

Date: 12-Dec-2017  
Time: 2:00 – 5:00 PM

**BIO F111 General Biology**  
**COMPREHENSIVE EXAMINATION**

Max. Marks: 80  
Weightage: 40%

Id. No.:

Name:

Tut. Sec. No.

- Attempt Section-I (closed-book) before proceeding with Section-II (open-book).
- The suggested time for working on Section-I is 45 minutes.
- Upon submission of the closed-book section, you can begin the open-book section.

20 marks (10%)

**PART-I (Closed-book)**<sup>3</sup>/<sub>4</sub> hr.

1. Heterozygous black guinea pigs (Bb) are crossed among themselves. What is the probability of the first three offspring being alternately black-white-black or white-black-white? Show your calculations also. [2]

$$P(\text{B-W-B or W-B-W}) = P(\text{B-W-B}) + P(\text{W-B-W})$$

$$= \frac{3}{4} \times \frac{1}{4} \times \frac{3}{4} + \frac{1}{4} \times \frac{3}{4} \times \frac{1}{4}$$

$$= \frac{12}{64} = \frac{3}{16}$$

For Q.2 through Q.25, from the multiple choices of answers, choose all correct answers and write their corresponding letters of the alphabet in the box. A question may have more than one correct answer. Credit will be given only if you pick all correct options, and only correct options. [24 x <sup>3</sup>/<sub>4</sub> = 18]

#	Answers
2	D, E
3	A
4	B, C, D
5	C
6	A, B, C, D
7	D, E
8	A, B, D
9	C, E
10	A, C
11	E
12	C
13	A, B, C, D

#	Answers
14	A, B, C
15	D
16	A
17	C
18	D
19	A, D
20	B
21	E
22	D, E
23	D
24	C
25	A

2. Which one of the following statements is true?

- A) Meiosis in spermatogenesis produces two spermatids starting from one primary spermatocyte.
- B) Meiosis in oogenesis produces four mature eggs from one primary oocyte.
- C) Oogenesis begins during puberty.
- D) Spermatogenesis begins after the male reaches age of puberty.**
- E) Oogenesis in humans is completed after stimulation by sperm.

3. Which one of the following correctly pair(s) the structure with its major function(s)?

- A) hypothalamus - regulates body temperature, blood pressure, and hunger**
- B) cerebellum - connects the cerebral hemispheres
- C) motor cortex - sorts data into categories and relays information on to higher brain regions
- D) thalamus - a planning center for body movements
- E) limbic system - sends commands to skeletal muscles

4. A sperm cell's acrosome \_\_\_\_\_.

- A) contains the sperm's nucleus and is the part of the sperm that enters the egg during fertilization
- B) a huge modified lysosome that is located around the anterior part of the sperm's head**
- C) contains enzymes that are released when the sperm encounters an egg
- D) is necessary for successful fertilization of the egg by the sperm**
- E) contains the sperm's mitochondria

5. The cell cycle results in the production of \_\_\_\_\_.

- A) four diploid cells, each with the same amount of genetic material and the same genetic information.
- B) two diploid cells, each with the same amount of genetic material but with different genetic information.
- C) two diploid cells, each with the same amount of genetic material and the same genetic information.**
- D) a diploid zygote.
- E) four haploid cells, each with the same amount of genetic material as the parent cell but with different genetic information.

6. The use of non-C3 and non-CAM plants as crops may be limited in some regions because on hot, dry days, they close their stomata. What happens as a result of closing their stomata?

- A) Water loss is reduced.**
- B) Carbon dioxide is prevented from entering the leaf.**
- C) In a process called photorespiration, Rubisco binds oxygen instead of carbon dioxide.
- D) Oxygen from the light reactions in the leaf builds up.**

7. Why are human testes located in an external sac rather than in the abdominal cavity?

- A) to shorten the distance that semen must travel during ejaculation
- B) to shorten the distance that sperm must swim during insemination
- C) so the testes can be kept at a constant temperature
- D) so the testes can be kept cooler than the body's interior**
- E) so that spermatogenesis can take place more efficiently**

8. Which of the following statements regarding cellular respiration and photosynthesis is/are true?

- A) Plants use the end products of both plant and animal respiration to produce foods.**
- B) Plants and animals use the end products of photosynthesis as sources of energy.**
- C) Plants do not undergo cellular respiration because their energy requirements are met during the first stage of photosynthesis.
- D)  $\text{NAD}^+$  is the electron carrier in respiration;  $\text{NADP}^+$  is the electron carrier in photosynthesis.**

9. Which of these is/are NOT correctly matched?

- A) Cocaine - blocks the reuptake of dopamine
- B) Serotonin - low amounts associated with depression
- C) GABA - excitatory neurotransmitter**
- D) Nicotine - binds to acetylcholine receptors of post-synaptic neurons
- E) Acetylcholinesterase - excitatory neurotransmitter released by the pre-synaptic neuron**

10. In each nephron of the kidney, the glomerulus and Bowman's capsule \_\_\_\_\_.

- A)** filter the blood and capture the filtrate
- B) reabsorb water into the blood
- C)** perform the process of glomerular filtration
- D) reabsorb salts and nutrients
- E) refine and concentrate the urine for excretion

11. Which of the following cells initiates an immune response by acting as an antigen-presenting cell, engulfing an invader and presenting its antigens to other immune cells?

- A) helper T cell
- B) cytotoxic T cell
- C) red blood cell
- D) bone marrow stem cell
- E)** None of these.

12. For which of the following is the number the same in spermatogenesis and oogenesis?

- A) timing of meiotic divisions
- B) functional gametes produced by meiosis
- C)** meiotic divisions required to produce each gamete
- D) different cell types produced by meiosis
- E) None of these.

