01. Which of the following is NOT a possible destination for vesicles leaving the Golgi apparatus?
(A) the plasma membrane  (B) the exterior of the cell
(C) lysosomes           (D) peroxisomes

02. The extracellular matrix is thought to participate in the regulation of animal cell behavior by
communicating information from the outside to the inside of the cell via which of the following?
(A) integrins     (B) collagens
(C) dyneins       (D) keratins

03. Which type of protein shields a newly forming protein from cytoplasmic influences while it is
folding into its functional form?
(A) antibodies   (B) keratins
(C) hemoglobins  (D) chaperonins

04. Which of the following enables a cell to pick up and concentrate a specific kind of molecule?
(A) passive transport  (B) facilitated diffusion
(C) osmosis           (D) receptor-mediated endocytosis

05. The TATA box is a DNA sequence (cis-regulatory element) found in the region of
genes in archaea and eukaryotes.
(A) primer      (B) promoter
(C) operator    (D) operon

06. Cilia and flagella move due to the interaction of the cytoskeleton with which of the following?
(A) actin         (B) myosin
(C) dynein       (D) tubulin

07. A protein built into the plasma membrane CANNOT be
(A) an enzyme.   (B) a transport protein.
(C) a peripheral protein.   (D) a hormone receptor.

08. Key enzymes that are involved in signal transduction transfer a phosphate group from ATP to
one or more sites on particular proteins are
(A) ATPases.   (B) ATP synthases.
(C) protein kinases.  (D) proteases.

09. Which of the following processes, normally associated with membrane transport, must occur to
account for an increase in the surface area of a cell?
(A) exocytosis   (B) active transport
(C) receptor-mediated endocytosis  (D) endocytosis
10. Which one of the following four membranes is most likely to have a lipid composition that is distinct from the other three?
(A) endoplasmic reticulum  (B) plasma membrane
(C) mitochondrial outer membrane  (D) lysosome membrane

11. Aquaporins are
(A) channel proteins.  (B) peripheral proteins.
(C) carrier proteins.  (D) receptor proteins.

12. Which of the following cell compartments is associated with a protein skeleton composed of lamins?
(A) peroxisome  (B) centrosome
(C) mitochondrion  (D) nucleus

13. Glycogen is to carbohydrate as
(A) tyrosine is to protein.  (B) lipid is to fat.
(C) keratin is to protein.  (D) deoxyribose is to DNA.

14. Most mitochondrial proteins are synthesized on
(A) mitochondrial ribosomes from nuclear mRNAs.
(B) mitochondrial ribosomes from mitochondrial mRNAs.
(C) cytosolic ribosomes; they are imported cotranslationally as they are being synthesized.
(D) cytosolic ribosomes; they are imported after they are completely synthesized.

15. Specialized cells of the human immune system prevent disease by ingesting bacteria and viruses. Which of the following hypotheses best predicts the fate of these antigens?
(A) They are stored in mitochondria.
(B) They are transported to lysosomes.
(C) They fuse with peroxisomes.
(D) They enter the endomembrane system and eventually are secreted.

16. 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

17. Familial hypercholesterolemia is characterized by which of the following?
(A) defective LDL receptors on the cell membranes
(B) poor attachment of the cholesterol to the extracellular matrix of cells
(C) a poorly formed lipid bilayer that cannot incorporate cholesterol into cell membranes
(D) a general lack of glycolipids in the blood cell membranes

18. Chiasmata are what we see under a microscope that let us know which of the following is occurring?
(A) asexual reproduction  (B) crossing over
(C) meiosis II  (D) separation of homologs
19. The toxin of *Vibrio cholerae* causes profuse diarrhea because it:
(A) modifies a G protein involved in regulating salt and water secretion.
(B) decreases the cytosolic concentration of calcium ions, making the cells hypotonic to the intestinal cells.
(C) binds with adenyl cyclase and triggers the formation of cAMP.
(D) signals inositol trisphosphate to become a second messenger for the release of calcium.

