Part 1 請作答於【選擇題作答區】 **(2 points/question, 50%)**

1. Complement components are important serum proteins for mediating
   (A) Programmed cell death
   (B) Drug metabolism
   (C) Immune adhesion
   (D) Immunoglobulin synthesis
   (E) Hematopoiesis

2. Bacterial lipopolysaccharide (endotoxin) is one of the essential cell wall components of Gram's negative bacilli that exerts a potent activity on
   (A) Thrombocytosis
   (B) High blood pressure
   (C) Erythropoiesis
   (D) Increased vascular permeability
   (E) Parasympathetic stimulation

3. Select the correct statement of polymerase chain reaction (PCR).
   (A) The target DNA should be isolated from the rest of genome
   (B) The DNA polymerase is derived from a relative thermo-labile bacterial enzyme
   (C) The amount of the starting DNA should be rather large volume
   (D) The amplified PCR products can be easily detected by Western blot
   (E) The PCR procedure is a cyclic reaction

4. Which description is correct for "chemokine"?
   (A) A group of chemoattractants for inflammatory cells
   (B) TNF-α is a typical chemokine
   (C) "C-C" typed chemokines are quite specific for neutrophils
   (D) A cytotoxic molecule to kill transformed cells
   (E) A sort of B lymphocyte maturation factors

5. C- reactive protein is one of the "acute phase reactants" induced by
   (A) DNA repairing process
   (B) Tissue destruction
   (C) During neovascularization
   (D) Tumorigenesis
   (E) Liver cell regeneration

6. Nitric oxide (NO) exhibits an array of physiological and pathological effects on the cells including;
   (A) Suppression of cyclo-oxygenase pathway
   (B) Enhance oxygen metabolism of mononuclear phagocytes

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(C) Potent non-specific immunosuppression
(D) Increase membrane flexibility of cells
(E) Inhibit leukocyte adherence to vascular endothelium

7. Eicosanoids are derived from phospholipid oxygenation in the cell membrane. Which property of these lipid mediators is correct?
(A) Only synthesized by immunological and inflammatory cells
(B) Negligible effect on vascular endothelial cells
(C) No specific receptor has been found till now
(D) They are produced intracellularly, but do not accumulate within the cells
(E) They are quite stable after synthesis

8. Which step is necessary in the metastasis of cancer cells?
(A) Overexpression of MHC class II molecules
(B) Increased homotypical cadherin expression in cancer tissues
(C) Secretion of matrix-degrading proteases
(D) Suppression of neovascularization
(E) Increase TNF-α production by cancer cells

9. Which kind of protein is the effector molecule to execute cell apoptosis?
(A) Phospholipase
(B) Caspase
(C) Neutral esterase
(D) Serine protease
(E) Tyrosine kinase

10. Which image study is most informative for understanding the internal structure with spatial arrangement of the cells?
(A) Confocal scanning microscopy
(B) Phase-contrast microscopy
(C) Scanning electron microscopy
(D) Polarized microscopy
(E) Fluorescence microscopy

11. DNA (gene) polymorphism can be detected by
(A) Restriction-fragment length polymorphism
(B) Electric motility shift assay
(C) High performance liquid chromatography
(D) RT-PCR
(E) Southern blot

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12. which of the following molecules fails to transduce signals in the cell?

(A) NF-κB
(B) Coenzyme A
(C) GPT-binding proteins
(D) Cationic ion Ca^{2+}
(E) Protein kinase C

13. Which answer is not correct for post-transcriptional modification of mRNA?

(A) methylation
(B) Histone-binding
(C) Splicing
(D) Trimming
(E) Polyadenylation

14. Genome-wide gene expression of a cell can be detected by the technology of

(A) Real time RT-PCR
(B) Fluorescence *in situ* hybridization
(C) Direct nucleotide sequencing
(D) cDNA microarray
(E) Chromosome karyotyping

15. Which molecule is not constitutively present in the cytosol?

(A) Transcription factors
(B) Nucleotides
(C) Polysomes
(D) Protein tyrosine phosphatase
(E) Introns

16. Which of the following assay can be used to detect protein-protein interactions:

(A) DNA footprinting
(B) Western
(C) Yeast two-hybrid
(D) Northern.

17. During mitosis, the nuclear membrane of a cell:

(A) disapears temporarily
(B) does not disappear;
(C) disappear permanently

18. Which one of the following amino acids can form covalent bonds with other amino acids?

(A) lysine

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(B) valine
(C) cystein
(D) alanine

19. Which cellular machinery is responsible for degrading poly-ubiquitinated proteins
(A) degradosome
(B) proteasome
(C) lysosome
(D) endosome

20. What is not the major advantage to use C. elegans as a model organism
(A) characterized cell lineages
(B) powerful genetic tools
(C) ease in RNAi approach
(D) ease in immunostaining

