A) Brain, receptors, spinal cord
- (B) Receptors, neurons, brain
- (C) Receptors, effectors and spinal cord
- (D) Receptors and effectors

Q74.

MDCAT 2019

In an action potential, the permeability of sodium ions in the neuron increases due to: [MDCAT-2019]

- (A) Repolarization
- (B) The action of the acetylcholinesterase enzyme
- (C) The opening of sodium channels/gates
- (D) Sodium ions forming an ionic bonding

Q75.

MDCAT 2019

If stimulation is above __, impulses travel to the brain along the sensory neuron. [MDCAT-2019]

- (A) Action Potential
- (B) Resting Potential
- (C) Threshold
- (D) Recovery Period

Q76.

SZABMU 2019

Impulses jump across synapse in the form of chemical messenger such as: [AJK-2019]

- (A) Glutamine
- (B) Arginine
- (C) Leucine
- (D) Dopamine

Q77.

MDCAT 2018

Taste buds on the tongue are example of: [MDCAT-2018]

- (A) Thermoreceptors
- (B) Pressure receptors
- (C) Photoreceptors
- (D) Chemoreceptors

Q78.

MDCAT 2018

How many sodium ions are pumped out in response to two potassium ions transported into the membrane? [MDCAT-2018]

- (A) 4
- (B) 1
- (C) 2
- (D) 3

Q79.

MDCAT 2018

When a nerve impulse jumps from one node of Ranvier to the next in a myelinated neuron, it is called [MDCAT-2018]

- (A) Saltatory conduction
- (B) Resting potential
- (C) Synapses
- (D) Membrane potential

Q80.

MDCAT 2018

In nervous system, chemical messengers are called [MDCAT-2018]

- (A) Enzymes
- (B) Chemoreceptors
- (C) Neurotransmitters
- (D) Hormones

Q81.

MDCAT 2017

Which of the following produce response? [MDCAT-2017]

- (A) Effectors
- (B) Nerve
- (C) Stimulators
- (D) Brain

Q82.

MDCAT 2017

Pick out the pressure receptors. [MDCAT-2017]

- (A) Chemoreceptors
- (B) Photoreceptors
- (C) Mechanoreceptors
- (D) Thermoreceptors

Q83.

MDCAT 2015

Conduction of action potentials from one node of Ranvier to another in myelinated neurons is through: [MDCAT-2015]

- (A) Hyperpolarization
- (B) Depolarization
- (C) Resting Membrane Potential
- (D) Saltatory conduction

Q84.

MDCAT 2015

In the following diagram of action potential in a neuron, '2' depicts:

**[MDCAT-2015]**

- (A) Depolarization
- (B) Repolarization
- (C) Polarization
- (D) Hyperpolarization

Q85.

MDCAT 2015

Neurotransmitter secreted at synapse outside the central nervous system is: [MDCAT-2015]

- (A) Dopamine
- (B) Androgen
- (C) Polypeptide
- (D) Acetylcholine

Q86.

PMDC 2015

For the impulse to transfer from presynaptic to post synaptic neuron, the substance required is: [LUMMHC-2015]

- (A) Sodium
- (B) Potassium
- (C) Protein
- (D) Calcium

RAPID 5–COLUMN ANSWER KEY

Official PMDC verified answer keys for 12. Nervous Coordination.

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Q#	KEY	BOARD	Q#	KEY	BOARD	Q#	KEY	BOARD	Q#	KEY	BOARD	Q#	KEY	BOARD
1	A	UHS 2024	19	D	SZABMU 2024	37	A	UHS 2023	55	D	SZABMU 2022	73	C	MDCAT 2019
2	C	SZABMU 2024	20	B	UHS 2024	38	C	UHS 2023	56	A	KMU 2022	74	C	MDCAT 2019
3	C	KMU 2024	21	A	KMU 2024	39	C	UHS 2023	57	A	NUMS 2022	75	C	MDCAT 2019
4	B	UHS 2024	22	D	KMU 2024	40	A	SZABMU 2023	58	D	BUMHS 2022	76	D	SZABMU 2019
5	A	KMU 2024	23	C	SZABMU 2024	41	A	SZABMU 2023	59	C	KMU 2022	77	D	MDCAT 2018
6	D	SZABMU 2024	24	C	NUMS 2024	42	B	SZABMU 2023	60	A	UHS 2022	78	D	MDCAT 2018
7	D	NUMS 2024	25	D	SZABMU 2024	43	C	SZABMU 2023	61	C	NUMS 2022	79	A	MDCAT 2018
8	B	NUMS 2024	26	C	UHS 2024	44	C	KMU 2023	62	B	NUMS 2022	80	C	MDCAT 2018
9	C	SZABMU 2024	27	D	KMU 2024	45	D	KMU 2023	63	B	UHS 2022	81	A	MDCAT 2017
10	C	UHS 2024	28	D	SZABMU 2024	46	C	KMU 2023	64	A	SZABMU 2022	82	C	MDCAT 2017
11	A	KMU 2024	29	B	KMU 2024	47	B	KMU 2023	65	C	KMU 2022	83	D	MDCAT 2015
12	C	UHS 2024	30	A	NUMS 2023	48	D	NUMS 2023	66	B	DUHS 2022	84	A	MDCAT 2015
13	B	UHS 2024	31	A	KMU 2023	49	C	NUMS 2023	67	A	DUHS 2022	85	D	MDCAT 2015
14	A	UHS 2024	32	A	KMU 2023	50	D	UHS 2023	68	B	KMU 2022	86	D	PMDC 2015
15	D	SZABMU 2024	33	B	KMU 2023	51	C	NUMS 2022	69	A	PMDC 2020			
16	D	NUMS 2024	34	A	KMU 2023	52	C	DUHS 2022	70	A	PMDC 2020			
17	C	NUMS 2024	35	B	KMU 2023	53	C	UHS 2022	71	D	PMDC 2020			
18	C	NUMS 2024	36	A	UHS 2023	54	A	NUMS 2022	72	B	KMU 2019			

TOTAL
MCQS

86

CORRECT

INCORRECT

BLANK

ACCURACY

%

Scan the booklet QR code to enter answers in
BeambePrep Grind Mode for automated error
autopsies.

PROPOLIS COGNITIVE ERROR AUTOPSIES

Step-by-step conceptual derivations, formula working, and distractor autopsies for every question.

Question #1 Key: (A)

UHS 2024

Taste receptor is an example of: [UHS-2024]

CORE CONCEPT AND DERIVATION

Gustation (taste) requires identifying the molecular composition of ingested food.

Solution:

- Taste receptors contain specialized cells that bind chemically to specific tastants (salts, sugars, acids) dissolved in saliva. Because they transduce chemical information into electrical signals, they are classified as **chemoreceptors**.

Why other options are incorrect:

- **Mechanoreceptors:** Detect physical forces (touch/hearing).
- **Nociceptors:** Detect tissue damage (pain).
- **Photo receptors:** Detect light (vision).

Question #2 Key: (C)

SZABMU 2024

Nociceptors are concerned with sensation of: [SZABMU-2024-Reconduct]

CORE CONCEPT AND DERIVATION

The nervous system has dedicated pathways to warn the organism of tissue damage.

Solution:

- **Nociceptors** (from Latin *nocere*, to harm or hurt) are specialized free nerve endings that respond strictly to potentially damaging chemical, mechanical, or thermal stimuli. The brain interprets these signals as **pain**.

Why other options are incorrect:

- **Touch, Pressure, Vibration:** These are benign mechanical stimuli detected by mechanoreceptors (like Merkel discs, Ruffini endings, and Pacinian corpuscles).

Question #3 Key: (C)

KMU 2024

A reflex action does not involve the: [KMU-2024]

CORE CONCEPT AND DERIVATION

To achieve maximum speed and protect the body, emergency reflexes bypass higher-order cognitive processing.

Solution:

- A standard spinal reflex arc travels from a sensory neuron, to the spinal cord (via an interneuron), directly to a motor neuron. It explicitly bypasses the **brain** to eliminate processing lag time, ensuring an immediate, involuntary muscular response.

Why other options are incorrect:

- **Spinal cord, Sensory neuron, Motor neuron:** These are the mandatory structural components that comprise the actual spinal reflex arc.

