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BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

First Semester 2017-2018

BIO F111 General Biology
COMPREHENSIVE EXAMINATION

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

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)** ¾ 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(B-W-B or W-B-W)= P(B-W-B) + P(W-B-W)

= ¾ x ¼ x ¾ + ¼ x ¾ x ¼

= 12/64 = 3/16

For Q.2 through Q.25, from the multiple choices of answers, choose <u>all</u> 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 <u>only if</u> you pick all correct options, and only correct options. **[24 x ¾ = 18]**

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

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

2. 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

3. 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

4. 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

5. 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

6. 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

7. 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

8. 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

9. 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.

10. 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.

11. A _____ can have more than one _____ .
A) phenotype … genotype
B) gene… allele
C) gene … intron
D) chromosome … gene
E) allele … chromosome

12. 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.

13. 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.

14. 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

15. 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) NAD^+ is the electron carrier in respiration; $NADP^+$ is the electron carrier in photosynthesis.

16. 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.

17. 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.

18. 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

19. 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

20. 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

21. 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

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. 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.

24. 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.

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

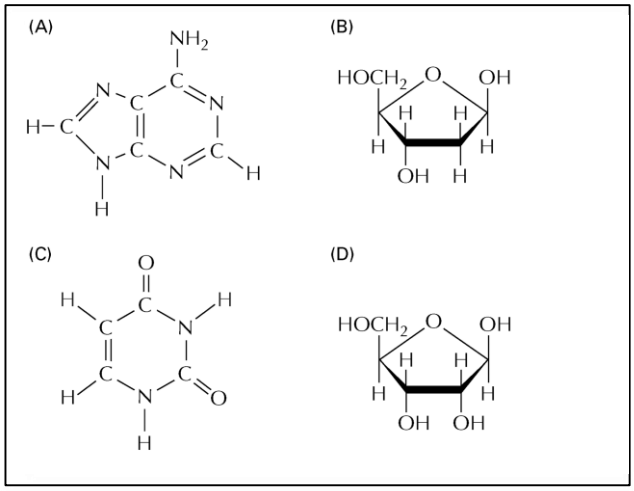
A) (A) and (B)

B) (A) and (D)

C) (C) and (B)

D) (C) and (D)

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.)