

**PART I.- Multiple choice questions (MCQ)-Select one correct answer and label it on the corresponding score sheet.**

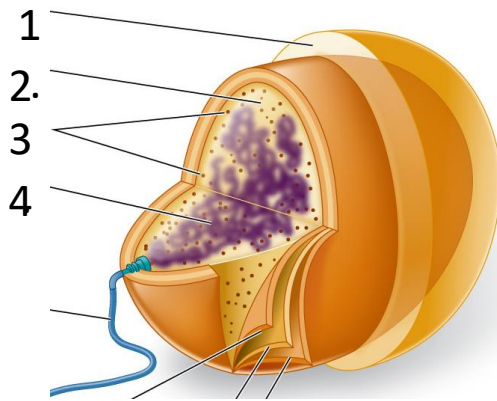
1. FSH and LH
  - A. are synthesized in the anterior pituitary.
  - B. are synthesized in the hypothalamus.
  - C. have negligible effects in male.
  - D. have negligible effects in female.
  - E. are stored in the posterior pituitary.
  
2. The velocity of blood flow is highest in
  - A. small arteries.
  - B. capillaries.
  - C. venules.
  - D. aorta.
  - E. arterioles.
  
3. What is the function of the saliva as a digestive fluid?
  - A. protein digestion
  - B. lipid digestion
  - C. nucleic acid digestion
  - D. carbohydrate digestion
  - E. vitamin digestion
  
4. What is the correct order of structures in the digestive system going from the mouth toward the anus?
  - A. pharynx, stomach, duodenum, esophagus
  - B. pharynx, esophagus, stomach, duodenum
  - C. stomach, duodenum, esophagus, pharynx
  - D. stomach, pharynx, esophagus, duodenum
  - E. stomach, pharynx, duodenum, esophagus
  
5. Choose the one FALSE statement. Hemoglobin
  - A. is composed of 4 globin chains
  - B. contains  $\text{Fe}^{2+}$  ions
  - C. is produced in the circulating red blood cells
  - D. binds  $\text{O}_2$  reversibly
  - E. binds  $\text{CO}_2$  reversibly
  
6. If 23 percent of the bases in a sample of double-stranded DNA are adenine, what percentage of the bases are guanine?
  - A. 0
  - B. 27
  - C. 73
  - D. 25
  - E. 50

## BIOLOGY SAMPLE TEST

7. The enzyme that restores the phosphodiester linkage between adjacent fragments in the lagging strand during DNA replication is
- A. DNA ligase.
  - B. primase.
  - C. reverse transcriptase.
  - D. helicase.
  - E. DNA polymerase I.
8. In Mendel's peas, tall and short plant variants resulted from differences at a single genetic locus, with tall being dominant to short. The differences between the tall and short plants were caused by their different
- A. alleles and gene pools.
  - B. gene pools.
  - C. alleles and genotypes.
  - D. alleles.
  - E. None of the above
9. Mitotic prophase differs from prophase I of meiosis in that
- A. chromatin becomes supercoiled only in mitotic prophase.
  - B. the nuclear envelope disappears only in prophase I of meiosis.
  - C. synapsis occurs only in mitotic prophase.
  - D. the chromatids separate in mitotic prophase, not in prophase I of meiosis.
  - E. crossing over is characteristic of prophase I of meiosis but not of mitotic prophase.
10. Which compounds link glycolysis and the citric acid cycle to the electron transport chain?
- A. NADH and ATP
  - B. ADP and  $P_i$
  - C.  $FADH_2$  and NADH
  - D. ATP and  $CO_2$
  - E. Pyruvate and acetyl CoA

**Section I.A Naming (5 points)**

Please name what is shown on the figure below and the structures labeled by numbers, too!



1. \_\_\_\_\_ (1)

2. \_\_\_\_\_ (1)

3. \_\_\_\_\_ (1)

4. \_\_\_\_\_ (1)

The figure shows: \_\_\_\_\_ (1)

**Section I.B. Calculation (5 points)**

Whether a pea seed is round or wrinkled is determined by a single gene called gene A, with round seeds being dominant to wrinkled seeds. In the progeny of a test cross, 900 seeds were collected. How many should be round out of the 900 seeds, if the unknown round-seeded plant being tested is heterozygous. Please give the genotypes of the testcross and genotypes of the progeny, too!

