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Part A – Multiple Choice (20 points) – circle the letter of the correct answer

1. The hormone epinephrine is secreted from the
a. anterior pituitary.
☒ b. adrenal cortex.
c. thyroid.
d. adrenal medulla.
2. Peptide hormones typically affect a cell by
a. entering the cell and providing a source of metabolic energy.
b. interacting with specific receptors located in the cell nucleus.
c. binding to DNA and altering gene expression.
☒ d. binding to receptors on the cell membrane and causing the release of second messengers.
3. Some flowers attract bees by releasing _____ into the air.
a. nectar
b. pheromones
c. pollen
☒ d. allomones
4. Neuronal and hormonal communication both involve
a. all-or-none impulses.
☒ b. specialized receptor molecules.
c. movement of materials through the bloodstream.
d. voluntary control.
5. _____ hormones directly affect the secretion of endocrine glands.
a. Posterior pituitary
b. Endocrine
☒ c. Releasing
d. Tropic
6. Which of the following is true about secondary sex characteristics?
a. Mean age at puberty is increasing.
☒ b. Testosterone promotes development of male secondary sex characteristics such as muscular development, facial hair, and voice deepening.
c. In both males and females, estradiol promotes skeletal growth.
d. Changes in the quantity and distribution of fat is promoted by testosterone.
7. Müllerian ducts develop to form
a. internal male reproductive structures.
b. labia.
☒ c. internal female reproductive structures.
d. ovaries.
8. Sperm and ova are known as _____, and when they fuse they form a(n) _____.
☒ a. undifferentiated cells; zygote
b. zygotes; embryo
c. zygotes; gamete
d. gametes; zygote

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- ✓ 9. Injecting leptin directly into the brain is most effective in changing feeding behavior and body weight if the target of the injection is the
- ☒ a. hypothalamus.
 - b. cortex.
 - c. choroid plexus.
 - d. pituitary.
- ✓ 10. Amino acids that are not manufactured by our bodies are called:
- a. obligatory.
 - b. inorganic.
 - ☒ c. essential.
 - d. dietary.
- 7 32 13
30 15
X 11. Stages 3 and 4 SWS are especially prominent during _____ of a night's sleep.
- a. sleep periods during the last half
 - b. sleep periods during the first half
 - c. only the last complete cycle
 - ☒ d. the middle third
- 7
✓ 12. Electrical stimulation of the reticular formation leads to immediate
- a. SWS.
 - b. REM sleep.
 - ☒ c. awakening.
 - d. PGO waves.
- X 13. Sleep that immediately follows a period of learning has the apparent effect of
- a. blocking long-term retention.
 - ☒ b. improving long-term retention.
 - c. undoing the learning.
 - d. impairing retrieval of the learned material.
- ✓ 14. The striped appearance of muscle fibers is due to the regular arrangement of thick _____ filaments and thin _____ filaments.
- a. extrafusal; intrafusal
 - ☒ b. myosin; actin
 - c. intrafusal; extrafusal
 - d. afferent; efferent
- X 15. Stretch of a muscle first activates
- a. spinal motoneurons.
 - ☒ b. muscle spindles.
 - c. gamma efferents.
 - ☒ d. slow motor fibers.
- ✓ 16. For a joint to straighten,
- a. Both the flexor and extensor contract.
 - b. Both the flexor and extensor relax.
 - c. Flexor contracts and extensor relaxes.
 - ☒ d. Extensor contracts and flexor relaxes.
- muscle



- ✓ 17. Patients with alcoholism often have damage to the _____, which results in impaired gait.
a. basal ganglia
b. cerebellum
c. Spinal ventral horns
d. primary motor cortex
- ✓ 18. Compared to premotor cortex, M1 is thought to be more involved in
a. imagining movement
b. timing and coordination of movement
c. the generation of movement commands and initiating movements
d. planning spatial and temporal features of movement
- ✓ 19. The fundamental initial pathological change in Parkinson's disease is
a. death of neurons of the substantia nigra.
b. destruction of the caudate and putamen.
c. decreased availability of serotonin.
d. atrophy of motor cortex.
- ✓ 20. Myasthenia gravis is thought to be caused by
a. toxins that block neuromuscular junctions.
b. antibodies that attack acetylcholine receptors.
c. deficient development of neuromuscular junctions.
d. excessive synapse elimination.

