

系所組別： 生命科學系

考試科目： 普通生物學

考試日期： 0713，節次： 4

※ 考生請注意：本試題 可 不可 使用計算機

1. A gene that contains introns can be made shorter (but remain functional) for genetic engineering purposes by using
 - A) DNA polymerase to reconstruct the gene from its polypeptide product.
 - B) a restriction enzyme to cut the gene into shorter pieces.
 - C) reverse transcriptase to reconstruct the gene from its mRNA.
 - D) RNA polymerase to transcribe the gene.
 - E) DNA ligase to put together fragments of the DNA that codes for a particular polypeptide.

2. Proteomics presents a particular challenge because
 - A) a cell's proteins differ with cell type.
 - B) the number of proteins in humans probably far exceeds the number of genes.
 - C) proteins are extremely varied in structure and chemical properties.
 - D) A and B only
 - E) A, B, and C

3. A eukaryotic cell lacking telomerase would
 - A) be highly sensitive to sunlight.
 - B) produce Okazaki fragments.
 - C) undergo a reduction in chromosome length.
 - D) have a high probability of becoming cancerous.
 - E) be unable to repair thymine dimers.

4. In what cellular compartment are introns removed from pre-mRNA to make mature mRNA?
 - A) cytoplasm
 - B) endoplasmic Reticulum
 - C) nucleus
 - D) mitochondria
 - E) golgi apparatus

5. A particular triplet of bases in the template strand of DNA is AGT. The corresponding codon for the mRNA transcribed is
 - A) UGA.
 - B) ACU.
 - C) either UCA or TCA, depending on wobble in the first base
 - D) AGT.

(背面仍有題目,請繼續作答)

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E) TCA.

6. Genomic imprinting, DNA methylation, and histone acetylation are all examples of
- A) genetic mutation.
 - B) chromosomal rearrangements.
 - C) karyotypes.
 - D) epigenetic inheritance.
 - E) translocation.
7. The phenomenon in which RNA molecules in a cell are destroyed if they have a sequence complementary to an introduced double-stranded RNA is called
- A) RNA interference.
 - B) RNA obstruction.
 - C) RNA autocleavage.
 - D) RNA targeting.
 - E) RNA splicing.
8. The number of repeated units of simple sequence repeat DNA can vary between homologous chromosomes or between individuals. Such variation could be caused by
- A) slippage of DNA polymerase during replication.
 - B) unequal crossing over events.
 - C) meiotic errors that result in polyploidy.
 - D) A and B only.
 - E) A, B, and C.
9. What is the function of reverse transcriptase in retroviruses?
- A) It hydrolyzes the RNA of RNA/DNA hybrid.
 - B) It uses viral RNA as a template for DNA synthesis.
 - C) It converts host cell RNA into viral DNA.
 - D) It converts viral ssDNA intermediate into dsDNA.
 - E) A, B, and D.
10. How does active CAP induce expression of the genes of the lactose operon?
- A) It terminates production of repressor molecules.
 - B) It degrades the substrate allolactose.
 - C) It binds cAMP then stimulates the binding of RNA polymerase to the promoter.
 - D) It stimulates splicing of the encoded genes.

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- E) It binds steroid hormones and controls translation.
11. Which of the following best describes the difference in the way B cells and cytotoxic T cells respond to invaders?
- A) B cells confer active immunity; cytotoxic T cells confer passive immunity.
B) B cells secrete antibodies against a virus; cytotoxic T cells kill virus-infected cells.
C) activation of B cells needs help from T_H cells; activation of cytotoxic T cells needs help from NK cells.
D) B cells accomplish cell-mediated immunity; cytotoxic T cells accomplish humoral immunity.
E) B cells respond the first time the invader is present; cytotoxic T cells respond subsequent times.
12. The clonal selection theory implies that
- A) specific antigens only select and activate specific lymphocytes.
B) brothers and sisters have similar immune responses.
C) only certain cells can produce interferon.
D) a B cell has multiple types of antigen receptors.
E) the body selects which antigens it will respond to.
13. Regarding the action of appetite-regulating hormones, which one is correct ?
- A) Ghrelin triggers feelings of hunger as mealtimes approach.
B) Leptin suppresses appetite as its level increases
C) Insulin suppresses appetite by acting on the brain.
D) PYY acts as an appetite suppressant
E) All of the above
14. Regarding the hormonal control of digestion, which one is incorrect?
- A) Gastric from the stomach stimulates the production of gastric juice
B) Secretin secreted by the duodenum stimulate the release of pancreatic enzymes
C) Cholecystokinin released by the duodenum stimulate the release of digestive enzymes from the pancreases and bile from the gallbladder.
D) Enterogstrone secreted by the duodenum inhibits peristalsis and acid secretion by the stomach
E) None of the above
15. In vertebrate animals, spermatogenesis and oogenesis differ, in that.

