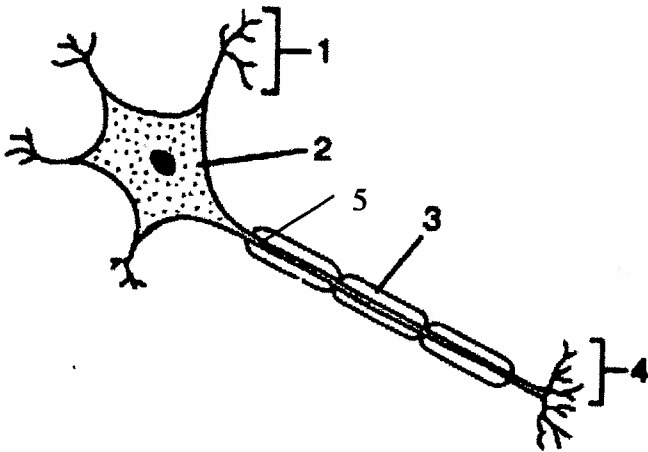
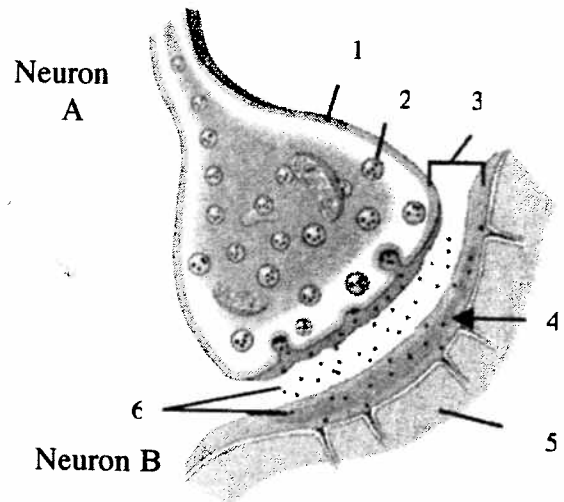


**Q 1** Identify the parts of the neuron and describe their function.



**Q 2** Identify the parts of the synapse, Identify A and B as a presynaptic or postsynaptic neuron.



**Q 3**

Describe the function of a synapse.

**Q 4**

Identify the energy source and the direction of ion flow when the sodium/potassium pump operates.

**Q 5**

- Identify the ion distribution in a resting neuron.
- If a resting neuron is polarized, is the outside of the neuron relatively negative or positive compared to the inside?

**Q 6**

Explain two ways that a resting membrane of a neuron is able to become polarized.

## A2

- 1 axon terminal
- 2 neurotransmitter vesicle
- 3 synaptic cleft
- 4 receptor site
- 5 dendrite
- 6 neurotransmitter chemicals

Neuron A: presynaptic

Neuron B: postsynaptic

## A1

- 1 **dendrites:** receive nerve impulses
- 2 **cell body:** contains nucleus and is the site of cell's metabolic reactions
- 3 **myelin sheath:** insulates neuron and speeds the rate of nerve impulse transmission
- 4 **axon terminals:** releases chemical signals into the space between it and the receptors of neighbouring cells
- 5 **axon:** conducts impulses away from the cell body

## A4

The energy source of the sodium/potassium pump is ATP, which is used to actively transport  $\text{Na}^+$  out of the cell and  $\text{K}^+$  into the cell

## A3

The synapse transmits the nerve impulse from one neuron to another.

## A6

1.  $\text{K}^+$  are able to diffuse out of the cell more easily than  $\text{Na}^+$  can diffuse into the cell, resulting in a net positive charge on the outside
2. The Sodium/Potassium pump actively transports three  $\text{Na}^+$  outside the cell for every two  $\text{K}^+$  inside the cell

## A5

- a) Sodium ions are in higher concentration outside the neuron and potassium ions are in higher concentration inside the neuron
- b) A resting neuron is relatively more positive on the outside than the inside.

**Q 7**

Sodium ions and potassium ions are transported through the neuron membrane by two methods and with two different kinds of membrane proteins.

Identify the names of the two proteins that the ions are transported through and the two methods of cellular transport through these membrane proteins.

**Q 8**

In myelinated neurons, action potentials only occur at one place. Identify this area of the neuron.

**Q 9**

Describe depolarization.

**Q 10**

Describe repolarization

**Q 11**

Define hyperpolarization.

**Q 12**

Define refractory period

## A 8

Action potentials only occur at the nodes of Ranvier.

## A 7

1. Protein: sodium/potassium pump  
Method of transport: active transport
2. Protein:  $\text{Na}^+$  and  $\text{K}^+$  gated ion channels  
Method of transport: diffusion

## A 10

**repolarization:** diffusion of potassium ions out of the nerve cell causing the inside of the neuron to become relatively negative

## A 9

**depolarization:** diffusion of  $\text{Na}^+$  into the nerve cell causing the inside of the neuron to become relatively positive.