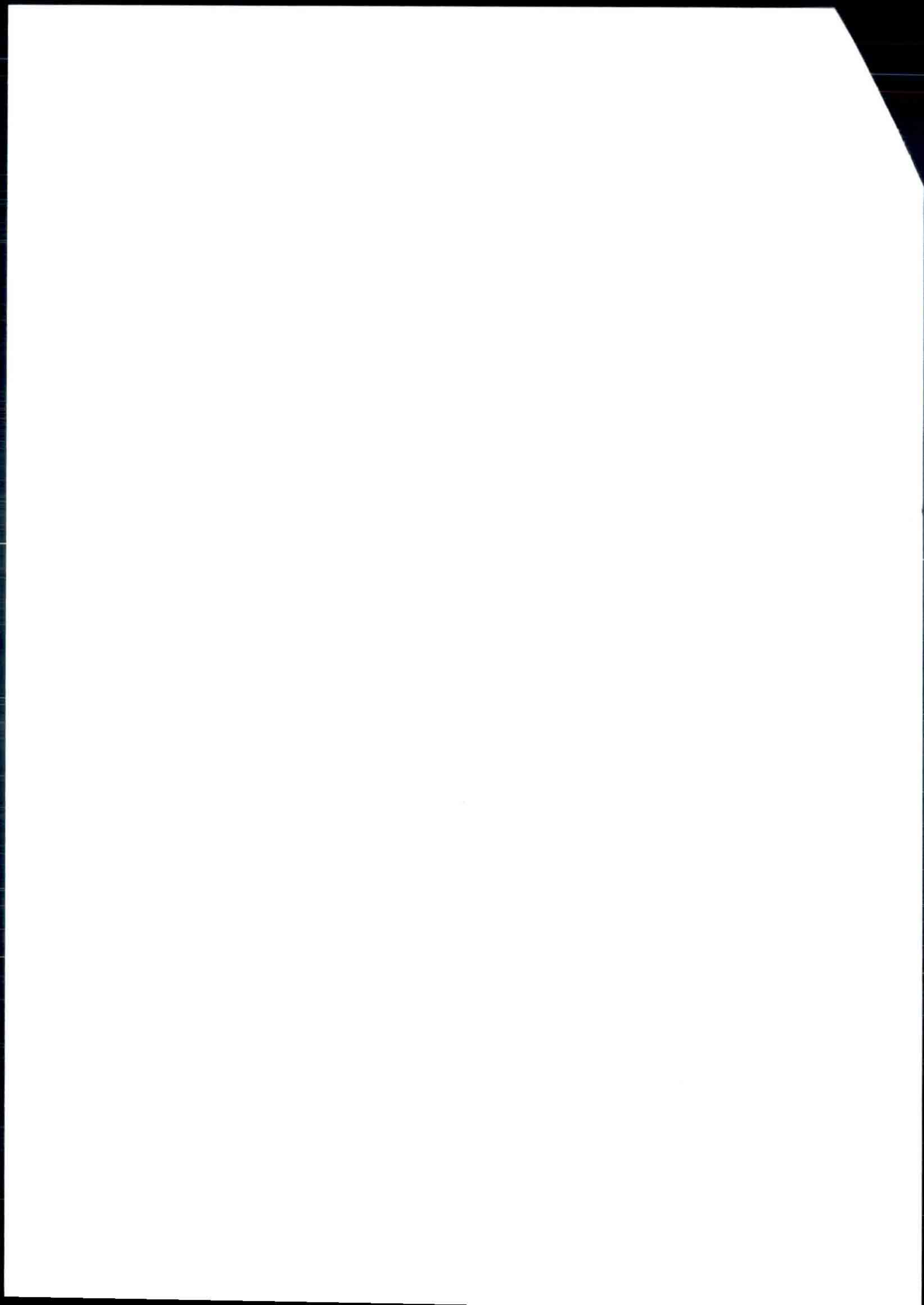
SMA → sequencing
PMA → hold motor plan

muscle atrophy

13
20

Part II – Short Answer (1.5 points each X 20 = 30 points)

- ✓ 1. steroid hormones are derived from 4 rings of carbon atoms.
- ✓ 2. The corpus luteum releases estradiol and progesterone, which promotes pregnancy.
- X 3. Stimulation of the nipple of a breast-feeding mother stimulates the release of milk from the maternal pituitary.
(anti-müllerian hormone)
- X 4. The hormone promoting the development of the Wolffian system is AMH.
- ✓ 5. An XO genotype would have a male / female phenotype (circle the correct answer).
- X 6. Male rats do not engage in sexual behavior during the resting period that follows ejaculation.



