**Homework4-2020**

1. Give examples of neurotransmitters in each of the following categories:

Biogenic amine: epinephrine, norepinephrine, histamine and 5-HT (serotonin)

Amino acid: glutamate, aspartate and glycine.

Peptide: substance P, opioid peptide and neuropeptide.

2. Is a serotonin reuptake inhibitor an agonist or an antagonist? Explain.

It is an agonist. Serotonin reuptake inhibitor such as Prozac can inhibit decreasing of serotonin concentration in synaptic cleft so that serotonin continuously interact with its receptors and perform down-stream effects.

3. What criteria define a classic neurotransmitter?

1) The substance must be present in presynaptic neuron.

2) It can be released respond stimulation of presynaptic neuron and the release must be trigged by Ca2+.

3) There are specific receptors of the substance on postsynaptic plasma membrane.

4. List the steps involved in chemical neurotransmission.

1. Loading transmitter into vesicles.
2. The mobilization of vesicle to plasma membrane.
3. An action potential induces opening of voltage-gated Ca2+ channels
4. Ca2+ concentration increase in cytoplasm.
5. Fusion between vesicle membrane and plasma membrane.
6. Neurotransmitters were released into synaptic cleft.
7. Interaction between neurotransmitters and receptor.
8. Opening or closing of ion channels on postsynaptic membrane.
9. Increasing or decreasing of ion current changes postsynaptic membrane potential and causes other biological effects.
10. Removal or degradation of transmitters.
11. Retrieval of vesicular membrane from plasma membrane.

5. What are the two major inhibitory neurotransmitters in the brain? The reversal potential of their corresponding receptors must be lower than: (1) Resting membrane potential; (2) Action potential threshold

They are GABA and glycine and the reversal potential must be lower than **action potential threshold**.

6. What is the glutamate–glutamine cycle?

After glutamate released, it can be transported into glial cell and converted to glutamine by glutamine synthetase. Then glutamine will be released by transporter on glial cell membrane and transported into presynaptic plasma again. In presynaptic plasma glutamine is degraded to glutamate by glutaminase.

**Key Terms**

Nicotinic Ach receptor

AMPA receptor

biogenic amine

dopamine

endocannabinoid

glutamate-glutamine cycle

neuropeptide

nicotine

NMDA receptor

noradrenaline

pre-propeptide

serotonin

vesicular transporter

CaMKII

PSD

Reversal potential

Spine

NO