

※ 注意：選擇題請於答案卷之「選擇題作答區」依序作答。

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. 選擇題每題兩分，填充一格一分。

1. Which blood vessels have the thinnest walls?
A) arterioles B) capillaries C) venules D) arteries E) veins
2. Which of the following is a function of the excretory system?
A) blood maintenance
B) detoxification
C) maintenance of water balance
D) elimination of undigested foods
E) production of urea
3. Key derived characters of sharks and rays include their
A) ability to filter material from the water.
B) vertebrae.
C) calcified (hard) bones.
D) jaws and swim bladder.
E) jaws and paired fins.
4. Which of the following statements regarding vitamins is true?
A) They are simple inorganic compounds.
B) They lower the activation energy required for biochemical reactions.
C) They must be ingested in large quantities.
D) They are major sources of dietary calories.
E) They can serve as coenzymes or parts of coenzymes.
5. Enhancers are
A) the site on DNA to which activators bind.
B) adjacent to the gene that they regulate.
C) the products of transcription factors.
D) required to turn on gene expression when transcription factors are in short supply.
E) required to facilitate the binding of DNA polymerases.
6. Fertilization
A) joins two haploid sets of chromosomes and activates development in the egg.
B) joins two diploid sets of chromosomes.
C) joins two diploid sets of chromosomes and activates development in the egg.
D) activates development in the egg.
E) joins two haploid sets of chromosomes.
7. The hormone prolactin, found in distantly related vertebrates, exerts different effects in different species. From an evolutionary standpoint, this is an indication that hormonal regulation
A) is an ancient process whose function diversified through evolution.
B) was a recent evolutionary adaptation.
C) is required only of nonsteroid hormones.
D) is not critical to all animals.
E) was not required in fish and amphibians.

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8. Gel electrophoresis sorts DNA molecules on the basis of their
- A) nucleotide sequence.
 - B) size.
 - C) ability to bind to mRNA.
 - D) solubility in water.
 - E) solubility in the gel.
9. Which of the following statements regarding the chemical grooming of pyruvate is false?
- A) Each pyruvate loses a carbon atom, which is released as CO₂.
 - B) Each pyruvate molecule has a CO₂ added and then joins with an NADH.
 - C) Two molecules of pyruvate are each converted into two-carbon molecules joined to a coenzyme A molecule.
 - D) Two pyruvate molecules together contain less chemical energy than was found in the original glucose molecule.
 - E) The pyruvate molecules are oxidized and two NAD⁺ are reduced.
10. Which of the following is considered a likely explanation for the events of the Cambrian explosion?
- A) Complex predator-prey relationships and increased atmospheric oxygen levels led to a mass extinction event.
 - B) A great surge of volcanic activity was triggered by significant movements of the continental plates and possibly by an asteroid impact.
 - C) Complex predator-prey relationships and increased atmospheric oxygen levels promoted animal diversification.
 - D) The massive growth of swamp vegetation depleted the atmosphere's carbon dioxide and eventually cooled the Earth's climate.
 - E) Solar flares led to increased UV radiation intensity, which in turn promoted a high rate of mutation. This led to rapid diversification of animals.
11. Most CO₂ is transported to the lungs
- A) as carbonic anhydrase.
 - B) as carboxyl.
 - C) as bicarbonate ions.
 - D) attached to hemoglobin.
 - E) dissolved in the plasma.
12. fMRI technology can provide significant insights into brain function by
- A) detecting damaged areas of the brain.
 - B) measuring changes in blood oxygen usage at sites of brain activity.
 - C) measuring areas of electronegativity.
 - D) stimulating oxygen-depleted areas.
 - E) measuring the pathway of nerve impulses.
13. Which of the following statements regarding the Golgi apparatus is false?
- A) The Golgi apparatus works closely with the endoplasmic reticulum.
 - B) The Golgi apparatus decreases in size when a cell increases its protein production.
 - C) The Golgi apparatus sorts molecules according to their destination.
 - D) The Golgi apparatus serves as a molecular warehouse and finishing factory.
 - E) The Golgi apparatus modifies chemicals received from the endoplasmic reticulum.

