一、問答題（60%），共六題、每題十分

1. How does RNA polymerase know when it has reached the end of a gene and that transcription should stop?

2. How does a plant know when it is the time of year to flower?

3. What are the advantages and disadvantages of asexual reproduction?

4. What is the gene therapy and how is it useful?

5. What is the human genome project and how is it useful?

6. What is biodiversity (biological diversity)? Describe the values of biodiversity.

二、選擇題（40%）（每題兩分，如果沒有適當答案，請選 0）

1. A microbiologist found that a clone of bacteria infected by phages had developed the ability to make a particular amino acid that they could not make before. This new ability was probably a result of
(1) transformation.
(2) natural selection.
(3) conjugation.
(4) spontaneous mutation.
(5) transduction.

2. A geneticist found that a particular nucleotide sequence was found on different chromosomes in different mouse skin cells. This suggested that
(1) transformation was occurring in some skin cells.
(2) transposons were moving around.
(3) the cells were engaging in conjugation.
(4) the mouse had been exposed to a mutagen.
(5) the mouse responded to a vaccine.

3. The correct sequence of DNA segments composing an operon is
(1) regulatory gene, operator, promoter, structural genes.
(2) lacI, operator, promoter, lacZ, lacY.
(3) structural genes, promoter, operator.
(4) promoter, operator, structural genes.
(5) prophage, operator, structural genes.

4. A bacterium makes the amino acid glycine or absorbs it from its surroundings. A biochemist found that glycine binds to a repressor protein and causes the repressor to bind to the bacterial chromosome, turning off an operon. If this is like other operons, the genes of this operon probably code for enzymes that
(1) control bacterial cell division.
(2) break down glycine.
(3) produce glycine.
(4) catalyze the formation of sex pili.
(5) manufacture the repressor protein.

5. In humans, the hormone testosterone enters cells and binds to specific proteins, which in turn bind to specific sites on the cells DNA. These proteins probably act to
(1) help RNA polymerase transcribe certain genes.
(2) alter the pattern of DNA splicing.
(3) inhibit transcription.
(4) unwind the DNA so that its genes can be transcribed.
(5) cause mutations in the DNA.

6. All your cells contain proto-oncogenes, which can change into cancer-causing genes. Why do cells possess such potential time bombs?
(1) Viruses infect cells with proto-oncogenes.
(2) Proto-oncogenes are genetic junk and have no known function.
(3) Proto-oncogenes are unavoidable environmental carcinogens.
(4) Cells produce proto-oncogenes as a by-product of mitosis.
(5) Proto-oncogenes are necessary for normal control of cell division.

7. When a typical restriction enzyme cuts a DNA molecule, the cuts are uneven, so that the DNA fragments have single-stranded ends. This is important in recombinant DNA work because
(1) it allows a cell to recognize fragments produced by the enzyme.
(2) the single-stranded ends serve as starting points for DNA replication.
(3) the fragments will bond to other fragments with complementary single-stranded ends.
(4) it enables researchers to use the fragments as introns.
(5) only single-stranded DNA segments can code for proteins.

8. Because eukaryotic genes contain introns, they cannot be translated by bacteria, which lack RNA splicing machinery. If you want to engineer a bacterium to produce a eukaryotic protein, you can synthesize a gene without introns--if you know the nucleotide sequence--or
(1) alter the bacteria used so that they can splice RNA.
(2) use a nucleic acid probe to find a gene without introns.
(3) work backward from mRNA to a piece of DNA without introns.
(4) use a phage to insert the desired gene into a bacterium.
(5) use a restriction enzyme to remove introns from the gene.

9. A genomic library is
(1) where you look to find out how to make recombinant DNA.
(2) a listing of the known nucleotide sequences for a particular species.
(3) all the genes contained in one kind of cell.
(4) a collection of cloned DNA pieces of recombinant DNA.
(5) a place where one can obtain DNA samples from various species.

10. Which of the following would be considered a transgenic organism?
(1) a bacterium that has received genes via conjugation
(2) a human given a corrected human blood-clotting gene
(3) a fern grown in cell culture from a single fern root cell
(4) a rat with rabbit hemoglobin genes
(5) a human treated with insulin produced by E. coli bacteria

11. A mature cell of a mature plant can develop into a new mature adult. This demonstrates that plant cells are
(1) zygotic.
(2) differentiated.
(3) meristematic.
(4) anucleate.
(5) totipotent.

12. In frogs, when an intestinal cell of a tadpole is transferred into an egg whose nucleus has been removed (nuclear transplantation) some of the eggs will develop into normal tadpoles. This demonstrates
(1) that frogs have meristematic cells.
(2) that intestinal cells are not differentiated.
(3) genomic equivalence.
(4) That frogs have large eggs.
(5) that these cells could not dedifferentiate.

13. A homeotic gene does which of the following?
(1) It serves as the ultimate control for the establishment of developmental polarity.
(2) It regulates the expression of groups of other genes during development.
(3) It represses the histone proteins that package eukaryotic DNA.
(4) It helps splice mRNA after transcription.
(5) It inactivates one of the X chromosomes in a female mammal.

14. The ultimate source of all genetic variation is
(1) natural selection.
(2) genetic drift.
(3) sexual recombination.
(4) the environment.
(5) mutation.

15. The relationship of genome to organism is the same as ___to population.
species
(1) gene
(2) gene pool
(3) mutation
(3) variation

16 Two animals are considered different species if they
(1) look different.
(2) cannot interbreed.
(3) live in different habitats.
(4) are members of different populations.
(5) are geographically isolated.

17. Which of the following is the first step in allopatric speciation?
(1) genetic drift
(2) geographical isolation
(3) polyploidy
(4) hybridization
(5) formation of reproductive barrier

18. Sympatric speciation is
(1) the appearance of a new species in the same area as the parent population.
(2) the process by which most animal species have evolved.
(3) initiated by the appearance of a geographical barrier.
(4) the emergence of many species from a single ancestor.
(5) especially important in the evolution of island species.

19. The wings of birds and insects have the same function, but they do not have the same evolutionary origin. Bird and insect wings are
(1) homologous.
(2) phylogenetic.
(3) analogous.
(4) binomial.
(5) taxonomic.

20. Koch's postulates
(1) outline the probable process by which life originated.
(2) are used to demonstrate that a microorganism causes a disease.
(3) enable researchers to determine whether an organism is a bacterium.
(4) suggest how eukaryotes evolved from prokaryotes.
(5) are public health standards used to prevent the spread of disease.