- ✓ 7. Water moves between the intracellular and extracellular compartments by Osmosis.
- ✓ 8. The type of diabetes which develops late in life (that is, not during childhood), is called type II.
- ✗ 9. While the Ventromedial Hypothalamus (VMH) is involved in the feeling of fullness, the Hypothalamus is involved in the feeling of hunger. (Lateral).
- ✓ 10. An organism's ability to adjust its physiological processes to maintain equilibrium is called homeostasis.
- ✓ 11. Physiological regulation of body temperature, via autonomic responses like shivering, is especially affected by lesions of the posterior hypothalamus (hypothalamus) PAXA PAXO PAX.
- ✓ 12. When the body temperature increases too much, some proteins in the body stop functioning. This condition is called hyperthermia.
- ✓ 13. A diurnal animal usually sleeps during the night ↳ day.
- ✗ 14. Melatonin pills have become popular as a sleep aid and seem to reduce the effects of onset insomnia.
- ✓ 15. During REM sleep we have very vivid dreams sleep.
- ✗ 16. Name at least 2 biological functions of sleep repairment of damage enabling and growth and memory enhancement.
- ✓ 17. A single motor axon and all the muscle fibers it innervates are called a motor unit.



- ✓ 18. Which disease is related to the degeneration of the substantia nigra?
Parkinson
- ✓ 19. Which part of the neuron is most likely to be accidentally cut? axon
- ✓ 20. Damage to the spinal cord at the cervical level would cause quadraplegia

22
30

Part III – Essay Questions. Answer 5 of the following 9 questions (8 points each, total of 40 points). You may answer up to 1 additional question for 8 additional points of extra credit. At the beginning of your answer, write the number of the question you are answering. You may continue on the other side of the page if needed. 6

- ✗ 1. Explain, with examples, how differences in reproductive investment affect differences between male and female sexual strategies.
- 2. What are the problems posed by homosexuality to evolutionary theory, and how does evolutionary theory respond to them?
- ✗ 3. Explain the “good genes” theory of sexual selection, and provide examples of the behavior it explains.
- 4. Give at least 7 general principles of hormone action. pharmacokinetics transport
- ✗ 5. Describe the involvement of genes and hormones in proper development of male anatomy.
- ✗ 6. Compare and contrast ectothermic and endothermic regulation of body temperature, illustrating your answer with specific examples of each type.
- ✗ 7. Discuss the role of the basal ganglia in motor control, illustrating your answer with at least one human clinical example.
- ✗ 8. Describe three phases in the involvement of glucose in feeding behavior. low → eat → high → stop → use of ① ② ③ -insulin?!
- ✗ 9. Describe some of the major sleep disorders, their apparent causes, and the currently available treatments.