Question #4 Key: (B)

UHS 2024

Medulla Oblongata is a part of: [UHS-2024]

CORE CONCEPT AND DERIVATION

The brain is divided into three primary evolutionary and embryological regions: forebrain, midbrain, and hindbrain.

Solution:

- The **hindbrain** (rhombencephalon) coordinates vital, unconscious survival functions. It structurally comprises the pons, the cerebellum, and the lower **medulla oblongata**, which connects directly to the spinal cord.

Why other options are incorrect:

- **Forebrain:** Includes the cerebrum, thalamus, and hypothalamus.
- **Midbrain:** A short section linking the forebrain and hindbrain.
- **Hippocampus:** A specific structure within the forebrain's limbic system.

Question #5 Key: (A)

KMU 2024

Which part of the brain is controlling your sense of balance? [KMU-2024]

CORE CONCEPT AND DERIVATION

The motor cortex initiates movement, but a separate structure calculates the physics of that movement to prevent falling.

Solution:

- The **cerebellum** processes proprioceptive sensory input from the muscles, joints, and the inner ear (vestibular system). It then continuously fine-tunes motor commands to maintain **balance**, posture, and smooth coordinated muscular action.

Why other options are incorrect:

- **Amygdala:** Processes intense emotions.
- **Hippocampus:** Consolidates memories.
- **Medulla Oblongata:** Controls involuntary autonomic functions like heart rate and breathing.

Question #6 Key: (D)

SZABMU 2024

Which part of the brain is responsible for the sensation of pleasure, punishment, fear, rage and sexual arousal...

CORE CONCEPT AND DERIVATION

The limbic system is the emotional center of the brain, utilizing specific nuclei for survival-based emotional responses.

Solution:

- The **amygdala** plays a crucial and classical role in processing deep emotional responses tied to survival, encompassing feelings of intense fear, rage, punishment, and aspects of pleasure and arousal.

Why other options are incorrect:

- **Hypothalamus:** While heavily linked to the limbic system (directing physiological arousal and basic drives), the emotional sensations of fear and rage are classically mapped to the amygdala in textbook curricula.
- **Hippocampus:** Memory formation.
- **Cerebellum:** Motor coordination.

Question #7 Key: (D)

NUMS 2024

During complex activity of flight, birds required the coordination of many skeletal muscles which part of thei...

CORE CONCEPT AND DERIVATION

High-speed, 3D spatial maneuvering requires immense motor processing power to coordinate thousands of muscle fibers simultaneously.

Solution:

- The **cerebellum** is strictly responsible for the precision, timing, and coordination of complex muscular activity. Because avian flight demands near-perfect, real-time balance and motor adjustment, the cerebellum is highly enlarged and exceptionally well-developed in birds.

Why other options are incorrect:

- **Cerebrum:** Initiates voluntary action, but does not handle the rapid subconscious coordination required to stay airborne.
- **Thalamus / Amygdala:** Relays sensory info and processes emotions, respectively.

Question #8 Key: (B)

NUMS 2024

Which part of the brain is actively used by mathematician trying to formulate a new equation? [NUMS-2024]

CORE CONCEPT AND DERIVATION

Abstract thought, logic, and problem-solving are higher-order cognitive functions.

Solution:

- The **cerebrum** (specifically the highly developed frontal lobes of the cerebral cortex) is exclusively responsible for complex problem solving, mathematical reasoning, intelligence, and conscious logical thought.

Why other options are incorrect:

- **Hippocampus:** Used for recalling old memories, but the cerebrum does the actual active analytical formulation.
- **Pons:** Autonomic bridge regulating sleep and breathing.
- **Amygdala:** Emotional processing.

Question #9 Key: (C)

SZABMU 2024

Sleep wake cycle is controlled by which part of brain? [SZABMU-2024-reconduct]

CORE CONCEPT AND DERIVATION

Biological rhythms must be synchronized with external light cues to maintain homeostasis.

Solution:

- The **hypothalamus** contains a specialized cluster of neurons called the suprachiasmatic nucleus (SCN). The SCN acts as the body's master circadian clock, receiving light data from the eyes to heavily regulate the 24-hour sleep-wake cycle.

Why other options are incorrect:

- Thalamus:** Blocks sensory input during sleep, but the hypothalamus dictates the rhythmic cycle itself.
- Hippocampus / Amygdala:** Involved in memory and emotions, completely separate from circadian rhythm control.

Question #10 Key: (C)

UHS 2024

Which of the following is NOT a feature of Autonomic Nervous System? [UHS-2024]

CORE CONCEPT AND DERIVATION

The peripheral nervous system is split into somatic (voluntary) and autonomic (involuntary) divisions based on the target effector.

Solution:

- The Autonomic Nervous System (ANS) innervates involuntary effectors: cardiac muscle, smooth muscle, and glands.
- Skeletal muscles** are strictly voluntary and are innervated entirely by the Somatic Nervous System. Therefore, regulating skeletal muscles is NOT a feature of the ANS.

Why other options are incorrect:

- Options A, B, and D describe the primary, involuntary targets of the autonomic nerves.

Question #11 Key: (A)

KMU 2024

The following function/activity is NOT controlled by the autonomic nervous system: [KMU-2024]

CORE CONCEPT AND DERIVATION

The autonomic nervous system handles background life-support processes, completely devoid of conscious effort.

Solution:

- Thoughts and emotions** are high-level cognitive and limbic functions that occur within the central nervous system (cerebral cortex and limbic system). They are not executed or controlled by the efferent peripheral pathways of the Autonomic Nervous System.

Why other options are incorrect:

- Smooth muscle, Cardiac muscle, and Salivation (glands):** These are all classic, involuntary target effectors managed directly by the sympathetic and parasympathetic branches of the ANS.

Question #12 Key: (C)

UHS 2024

In human myelinated fibers nerve impulse travels at _____ meters per second. [UHS-2024]

CORE CONCEPT AND DERIVATION

Myelination vastly accelerates the speed of electrical conduction via saltatory propagation.

Solution:

- In human neurobiology, the thickest, heavily myelinated somatic motor and sensory fibers (Type A-alpha fibers) have a maximum conduction velocity generally ranging from **100 to 120 meters per second** (approx. 220–270 mph).

Why other options are incorrect:

- Options above 120 m/s exceed the known physiological limits of human neuronal conduction.

Question #13 Key: (B)

UHS 2024

During non-conducting state, the neuron membrane is permeable to efflux of: [UHS-2024]

CORE CONCEPT AND DERIVATION

The resting membrane potential (-70 mV) is primarily established by the membrane's selective permeability to certain ions while at rest.

Solution:

- During the non-conducting (resting) state, voltage-gated channels are closed, but un-gated "leak" channels remain open. The membrane has significantly more **Potassium (K^+)** leak channels than sodium leak channels, allowing a continuous outward leakage (efflux) of K^+ down its concentration gradient, keeping the inside of the cell negative.

Why other options are incorrect:

- Na^+ / Ca^{2+} : Their permeability is exceedingly low at rest; allowing them to freely diffuse would instantly destroy the resting potential.

Question #14 Key: (A)

UHS 2024

Depolarization during conduction of nerve impulse is due to: [UHS-2024]

CORE CONCEPT AND DERIVATION

An action potential occurs when the neuron briefly reverses its internal charge from negative to positive (depolarization).

Solution:

- When a stimulus reaches threshold, voltage-gated sodium channels burst open. Because sodium is highly concentrated outside the cell, there is a massive **inward movement (influx) of Na^+ ions** into the neuron, rapidly changing the membrane potential to $+50$ mV.

Why other options are incorrect:

- Outward movement of K^+** : This causes repolarization (returning to negative), not depolarization.
- Outward Na^+ / Inward K^+** : This ion direction is forced by the slow Na^+ / K^+ pump to maintain the resting state, not the rapid action potential.

Question #15 Key: (D)

SZABMU 2024

In a resting membrane, the concentration of K^+ ions on inside of the membrane is ____ times greater than outside.

CORE CONCEPT AND DERIVATION

Resting membrane ion concentration gradients.

Solution: Active transport by the Na^+ / K^+ pump maintains an intracellular Potassium (K^+) concentration that is roughly **10 to 30 times greater** inside the cell than in the extracellular fluid.