14. Neurotransmitters that open Na^+ channels and trigger action potentials in receiving cells are called
A) blocked. B) inhibitory. C) cross-linked. D) excitatory. E) obligatory.
15. Which of the following statements about blood clotting is true?
A) Threads of fibrin trap blood cells and platelets.
B) Fibrin is enzymatically converted to fibrinogen.
C) During the clotting response, platelets rapidly congregate in the interstitial fluid.
D) The first response to an injury is dilation of the damaged blood vessels.
E) Chemicals released by platelets prevent cell division in smooth muscle and connective tissues.
16. Which of the following statements regarding infertility and fertilization procedures is true?
A) Embryos fertilized through assisted reproductive technologies cannot be frozen for later use, as they degrade rapidly.
B) Children conceived using reproductive technologies such as IVF and ICSI display a high rate of abnormalities resulting from these procedures.
C) In IVF, fertilization occurs in a dish. The embryo is allowed to develop for several days, then the embryo is placed into the uterus.
D) In GIFT, sperm are injected into an embryo in vitro, and the embryo is placed into the oviducts.
E) The most common cause of human infertility is female infertility problems.
17. Why has it been so difficult for researchers to develop effective antivirals for HIV?
A) due to the damaged helper T cells that are targets for HIV
B) because the virus is able to produce DNA as an intermediate in viral replication
C) because HIV has a high mutation rate
D) because HIV is a sexually transmitted viral disease
E) because evolution favors a rapidly expanding viral population
18. A person with AB blood illustrates the principle of
A) incomplete dominance. B) codominance. C) pleiotropy.
D) blending inheritance. E) polygenic inheritance.
19. Which of the following is a part of the immune system?
A) endocrine system B) bone marrow C) pancreas D) liver E) lungs
20. Which of the following statements regarding viral diseases is false?
A) Very few new human diseases have originated in other animals because the genetic differences are too great.
B) AIDS was around for decades before becoming a widespread epidemic.
C) RNA viruses tend to have an unusually high rate of mutation because their RNA genomes cannot be corrected by proofreading.
D) Some new viral diseases arise as a result of a mutation of existing viruses.
E) New viral diseases often emerge when a virus infects a new host species.
21. Heating inactivates enzymes by
A) breaking the covalent bonds that hold the molecule together.
B) changing the enzyme's three-dimensional shape.
C) causing enzyme molecules to stick together.
D) removing phosphate groups from the enzyme.
E) inducing the addition of amino acids.

22. Most animals are
A) substrate feeders. B) suspension feeders. C) fluid feeders. D) parasites. E) bulk feeders.
23. Mouse lung cells are much more active metabolically than frog lung cells. What is the consequence of this?
A) There is a salt imbalance in the frog.
B) The frog must eat insects for energy.
C) The mouse can survive longer and colder winters.
D) The mouse lung cells must have a large cell surface area.
E) The internal environment of the frog fluctuates significantly.
24. Which of the following hormones causes glucose release and, consequently, a rise in the concentration of sugar in the blood?
A) glucagon B) calcitonin C) insulin D) oxytocin E) melatonin
25. The immune system is capable of mounting specific responses to particular microorganisms because
A) stem cells make different antigen receptors depending on the invading microorganism.
B) lymphocytes are able to change their antigen specificity as required to fight infection.
C) stem cells determine which type of B and T cells to make.
D) the body contains an enormous diversity of lymphocytes, each with the ability to respond to a different antigen.
E) stem cells are able to change their antigen specificity as required to fight infection.
26. Which of the following scientists critically influenced Darwin's view on the nature of population growth?
A) Cuvier B) Malthus C) Lyell D) Hutton E) Wallace
27. The biological species concept classifies a species based on
A) morphological characteristics
B) reproductive isolation
C) the niche the organism occupies in the environment
D) genetic relationships between an organism and its ancestor
E) both a and b
28. Which of the following would be considered an example of a postzygotic isolating mechanism?
A) incompatible genitalia
B) different mating seasons
C) incompatible gametes
D) mountain range separating two population
E) fertilized egg fails to develop normally
29. Founder events may lead to rapid speciation because of
A) differences in natural selection on new population versus the original population
B) genetic difference due to genetic drift
C) enhance gene flow between the new population and the original population
D) all of above
E) a and b only