20. Which of the following statements most accurately defines epistasis?
(A) The inheritance of two or more genes close together on the same chromosome.
(B) Inactivation of the allele from one parent and expression of the allele from the other parent.
(C) The genotype of the mother determining the phenotype of the offspring.
(D) The alleles of one gene masking the dominant alleles of another gene.

21. Proteasomes can degrade proteins that have been targeted for breakdown by attachment of
(A) dynein.
(B) ubiquitin.
(C) kinesin.
(D) myosin.

22. An inhibitor of which of the following could be used to block the release of calcium ions from the endoplasmic reticulum?
(A) adenylyl cyclase
(B) serine/threonine kinases
(C) phosphodiesterase
(D) phospholipase C

23. A Barr body is normally found in the nucleus of which kind of human cell?
(A) unfertilized egg cells only
(B) sperm cells only
(C) somatic cells of a female only
(D) somatic cells of a male only

24. Entry into mitosis occurs because
(A) cyclin is destroyed at the beginning of mitosis.
(B) cyclin is phosphorylated at the beginning of mitosis.
(C) sufficient cyclin-dependent kinase is synthesized to trigger mitosis.
(D) cyclin binds to a protein kinase and activates it.

25. Phenylketonuria is an example of a genetic disease in which
(A) inheritance is sex-linked.
(B) a single enzyme is not functional.
(C) two parents without the disease cannot have a child with the disease.
(D) a transport protein does not work properly.

26. What is the difference between a monohybrid cross and a dihybrid cross?
(A) A monohybrid cross involves a single parent, whereas a dihybrid cross involves two parents.
(B) A monohybrid cross produces a single progeny, whereas a dihybrid cross produces two progeny.
(C) A dihybrid cross involves organisms that are heterozygous for two characters and a monohybrid only one.
(D) A monohybrid cross is performed for one generation, whereas a dihybrid cross is performed for two generations.

27. Which of the following is not a major protein component of the ECM in animals?
(A) calmodulin
(B) elastin
(C) fibronectin
(D) collagen
28. Which of the following is a type of tumor?
   (A) retinoblastoma.  (B) Huntington's disease.
   (C) phenylketonuria.  (D) cystic fibrosis.

29. All cells of a multicellular organism may not respond in the same way to a particular signal that
binds to a cell surface receptor. The difference in response may be due to
   (A) the concentration of the signal molecule in the cytoplasm.
   (B) the functional differences of the receptors.
   (C) the structural differences that may occur in ligands.
   (D) mutations that occur during development.

30. The nondisjunction of the X chromosomes during meiosis I can result in the formation of an egg
   cell that contains
   (A) two X chromosomes.
   (B) the diploid number of autosomes.
   (C) an X chromosomes condensed as a Barr body.
   (D) a deletion of the long arm of the X chromosome.

31. Malignant tumors are those that spread to surrounding tissues or export cancer cells via the
   circulatory system to other parts of the body, in a process called
   (A) apoptosis.
   (B) metastasis.
   (C) phagocytosis.
   (D) necrosis.

32. Which of the following chromosomal alterations does not alter genetic balance but may alter
phenotype because of differences in gene expression?
   (A) deletion.
   (B) duplication.
   (C) inversion.
   (D) nondisjunction.

33. Which of the following statements accurately describes hormone receptors?
   (A) Polypeptide hormones bind to receptors located inside target cells.
   (B) Steroid hormones bind to receptors located on the surface of target cells.
   (C) Steroid hormones bind to receptors located inside target cells.
   (D) Most amino-acid-derived hormones bind to receptors located inside target cells.

34. Which of the following does NOT describe a typical cellular response to signaling molecules?
   (A) activation of enzymes within the cell.
   (B) change in the function of structural proteins, which determine cell shape.
   (C) alteration of levels of certain proteins in the cell by changing the level of gene expression.
   (D) change in a gene sequence that encodes a particular protein.

35. Checkpoints during the cell cycle are important because they
   (A) allow the organelle activity to catch up to cellular demands.
   (B) ensure the integrity of the cell’s DNA.
   (C) allow the cell to generate sufficient ATP for cellular division.
   (D) are the only time DNA replication can occur.