## A 12

**refractory period** is the recovery time required before a neuron can produce another action potential

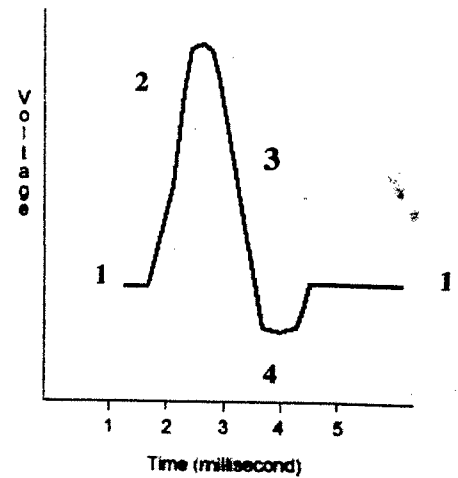
## A 11

**hyperpolarization:** condition in which the inside of a nerve cell has a greater negative charge than the resting neuron; caused by an excessive diffusion of  $\text{K}^+$  out of the cell

**Q 13**

What is the difference between action potential and resting potential?

**Q 14** Identify areas 1 -4



**Q 15**

Increasing the intensity of a stimuli above the critical threshold value will not produce an increased response in the action potential—the intensity of the nerve impulse and speed remain the same. What is this called when a nerve or muscle fiber responds completely or not at all to a stimulus?

**Q 16**

What is a neurotransmitter ?

Identify two neurotransmitters.

**Q 17**

What is the function of acetylcholine and the function of cholinesterase?

**Q 18**

Which type of neurons make the postsynaptic membrane more permeable to  $\text{Na}^+$ : inhibitory or excitatory?

Which type of neurons make the postsynaptic membrane more permeable to  $\text{K}^+$ : inhibitory or excitatory?

#### A 14

1. polarized
2. depolarized
3. repolarized
4. hyperpolarized

#### A 13

- **action potential** is the voltage difference across a nerve cell membrane when the nerve is excited
- **resting potential** is the voltage difference across a nerve cell membrane when it is not transmitting a nerve impulse

#### A 16

**neurotransmitter:** chemical messenger released by the presynaptic neuron that binds to receptors on the postsynaptic neuron.

Two examples are acetylcholine and norepinephrine

#### A 15

all-or-none response

#### A 18

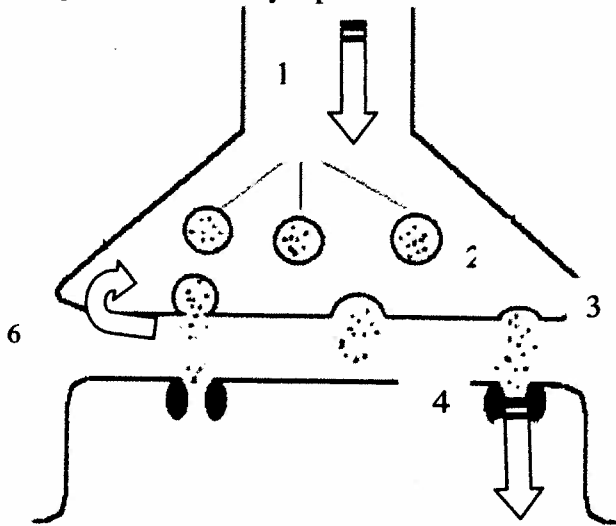
- **more permeable to  $\text{Na}^+$ :**  
excitatory
- **more permeable to  $\text{K}^+$ :** inhibitory

#### A 17

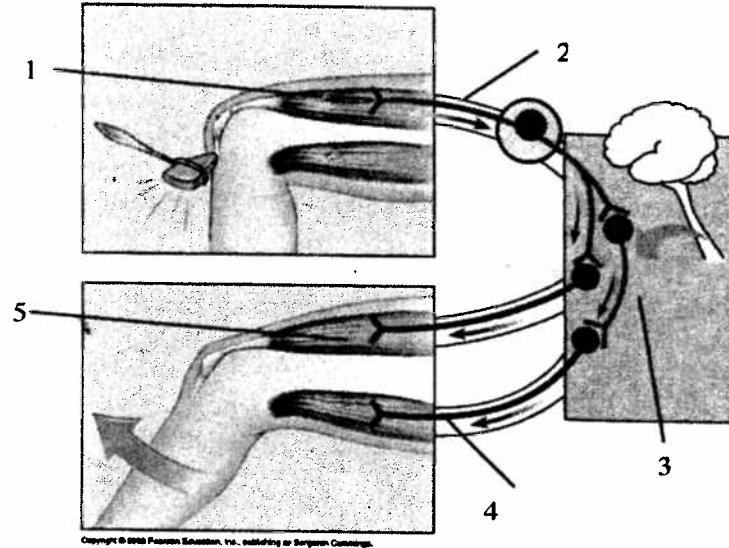
**Acetylcholine** is a neurotransmitter released from vesicles in presynaptic neurons which makes the postsynaptic membranes more permeable to  $\text{Na}^+$  ions

Cholinesterase is an enzyme which breaks down acetylcholine.

