

所別：光電科學研究所碩士班 不分組 科目：生物學

一、選擇題（請選出一個最適當的答案，每題2分）

- Let  $P$  = purple flowers and  $p$  = white, and  $T$  = tall plants and  $t$  = dwarf. Of the 16 possible gamete combinations in the dihybrid cross, how many would be the phenotype white, tall?  
A. none    B. 1    C. 3    D. 9    E. 16
- Which of the following type of cell is not correctly matched to its function?  
A. platelets — blood clotting    B. leukocytes — immunity    C. erythrocytes — new cell production  
D. leukocytes — phagocytosis    E. erythrocytes — oxygen transport
- The bacterial genome exist as a  
A. single, circular, protein-coated, double stranded DNA molecule  
B. single, circular, uncoated, double stranded DNA molecule    C. single, circular, uncoated, double stranded RNA molecule  
D. single, linear, uncoated, double stranded DNA molecule    E. many, circular, uncoated, double stranded DNA molecules
- The membrane of a resting neuron is much more permeable to which of the following ion than any other ion?  
A.  $Cl^-$     B.  $Ca^{++}$     C.  $Na^+$     D.  $K^+$     E.  $H^+$
- Which of the following conditions is not related to Type I or II diabetic disease?  
A. elevated levels of blood glucose    B. lowered production of insulin by the pancreas  
C. reduced sensitivity to insulin by the body cells    D. ineffective pituitary gland  
E. diet and exercise usually help to balance the blood sugar levels
- Which of the following is not a nonspecific defense of the vertebrate system?  
A. cells that ingest invading microbes    B. antimicrobial proteins that kill pathogens    C. immunoglobulin synthesis  
D. the inflammatory response    E. the temperature response
- Before cell division of the body cells, each homologue replicates into two parts. These parts are connected by a centromere and are called  
A. sister chromatids    B. daughter chromatids    C. homologous chromosomes    D. daughter chromosomes    E. genes
- The zygote has  
A. one copy of each chromosome    B. one full haploid complement of chromosomes  
C. chromosomes identical to those of a sperm cell    D. chromosomes identical to those of an egg cell  
E. two copies of each chromosome
- Small, circular auxiliary DNA molecules of bacteria which are commonly used in genetic engineering technology are referred to as  
A. transposons    B. germ-line DNA molecules    C. plasmids    D. conformational DNA molecules  
E. translational DNA molecules
- The genetic material of which kind of cells is included in a single, circular molecule of DNA devoid of any histone proteins?  
A. bacteria    B. protozoa    C. insects    D. flowering plants    E. yeasts
- The physical distribution of cytoplasmic material into the two daughter cells is called  
A. DNA replication    B. mitosis    C. cytokinesis    D. binary fission    E. syngamy
- The polymerase chain reaction, more popularly known as PCR, includes which of the following steps?  
A. denaturation of primers and the DNA fragment to be amplified  
B. annealing of primers to the complementary sequences on the DNA    C. primer extension with DNA polymerase  
D. repeating steps 1-3 in many cycles    E. all of the above
- Gene expression includes which two of the following processes?  
A. transcription and replication    B. replication and repression    C. protein synthesis and replication  
D. mutation and cell division    E. transcription and translation
- Membrane-bound organelles that contain powerful enzymes found in cells are known as  
A. lysosomes    B. plastids    C. vacuoles    D. liposomes    E. ribosomes
- Two strands of DNA that have been cut by an endonuclease can be sealed together by  
A. a polymerase enzyme    B. a ligase enzyme    C. an exonuclease enzyme    D. a protease enzyme    E. a methylase enzyme
- The dark reactions of photosynthesis are those that  
A. convert chlorophylls into enzymes    B. convert enzymes into chlorophylls    C. convert water into hydrogen and oxygen  
D. convert  $CO_2$  into reduced molecules (sugars)    E. only occur in the dark

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17. One of the most important coenzymes that accepts electrons/hydrogens is  
A.  $\text{NAD}^+$  B. NADH C. ATP D. NADPH E. ribozyme
18. Ribosomes are  
A. only DNA molecules B. only RNA molecules C. single, naked, and circular chromosomes  
D. only protein molecules E. large molecular aggregates of protein and RNA
19. All of the following animal cells are diploid except  
A. gametic B. muscles C. nerves D. skin E. reproductive organ
20. Small cells function more effectively, because as cells become larger their surface area to volume ratio  
A. increases B. decreases C. stays the same D. is squared E. is cubed
21. Eukaryotic chromosomes are coated with proteins containing a high proportion of basic amino acids. These proteins are given the name  
A. albumins B. antibodies C. enzymes D. histamines E. histones
22. Let P = purple flowers and p = white, and T = tall plants and t = dwarf. What would be the appearance of a plant with the genotype PpTt?  
A. purple flowers, tall B. purple flowers, dwarf C. white flowers, tall D. white flowers, dwarf  
E. pale purple flowers, intermediate height
23. Bacterial DNA is protected from its own restriction enzyme's action by  
A. covering it with protein B. methylating the DNA in some nucleotides C. its hydrophobic nature  
D. keeping important genes in plasmids E. producing large quantities of it
24. The humoral and cellular immune responses are both initiated by  
A. killer T cells B. helper T cells C. complement T-cells D. B cells E. antibody production
25. RNA molecules that have been recently reported to act also as enzymes are given the name  
A. ribozymes B. deoxyribozymes C. chromosomes D. coenzymes E. metalloenzymes
26. Schlieden and Schwann stated the "cell theory," which in its modern form includes all of the following postulates except  
A. all organisms are composed of one or more cell B. all cells need oxygen C. cells are the smallest living things  
D. cells arise only by division of a previously existing cell E. cells vary in size and shape
27. Which of the following is common to both cellular respiration and the light reactions of photosynthesis?  
A. the transfer of electrons to glucose B. the chemiosmotic formation of ATP C. oxygen is one of the byproducts  
D. mitochondria are essential organelles E. must have light
28. Most genetic engineering experiments include four stages. Which of the following is not one of them?  
A. cleaving the source DNA B. production of recombinant DNA C. cloning copies of the recombinants  
D. screening the cloned copies for the desired gene E. integration of the entire bacterial chromosome
29. Organic phosphates, nerve gases, and insecticides produce continuous neuromuscular contraction leading up to death by  
A. binding of acetylcholine to receptors B. inhibiting the action of acetylcholinesterase  
C. decreasing the distance in the neuromuscular junction D. propagating a continuous action potential E. all of the above
30. If the DNA triplet code were ATG-CGT, the tRNA anticodons would be:  
A. AUGCGU B. ATGCGT C. UACGCA D. UAGCGU

二、簡答題 (請簡要回答下列問題, 每題 8 分)

1. What three unique features distinguish meiosis from mitosis?
2. What is an intron? What is an exon? How is each involved in the mRNA molecule that is ultimately translated?
3. How can a eukaryotic cell control the translation of mRNA transcripts after they have been transported from the nucleus to the cytoplasm?
4. What is the difference between heterochromatin and euchromatin in terms of their appearance under the light microscope? What is the difference in terms of gene expression?
5. How is cytokinesis in animal cells different from that in plant cells?

參考用