13. A \_\_\_\_\_ can have more than one \_\_\_\_\_.

- A)** phenotype ... genotype
- B)** gene... allele
- C)** gene ... intron
- D)** chromosome ... gene
- E) allele ... chromosome

14. Which of the following statements regarding pornography use is/are true?

- A)** Some scientific studies have shown that it could be as addictive as cocaine or heroin.
- B)** This habit has also been linked to dysfunctional marriages that may end in divorce.
- C)** Functional MRI studies have been done to scan the brains of long-term, compulsive pornography users.
- D) The reward center of the brain is unresponsive in case of pornography users.

15. Hormones are usually transported through \_\_\_\_\_ and affect only cells with \_\_\_\_\_.

- A) ducts . . . cilia
- B) intercellular junctions . . . cell junctions
- C) microtubules . . . microvilli
- D)** blood vessels . . . specific receptors
- E) lymph vessels . . . cell membranes

16. Which one of the following describes the correct sequence of stages during embryogenesis?

- A)** cleavage, blastocyst formation, gastrulation
- B) cleavage, gastrulation, blastocyst formation
- C) blastocyst formation, gastrulation, cleavage
- D) blastocyst formation, cleavage, gastrulation
- E) gastrulation, cleavage, blastocyst formation

17. The body systems that perform respectively some generative and metabolic processes would be:

- A) Urinary and Immune systems
- B) Endocrine and Reproductive systems
- C)** Reproductive and Digestive systems
- D) Endocrine and Urinary systems
- E) Immune and Digestive systems

18. Which of the following choices do(es) NOT pair an endocrine gland or hormone with an aspect of metabolism that it regulates?

- A) testosterone - development of gonads
- B) pancreas - blood glucose levels
- C) glucagon - blood glucose levels
- D)** oxytocin - water balance in blood
- E) hCG - maintenance of corpus luteum

19. What might happen to neurotransmitters after they have carried the signal to the receiving neuron? The neurotransmitters are \_\_\_\_\_.

- A)** recycled back to the sending neuron
- B) absorbed by the receiving neuron
- C) incorporated into the membrane structure of the receiving neuron
- D)** chemically broken down

20. When in its life cycle does a B cell first exhibit its particular surface antibody?

- A) after the memory cell giving rise to it divides
- B)** before it ever encounters an antigen
- C) after it encounters several antigens
- D) after it encounters a single antigen
- E) before the stem cell giving rise to it divides

21. If an organism is diploid and a certain gene found in the organism has 18 known alleles, then what can be said about a given organism of that species?

- A) The organism has up to, but not more than, 18 different characters.
- B) It has up to 18 genes for a given character.
- C) Haploid cells of the organism are expected to have 9 chromosomes.
- D) Each of the alleles is independently assorting to another.
- E) None of these conclusions can be drawn from the given information.**

22. Chemiosmosis mechanism \_\_\_\_\_.

- A) is used to generate ATP from concentration gradient of electrons across a membrane
- B) is called so because it uses the energy of electrons for ATP synthesis
- C) is a type of active membrane transport
- D) is operative in both the semi-autonomous organelles in eukaryotes**
- E) involves the reversal of the mechanism involved in active transport such those found in membrane pumps**

23. Why do diseases involving widespread infection usually result in a fever?

- A) The rapid multiplication of the invading microorganisms results in extra heat production.
- B) The inflammatory and immune responses result in extra heat production.
- C) The microorganisms trick the brain's temperature control center into creating a hot environment that favors their growth.
- D) The brain's temperature control center responds to inflammation by creating a hot environment unfavorable to microorganisms.**

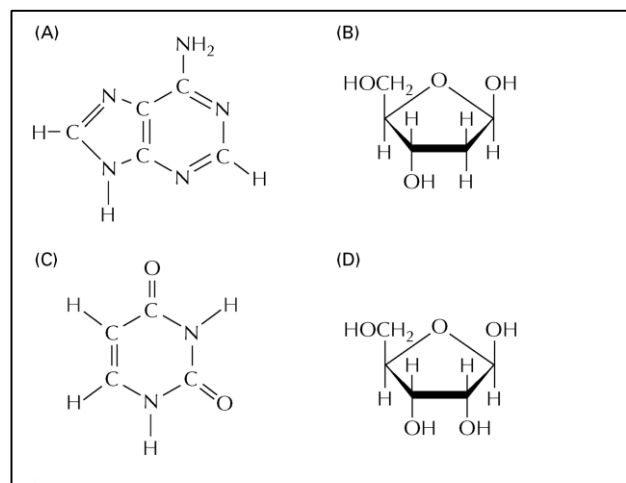
E) None of the choices is correct.

24. The immune system is capable of mounting specific responses to particular microorganisms because \_\_\_\_\_.

- A) lymphocytes are able to change their antigen specificity as required to fight infection
- B) the body is able to determine which type of B and T cells to produce after pathogen entry
- C) the body contains an enormous diversity of lymphocytes, each with a specific kind of antigen receptor**
- D) the body is able to make different antigen receptors depending on the invading microorganism, after it enters the body
- E) body cells are able to change their antigen specificity as required to fight infection

25. Pick the letters that correspond to an adenine and ribose, respectively, from the panel shown:

- A) (A) and (D)**
- B) (A) and (B)
- C) (C) and (D)
- D) (C) and (B)
- E) None of these options is correct.



**Write your answers only on the first page of this question booklet.**

**RETURN THIS BOOKLET TO THE INVIGILATOR AND PROCEED TO SECTION-II (O.B.)**