36. When a cell secretes a signaling molecule that binds to receptors on neighboring cells as well
as the same cell, this is called __________ signaling.
   (A) paracrine  (B) autocrine
   (C) synaptic  (D) endocrine
37. Wild type refers to
(A) the most extreme mutant phenotype observed in an experiment.
(B) any mutant genotype.
(C) a kind of chromosomal deletion.
(D) the most common phenotype thought to be found in the natural population.

38. Inositol trisphosphate (IP3) acts by
(A) activating adenylyl cyclase.
(B) phosphorylating signal receptors.
(C) activating DAG.
(D) opening Ca\(^{2+}\) channels.

39. Translation of mRNAs starts at
(A) the 3' end of the mRNA.
(B) the 5' end of the mRNA.
(C) a site downstream of a 5' untranslated region.
(D) a site downstream of a 3' untranslated region.

40. Sites in the genome of a species which are commonly used for DNA fingerprinting are most accurately referred to as
(A) contigs.
(B) restriction sites.
(C) short tandem repeats.
(D) microarrays.

41. Why is it possible that a point mutation may have no effect on an individual’s fitness?
(A) The encoded protein may be unchanged due to the redundancy of the genetic code.
(B) The encoded protein may not be essential for an individual’s survival.
(C) The mutation may not be passed on to daughter cells during cell division.
(D) The mutation may confer an advantage by decreasing susceptibility to another disease.

42. Which of the following statements is NOT true?
(A) Ribozymes can link amino acids to form protein.
(B) Ribozymes are proteins.
(C) Ribozymes can act as enzymes.
(D) Ribozymes can act as informational molecules.

43. DNA synthesis is
(A) initiated by an RNA primer at the 5' end of the existing strand
(B) initiated only once at the replication fork during the synthesis of both strands
(C) continuous in the 5' to 3' direction in the lagging strand and discontinuous in the leading strand
(D) conducted in the 5' to 3' direction in both the lagging and leading strands

44. As they emerge from the ribosome, signal peptides (signal sequences) are recognized and bound by a
(A) spliceosome.
(B) signal peptidase.
(C) signal recognition particle (SRP).
(D) SRP receptor.

45. All of the following are posttranscriptional modifications of pre-mRNA EXCEPT
(A) capping at the 5' end.
(B) poly-A addition at the 3' end.
(C) endonucleolytic cleavage to produce a new 5' end.
(D) endonucleolytic cleavage to produce a new 3' end.
46. Telomerase
(A) is active in cancer cells.
(B) is more active in adult than embryonic cells.
(C) complexes with the ribosome to form telomeres.
(D) shortens the ends of chromosomes.

47. Individuals with the disorder xeroderma pigmentosum are hypersensitive to sunlight. This occurs because their cells have which impaired ability?
(A) They cannot replicate DNA.
(B) They cannot repair thymine dimers.
(C) They cannot exchange DNA with other cells.
(D) They cannot undergo mitosis.

48. Paralogous genes are genes that trace back to a common ________ event.
(A) speciation
(B) deletion
(C) substitution
(D) duplication

49. A ________ is a description of the history of descent of a group of organisms from their common ancestor.
(A) phylogeny
(B) synapomorphy
(C) clade
(D) parasimony

50. The homeobox is a DNA sequence found in Hox genes and other genes that code for
(A) motor proteins.
(B) receptor proteins.
(C) transcription factors.
(D) growth factors.

第二部份 翻譯題 [共 50 分]
說明： 將下列短文譯成中文，每題 5 分。

1. Secreted molecules have a critical role in the transmission of information by neurons. Neurons communicate with target cells in other neurons and muscles at specialized junctions known as synapses. At many synapses, neurons secrete molecules called neurotransmitters that diffuse a very short distance to bind receptors on the target cells. Neurotransmitters play an essential role in sensation, memory, cognition, and movement.

2. Interferons are proteins that provide innate defense against viral infections. Virus-infected body cells secrete interferons, inducing nearby uninfected cells to produce substances that inhibit viral reproduction. In this way, interferons limit the cell-to-cell spread of viruses in the body, helping control viral infections such as colds and influenza. Some white blood cells secrete a different type of interferon that helps activate macrophages, enhancing their phagocytic ability. Pharmaceutical companies now mass-produce interferons by recombinant DNA technology for treating certain viral infections, such as hepatitis C.