**Q 19** Outline the steps involved to transmit a nerve signal across the synapse.



**Q 20** Describe the components of the reflex arc.



**Q 21**

What is a reflex arc?

**Q 22**

Identify the neuron that

1. carries impulses to the CNS
2. carries information from the CNS to an effector
3. is a neuron of the CNS

**Q 23**

There are two divisions of the peripheral nervous system.

Identify each one and state whether it is under voluntary control or involuntary control

**Q 24**

The autonomic nervous system made up of two distinct opposing divisions.

Identify these two divisions and state the response of the following organs:

1. heart
2. salivation
3. liver
4. pupil
5. bronchioles
6. skin

## A20

1. **Receptor** receive the stimulus
2. **Sensory neuron** carries nerve impulse toward spinal cord
3. **Interneuron** in spinal cord is activated
4. **Motor neuron** carries nerve impulse away from spinal cord
5. **Effector** ( a muscle or a gland) responds

## A 19

1. Action potential travels to presynaptic terminal
2. Vesicles fuse with membrane
3. Neurotransmitters diffuse across the synaptic cleft
4. Neurotransmitters bind to receptor sites.
5. The postsynaptic neuron membrane is depolarized
6. Afterward, an enzyme will break up the neurotransmitter and its components will be reabsorbed

## A 22

1. sensory
2. motor
3. interneuron

## A 21

A reflex arc is the simplest nerve pathway which result in involuntary and unconscious responses

## A 24

The two divisions are sympathetic (fight-or-flight response) and parasympathetic (rest-and-digest response). The responses are:

1. sympathetic increases heart rate;  
parasympathetic decreases heart rate
2. sympa. inhibits salivation; para. stimulates
3. sympathetic stimulates liver to release glucose; parasympathetic stimulates the liver to store glucose as glycogen
4. sympa. dilates bronchioles; para. constricts
5. sympathetic constricts pupil;  
parasympathetic <sup>dilates</sup> dilates ~~constricts~~
6. symp. dec. blood flow to skin and diverts blood to brain/heart; para. inc. flow to skin

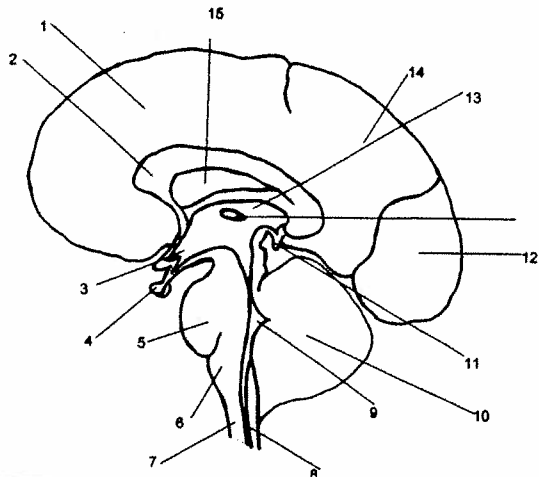
## A 23

The two divisions are:

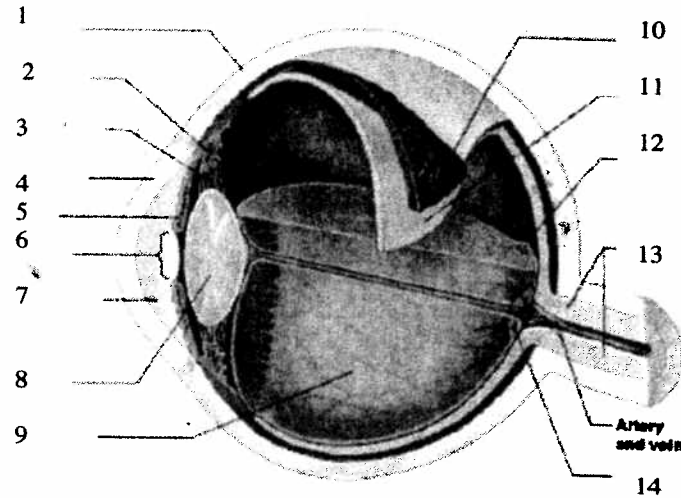
1. The Somatic Nervous System:  
under voluntary control
2. The Autonomic Nervous System:  
under involuntary control