This page for essay questions

1. ^{Females} ~~reproductive~~ investment a lot in raising their offspring and therefore are very focused in choosing males with healthy genes to ensure the offspring's survival. ^{why?}
- Males want to pass on their genes and therefore want to mate with as many females as possible and are thus less picky than females in choosing a partner. ^{why?} What is the cause for the differences? ⁻²
- Males attract females through for example their bowles, (bowle bird) females choose the one that is the biggest and best, since that represents a strong and healthy male with good genes. They mate and the female leaves to raise their children, whereas the male is straight away ready to mate again with a new female.
3. ~~The "good gene" theory says that animals choose their partners according to their genes, so the best genes get passed on, thus the survival of the species. Good genes are represented in specific physical patterns. Like orange color in ^{some} ~~guppies~~ birds that comes along through carotene, what represents a good food intake and thus a healthy body. ^(or bright colors) ~~songs~~~~
5. Up to the 6th week of pregnancy ~~gender (the gonates) are~~ ^{gender (the gonates) are} not specified and both the Mullerian and Wulfian duct are present. When there is the SRY gene expressed in the Y chromosome, ^(the determining factor) the gonates develop to testies. Testies release AMH and Testosterone. The Anti-mullerian hormone ~~depresses~~ ^{depresses} the Mullerian duct and testosterone leads to the development of internal sex organs. ^{(like} prostate) ~~and~~ ^{like} 5 α -reductase converts testosterone in DHT, that leads to the development of the external genitalia. ^{(like the} penis and ^{testicles} ~~testes~~) In puberty secondary sex characteristics (like hair on the chest, deeper voice etc.) by the release of LH and FSH from the anterior pituitary gland.
6. Ectothermic regulation $\rightarrow$ Amphibians and reptiles use external factors to maintain their core temperature. For reducing the body temperature they retreat in the shade and for increasing it they take a sun bath.
- Endothermic regulation $\rightarrow$ animals rely on internal, metabolic processes to maintain their temperature setpoint. (mammals) To increase the core temperature the body increases metabolic rate by releasing thyroid hormones from the thyroid glands.
- Arteries constrict to reduce heat loss and muscle activity increases in form of shivering to produce heat.

To decrease ^{body} ~~core~~ temperature arteries ^{become placed} ~~go~~ close to the surface to increase
✓ heat loss. We sweat to cool down our body and the metabolic rate
_(lead to a red face for example)
decreases.

This page for essay questions

(caudate nucleus, globus pallidus and putamen)

7. The basal ganglion contains three nuclei, that get input from the cortex and the substantia nigra and send signals to the thalamus, contributes to the ventromedial pathway, motor cortex.

The basal ganglion decides whether to induce a voluntary movement or not, only when the signal passes the basal ganglion in a sufficient strength the voluntary movement gets implemented. Furthermore it can inhibit structures like the thalamus and thus controls action and has a function in motor learning and sequencing.

For example in Huntington disease the basal ganglion activity is inhibited ^{reduces the ability for} what ~~makes~~ controlled movements problematic and leads to chorea, dance-like, jerky movements.

Another example is Parkinson, dopamine activity in the basal ganglion is reduced and voluntary movement is impaired. For example movements slow down and tremor occurs, and joints stiffen.

8. When glucose levels are low our body needs energy signaling us hunger (drive experience)

① When food is presented insulin levels rise, insulin is responsible to help glucose

② to pass the cell membrane ^{to convert and store glucose} by interacting with and to transform glucose into glycogen that can be stored in body cells. When we eat, glucose and insulin levels raise further, till we gained enough food and we feel satiety. ^{Glucose - after all glucose is used off}

③ Insulin levels drop and glucose levels as well, the body then starts using off stored glycogen by using glucagon to convert it back into glucose.

9. Sleep disorders are divided into two groups Dissomnia and Parasomnia. Dissomnia is when we have problems initiating, maintaining sleep, with sleep quality.

One example is sleep apnea, breathing sets out for a view seconds and we wake up gasping for air. We soon fall back asleep but our sleep quality is reduced. A common increasing the risk for sleep apnea is obesity. ^{treatment?} Insomnia is another disorder that leads us to problems with sleep. It is divided into onset and maintenance insomnia, problems to fall asleep and to stay asleep. Medications like benzodiazepines make us fall asleep earlier (~15 min) and sleep longer (~30) but do not lead to a severe improvement. It might help to write a to do list before going to sleep.

* Obesity leads to snoring, interfering with the flow of breathing. A diet can reduce it.