3. In response to changes in the temperature of their surroundings, many animals alter the amount of blood (and hence heat) flowing between their body core and their skin. Nerve signals that relax the muscles of the vessel walls result in vasodilation, an increase in the diameter of superficial blood vessels (those near the body surface). As a consequence of the increase in vessel diameter, blood flow in the skin is elevated. In endotherms, vasodilation usually warms the skin and increases the transfer of body heat to the environment by radiation, conduction, and convection. The reverse process, vasoconstriction, reduces blood flow and heat transfer by decreasing the diameter of superficial vessels.
4. Two components of gastric juice carry out chemical digestion. One is hydrochloric acid (HCl), which disrupts the extracellular matrix that binds cells together in meat and plant material. The concentration of HCl is so high that the pH of gastric juice is about 2, acidic enough to dissolve iron nails. This low pH not only kills most bacteria but also denatures (unfolds) proteins in food, increasing exposure of their peptide bonds. The exposed bonds are attacked by the second component of gastric juice—a protease called pepsin. Unlike most enzymes, pepsin works best in a strongly acidic environment. By breaking peptide bonds, it cleaves proteins into smaller polypeptides.

5. Plasma proteins act as buffers against pH changes, help maintain the osmotic balance between blood and interstitial fluid, and contribute to the blood's viscosity. Particular plasma proteins have additional functions. The immunoglobulins help combat viruses and other foreign agents that invade the body. Others are escorts for lipids, which are insoluble in water and can travel in blood only when bound to proteins. A third group of plasma proteins are clotting factors that help plug leaks when blood vessels are injured. (The term serum refers to blood plasma from which these clotting factors have been removed.)

6. From Bowman's capsule, the filtrate passes into the proximal tubule, the first of three major regions of the nephron. Next is the loop of Henle, a hairpin turn with a descending limb and an ascending limb. The distal tubule, the last region of the nephron, empties into a collecting duct, which receives processed filtrate from many nephrons. This filtrate flows from all of the collecting ducts of the kidney into the renal pelvis, which is drained by the ureter.

7. Not all fertilized eggs are capable of completing development. Many pregnancies terminate spontaneously as a result of chromosomal or developmental abnormalities. Much less often, a fertilized egg lodges in the oviduct, resulting in a tubal, or ectopic, pregnancy. Such pregnancies cannot be sustained and may rupture the oviduct, resulting in serious internal bleeding. A number of conditions, including endometriosis, increase the likelihood of tubal pregnancy. Bacterial infections arising during childbirth, from medical procedures, or as a sexually transmitted disease can also scar the oviduct, making ectopic pregnancy more likely.

8. Although each cerebral hemisphere in humans has sensory and motor connections to the opposite side of the body, the two hemispheres do not have identical functions. For example, the left side of the cerebrum has a dominant role with regard to language, as reflected in the location of both Broca's area and Wernicke's area in the left hemisphere. There are also subtler distinctions in the functions of the two hemispheres. For example, the left hemisphere is more adept at math and logical operations. In contrast, the right hemisphere appears to be dominant in the recognition of faces and patterns, spatial relations, and nonverbal thinking.

9. Signals from rods and cones can follow several different pathways in the retina. Some information passes directly from photoreceptors to bipolar cells to ganglion cells. In other cases, horizontal cells carry signals from one rod or cone to other photoreceptors and to several bipolar cells. When an illuminated rod or cone stimulates a horizontal cell, the horizontal cell inhibits more distant photoreceptors and bipolar cells that are not illuminated. The result is that the light spot appears lighter and the dark surroundings even darker.

10. For some genetic disorders, medical scientists can detect an abnormal disease-causing allele by testing for genetic markers that are known to be very close (linked) to the allele. A genetic marker is a DNA sequence that varies in a population; in a gene, such sequence variation is the basis of different alleles. Just like coding sequences, noncoding DNA at a specific locus on a chromosome may exhibit small nucleotide differences among individuals. Variations in DNA sequence are called polymorphisms.