Question #16 Key: (D)

NUMS 2024

Which immediate change is brought about in the postsynaptic membrane on binding with excitatory neurotransmitter...

CORE CONCEPT AND DERIVATION

Excitatory neurotransmitters must encourage the postsynaptic cell to fire, which requires making the cell interior more positive.

Solution:

- When an excitatory neurotransmitter (like glutamate or acetylcholine) binds to postsynaptic receptors, it triggers ligand-gated **sodium gates to open**. The resulting influx of positive Na^+ ions initiates an Excitatory Postsynaptic Potential (EPSP), driving the cell toward threshold.

Why other options are incorrect:

- Sodium gates close**: This would prevent excitation entirely.
- Calcium gates open**: This happens in the presynaptic terminal to release the neurotransmitter, not primarily in the postsynaptic membrane to generate the impulse.
- Pump ceases to work**: The pump runs continuously in the background and is not immediately halted by synaptic binding.

Question #17 Key: (C)

NUMS 2024

During the conduction of nerve impulse, hyperpolarization would not occur if: [NUMS-2024]

CORE CONCEPT AND DERIVATION

Voltage-gated potassium channel kinetics.

Solution: Hyperpolarization occurs because voltage-gated K^+ channels close slowly, allowing excess positive K^+ to leak out. If K^+ channels closed promptly upon reaching resting potential, hyperpolarization would not occur.

Question #18 Key: (C)

NUMS 2024

Which option given below characterizes refractory period? [NUMS-2024]

CORE CONCEPT AND DERIVATION

Neurons require a brief recovery window before they can fire again to ensure impulses travel in only one direction.

Solution:

- The absolute refractory period occurs directly during the action potential, heavily characterized by the active **reversal of charges** (depolarization and immediate repolarization). Because the sodium channels are already open or inactivated during this massive charge reversal, it is impossible for the membrane to respond to a new stimulus until resting states are restored.

Why other options are incorrect:

- Next impulse can be conducted:** This is the exact opposite of what "refractory" means.
- Membrane potential +50mV:** This only describes the peak of the action potential, while the refractory period encompasses the falling phase as well.

Question #19 Key: (D)

SZABMU 2024

Nerve impulse conducted from one node of Ranvier to another skipping the myelinated regions moves up to ____ t...

CORE CONCEPT AND DERIVATION

Saltatory conduction provides a massive evolutionary advantage in reaction speed.

Solution:

- Because the myelin sheath insulates the axon and restricts ion exchange solely to the nodes of Ranvier, the action potential functionally "skips" down the axon. This mechanism is universally taught to allow impulses to travel up to **50 times faster** than the continuous wave of depolarization seen in naked, unmyelinated axons of similar diameter.

Why other options are incorrect:

- Options 30, 100, and 120 deviate from the standard textbook physiological metric established for this comparison.

Question #20 Key: (B)

UHS 2024

Which of the following neurotransmitters is lying outside the central nervous system? [UHS-2024]

CORE CONCEPT AND DERIVATION

Neurotransmitters are generally compartmentalized to serve specific neural networks.

Solution:

- Acetylcholine (ACh)** is the primary neurotransmitter of the Peripheral Nervous System (lying outside the brain and spinal cord). It bridges the neuromuscular junction to command skeletal muscle and serves as the chief messenger for the parasympathetic nervous system.

Why other options are incorrect:

- GABA, Dopamine, Endorphins:** These are predominantly active within the networks of the Central Nervous System (brain and spinal cord) for mood, pain regulation, and motor control integration.

Question #21 Key: (A)

KMU 2024

The neurotransmitter ____ is hydrolyzed by monoamine oxidase. [KMU-2024]

CORE CONCEPT AND DERIVATION

Enzymatic degradation is specific to the chemical structure of the neurotransmitter.

Solution:

- Monoamine Oxidase (MAO) is an enzyme specifically designed to break down monoamine neurotransmitters (compounds featuring a single amine group connected to an aromatic ring). **Adrenaline** (epinephrine), along with dopamine and noradrenaline, falls directly into this structural category and is metabolized by MAO.

Why other options are incorrect:

- Acetylcholine:** Hydrolyzed strictly by Acetylcholinesterase, not MAO.
- Glutamate:** An amino acid, cleared via reuptake transporters, not MAO.
- Note:** While Serotonin is also a monoamine broken down by MAO, classical syllabus emphasis on catecholamine degradation pathways prioritizes Adrenaline/Noradrenaline as the primary textbook answer here.

Question #22 Key: (D)

KMU 2024

Diffusion of _____ across the post synaptic membrane causes it to depolarize. [KMU-2024]

CORE CONCEPT AND DERIVATION

Depolarization is defined as the interior of a cell becoming less negative, which requires the rapid entry of a positive ion.

Solution:

- When an excitatory synapse is activated, ligand-gated channels open and allow an overwhelming influx (diffusion) of positively charged **Sodium (Na^+) ions** into the postsynaptic neuron. This neutralizes the resting negative charge, causing depolarization.

Why other options are incorrect:

- Chloride ions (Cl^-):** Entering the cell makes it *more* negative (hyperpolarization/inhibition).
- Potassium ions (K^+):** Exiting the cell removes positive charge, leading to repolarization or hyperpolarization.
- Calcium:** Works primarily in the presynaptic terminal, not for bulk postsynaptic depolarization.

Question #23 Key: (C)

SZABMU 2024

The neurotransmitters bind to the receptors on the postsynaptic membrane, triggering an action potential in th...

CORE CONCEPT AND DERIVATION

Neurotransmitters act as keys that unlock highly specific gates on the receiving cell.

Solution:

- Receptors on the postsynaptic membrane are actually ligand-gated ion channels. When a neurotransmitter binds, it physically alters the shape of the channel, changing the membrane's **permeability to certain ions** (like allowing Na^+ to rush in). This change in permeability allows ions to flow, altering the electrical potential.

Why other options are incorrect:

- Concentration:** Neurotransmitters don't directly alter the overall concentration of ions; they just open the gates (change permeability) so ions can move down their pre-existing concentration gradients.
- Calcium ions:** Postsynaptic excitation relies primarily on Sodium and Potassium permeability, not Calcium.

Question #24 Key: (C)

NUMS 2024

What is the fate of our neurotransmitter after the transmission of nerve impulse across synapse? [NUMS-2024]

CORE CONCEPT AND DERIVATION

Synapses must be "reset" almost instantly to allow the processing of new, incoming signals.

Solution:

- To terminate the signal and prevent continuous, paralyzing stimulation of the postsynaptic cell, the neurotransmitter is swiftly removed from the cleft. A primary biological mechanism for this (classically seen with Acetylcholine) is being **broken down by specific enzymes** (e.g., acetylcholinesterase) directly in the synaptic cleft.

Why other options are incorrect:

- Remains bound / stray:** This would cause permanent activation and muscle tetanus/spasms.
- Taken into post synaptic neuron:** Reuptake mechanisms pull the transmitter back into the *presynaptic* neuron, never the postsynaptic one.

Question #25 Key: (D)

SZABMU 2024

Which sequence will be followed when impulse travel from receptor to effector? [SZABMU-2024-Reconduct]

CORE CONCEPT AND DERIVATION

The reflex arc follows a strict anatomical highway from sensory input to physical output.

Solution:

- Sensory neuron:** Carries the detected stimulus from the receptor towards the Central Nervous System (CNS).
- Inter neuron:** Located entirely within the CNS (spinal cord), it bridges the incoming and outgoing signals.
- Motor neuron:** Carries the command away from the CNS to the effector (muscle or gland).

Why other options are incorrect:

- Any sequence that does not place the Inter neuron exactly in the middle of Sensory and Motor pathways is anatomically impossible.

Question #26 Key: (C)

UHS 2024

Nissl's granules are groups of: [UHS-2024]

CORE CONCEPT AND DERIVATION

Neurons require immense amounts of protein to continuously build neurotransmitters and maintain long axonal membranes.

Solution:

- **Nissl's granules** (or Nissl bodies) are massive, granular bodies found extensively in the neuronal cell body (soma). Under a microscope, they are revealed to be large clusters of rough endoplasmic reticulum with free rosettes of **ribosomes**, dedicated to high-volume protein synthesis.