21. Which of the following statement is not correct for the RNA interference (RNAi)?
(A) RNA interference is the method of choice for knocking down gene expression in a variety of biological systems
(B) RNAi is a phenomenon in which the introduction of single stranded RNA into a diverse range of organisms and cell types caused degradation of complementary mRNA
(C) The small interfering RNAs (siRNAs) and microRNAs (miRNAs) trigger posttranscriptional gene silencing in animals, are 21 nt double-stranded RNAs
(D) Both siRNAs and miRNAs are produced by the cleavage of double-stranded RNA (dsRNA) precursors by Dicer
(E) Dicer is one of the member of the RNase III family of dsRNA-specific endonucleases

22. All of the following statements concerning membrane are true EXCEPT
(A) All transmembrane proteins and glycolipids are asymmetrically oriented in the bilayer
(B) Biomembranes make themselves selectively permeable to ions
(C) Most lipids and many proteins are laterally mobile in biomembranes
(D) Short-chain lipids attached to certain amino acids anchor some proteins to one or the other membrane leaflet
(E) Peripheral proteins are attached to the membrane by ionic bonds that link them to other membrane protëins or to phospholipid bead groups

23. Which of the following statement(s) is (are) true about the protein?
(A) Two protein molecules having the same molecular weight and charge can have different mobility
(B) Two-dimensional polyacrylamide gel electrophoresis (2-D PAGE) is the powerful method currently available which is capable of simultaneously separating thousands of protein

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(C) A monoclonal antibody differs from a polyclonal antibody in that monoclonal antibodies are synthesized by a population of identical or cloned cells

(D) The reaction between specific antibody and a protein antigen depends on the presence of recognized epitopes of protein antigen

(E) All of the above are correct

24. Protein coding genes are mainly transcribed by RNA polymerase

(A) I

(B) II

(C) III

(D) alpha

(E) beta.

25. The probability to obtain an Aa phenotype from Aa x Aa intercrosses is

(A) 1/4

(B) 1/8

(C) 1/2

(D) 1/6

(E) 1/12

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Part 2 (50%) 請作答於次頁【非選擇題作答區】

1. Which of the following genetic methods is the most useful for understanding the function of essential genes? (a) null mutations, (b) domain deletions, (c) conditional mutations, (d) scanning mutagenesis, (e) fusions.
2. Which is the function of peroxisome? (a) nuclear receptor activation, (b) β-oxidation of fatty acids, (c) glycolysis, (d) TCA cycle, (e) pentose phosphate pathway.
3. Which of the following molecules is (are) involved in the homeostasis of blood glucose level? (a) ACTH, (b) Grhelin, (c) Leptin, (d) Catecholamine, (e) glucocorticoid.
4. Fatty acid synthesis and degradation are reciprocally regulated so that both are not simultaneously active. A person with obesity is often found to be associated with type II diabetes. Which of the following enzymes may be most likely responsible for this disorder? (a) acetyl CoA carboxylase, (b) protein kinase, (c) AMP-stimulated protein kinase, (d) lipase, (e) protein phosphatase 2A.
5. To study how a particular secretory protein folds within the ER, you perform experiments to determine whether a particular chaperone binds to the newly synthesized protein in ER extracts. Please indicate which of the following molecules should be added to the extracts: (a) GTP, (b) GDP, (c) ATP, (d) ADP, (e) no need to add anything.
6. Human alpha-, beta-, and gamma-tubulin genes are (a) homologous, (b) orthologous, (c) paralogous, (d) redundant, genes.
7. The ticks spend much of their time as blood-sucking parasites on various animals. The pheromone is deposited on the natural substrate of the tick off its host, i.e., on bushes or on the ground or wherever the tick lives when it has no host. This pheromone arrests wandering ticks on contact, causing them to aggregate in tight clusters and remain quiescent. The pheromone responsible for this behavior is guanine. Write the chemical structure of guanine!
8. When performing metabolic labeling by pulse chase, the cells are kept first in methionine- or leucine-free medium for at least 30 min, then pulse-labeled for 20 min with [^{35}S]methionine or [^{14}C]leucine followed by chase in the presence of 10 mM unlabeled methionine or leucine. You cannot replace the radiolabeled methionine or leucine with radioactive cysteine or serine followed by chase with unlabeled cysteine or serine! Why? (You must give a very concise answer with no more than two sentences!)
9. A particulate enzyme is isolated by extracting the membrane fraction with buffers containing detergents and precipitated with acetone. The enzyme activity of the precipitate suspension can be detected only when phosphatidylcholine is added following brief sonication. Please explain why! (You should not use more than two sentences!)
10. The activity of a key metabolic enzyme, E, may be regulated by the availability of its substrate, S. S is brought into the cell by an active transport system. What is the most important small molecule factor that could influence the activity of E?
11. Tommy bought a vial of radioactive [γ^{32}P]ATP that is 5000 Ci/mmol and 10 mCi/ml. What is the concentration of ATP? (a) 10μM, (b) 5μM, (c) 2μM, (d) 1μM, (e) 10nM.
12. Photosynthetic phosphorylation and oxidative phosphorylation appear to be generally similar processes. Which of the following statements is not true of both processes? (a) Each represents the major route of ATP synthesis in cells in which it exits, (b) Both processes are associated with membranous elements, (c) Both contain cytochromes and flavins in their electron carrier chains, (d) Both make use of oxygen as a terminal electron carrier.