Genotypes of the testcross: \_\_\_\_\_ and \_\_\_\_\_ (1)

Genotypes of the progeny of the testcross: \_\_\_\_\_ (1)

Since \_\_\_\_\_ of the testcross progeny has \_\_\_\_\_ genotype, \_\_\_\_\_ round seeds should be present among the 900 seeds. (3)

**PART II: Multiple choice questions (MCQ)-Select one correct answer and label it on the corresponding score sheet.**

11. Which statement is true?
- A. Kaposi's sarcoma is characteristic to AIDS patients.
  - B. Anaemia perniciousa is characteristic to AIDS patients.
  - C. Hay fever is characteristic to AIDS patients.
  - D. Rheumatoid arthritis is characteristic to AIDS patients.
  - E. Diabetes mellitus is characteristic to AIDS patients.
12. Partial pressure
- A. of oxygen is almost 100 mmHg in the systemic arteries, and about 40 mmHg in the systemic veins
  - B. of oxygen is about 40 mmHg in the systemic arteries, almost 100 mmHg in the systemic veins
  - C. of CO<sub>2</sub> is almost 100 mmHg in the systemic arteries, and about 40 mmHg in the systemic veins
  - D. of CO<sub>2</sub> is about 40 mmHg in the systemic arteries, almost 100 mmHg in the systemic veins
  - E. of oxygen is almost 100 mmHg in the pulmonary arteries, and about 40 mmHg in the pulmonary veins
13. Choose the one FALSE statement. Involved in the regulation of the breathing:
- A. Pons
  - B. Medulla oblongata
  - C. Cervical spinal cord
  - D. Lumbar spinal cord
  - E. Carotid body
14. Choose the one FALSE statement. Which of the followings take place during the systole?
- A. Contraction of the ventricles
  - B. Relaxation of the ventricles
  - C. Increase of the pressure in the left ventricle
  - D. Increase of the pressure in the aorta
  - E. Decrease of the left ventricular volume
15. Choose the one FALSE statement. Progesterone...
- A. prepares uterus for pregnancy.
  - B. prepares mammary glands for lactation.
  - C. is a peptide hormon.
  - D. inhibits the secretion of LH.
  - E. increases the body temperature.

16. Which protein is *not* part of the structure of a cilium?
- A.  $\alpha$ -tubulin
  - B. Keratin
  - C. Nexin
  - D. Dynein
  - E.  $\beta$ -tubulin
17. The statement “enzymes are highly specific” means that specific
- A. enzymes are found in specific cells
  - B. enzymes require specific concentrations of substrates.
  - C. reactions with specific activation energies are catalyzed by specific enzymes.
  - D. reactions involving specific substrates are catalyzed by specific enzymes.
  - E. concentrations of substrates work with specific enzymes.
18. The conversion of malate to oxaloacetate in the citric acid cycle takes place with the conversion of  $\text{NAD}^+$  to  $\text{NADH}$ . In this reaction,  $\text{NAD}^+$  is a(n)
- A. reducing agent.
  - B. oxidizing agent.
  - C. allosteric inhibitor.
  - D. allosteric activator.
  - E. feedback inhibitor.
19. Which of the following provides the correct order of events in the synthesis of the lagging strand?
- A. Primase adds RNA primer, DNA polymerase III creates a segment of new DNA, DNA polymerase I removes the primer, and ligase seals the gaps.
  - B. Primase adds primer, DNA polymerase I removes the primer, DNA polymerase III extends the segment, and ligase seals the gap.
  - C. Ligase adds bases to the primase, the primase generates polymerase I, polymerase III adds to the segment of new DNA, and helicase winds the DNA.
  - D. Helicase unwinds the DNA, primase creates a primer, DNA polymerase I elongates the segment of new DNA, DNA polymerase III removes the primer, and ligase seals the gaps in the DNA.
  - E. None of the above
20. A codon is \_\_\_\_\_ nucleotides long, and there are \_\_\_\_\_ different possible codons in total.
- A. 2; 16
  - B. 3; 64
  - C. 2; 64
  - D. 4; 64
  - E. 3; 16