Why other options are incorrect:

- **Mesosomes:** Invaginations in bacterial cell membranes.
- **Lysosomes:** Digestion organelles, not granular protein factories.
- **Chromosome:** Found exclusively packed in the nucleus.

Question #27 Key: (D)

KMU 2024

A motor neuron: [KMU-2024]

CORE CONCEPT AND DERIVATION

Efferent pathways carry "effects" outward.

Solution:

- By anatomical definition, a **motor neuron (efferent neuron)** has its cell body in the Central Nervous System (CNS) and projects its long axon outward to transmit electrical impulses **from the CNS to muscles** or glands (effectors), commanding them to act.

Why other options are incorrect:

- **Receptors to CNS:** This is the strict job of the sensory (afferent) neuron.
- **Effectors to CNS:** Signals do not travel backwards from effectors.
- **Connects nerves to ganglions:** Describes structural anatomy, not the functional directionality of a motor fiber.

Question #28 Key: (D)

SZABMU 2024

The groups of ribosomes associated with rough endoplasmic reticulum and Golgi apparatus in the cell body of ne...

CORE CONCEPT AND DERIVATION

Neuroanatomists name specific cellular structures based on historical staining techniques.

Solution:

- When stained with basic dyes, the neuronal cell body shows prominent basophilic clumps. These clumps, discovered by Franz Nissl, are known as **Nissl's Granules**. They are structurally comprised of densely packed rough endoplasmic reticulum and free ribosomes used for high-capacity protein production.

Why other options are incorrect:

- **Soma:** The entire cell body itself, not the specific organelles inside it.
- **Neuroglia:** The entire class of supporting cells (like astrocytes), not an organelle.
- **Axofibrils:** Cytoskeletal structures (neurofibrils) in the axon for transport, not protein synthesis.

Question #29 Key: (B)

KMU 2024

Most of the neurons in the CNS are: [KMU-2024]

CORE CONCEPT AND DERIVATION

Neurons are classified by the number of processes extending from their cell body. The more complex the integration required, the more dendrites are needed.

Solution:

- Because the Central Nervous System (brain and spinal cord) must integrate vast amounts of information from thousands of converging inputs, over 99% of neurons within the CNS (including all motor neurons and interneurons) are **multipolar**. They possess one axon and many highly branched dendrites.

Why other options are incorrect:

- **Unipolar / Pseudounipolar:** Primarily sensory neurons located in peripheral ganglia outside the CNS.
- **Bipolar:** Extremely rare, found only in specialized sensory organs like the retina of the eye and olfactory epithelium.

Question #30 Key: (A)

NUMS 2023

Endorphins are produced in: [NUMS-2023]

CORE CONCEPT AND DERIVATION

Endogenous pain regulation originates centrally within the nervous system.

Solution:

- Endorphins are naturally occurring opioid peptides synthesized primarily in the pituitary gland and the hypothalamus within the **brain** in response to pain or stress.

Why other options are incorrect:

- **Adrenal gland:** Produces stress hormones like cortisol and adrenaline.
- **Stomach / Thymus:** Involved in digestion and immunity, respectively, not endogenous analgesia.

Question #31 Key: (A)

KMU 2023

The activities like sleeping, walking and dreaming are controlled by which part of the brain: [ETEA-2023]

CORE CONCEPT AND DERIVATION

The brainstem contains distinct centers that regulate fundamental rhythmic and states-of-consciousness behaviors.

Solution:

- The **pons** (Latin for "bridge") connects different parts of the brain. It houses specialized nuclei that are heavily involved in the regulation of sleep-wake cycles, the generation of dreams (especially REM sleep), and bridging motor tracts required for movements like walking.

Why other options are incorrect:

- **Cerebellum:** Fine-tunes movement but does not generate sleep or dreams.
- **Hippocampus:** Memory consolidation.
- **Olfactory bulb:** Smell processing.

Question #32 Key: (A)

KMU 2023

A shallow groove in cerebrum is called and deep groove is called [ETEA-2023 Retake]

CORE CONCEPT AND DERIVATION

The cerebral cortex is folded to maximize surface area within the skull, creating a distinct topographical map of ridges and grooves.

Solution:

- A shallow depression or groove on the cortical surface is anatomically termed a **sulcus**.
- A much deeper, more pronounced groove (such as the one dividing the two hemispheres) is called a **fissure**.

Why other options are incorrect:

- **Gyrus:** Refers to the raised ridge or "bump" on the brain, not a groove. Therefore, any option containing gyrus is incorrect.

Question #33 Key: (B)

KMU 2023

The cerebellum is primarily concerned with: [ETEA-2023 Retake]

CORE CONCEPT AND DERIVATION

The cerebellum acts as a high-speed error-correction system for the motor cortex.

Solution:

- The primary role of the cerebellum is to integrate sensory data regarding body position and fine-tune motor outputs to ensure perfect **balance, posture, and coordination during active movement**.

Why other options are incorrect:

- **Thinking and reasoning:** Function of the cerebrum (frontal lobe).
- **Temperature regulation:** Function of the hypothalamus.
- **Initiation of contraction:** Starts in the primary motor cortex of the cerebrum.

Question #34 Key: (A)

KMU 2023

The total number of cranial nerves in human body are: [ETEA-2023 Retake]

CORE CONCEPT AND DERIVATION

Nerves are always organized bilaterally (in symmetrical left-right pairs) as they exit the central nervous system.

Solution:

- There are exactly **12 pairs** of cranial nerves emerging directly from the brain/brainstem to innervate primarily the head and neck.

Why other options are incorrect:

- 31 pairs:** Represents the number of spinal nerves exiting the spinal cord.
- 24 pairs / 62 pairs:** Anatomically incorrect groupings.

Question #35 Key: (B)

KMU 2023

Which part of the brain plays a key role in long term memory? [ETEA-2023 Retake]

CORE CONCEPT AND DERIVATION

Memories must be encoded and consolidated before they can be stored permanently in the cortex.

Solution:

- The **hippocampus** (a seahorse-shaped structure in the limbic system) is absolutely critical for forming new long-term declarative memories and spatial navigation. Damage to this area prevents the creation of new memories.

Why other options are incorrect:

- Amygdala:** Emotional processing (fear).
- Thalamus:** Sensory routing station.
- Hypothalamus:** Autonomic homeostatic control.

Question #36 Key: (A)

UHS 2023

In a typical nerve, the action potential duration is: [UHS-2023]

CORE CONCEPT AND DERIVATION

Neural communication relies on extreme speed to allow for rapid reactions.

Solution:

- A complete action potential—from initial depolarization through repolarization and the refractory undershoot—is an incredibly brief electrical event lasting approximately **1 millisecond** (10^{-3} seconds).

Why other options are incorrect:

- 1 microsecond:** Far too fast for ion channels to mechanically open and close.
- 1 second / 1 minute:** Impossibly slow, which would cause severe biological lag and paralysis.

Question #37 Key: (A)

UHS 2023

During resting membrane potential condition: [UHS-2023]

CORE CONCEPT AND DERIVATION

The resting neuron is highly polarized due to the selective permeability of its membrane and active pumping mechanisms.

Solution:

- Because of the massive abundance of Na^+ ions pumped to the outside, and the presence of large, negatively charged proteins trapped inside the cell, the **outer surface of the neuron is distinctly more positive** relative to the negatively charged interior.

Why other options are incorrect:

- Inner more positive:** This state only occurs briefly during the peak of an active action potential (depolarization).
- If surfaces were equal, voltage would be zero and impulse transmission would be impossible.

Question #38 Key: (C)

UHS 2023

The value of active membrane potential of the neuron is: [UHS-2023]

CORE CONCEPT AND DERIVATION

Action potential peak voltage conversion.

Solution: During peak depolarization, the active membrane potential reaches approximately **+50 millivolts**. Converting millivolts to volts ($50 \text{ mV} / 1000 = 0.05 \text{ Volts}$).

Question #39 **Key: (C)**

UHS 2023

The chemical messengers that transmit action potential across the synapse in the form of chemicals are? [UHS-2023]

CORE CONCEPT AND DERIVATION

Electrical action potentials cannot bridge the physical gap of a synapse.

