

Anatomy & Physiology of Domesticated Animals — Exam 4

Section I – True/False (Explain if False)

1. _____ The medulla of the kidney contains the nephrons. – F

Explanation: The cortex contains the nephrons (glomerulus + tubules). The medulla mainly contains loops of Henle and collecting ducts.

2. _____ The glomerulus filters small solutes from the blood. – T
3. _____ Basophils are the main phagocytic cells of the immune system. – F

Explanation: Neutrophils and macrophages are the main phagocytes. Basophils release histamine and other inflammatory mediators.

4. _____ Transitional epithelium lines the urinary tract. – T
5. _____ The ureters store urine until it is released. – F

Explanation: Ureters transport urine from the kidneys to the bladder. The bladder stores urine.

6. _____ Cytokines are signaling proteins that help recruit more immune cells. – T
7. _____ Ruminants perform microbial fermentation in the abomasum. – F

Explanation: Microbial fermentation occurs in the rumen. The abomasum performs enzymatic digestion.

8. _____ The pancreas produces digestive enzymes that break down carbohydrates, proteins, and lipids. – T
9. _____ Oxytocin causes smooth muscle contraction. – T
10. _____ All hormones can pass directly through the cell membrane. – F

Explanation: Only steroid hormones can pass through membranes. Peptide/protein hormones require second messengers.

11. _____ Adaptive immune responses are immediate and inherited. – F

Explanation: Adaptive immunity develops over time and is specific. Innate immunity is immediate and inherited.

12. _____ Urine normally contains red blood cells. – F

Explanation: Healthy urine contains no red blood cells. Presence of RBCs indicates a problem like infection, trauma, or kidney disease.

13. _____ Ghrelin stimulates hunger. – T

14. _____ The omasum receives food directly from the abomasum. – F

Explanation: Food moves in this order: rumen → reticulum → omasum → abomasum. The omasum comes before the abomasum.

15. _____ Antigens are substances capable of initiating an immune response. – T

Section II – Multiple Choice (Choose the best answer)

1. Which cells participate in memory and long-term adaptive immunity?

- a) Neutrophils
- b) B cells and T cells
- c) Basophils
- d) Macrophages

Answer: b) B cells and T cells

2. Which structure houses the nephron?

- a) Medulla
- b) Hilus
- c) Cortex
- d) Renal pelvis

Answer: c) Cortex

3. What type of epithelial tissue lines the urinary bladder?

- a) Simple squamous
- b) Transitional epithelium
- c) Stratified columnar
- d) Simple cuboidal

Answer: b) Transitional epithelium

4. Which antibody type is associated with allergies?

- a) IgA
- b) IgG
- c) IgM
- d) IgE

Answer: d) IgE

5. What hormone stimulates milk let-down and smooth muscle contraction?

- a) Cortisol
- b) Oxytocin
- c) Insulin
- d) Aldosterone

Answer: b) Oxytocin

6. What process occurs in the glomerulus?

- a) Hormone secretion
 - b) Filtration of small solutes from blood
 - c) Water absorption
 - d) Enzymatic digestion
- Answer: b) Filtration of small solutes from blood

7. Which immune cells are responsible for phagocytosis in the innate immune system?

- a) Basophils and eosinophils
- b) T cells and NK cells
- c) Neutrophils and macrophages
- d) Lymphocytes

Answer: c) Neutrophils and macrophages

8. The ruminant compartment responsible for waste removal and regurgitation is:

- a) Omasum
- b) Abomasum
- c) Rumen
- d) Reticulum

Answer: d) Reticulum

9. Which hormone lowers blood glucose after a meal?

- a) Glucagon
- b) Epinephrine
- c) Insulin
- d) Melatonin

Answer: c) Insulin

10. Which class of hormones requires a second messenger?

- a) Steroid hormones
- b) Peptide hormones
- c) Amine hormones
- d) All hormones

Answer: b) Peptide hormones

11. What is the primary function of the endocrine system?

- a) Blood filtration
- b) Breakdown of nutrients
- c) Regulation of growth, metabolism, and homeostasis
- d) Oxygen transport

Answer: c) Regulation of growth, metabolism, and homeostasis

12. Which hormone is released by the adrenal gland during stress?

- a) Melatonin
- b) Cortisol
- c) Insulin
- d) Calcitonin

Answer: b) Cortisol

13. Which digestive enzyme is responsible for breaking down lipids?

- a) Amylase
- b) Lipase
- c) Pepsin
- d) Protease

Answer: b) Lipase

14. What structure is responsible for suspending the female reproductive tract from the dorsal body wall?

- a) Cervix
- b) Oviduct
- c) Broad ligament
- d) Urethra

Answer: c) Broad ligament

15. Which ruminant stomach compartment is primarily responsible for water absorption?

- a) Rumen
- b) Reticulum
- c) Omasum
- d) Abomasum

Answer: c) Omasum

16. Which structure forms a protective seal between the uterus and vagina?

- a) Vulva
- b) Cervix
- c) Urethra
- d) Infundibulum

Answer: b) Cervix

17. What type of feedback loop is involved when T3/T4 inhibits TRH and TSH release?

- a) Positive feedback
- b) Paracrine signaling
- c) Negative feedback
- d) Somatic response

Answer: c) Negative feedback

18. Which nutrient class is considered the most essential for life?

- a) Proteins
- b) Lipids
- c) Water
- d) Vitamins

Answer: c) Water

19. What hormone increases hunger and stimulates ingestion?

- a) Ghrelin
- b) Glucagon
- c) Progesterone
- d) Epinephrine

Answer: a) Ghrelin

20. Where does enzymatic digestion occur in ruminants?

- a) Rumen
- b) Omasum
- c) Reticulum
- d) Abomasum

Answer: d) Abomasum

21. Which hormone is involved in stress and secreted by the adrenal cortex?

- a) Aldosterone
- b) Cortisol
- c) Epinephrine
- d) Insulin

Answer: b) Cortisol

22. What cell type presents antigens via MHC II?

- a) B cells
- b) Neutrophils
- c) Parietal cells
- d) Leydig cells

Answer: a) B cells

23. The corpus luteum produces which hormone?

- a) Estrogen
- b) Progesterone
- c) LH
- d) GnRH

Answer: b) Progesterone

Section III – Matching

Match each item to its correct definition or function.