(背面仍有題目,請繼續作答)

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- A) Oogenesis has long “resting” periods, in contrast to spermatogenesis, which produces mature sperm from precursor cells in an uninterrupted sequence
- B) Spermatogenesis begins before birth while oogenesis begins at the onset of sexual maturity
- C) Oogenesis produces four haploid cells, while spermatogenesis produces only one functional spermatozoon.
- D) During the meiotic division of spermatogenesis, cytokinesis is unequal..
- E) All of the above
16. Which of these is a correct statement about human reproduction?
- A) A pregnant woman not to reject her “foreign” fetus may be due to the suppression of the immune response in her uterus.
- B) Oxytocin stimulates powerful contraction of uterus via the negative feedback.
- C) Ovulation release a secondary oocyte into the oviduct
- D) Cleavage (cell division) begins in the uterus
- E) All of the above
17. Arrange the following stages of fertilization in a proper sequence.
- I. acrosome reaction
- II. cortical reaction
- III. fast block of polyspermy
- IV. slow block of polyspermy
- V. intracellular calcium surge
- VI. onset of DNA synthesis
- A) I、V、III、II、IV、VI
- B) I、III、V、II、IV、VI
- C) I、III、II、IV、V、VI
- D) I、VI、III、II、IV、V
- E) I、VI、III、V、IV、II
18. Which developmental sequence is correct?
- A) Cleavage, embryonic germ layers, gastrulation, organogenesis, morphogenesis.
- B) Cleavage, embryonic germ layers, organogenesis, gastrulation, morphogenesis.
- C) Cleavage, gastrulation, embryonic germ layers, organogenesis, morphogenesis.
- D) Cleavage, gastrulation, embryonic germ layers, morphogenesis, organogenesis.
- E) Cleavage, embryonic germ layers, organogenesis, morphogenesis, gastrulation.
19. The developmental fate of cells depends on
- A) uneven distribution of cytoplasmic determinants.

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- B) inductive signals among the embryonic cells.
 - C) apical ectodermal ridge (AER) in vertebrate limbs.
 - D) zone of polarizing activity (ZPA) in vertebrate limbs.
 - E) All of the above
20. The rate and depth of breathing are governed by
- A) chemoreceptors in arterial walls.
 - B) baroreceptors in the diaphragm.
 - C) the partial pressure of O₂ in the atmosphere.
 - D) a respiratory centre in the brainstem.
 - E) all of the above except B.
21. A rise in sodium levels and extracellular volume leads to a rise in blood pressure. As a result:
- A) renin levels and angiotensin level rise, but aldosterone levels fall.
 - B) rennin levels rise, but angiotensin levels fall.
 - C) rennin, angiotensin, and aldosterone levels all rise.
 - D) rennin, angiotensin, and aldosterone levels all drop.
22. An organism that lacks integration centers
- A) cannot receive stimuli.
 - B) will not have a nervous system.
 - C) will not be able to interpret stimuli.
 - D) can be expected to lack myelinated neurons.
 - E) both A and D
23. Which statement about transmission along neurons is *false*?
- A) The rate of transmission of a nerve impulse is directly related to the diameter of the axon.
 - B) The intensity of a stimulus is related to the magnitude of the action potential.
 - C) The resting potential is maintained by differential ion permeabilities and the sodium-potassium pump.
 - D) Once initiated, local depolarizations stimulate a propagation of serial action potentials down the axon.
 - E) A stimulus that affects the membrane's permeability to ions can either depolarize or hyperpolarize the membrane.