Solution:

- To continue the signal, the presynaptic neuron releases endogenous chemical agents known as **neurotransmitters**. These diffuse across the cleft and bind to receptors, sparking a new electrical potential in the next cell.

Why other options are incorrect:

- Synaptic knob:** The physical anatomical structure that holds the vesicles.
- Acetylcholinesterase:** An enzyme that destroys the messenger, rather than transmitting it.

Question #40 **Key: (A)**

SZABMU 2023

The junction between the axon ending of a neuron and the dendrites of another neuron is called: [SZABMU-2023]

CORE CONCEPT AND DERIVATION

Neurons form complex interconnected networks by linking their terminal ends to the receiving ends of neighbors.

Solution:

- The functional and anatomical connection point where the axon terminal of one neuron meets the dendrite (or soma) of another is called a **synapse**.

Why other options are incorrect:

- Nissl's body:** Granules of rough endoplasmic reticulum located within the cell body.
- Neuroglia:** Support cells of the nervous system.
- Myelin sheath:** The insulating fat layer wrapping the axon.

Question #41 **Key: (A)**

SZABMU 2023

During non-conducting state, the neuron membrane is permeable to efflux of: [SZABMU-2023]

CORE CONCEPT AND DERIVATION

The resting membrane potential is largely dictated by "leak" channels that remain open when the neuron is idle.

Solution:

- In a non-conducting (resting) state, the neuronal membrane contains significantly more open potassium leak channels than sodium leak channels. Therefore, it is highly permeable to the slow, continuous **efflux of potassium ions (K^+)** moving down their concentration gradient out of the cell.

Why other options are incorrect:

- Na^+ / Ca^{2+} : Their voltage-gated channels are strictly closed during the resting state to maintain the electrochemical gradient.

Question #42 **Key: (B)**

SZABMU 2023

GABA is an example of: [SZABMU-2023]

CORE CONCEPT AND DERIVATION

Neurotransmitters can either encourage a neuron to fire (excitatory) or prevent it from firing (inhibitory).

Solution:

- GABA** (Gamma-Aminobutyric Acid) is the primary **inhibitory neurotransmitter** in the human central nervous system. It works by opening chloride channels, causing hyperpolarization and making it harder for the postsynaptic neuron to reach action potential threshold.

Why other options are incorrect:

- Excitatory:** Glutamate is the main excitatory neurotransmitter, performing the opposite function of GABA.
- Enzyme / Hormone:** GABA is an amino acid derivative acting as a local synaptic messenger, not a systemic hormone or catalyst.

Question #43 Key: (C)

SZABMU 2023

What is the fate of neurotransmitters after provoking impulse in postsynaptic membrane? [SZABMU-2023]

CORE CONCEPT AND DERIVATION

For clear and precise neural signaling, the synaptic cleft must be rapidly cleared of neurotransmitters once the message is delivered.

Solution:

- To prevent continuous, paralyzing over-stimulation, neurotransmitters are swiftly removed. While some undergo presynaptic reuptake, a primary and definitive fate (especially for Acetylcholine) is being rapidly **degraded by specific enzymes** (like acetylcholinesterase) directly in the cleft.

Why other options are incorrect:

- Stay indefinitely:** This would cause lethal tetanic spasms or complete desensitization.
- Taken up by postsynaptic:** Reuptake strictly occurs into the *presynaptic* neuron, not postsynaptic.

Question #44 Key: (C)

KMU 2023

The size of synaptic cleft in electrical synapse is: [ETEA-2023]

1.

CORE CONCEPT AND DERIVATION

Synapses transmit nerve impulses either electrically or chemically. In an electrical synapse, pre- and post-synaptic membranes are in extreme proximity and connected by gap junctions (connexons), enabling direct and rapid ionic current flow.

2. Textbook Specification (KPK Biology / ETEA):

According to the KPK Textbook Board Biology syllabus (Chapter: Nervous Coordination), the synaptic cleft in an **electrical synapse** is only **0.2 nm** wide, whereas in a **chemical synapse**, the cleft is significantly wider at approximately **20 nm** (or 20–30 nm).

3. Solution:

- Electrical synapse synaptic cleft: 0.2 nm** (Option C).
- Chemical synapse synaptic cleft: Approximately 20 nm.**

4. Why other options are incorrect:

- Option A (20nm):** Characteristic cleft width of a *chemical* synapse.
- Option B (2nm):** While certain international physiology references quote the physical gap of connexons as ~2 nm (20 Å), the authoritative KPK textbook line tested in ETEA examinations explicitly establishes **0.2 nm**.
- Option C (0.2nm): Correct.** Verbatim textbook specification for the electrical synapse cleft in the KPK MDCAT/ETEA curriculum.
- Option D (200nm):** Disproportionately large for any anatomical synaptic cleft.

Question #45 Key: (D)

KMU 2023

Which type of nerve impulse occurs in non-myelinated neuron fibers? [ETEA-2023]

CORE CONCEPT AND DERIVATION

The presence or absence of myelin radically alters how an action potential propagates along the axon membrane.

Solution:

- In **non-myelinated neurons**, voltage-gated channels are distributed evenly along the entire length of the axon. The action potential must depolarize every single adjacent patch of the membrane consecutively, resulting in a **continuous impulse**.

Why other options are incorrect:

- **Saltatory / Jumping impulse:** These describe the highly rapid propagation in *myelinated* fibers, where the signal "jumps" between the nodes of Ranvier.
- **Rapid impulse:** Continuous conduction is comparatively very slow, not rapid.

Question #46 Key: (C)

KMU 2023

The neuron is said to be polarized when the: [ETEA-2023 Retake]

CORE CONCEPT AND DERIVATION

A resting neuron behaves like a biological battery, maintaining a separation of charge across its lipid bilayer.

Solution:

- During the resting (polarized) state, the active Na^+/K^+ pumps and selective leak channels create an electrochemical gradient. This results in the **inside of the plasma membrane having a net negative charge** (recorded as negative voltage or "energy" in the exact exam phrasing) relative to the more positive outside.

Why other options are incorrect:

- **Inside is positive / Positive charge moves inside:** This describes the *depolarized* active state, not the polarized resting state.
- **Same energy:** This would mean zero membrane potential, meaning the neuron is dead or unable to fire.

Question #47 Key: (B)

KMU 2023

What brings membrane potential to threshold? [ETEA-2023 Retake]

CORE CONCEPT AND DERIVATION

Excitation of a neuron requires shifting its resting negative voltage towards a more positive critical threshold (-55 mV) to fire an action potential.

Solution:

- When excitatory neurotransmitters bind to receptors on the post-synaptic membrane, they trigger ligand-gated sodium channels to open. The subsequent **influx of positively charged sodium (Na^+) ions** reduces the negative charge inside the cell, driving the membrane potential up to the threshold.

Why other options are incorrect:

- **Outflow of sodium / Influx of potassium:** These ion movements would generally hyperpolarize the cell (make it more negative), moving it away from the threshold.
- **Calcium:** Primarily involved in neurotransmitter exocytosis at the terminal, not the initial postsynaptic depolarization in typical neurons.

Question #48 Key: (D)

NUMS 2023

Site of the production of neurotransmitter is: [NUMS-2023]

CORE CONCEPT AND DERIVATION

Neurotransmission is a highly directional process requiring the sender cell to manufacture and store chemical messengers.

Solution:

- Neurotransmitters are synthesized, packaged into synaptic vesicles, and stored within the terminal buttons of the **presynaptic neuron**. Upon receiving an action potential, this presynaptic neuron releases them into the cleft.

Why other options are incorrect:

- **Post synaptic neuron:** The receiver of the neurotransmitters.
- **Synaptic cleft:** The empty physical gap between the cells; nothing is produced here.
- **Dendrite:** The primary receiving structure, not the production/release site.

Question #49 **Key: (C)**

NUMS 2023

The junction between two neurons is: [NUMS-2023]

CORE CONCEPT AND DERIVATION

Neurons form complex communication networks by forming highly specialized junction points.

Solution:

- The functional connection where a nerve impulse is transmitted from one neuron to another is biologically defined as a **synapse**. It encompasses the presynaptic terminal, the cleft, and the postsynaptic membrane.