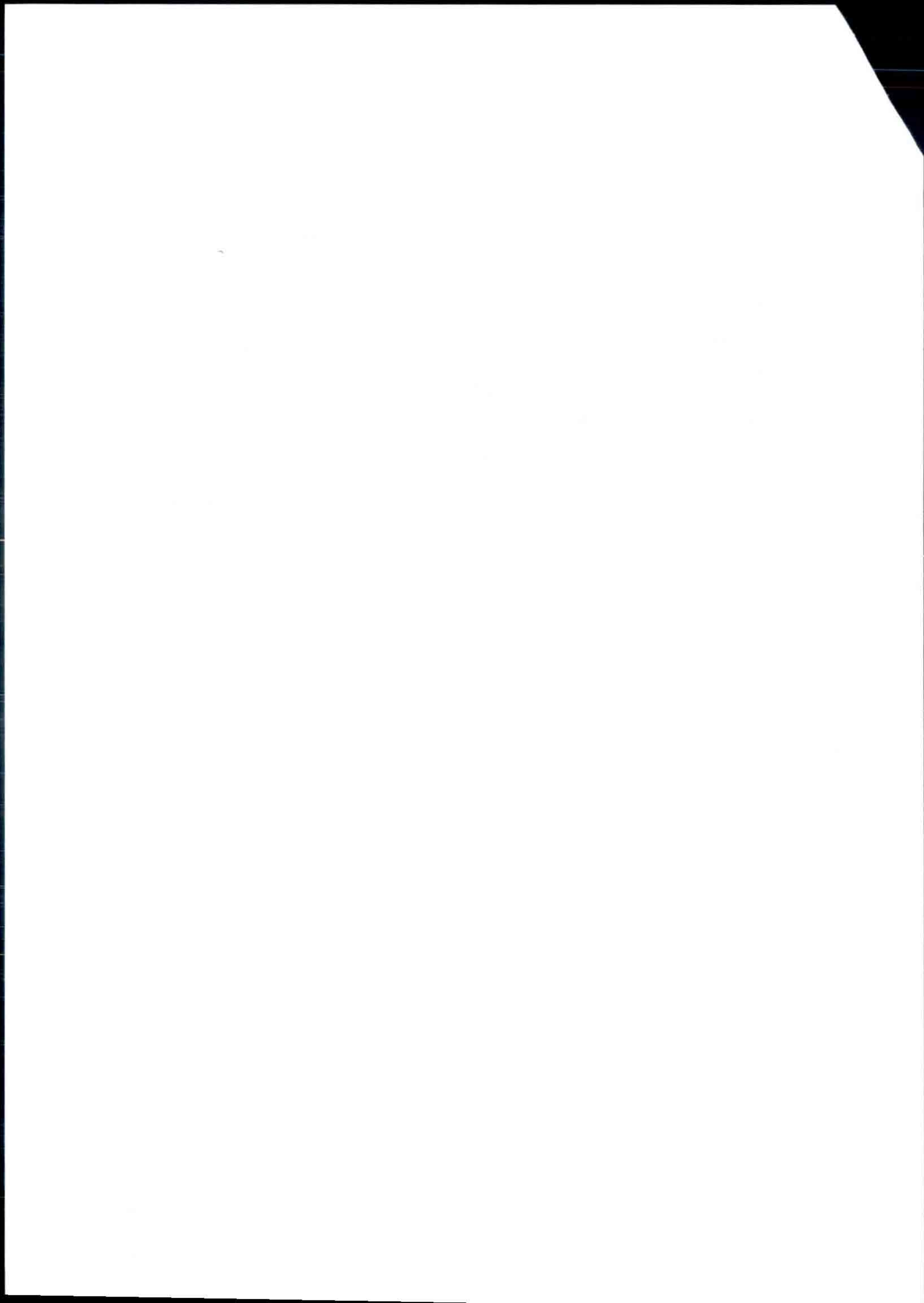
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✓ and to ~~watch out~~ maintain a regular sleeping rhythm. Insomnia can result from stress.

✓ Parasomnias lead to disruption of sleep. Examples are nightmares that disturb children often more than adults but can be reduced by lucid dreaming the understanding that we are just dreaming and can consciously interfere.*
Night terrors ~~often~~ occur more in childhood and than reduce, in adults psychopathology and drug use, anxiety might lead to Night terrors as well as PTSD. REM sleep behavior disorder is another example. Our body does not experience paralyzes during REM sleep, so we start acting out our dreams, destroying furniture or hurting our sleep partner. Medications like melatonin or benzodiazepins might help.