## Section II.A.

## II. A. 1. Calculation (5 points).

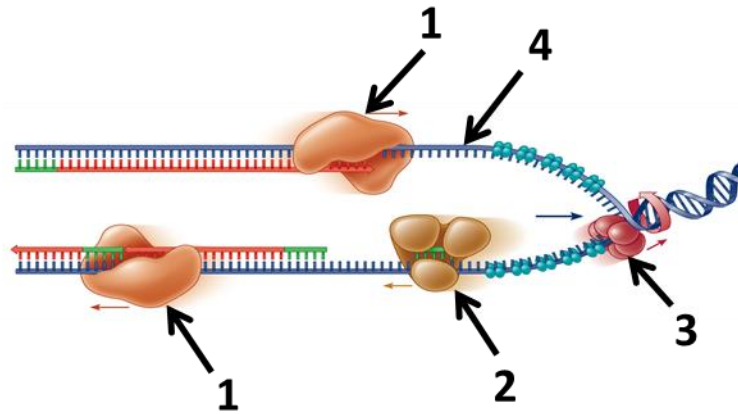
The scientists determined the mean diameter of muscle fibres in trained mice using an optical microscope to examine sections of muscle tissue. The circular area of one field of view was  $1.25 \text{ mm}^2$ . The diameter of this area was equal to the diameter of 15 muscle fibres.

Using this information, calculate the mean diameter in  $\mu\text{m}$  (micrometres) of muscle fibres in this section of tissue.

Answer= \_\_\_\_\_  $\mu\text{m}$

## II.A.2.Describe (5 points):

Please describe characteristics of the process shown on the figure below.



The figure represents \_\_\_\_\_. (1)

The aim of the process is to \_\_\_\_\_. (1)

The major enzyme required for the process is the \_\_\_\_\_. (1)

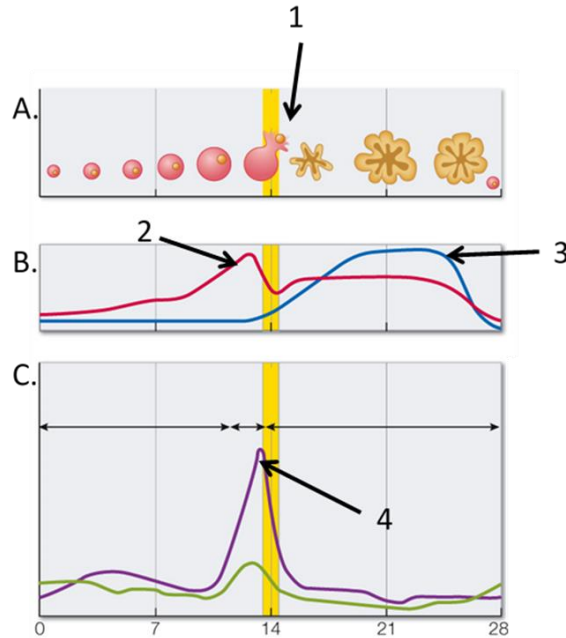
The \_\_\_\_\_ strand is labeled by 4. (1)

The function of the enzyme labeled by 2 is to synthesize the \_\_\_\_\_. (1)

## Section II. B.

## II.B.1. Problem solving (one graph and multiple questions about that) (7)

The figure shows events and regulators of the female ovarian cycle.



(A) The process shown progresses from the development of \_\_\_\_\_ to \_\_\_\_\_ and then to growth and finally to degeneration of the \_\_\_\_\_. (3)

The event labeled by **1**. is the \_\_\_\_\_. (1)

(B) Part B shows levels of hormones that stimulate the development of the endometrium in preparation for pregnancy. Hormone **2** is \_\_\_\_\_ and hormone **3** is \_\_\_\_\_. (2)

(C) The hormone labeled by **4** is \_\_\_\_\_. (1)

**II.B.2. Problem solving. The table shows three statements about some biological molecules. Fill the table by T (TRUE) and F (FALSE) signs appropriately. (3)**

Statement	Facilitated transport	Active transport
Transport through intrinsic membrane		
Requires ATP		
From high to low concentration		