Why other options are incorrect:

- **Cleft:** Refers strictly to the empty space within the synapse, not the functional junction as a whole.
- **Axon / Impulse:** Parts of a single neuron's structure and electrical activity.

Question #50 **Key: (D)**

UHS 2023

The pressure receptors that receive deep pressure stimulus in human body are called: [UHS-2023]

CORE CONCEPT AND DERIVATION

Mechanoreceptors in the skin are layered based on their function; superficial receptors detect light touch, while deeper receptors detect heavy force.

Solution:

- **Pacinian corpuscles** are large, onion-like encapsulated nerve endings located deep within the dermis and hypodermis. They are specifically tuned to detect deep pressure and high-frequency vibrations.

Why other options are incorrect:

- **Meissner Corpuscles:** Located near the skin surface to detect light touch and texture.
- **Red blood Corpuscles:** Erythrocytes (carry oxygen), not nervous tissue.
- **Cholesterol:** A structural lipid molecule.

Question #51 **Key: (C)**

NUMS 2022

Touch receptors are: [NUMS-2022]

CORE CONCEPT AND DERIVATION

Mechanoreceptors in the skin are specialized to detect different mechanical stimuli such as touch, pressure, and vibration.

Solution:

- **Meissner's corpuscles** are encapsulated nerve endings located in the dermal papillae, primarily responsible for detecting light touch and low-frequency vibration.

Why other options are incorrect:

- **Pacinian's corpuscles:** Specifically detect deep pressure and high-frequency vibration.
- **Olfactory receptors:** Chemoreceptors located in the nasal cavity for smell.
- **Nociceptors:** Specialized free nerve endings that detect pain.

Question #52 **Key: (C)**

DUHS 2022

They detect pain and tissue damage: [DUHS-2022]

CORE CONCEPT AND DERIVATION

Different sensory receptors are tuned to specific modalities of stimuli to protect and inform the body.

Solution:

- **Nociceptors** are specialized sensory receptors that respond to damaging or potentially damaging stimuli by sending "possible threat" signals to the spinal cord and brain, resulting in the perception of pain.

Why other options are incorrect:

- **Baroreceptors:** Detect changes in blood pressure.
- **Chemoreceptors:** Detect chemical changes (e.g., blood pH, taste, smell).
- **Mechanoreceptors:** Detect physical deformation like touch or pressure, but not inherently pain.

Question #53 **Key: (C)**

UHS 2022

There is no clear difference between dendrites and axons in sensory neurons, except : [UHS-2022]

CORE CONCEPT AND DERIVATION

In pseudo-unipolar sensory neurons, both the peripheral and central processes are structurally axon-like (myelinated, capable of action potentials).

Solution:

- The primary morphological and functional difference lies at their **terminal portions**. The peripheral process (functional dendrite) ends in sensory receptors, whereas the central process (true axon) ends in synaptic knobs within the central nervous system.

Why other options are incorrect:

- Thickness / Length:** In sensory neurons, the peripheral and central branches can be nearly identical in diameter and extensive length.

Question #54 **Key: (A)**

NUMS 2022

A long extension of nerve cell is called: [NUMS-2022]

CORE CONCEPT AND DERIVATION

Neurons require specific anatomical structures to project signals across the body.

Solution:

- The **axon** is the singular, long cytoplasmic extension of a neuron dedicated to carrying action potentials away from the soma.

Why other options are incorrect:

- Auxins:** These are plant hormones, completely unrelated to human neurobiology.
- Schwann cells:** Glial cells, not extensions of the neuron.
- Dendrites:** Usually short, tapering, and highly branched structures.

Question #55 **Key: (D)**

SZABMU 2022

Which axon would transmit an action potential most rapidly? [SZABMU-2022]

CORE CONCEPT AND DERIVATION

Factors influencing nerve conduction velocity.

Solution: Conduction speed increases with larger axon diameter and myelination. Myelination enables rapid saltatory conduction across nodes of Ranvier.

Question #56 **Key: (A)**

KMU 2022

The type of neuron that carries nerve impulse from tissue and organ to the spinal cord and brain is: [ETEA-202...]

CORE CONCEPT AND DERIVATION

Neural pathways are directional. Afferent pathways bring signals IN, while efferent pathways send signals OUT.

Solution:

- Sensory (afferent) neurons** detect stimuli in peripheral tissues and organs and carry those electrical impulses towards the Central Nervous System (spinal cord and brain) for integration.

Why other options are incorrect:

- Motor neuron:** Carries signals away from the CNS to effectors.
- Intermediate / Associative neuron:** Synonymous with interneurons; located entirely within the CNS to process information.

Question #57 Key: (A)

NUMS 2022

An automatic, involuntary response to any change external or internal is called: [NUMS-2022]

CORE CONCEPT AND DERIVATION

Nervous systems provide rapid, hardwired responses to specific stimuli to maintain homeostasis and avoid danger.

Solution:

- A **reflex** is strictly defined as an automatic, involuntary, and virtually instantaneous movement or internal physiological response to a stimulus.

Why other options are incorrect:

- **Instinct:** A complex, inherited pattern of behavior, not a simple physiological response.
- **Taxis / Tropism:** Directional movements in simpler organisms or plants in response to light, gravity, or chemicals.

Question #58 Key: (D)

BUMHS 2022

During an involuntary action, nerve impulse is passed through a pathway called: [BUMHS-2022]

CORE CONCEPT AND DERIVATION

Anatomical structures create the specific "wiring" for physiological behaviors.

Solution:

- The actual anatomical pathway that a nerve impulse travels along to produce a reflex is termed the **reflex arc**. It structurally consists of the receptor, sensory neuron, integration center, motor neuron, and effector.

Why other options are incorrect:

- **Reflex action** is the functional behavior or result (e.g., pulling your hand away), whereas the **reflex arc** is the physical pathway itself.

Question #59 Key: (C)

KMU 2022

The resting membrane potential of neuron is measured about: [ETEA-2022]

CORE CONCEPT AND DERIVATION

When a neuron is not transmitting a signal, there is a stable, uneven distribution of ions across its membrane.

Solution:

- The interior of a typical resting neuron is negatively charged relative to the exterior. This difference in electrical charge is the **resting membrane potential**, globally accepted to be approximately **-70 millivolts (mV)**.

Why other options are incorrect:

- **-30 mV:** Incorrect resting value.
- **+50 mV:** Represents the peak of an active action potential.
- **100 mV:** Not a physiological resting state for human neurons.

Question #60 Key: (A)

UHS 2022

The neurotransmitter active outside CNS (Central Nervous System) is: [UHS-2022]

CORE CONCEPT AND DERIVATION

Neurotransmitters have specific functional domains within the body.

Solution:

- **Acetylcholine** is the quintessential peripheral neurotransmitter. It is solely responsible for bridging the gap between motor neurons and skeletal muscle cells (neuromuscular junction) and is widely active in the autonomic nervous system outside the brain and spinal cord.

Why other options are incorrect:

- **Dopamine, Glutamate, Serotonin:** While they may have some peripheral effects, they are overwhelmingly characterized as central nervous system (CNS) neurotransmitters responsible for mood, cognition, and motor regulation in the brain.

Question #61 Key: (C)

NUMS 2022

Molecules responsible for conveying message from one neuron to the next are called: [NUMS-2022]

CORE CONCEPT AND DERIVATION

Action potentials cannot jump physical gaps; they require a chemical intermediary.

Solution:

- **Neurotransmitters** are the packaged molecules stored in presynaptic vesicles that diffuse across the synaptic cleft to convey the neural message to the receptors of the adjacent post-synaptic neuron.

Why other options are incorrect:

- **Hormones:** Transported via blood over long distances.
- **Enzymes:** Proteins that speed up reactions (e.g., Acetylcholinesterase breaks down the message, rather than conveying it).

Question #62 Key: (B)

NUMS 2022

The gap between neurons at a synapse is: [NUMS-2022]

CORE CONCEPT AND DERIVATION

Neurons in a chemical synapse do not physically touch; they maintain a microscopic separation.

Solution:

- The literal physical gap (approximately 20–30 nanometers wide) separating the presynaptic terminal from the postsynaptic membrane is anatomically termed the **synaptic cleft**.