(背面仍有題目,請繼續作答)

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24. Taste and smell are two distinct senses in animals living in terrestrial environments. Animals living in aquatic environments, however, have no distinction between taste and smell. Which response might explain this difference? (Concept 49.3) [Hint]
- A) Animals living in aquatic environments do not have noses.
 - B) Aquatic animals do not rely on chemoreceptors to respond to their environment.
 - C) The equivalent of air in the terrestrial environment does not exist in an aqueous environment.
 - D) Aquatic animals rarely remain in one place long enough to be able to smell something.
 - E) Aquatic animals cannot smell because they lack chemoreceptors on the anterior portion of their body.
25. Why is having a hydrostatic skeleton, rather than an internal skeleton, more advantageous to an earthworm?
- A) Having an internal skeleton would not allow the fine movements an earthworm uses when it moves.
 - B) Having an internal skeleton would prevent an earthworm from being able to burrow underground tunnels.
 - C) Having a hydrostatic skeleton means that having muscles is not a requirement for movement.
 - D) Having a hydrostatic skeleton allows the earthworm to use peristaltic motion to move over the substrate.
 - E) Actually, earthworms do not have a skeleton.
26. Cells of the pancreas will incorporate radioactively labeled amino acids into proteins. This "tagging" of newly synthesized proteins enables a researcher to track the location of these proteins in a cell. In this case, we are tracking an enzyme that is eventually secreted by pancreatic cells. Which of the following is the most likely pathway for movement of this protein in the cell?
- A) ER → Golgi → Nucleus
 - B) Golgi → ER → Lysosome
 - C) Nucleus → ER → Golgi
 - D) ER → Golgi → Vesicles that fuse with plasma membrane.
 - E) ER → lysosomes → Vesicles that fuse with plasma membrane

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27. Which of the following is a reasonable explanation for why unsaturated fatty acids help keep any membrane more fluid at lower temperatures?
- A) The double bonds form a kink in the fatty acid tail, forcing adjacent lipids to be further apart.
 - B) Unsaturated fatty acids have a higher cholesterol content.
 - C) Unsaturated fatty acids permit more water in the interior of the membrane.
 - D) The double bonds block interaction among the hydrophilic head groups of the lipids.
 - E) The double bonds result in a shorter fatty acid tail.
28. An animal cell lacking oligosaccharides on the external surface of its plasma membrane would likely be impaired in which function?
- A) transporting ions against an electrochemical gradient
 - B) cell-cell recognition
 - C) maintaining fluidity of the phospholipid bilayer
 - D) attaching to the cytoskeleton
 - E) establishing the diffusion barrier to charged molecules
29. In the absence of oxygen, yeast cells can obtain energy by fermentation, resulting in the production of
- A) ATP, CO₂ and ethanol (ethyl alcohol).
 - B) ATP, CO₂, and lactate.
 - C) ATP, NADH, and pyruvate.
 - D) ATP, pyruvate, and oxygen.
 - E) ATP, pyruvate, and acetyl CoA.
30. Glycolysis is thought to be one of the most ancient of metabolic processes. Which statement supports this idea?
- A) Glycolysis is the most widespread metabolic pathway.
 - B) Glycolysis neither uses nor needs O₂.
 - C) Glycolysis is found in all eukaryotic cells.
 - D) The enzymes of glycolysis are found in the cytosol rather than in a membrane-enclosed organelle.
 - E) Ancient prokaryotic cells, the most primitive of cells, made extensive use of glycolysis long before oxygen was present in Earth's atmosphere.

(背面仍有題目,請繼續作答)

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31. Of the following, what do both mitochondria and chloroplasts have in common?
- A) thylakoid membranes
 - B) chemiosmosis
 - C) ATP synthase
 - D) B and C only
 - E) A, B, and C
32. In an experiment studying photosynthesis performed during the day, you provide a plant with radioactive carbon (^{14}C) dioxide as a metabolic tracer. The ^{14}C is incorporated first into oxaloacetate. The plant is best characterized as a
- A) C_4 plant.
 - B) C_3 plant.
 - C) CAM plant.
 - D) heterotroph.
 - E) chemoautotroph.
33. Which of the following statements is a correct distinction between cyclic and noncyclic electron flow?
- A) Only noncyclic electron flow produces ATP.
 - B) In addition to ATP, cyclic electron flow also produces O_2 and NADPH.
 - C) Only cyclic electron flow utilizes light at 700 nm.
 - D) Chemiosmosis is unique to noncyclic electron flow.
 - E) Only cyclic electron flow can operate in the absence of photosystem II.
34. Caffeine is an inhibitor of phosphodiesterase. Therefore, the cells of a person who has recently consumed coffee would have increased levels of
- A) phosphorylated proteins.
 - B) GTP.
 - C) cAMP.
 - D) adenylyl cyclase.
 - E) activated G proteins.
35. If there are 20 chromatids in a cell at metaphase, how many chromosomes are there in each daughter cell following cytokinesis?
- A) 10
 - B) 20
 - C) 30

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D) 40

E) 80

36. Taxol is an anticancer drug extracted from the Pacific yew tree. In animal cells, taxol disrupts microtubule formation by binding to microtubules and accelerating their assembly from the protein precursor, tubulin. Surprisingly, this stops mitosis. Specifically, taxol must affect

A) the fibers of the mitotic spindle.