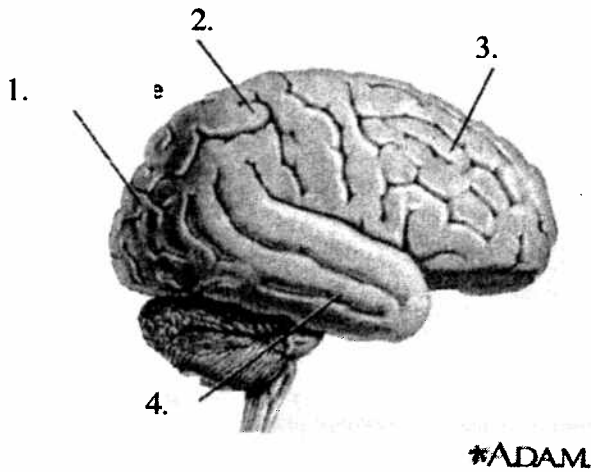
**Q 25** Identify 2, 3, 4, 5, 6, 7, 10 and provide a function



**Q 26** Identify the structures and provide the functions of each.



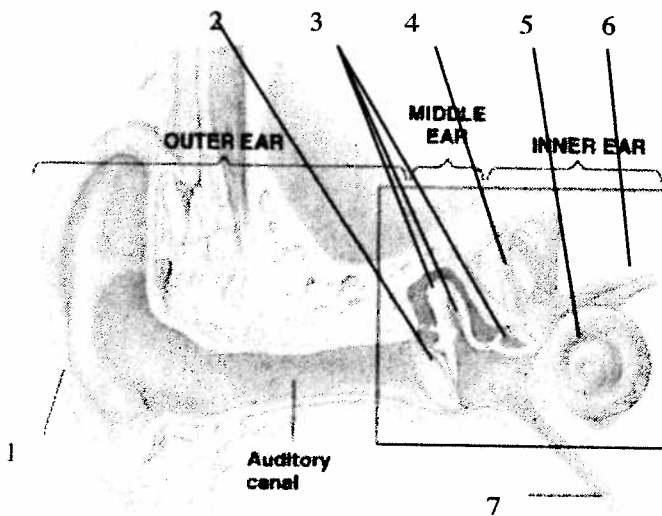
**Q 27** Identify the four lobes of the cerebrum and provide functions of each lobe



**Q 28**

Identify the two specialized types of photoreceptor cells of the eye and describe their function.

**Q 29** Identify the structures and provide the functions of each.



**Q 30**

Describe the structure of the ~~chotea~~ cochlea

## A 26

- 1 sclera: protect and support the eyeball
- 2 muscle, 3 ligament
- 4 cornea: bends light rays into eye
- 5 iris: regulates the amount of light entering the eye
- 6 pupil: opening for light to enter inner eye
- 7 aqueous humour, 9 vitreous humour
- 8 lens: focuses light rays onto retina
- 10 choroid: contains blood vessels
- 11 retina: contains photoreceptor cells
- 12 fovea: high density of cones; most light sensitive area of retina
- 13 optic nerve: transmits sensory information to the brain
- 14 blind spot: where optic nerve attaches to retina

## A 25

2. corpus callosum: connects the right and left hemispheres
3. hypothalamus: regulates the pituitary gland, heart rate, temperature, controls drives such as hunger and thirst
4. pituitary gland: produces hormones
5. pons: relays information between the cerebellum and cerebral cortex
6. medulla oblongata: controls heart rate, blood pressure, breathing, swallowing
7. spinal cord: carries sensory messages from receptors to brain and relays motor nerve messages from the brain to muscles, organs and glands
10. cerebellum: muscle coordination/balance

## A 28

Rods and Cones.

**Rods:** photoreceptors operate in dim light to detect light in black and white

**Cones:** photoreceptors that operate in bright light to detect color

## A 27

1. Occipital lobes: process visual information
2. Parietal lobes: receive sensory information from the skin, and process information about body position
3. Frontal lobes: associated with intelligence and personality; control voluntary muscle movements.
4. Temporal lobes: auditory reception

## A 30

The cochlea converts the mechanical energy of sound into nerve impulses that are transmitted to the temporal lobe of the brain

## A 29

- 1 pinna: amplifies sound and focuses vibrations into the auditory canal
- 2 tympanic membrane: vibrates in response to sound waves
- 3 ossicles: amplifies sound vibrations and carry sound to the middle ear
- 4 semicircular canals: mechanoreceptors filled with fluid that detect body and head motion
- 5 organ of Corti: fluid filled; contains cochlea
- 6 auditory nerve:
- 7 Eustachian tube: air-filled tube of the middle ear that equalizes pressure