Why other options are incorrect:

- **Synaptic knob:** The swollen end of the presynaptic axon.
- **Synaptic vesicle:** The sacs inside the knob holding the neurotransmitters.
- **Synaptic delay:** The brief fraction of a millisecond it takes for the chemical process to occur, not a structural space.

Question #63 Key: (B)

UHS 2022

The part of brain which guides smooth and accurate motions and maintains body position is: [UHS-2022]

CORE CONCEPT AND DERIVATION

Motor commands originate in the cerebrum, but they must be refined and coordinated for fluid movement.

Solution:

- The **cerebellum** (the "little brain" at the back of the skull) acts as a high-speed computer that calculates and refines muscular contractions, ensuring motions are smooth, accurate, and that posture and balance are seamlessly maintained.

Why other options are incorrect:

- **Cerebrum:** Initiates voluntary movement but does not do the fine-tuning for balance.
- **Medulla / Pons:** Control vital autonomic functions like heart rate and breathing rhythms.

Question #64 Key: (A)

SZABMU 2022

The feelings and emotions of love and hate are controlled by: [SZABMU-2022]

CORE CONCEPT AND DERIVATION

The limbic system is the emotional brain, with specific sub-structures handling different emotional valences.

Solution:

- The **amygdala** is an almond-shaped cluster of nuclei deep within the temporal lobe. It is fundamentally responsible for processing intense emotional responses, aggressive behaviors, fear, and strong feelings of love and hate.

Why other options are incorrect:

- **Hippocampus:** Primarily involved in consolidating short-term memory into long-term memory.
- **Thalamus:** The sensory relay station.
- **Hypothalamus:** Homeostatic regulation (hunger, thirst, body temp).

Question #65 Key: (C)

KMU 2022

The hind brain is comprised of all of the following except : [ETEA-2022]

CORE CONCEPT AND DERIVATION

The brain is divided embryologically into the forebrain, midbrain, and hindbrain.

Solution:

- The hindbrain (rhombencephalon) consists strictly of the pons, the medulla oblongata, and the cerebellum. The **cerebrum**, however, is the largest structure of the completely separate **forebrain** (prosencephalon).

Why other options are incorrect:

- Options A, B, and D are all anatomically correct components of the hindbrain.

Question #66 Key: (B)

DUHS 2022

It is the site of all conscious activity: [DUHS-2022]

CORE CONCEPT AND DERIVATION

Higher-order cognitive processing requires a massive network of unmyelinated neuronal cell bodies.

Solution:

- The cerebral **cortex** (the highly convoluted outer layer of the cerebrum) is responsible for all conscious thought, sensory perception, voluntary movement initiation, language, and reasoning.

Why other options are incorrect:

- Hind brain / Mid brain / Spinal cord:** These regions deal with subconscious, involuntary, autonomic survival functions and reflex arcs.

Question #67 Key: (A)

DUHS 2022

Spinal cord comes out from the cranium through an opening known as: [DUHS-2022]

CORE CONCEPT AND DERIVATION

The central nervous system is continuous, transitioning from the brain to the spinal cord as it exits the skull.

Solution:

- The **foramen magnum** (Latin for "great hole") is the large opening at the base of the occipital bone through which the medulla oblongata extends downward to become the continuous spinal cord.

Why other options are incorrect:

- Acetabulum:** The hip socket where the femur attaches.
- Lumen:** The hollow inside space of a tubular structure like a blood vessel.
- Ganglion:** A cluster of nerve cell bodies in the peripheral nervous system.

Question #68 Key: (B)

KMU 2022

Those nerves that originate from or lead to the brain are called cerebral nerves. These are ____ pairs of cere...

CORE CONCEPT AND DERIVATION

The peripheral nervous system connects directly to the central nervous system via distinct sets of paired nerves.

Solution:

- Cerebral nerves (commonly known as **cranial nerves**) emerge directly from the brain and brainstem. In humans, there are exactly **12 pairs** of cranial nerves (e.g., Optic, Vagus, Olfactory).

Why other options are incorrect:

- 31 pairs:** Refers to the number of *spinal* nerves.
- 6 and 14:** Are incorrect anatomical counts.

Question #69 **Key: (A)**

PMDC 2020

Which one of the following is common to all neurons? [PMC-2020]

CORE CONCEPT AND DERIVATION

Neurons come in many morphological classifications (unipolar, bipolar, multipolar), but they share fundamental cellular necessities.

Solution:

- Regardless of type, every functional neuron must have a **soma (cell body)** containing a nucleus to direct protein synthesis and maintain cellular metabolism.

Why other options are incorrect:

- **Nodes of Ranvier, Myelin Sheath, Schwann Cells:** These are characteristic of *myelinated* neurons only. Unmyelinated neurons lack these structures entirely.

Question #70 **Key: (A)**

PMDC 2020

Neurons are cells adapted for the rapid transmission of electrical impulses. To do this, they have long thin p...

CORE CONCEPT AND DERIVATION

The morphology of a neuron is perfectly adapted for long-distance communication.

Solution:

- **Axons** are the elongated, thin processes (fibers) that conduct electrical impulses (action potentials) away from the cell body over long distances (sometimes up to a meter in humans) to target effectors or other neurons.

Why other options are incorrect:

- **Dendrites:** Typically short and highly branched; they receive signals rather than transmitting them over long distances.
- **Myelin sheath / Schwann cell:** These insulate the axon to speed up transmission, but they are not the "process" itself.

Question #71 **Key: (D)**

PMDC 2020

Which of the following neurotransmitters function, both as neurotransmitter and hormones, decreasing our perce...

CORE CONCEPT AND DERIVATION

The body has endogenous analgesic (pain-relieving) systems to cope with extreme stress or physical exertion.

Solution:

- **Endorphins** (endogenous morphines) are neuropeptides produced by the central nervous system and pituitary gland. They bind to opiate receptors to significantly block pain signals and can induce feelings of euphoria.

Why other options are incorrect:

- **Epinephrine / Dopamine / Serotonin:** While they affect mood and the "fight or flight" response, they are not primarily known as the body's natural painkillers.

Question #72 **Key: (B)**

KMU 2019

_____ is considered as chief structural and functional unit of nervous system. [ETEA-2019]

CORE CONCEPT AND DERIVATION

Every organ system is built upon a foundational cellular unit that performs its primary functions.

Solution:

- The **neuron** (or nerve cell) is the core component of the nervous system, uniquely specialized for generating, propagating, and transmitting electrochemical impulses.

Why other options are incorrect:

- **Nephron:** The structural and functional unit of the kidney.
- **Brain:** The central processing organ, not the microscopic foundational unit.
- **Cell:** Too generic; many cells (like glia) support the nervous system but do not transmit primary impulses.

Question #73 Key: (C)

MDCAT 2019

The reflex action is the phenomena which only involves: [MDCAT-2019]

CORE CONCEPT AND DERIVATION

A spinal reflex arc is an involuntary, rapid response mechanism that bypasses conscious thought to protect the body.

Solution:

- A standard spinal reflex relies purely on the peripheral and spinal pathways: it detects a stimulus (**receptors**), processes it at the level of the **spinal cord** via an interneuron, and immediately triggers a response via **effectors**. The brain is not actively involved in the reflex execution itself.

Why other options are incorrect:

- Options involving the **Brain** represent conscious pathways or cranial reflexes, not the standard localized spinal reflex action meant by this specific curriculum question.

Question #74 Key: (C)

MDCAT 2019

In an action potential, the permeability of sodium ions in the neuron increases due to: [MDCAT-2019]

CORE CONCEPT AND DERIVATION

Changes in membrane permeability are controlled by voltage-gated ion channels embedded in the lipid bilayer.

Solution:

- When the membrane reaches threshold potential, voltage-gated **sodium channels undergo a conformational change and open**. This drastically increases the membrane's permeability to Na^+ , allowing a massive influx of sodium down its electrochemical gradient, triggering depolarization.

Why other options are incorrect:

- Repolarization:** Occurs due to the *closing* of sodium gates and the opening of potassium gates.
- Acetylcholinesterase:** An enzyme that breaks down neurotransmitters in the synaptic cleft, unrelated to axonal sodium gates.