30. Which of the following is not a distinguishing characteristic of animal?
- A) the capacity to move at some point in their life cycle
 - B) possession of cell wall
 - C) multicellularity
 - D) heterotrophy
 - E) all of the above are characteristics of animals
31. Terrestrial adaptations seen in animals include
- A) internal fertilization
 - B) tough, protective shells around eggs
 - C) a waxy cuticle covering exposed tissue
 - D) a and b only
 - E) all of the above
32. The germ layer that is present in triploblastic animals but is absent in diploblastic animals is
- A) the ectoderm B) the mesoderm C) the endoderm
 - D) the pseudocoelom E) the coelom
33. Pseudocoelomates
- A) lack a fluid-filled cavity
 - B) have a fluid-filled cavity that is completely lined with mesoderm
 - C) have a fluid-filled cavity that is partially lined with mesoderm
 - D) have a fluid-filled cavity that is not lined with mesoderm
 - E) have an air-filled cavity that is partially lined with mesoderm
34. Naturally occurring identical twins are possible only in animals that
- A) have spiral cleavage
 - B) have determinate cleavage
 - C) are protostomes
 - D) have indeterminate cleavage
 - E) a, b, and c
35. Genes involved in the patterning of the body axis, that is, in determining characteristics such as neck length and appendage formation, are called
- A) small subunit (SSU) rRNA genes
 - B) Hox genes
 - C) metamerism genes
 - D) determinate genes
 - E) none of the above
36. Incomplete metamorphosis
- A) is characterized by distinct larval and adult stages that do not compete for sources
 - B) is typically seen in arachnids
 - C) involves gradual changes in life stages where young resemble the adult stage
 - D) is characteristic of the majority of insects
 - E) always includes a pupal stage

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37. The membrane of the amniotic egg that serves as a site for waste storage is
A) the amnion B) the yolk sac C) the allantois
D) the chorion E) the albumin
38. Which of the following is not a distinguishing characteristic of birds?
A) amniotic egg B) feathers C) air sacs
D) lack of certain organs E) lightweight skeletons
39. Placental mammals that gestate their young for a prolonged time are
A) monotremes B) marsupials C) eutherians D) therapsids E) all of the above
40. The greenhouse effect is
A) a new phenomenon resulting from industrialization
B) due to the absorption of solar radiation by atmospheric gases
C) responsible for the natural warming of the earth
D) all of the above
E) b and c only
41. Which is the most important contribution to human-caused global warming?
A) carbon dioxide
B) nitrous oxide
C) sulfur oxide
D) methane
E) chlorofluorocarbons
42. Patrick has decided to teach his new puppy a few new tricks. Each time the puppy responds correctly to Patrick's command, the puppy is given a treat. This is an example of
A) habituation
B) classic conditioning
C) operant conditioning
D) imprinting
E) orientation
43. When an individual behaves in a way that reduces its own fitness but increase the fitness of others, the organism is exhibiting
A) kin selection
B) group selection
C) altruism
D) selfishness
E) ignorance
44. When each female in the population mates with several males, but each male mates with only one female, the mating system is referred to as
A) polygamy
B) polyandry
C) polygyny
D) monogamy
E) harem mating

45. A life table usually contains information about
- A) the number of surviving individuals of particular age class
 - B) fertility for specific age classes
 - C) dispersal pattern of a population
 - D) all of the above
 - E) a and b only
46. If the net reproductive rate (R_0) is equal to 0.5, what assumptions can we make about the population?
- A) This population is essentially not changing in number
 - B) This population is in decline
 - C) This population is growing
 - D) This population is in equilibrium
 - E) None of the above
47. The amount of land necessary for survival for each person in a sustainable world is known as
- A) the sustainability level
 - B) an ecological impact
 - C) an ecological footprint
 - D) survival needs
 - E) all of the above
48. The chain lengths in food webs are limited by
- A) the amount of energy such as sunlight available in an ecosystem
 - B) the efficiency of energy transfers that occur between trophic levels
 - C) the efficiency by which primary consumers assimilate energy into biomass
 - D) all of the above
 - E) a and b only
49. Which of the following is not a prime cause of species extinction?
- A) predation by introduced species
 - B) habitat destruction
 - C) direct exploitation
 - D) disease brought by invasive species
 - E) bioremediation
50. The three levels at which biodiversity can be examined include (請於答案卷內之「非選擇題作答區」作答)
_____ diversity, _____ diversity, & ecosystem diversity.

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