- A. Neutrophil
- B. Basophil
- C. Eosinophil
- D. Macrophage
- E. Antigen
- F. Cytokines
- G. Transitional Epithelium
- H. Cortex
- I. Medulla
- J. Reticulum

- _____ Signaling proteins that recruit additional immune cells – F
- _____ Inner portion of the kidney, darker in appearance – I
- _____ The ruminant stomach compartment responsible for initiating regurgitation – J
- _____ Tissue that stretches to line the urinary bladder and urinary tract – G
- _____ A large phagocytic cell that originates from a monocyte – D
- _____ The outer kidney region where nephrons are housed – H
- _____ Immune cell active during parasitic infections and allergic reactions – C
- _____ A foreign molecule capable of triggering an immune response – E
- _____ Immune cell that releases histamine during allergic responses – B
- _____ Fast-acting phagocyte involved in innate immunity – A
- _____ Stretchable epithelial tissue that prevents urine diffusion – G
- _____ Immune cell active in parasitic defense and hypersensitivity reactions – C
- _____ Chemical messengers used for cell-to-cell immune communication – F
- _____ Structure involved in trapping foreign material that stimulates rumination – J
- _____ First line phagocyte that rapidly responds to bacterial infection – A
- _____ Kidney layer containing renal corpuscles and the majority of nephrons – H
- _____ Foreign substance recognized by the immune system – E
- _____ Phagocytic cell that engulfs pathogens and presents antigens – D

_____ Cell type that participates in allergic reactions by releasing histamine – B

_____ Kidney region responsible for collecting ducts and concentration of urine – I

Section IV – Short Answer

1. Define innate vs. adaptive immunity.

- Innate immunity is present at birth, provides fast, nonspecific defenses, and uses cells like neutrophils, macrophages, skin, and mucous membranes.

Adaptive immunity develops over time, involves memory, and uses B and T cells to target specific antigens.

2. What is the function of the renal system?

- Regulates blood volume and pressure, ion concentration, pH balance, removes waste, and reabsorbs nutrients; forms urine.

3. Describe the three modes of hormone transmission.

- Endocrine: Hormone travels through the bloodstream to distant tissue.
- Paracrine: Hormone acts on nearby cells.
- Autocrine: Hormone acts on the same cell that secreted it.

4. What is microbial fermentation and where does it occur?

- Breakdown of roughages by microbes, producing volatile fatty acids.
- Occurs in the rumen of ruminants and cecum of hindgut fermenters.

5. List the digestive enzymes and their functions.

- Amylase: Digests carbohydrates
- Lipase: Digests lipids
- Protease: Digests proteins
- Pepsin: Active form of pepsinogen; digests proteins in stomach

6. What is Digestion?

- The process of breaking down food using mechanical, enzymatic and microbial digestion

7. Explain the process of Urine Formation?

1. Glomerular Filtration of blood
2. Tubular Reabsorption
3. Secretion of Urine

8. What is the difference between Pathogen and Antigen?

- Pathogen - any organism that can cause harm
- Antigen - has an ability to cause an inflammatory response

9. Control of water retention is controlled by _____, which is secreted by the _____.

- ADH, and Anterior Pituitary

10. What is the broad ligament ?

- Supports the female reproductive organs made of connective tissue

11. What are the 6 essential nutrients?

- Water, Carbohydrates, Lipids, Proteins, Vitamins, Minerals

Section V – Extended Response

1. Describe the structure and function of the nephron.

- Glomerulus (filters solutes from blood)
- PCT (reabsorbs ions, water, nutrients; adjusts pH)
- Descending loop (water exits via aquaporins)
- Ascending loop (reabsorbs Na^+ and Cl^-)
- Distal tubule (ion balance + pH regulation)
- Collecting duct (reabsorbs water/solute; produces final urine)

2. Explain the inflammatory response.

- Mast cells release histamine, causing vasodilation.
- The four signs: heat, pain, redness, swelling.
- This increases blood flow, brings immune cells, and isolates pathogens.

3. Describe the digestive process from start to finish.

- Prehension → Mastication → Deglutition → Regurgitation (ruminants) → Digestion → Absorption → Assimilation → Egestion.

4. Discuss ways the body regulates temperature control of the testes.

- The testes are kept 5 degrees F, cooler than body temperature for proper sperm production. Temperature is regulated by:
- Cremaster muscle: Moves testes closer to or away from the body.
- Sweat Glands, help with cooling
- Pampiniform plexus: Cools arterial blood through countercurrent exchange.

5. What is the pathway of the Male Gamete out of the body?

1. Testes, produces sperm cells and testosterone
2. Epididymis, matures sperm cells to maturity
3. Vas Deferens, transports mature sperm cells to urethra during ejaculation
4. Urethra, the passage for excretion of sperm and urine but not at the same time.
5. Penis, facilitates sexual reproduction by delivering sperm cells to the female reproductive tract.

6. What are the Gonadotrophins in both Males and Females

- Males
 - FSH, Prompts Development of new sperm cells
 - LH, Prompts secretion of Testosterone, by Leydig cells
- Females
 - FSH, Prompts Follicular Growth
 - LH, Prompts ovulation and formation of corpus luteum