Question #75 Key: (C)

MDCAT 2019

If stimulation is above _ , impulses travel to the brain along the sensory neuron. [MDCAT-2019]

CORE CONCEPT AND DERIVATION

Neurons obey the "all-or-none" principle. An action potential is only fired if a specific voltage criteria is met.

Solution:

- The **threshold potential** (usually around -55 mV) is the critical level to which a membrane potential must be depolarized to initiate an action potential. If a stimulus brings the membrane above this threshold, a full impulse is generated and sent to the brain.

Why other options are incorrect:

- Action Potential:** This is the result, not the triggering requirement.
- Resting Potential:** The baseline state. A stimulus must exceed resting potential significantly to reach threshold.

Question #76 Key: (D)

SZABMU 2019

Impulses jump across synapse in the form of chemical messenger such as: [AJK-2019]

CORE CONCEPT AND DERIVATION

Synaptic clefts are bridged by specialized neurochemical compounds.

Solution:

- Dopamine** is a major biogenic amine neurotransmitter in the central nervous system, heavily involved in motor control, reward pathways, and mood regulation. It carries the impulse chemically across the synapse.

Why other options are incorrect:

- Glutamine, Arginine, Leucine:** These are standard amino acids primarily used for protein synthesis or metabolic precursors, and are not classical neurotransmitters in this specific context (though Glutamine is a precursor to Glutamate, it is not the active messenger itself).

Question #77 Key: (D)

MDCAT 2018

Taste buds on the tongue are example of: [MDCAT-2018]

CORE CONCEPT AND DERIVATION

Gustation (taste) is fundamentally a chemical sense.

Solution:

- Taste buds contain gustatory cells that bind to specific food molecules (tastants) dissolved in saliva. Because they detect chemical substances, they are classified as **chemoreceptors**.

Why other options are incorrect:

- **Thermoreceptors / Pressure receptors:** Present on the tongue for temperature and texture, but they are not the taste buds themselves.
- **Photoreceptors:** Found only in the retina of the eye.

Question #78 Key: (D)

MDCAT 2018

How many sodium ions are pumped out in response to two potassium ions transported into the membrane? [MDCAT-20...

CORE CONCEPT AND DERIVATION

The resting membrane potential is actively maintained by an electrogenic pump powered by ATP.

Solution:

- The **Sodium-Potassium Pump** (Na^+/K^+ ATPase) utilizes one molecule of ATP to actively transport **3 Na^+ ions out** of the cell while simultaneously bringing **2 K^+ ions into** the cell. This 3:2 ratio maintains the negative charge inside the membrane.

Why other options are incorrect:

- Options 1, 2, and 4 do not reflect the strict stoichiometric 3:2 ratio characteristic of this fundamental cellular pump.

Question #79 Key: (A)

MDCAT 2018

When a nerve impulse jumps from one node of Ranvier to the next in a myelinated neuron, it is called [MDCAT-20...

CORE CONCEPT AND DERIVATION

Myelination alters how action potentials propagate, making the nervous system highly efficient.

Solution:

- Because the myelin sheath prevents ion leakage, depolarization can only occur at the exposed gaps known as Nodes of Ranvier. The impulse appears to "leap" from node to node, a phenomenon strictly termed **saltatory conduction**.

Why other options are incorrect:

- **Resting / Membrane potential:** Refer to voltage states, not the physical movement of the impulse.
- **Synapses:** The junction between two entirely separate cells.

Question #80 Key: (C)

MDCAT 2018

In nervous system, chemical messengers are called [MDCAT-2018]

CORE CONCEPT AND DERIVATION

Chemical signaling depends on the system utilized (Nervous vs. Endocrine).

Solution:

- In the nervous system, the highly specific endogenous chemicals that transmit signals across a synaptic cleft from one neuron to another target cell are specifically called **neurotransmitters**.

Why other options are incorrect:

- **Hormones:** Chemical messengers of the endocrine system that travel via the bloodstream.
- **Enzymes:** Biological catalysts, not signaling messengers.
- **Chemoreceptors:** The sensory structures that detect chemicals.

Question #81 Key: (A)

MDCAT 2017

Which of the following produce response? [MDCAT-2017]

CORE CONCEPT AND DERIVATION

In the nervous system, the complete pathway of a response involves a receptor, an integrating center, and an effector.

Solution:

- Receptors detect the stimulus.
- Sensory neurons carry the signal to the CNS.
- Motor neurons carry the signal from the CNS to the **effectors** (muscles or glands), which execute the actual physical or chemical response.

Why other options are incorrect:

- **Nerve:** Acts as a transmission cable but does not produce the final physiological response.
- **Stimulators:** Initiate the sensory process.
- **Brain:** Processes the information but relies entirely on effectors to execute the action.

Question #82 Key: (C)

MDCAT 2017

Pick out the pressure receptors. [MDCAT-2017]

CORE CONCEPT AND DERIVATION

Receptors are classified based on the type of stimulus energy they transduce into electrical signals.

Solution:

- Pressure is a mechanical force. **Mechanoreceptors** (like Pacinian corpuscles) are specifically designed to detect mechanical deformation of the receptor membrane caused by pressure or stretch.

Why other options are incorrect:

- **Chemoreceptors:** Respond to specific molecules/chemicals.
- **Photoreceptors:** Respond to photons (light).
- **Thermoreceptors:** Respond to changes in temperature.

Question #83 Key: (D)

MDCAT 2015

Conduction of action potentials from one node of Ranvier to another in myelinated neurons is through: [MDCAT-2015]

CORE CONCEPT AND DERIVATION

Myelin acts as a high-resistance electrical insulator, forcing the action potential to "skip" down the axon.

Solution:

- In myelinated axons, ion channels are concentrated at the nodes of Ranvier. The electrical impulse jumps from node to node, a highly efficient and rapid process known as **saltatory conduction** (from the Latin *saltare*, to jump).

Why other options are incorrect:

- **Depolarization / Hyperpolarization:** These are phases of the action potential itself, not the mechanism of propagation along the axon length.

Question #84 Key: (A)

MDCAT 2015

In the following diagram of action potential in a neuron, '2' depicts: mV +30 -70 1 2 3 4 Neuron Action Potent...

CORE CONCEPT AND DERIVATION

An action potential graph tracks membrane voltage over time, featuring distinct phases dictated by specific ion channels opening and closing.

Solution:

- Phase 1: Resting state.
- **Phase 2: Depolarization.** Voltage-gated Na^+ channels open, allowing an influx of sodium ions, causing the membrane potential to rapidly become positive.
- Phase 3 & 4: Repolarization (falling phase).
- Phase 5: Hyperpolarization (undershoot).

Why other options are incorrect:

- **Repolarization:** Occurs during the downward slope of the graph.
- **Hyperpolarization:** The dip below the baseline resting potential.

Question #85 **Key: (D)**

MDCAT 2015

Neurotransmitter secreted at synapse outside the central nervous system is: [MDCAT-2015]

CORE CONCEPT AND DERIVATION

Different neurotransmitters dominate different divisions of the nervous system.

Solution:

- Outside the CNS, within the Peripheral Nervous System (specifically at the neuromuscular junction and in autonomic ganglia), **Acetylcholine (ACh)** is the primary active neurotransmitter responsible for stimulating skeletal muscles and parasympathetic responses.

Why other options are incorrect:

- **Dopamine:** Primarily active within the brain (CNS).
- **Androgen:** A steroid hormone, not a neurotransmitter.
- **Polypeptide:** A broad category of molecules, not specific.

Question #86 **Key: (D)**

PMDC 2015

For the impulse to transfer from presynaptic to post synaptic neuron, the substance required is: [LUMMHC-2015]

CORE CONCEPT AND DERIVATION

Exocytosis of neurotransmitters is entirely dependent on a specific extracellular ion.

Solution:

- When an action potential reaches the axon terminal, it opens voltage-gated **Calcium (Ca^{2+})** channels. The influx of calcium ions forces synaptic vesicles to fuse with the presynaptic membrane, releasing the chemical messenger into the cleft. Without calcium, this transfer cannot occur.

Why other options are incorrect:

- **Sodium / Potassium:** Required for the action potential along the axon, but they do not directly trigger vesicular exocytosis.