B) anaphase.

C) formation of the centrioles.

D) chromatid assembly.

E) the S phase of the cell cycle.

37. Which of the following are primarily responsible for cytokinesis in plant cells?

A) kinetochores

B) Golgi-derived vesicles

C) actin and myosin

D) centrioles and basal bodies

E) cyclin-dependent kinases

38. The smallest biological unit that can evolve over time is

A) a cell.

B) an individual organism.

C) a population.

D) a species.

E) an ecosystem.

39. The following important concepts of population genetics are due to random events or chance *except*

A) mutation.

B) the bottleneck effect.

C) the founder effect.

D) natural selection.

E) sexual recombination.

40. Gene flow is a concept best used to describe an exchange between

A) species.

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- B) males and females.
 - C) populations.
 - D) individuals.
 - E) chromosomes.
41. A defining characteristic of allopatric speciation is
- A) the appearance of new species in the midst of old ones.
 - B) asexually reproducing populations.
 - C) geographic isolation.
 - D) artificial selection.
 - E) large populations.
42. According to the concept of punctuated equilibrium, the "sudden" appearance of a new species in the fossil record means that
- A) the species is now extinct.
 - B) speciation occurred instantaneously.
 - C) speciation occurred in one generation.
 - D) speciation occurred rapidly in geologic time.
 - E) the species will consequently have a relatively short existence, compared with other species.
43. The ostrich and the emu look very similar and live in similar habitats, however they are not very closely related. This is an example of
- A) divergent evolution.
 - B) convergent evolution.
 - C) exaptation.
 - D) adaptive radiation.
 - E) sympatric speciation.
44. What is typically the result of double fertilization in angiosperms?
- A) The endosperm develops into a diploid nutrient tissue.
 - B) A triploid zygote is formed.
 - C) Both a diploid embryo and triploid endosperm are formed.
 - D) Two embryos develop in every seed.
 - E) The fertilized antipodal cells develop into the seed coat.
45. Which of the following statements is *true* about transgenic plants?

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- A) They can be produced only by genetic engineering.
B) They contain genes from more than one species.
C) Intermediate species are required for transgenic plants to be produced.
D) They require many years to be produced.
E) A and D are correct statements.
46. The step(s) between a plant's perception of a change in the environment and the plant's response to that change is (are) best called
- A) a mutation.
B) hormone production.
C) pH change.
D) signal transduction.
E) an "all-or-none" response.
47. One difference between meiosis I and meiosis II is that _____.
- A) only meiosis I includes prophase, metaphase, anaphase, and telophase
B) crossing over occurs in meiosis I, but not in meiosis II
C) the two daughter cells produced at the end of meiosis I are different from each other, but the two cells produced in meiosis II are identical
D) only meiosis I occurs in males, but both meiosis I and meiosis II occur in females
E) chromosomes line up at the metaphase plate during meiosis I, but remain dispersed throughout the cell during meiosis II
48. A phenotypic ratio of 9:3:3:1 in the offspring of a cross indicates that _____.
- A) one parent is homozygous dominant and one parent is homozygous recessive
B) one parent is heterozygous and one parent is homozygous recessive
C) one parent is homozygous dominant and one parent is heterozygous
D) both parents are heterozygous for both genes
E) both parents are homozygous dominant
49. A woman with type O blood is expecting a child. Her husband is type A. Both the woman's father and her husband's father had type B blood. What is the probability that the child will have type O blood?
- A) 100%
B) 75%
C) 50%
D) 25%

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E) 0%

50. Four genes (A, B, C, and D) are on the same chromosome. The recombination frequencies are as follows: A-B: 19%; B-C: 14%; A-C: 5%; B-D: 2%; A-D: 21%; C-D: 16%. Based on this information, which sequence of genes is correct?

- A) ABCD
- B) ABDC
- C) ACBD
- D) ACDB
- E) ADBC