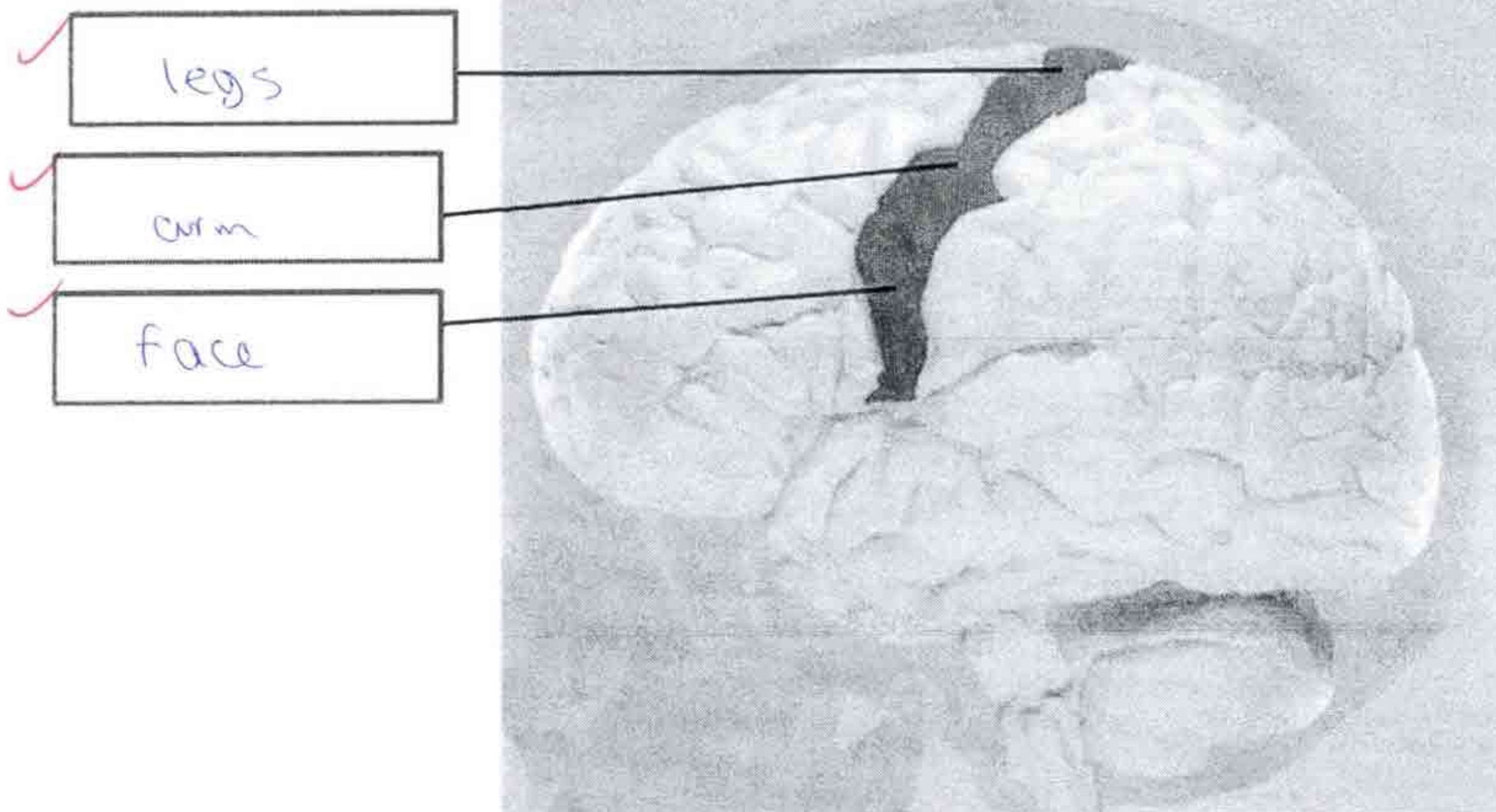
You were allowed to answer up to 6 questions only →
therefore we referred to the 6 first answers only!

* Nightmares often increase after upsetting entertainment or, natural catastrophes.
experiencing



Part IV - Picture labeling – 10 points

Label which part of the motor homunculus maps the arm, face, and leg (4 points).



Label the three major areas of motor cortex (6 points):

