※ 注意：請用 2B 鉛筆作答於答案卡，並先詳閱答案卡上之「畫記說明」。

Please choose the most appropriate terms/phrases/statements that complete or answer the questions.
Attention: <u>More than one</u> of the choices provided may be correct. (2.5 points for each question)

1. Metastasis of malignant cells is a complex process involving many steps of
(A) Decreased expression of cadherin on the cancer cells
(B) Increased production pf prostaglandin E2 by vascular endothelial cells
(C) Decreased production of nitric oxide by blood vessel endothelium
(D) Increased degradation of extracellular matrix by cancer cells
(E) Down-regulation of MHC class I molecules on cancer cells

2. Which statements regarding physiological functions of cytokines are true?
(A) Increased renal blood flow
(B) Modulation of immune responses
(C) Angiogenesis
(D) Hematopoiesis
(E) Decreased energy demand of the body

3. Production of acute phase reactants by hepatocytes is induced by
(A) Sex hormones
(B) Microbial infections
(C) Allergic reactions
(D) Mental stress
(E) TNF-α stimulation

4. Inflammatory reactions can be elicited by
(A) Thermal injury
(B) Viral infections
(C) Irradiation
(D) Chemical burn
(E) Allergy

5. Nitric oxide exerts an array of physiological and pathological effects on the body including
(A) Vasodilation
(B) Inhibition of leukocyte adhesion to vascular wall
(C) Immunomodulation
(D) Enhancement of phagocytosis
(E) Modulation of cyclo-oxygenase pathway

6. Which molecules involve in cell apoptois?
(A) Phospholipases
(B) Protein tyrosine phosphatases
(C) Endonucleases
(D) Neutral esterases

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(E) Caspases

7. Which molecules act as cytoplasmic signal transducers in the cells?
(A) Protein kinase C
(B) STATs
(C) Na^+-K^+-ATPase
(D) Ca^{2+}
(E) NF-κB

8. Which pairings in the below are correct for the biological functions of cytoplasmic organelles
(A) Proteosome-- peptide degradation
(B) Endosome--proteins and lipids sorting
(C) Peroxisome—breakdown of oxidative products of amino acids
(D) Polysome—digestion of phagocytosed microbes
(E) Ribosome—protein synthesis

9. Normal human plasma contains many protein molecules including
(A) Amyloid substances
(B) Cellulose
(C) Cryoglobulin
(D) Fibronectin
(E) Ferritin

10. Which immune reactions are mediated by cellular immunity?
(A) Transfusion reaction
(B) Tumor cell killing
(C) Allograft rejection
(D) Defense against intracellular pathogens
(E) Complement-mediated tissue damage

11. Which of the following statements is/are true?
(A) Translation of an mRNA may be regulated at the level of its stability.
(B) The half-life of an mRNA is largely translation dependent.
(C) Translation process may be blocked by actinomycin D.
(D) Translation of an mRNA may be regulated by ~22 nucleotide microRNAs.
(E) Translation of an mRNA depends on the dynamic assembly of mRNPs.

12. Which of the following statements is/are false?
(A) A particulate enzyme usually depends on phospholipids for its activity.
(B) Secreted proteins are usually not phosphorylated.
(C) Secreted proteins contain carbohydrates usually have short half-life.
(D) Albumin may serve as carrier for steroid hormones and fatty acids.
(E) The activity of a protein is determined co-translationally.

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13. Which of the following statements is/are false?
(A) During mitosis, the correct microtubule arrangement that persists is the one in which sister kinetochores are attached to opposite poles.
(B) Embryonic stem (ES) cells are derived form the primodial germ cells and can potentially develop into all types of tissue.
(C) Spermatid derives from division of secondary spermatocytes.
(D) Spermatid DNA is transcriptionally active.
(E) Protamines are important for spermatid elongation.

14. A semi-permeable membrane separates a solution of sodium proteinate (0.001M) from a solution of 0.01M NaCl. If the membrane is permeable to NaCl, but not to the protein anion, how many moles of salt (per liter) will move across the membrane?
(A) 0.0099
(B) 0.0090
(C) 0.0072
(D) 0.0052
(E) 0.0048.

15. Which of the following statements is/are true?
(A) The optimal pH for an enzyme means that the quaternary structure of that enzyme is pH-dependent.
(B) The molecular weight of a functional protein can be determined by SDS-PAGE.
(C) The functional activity of a protein is spatial and temporal dependent.
(D) The activity of a protein depends on its interaction with other proteins.
(E) The correct disulfide linkage of a protein is formed after translation.

16. Which of the following statements is/are false?
(A) The final shape of a protein is determined by only one thing: the precise sequence of amino acids in the protein.
(B) Prion diseases (e.g., "mad-cow" disease) are likely resulted from a failure of chaperones.
(C) *Trans* peptide bonds before proline residues are often located at the first residue of certain types of tight turns in the protein backbone.
(D) The cleavage of the four-residue peptide Ala-Ala-Pro-Phe by chymotrypsin may be accelerated by prolyl isomerase.
(E) Heat shock proteins (HSP) are a group of proteins whose expression is transcriptionally regulated.

17. Which of the following statements is/are true?
(A) During protein synthesis, all peptide bonds are synthesized in the *cis* configuration.
(B) The prolyl peptide bonds of a denatured protein can isomerize to *trans*.
(C) The segment of a protein with the sequence, NH2-LRKEDPYTSPVLDHCNRM-COOH is likely to reside in the loop region of that protein.
(D) The peptide, GNCRLDSKTVQFYE, has one potential phosphorylation site.
(E) The peptide, PNCRLDSKTVQFYE, has one potential acetylation site.

18. Which of the following statements is/are true?

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(A) Centromere is transcriptionally inactive.
(B) Selfish genes are dispersed into both euchromatin and heterochromatin regions.
(C) DNA methylation and histone methylation are tightly linked.
(D) DNA methylation is *a priori* for heterochromatin formation.
(E) Iron deficiency may affect the histone modification.

19. Which of the following statements is/are true?
(A) X-inactivation may be mediated by RNAs encoded by X chromosomes.
(B) The sequence of mRNA transcribed from the double stranded DNA,
5'-GATCGGTAAGTTCCCATACCTGTGA-3' (upper strand), is
5'-GAUCGGTAAGTTCCCAUACCUGUGA-3'.
(C) Suppose that a suppressor RNA can be transcribed from the double stranded DNA
5'-GATCGGTAAGTTCCCATACCTGTGA-3' (upper strand), its sequence would be
5'-CUAGCCAUUCAAGGGUAUGGUCACU-3'.
(D) Reverse transcriptase can be inhibited by anisomycin.
(E) RNA is easier precipitated in the ethanol when 0.1 M NaCl is present than no NaCl at all.

20. Which of the following statements is/are true?
(A) Velocity-type ultracentrifugation is frequently employed for DNA purification.
(B) Phenyl-Sepharose is an anionic exchanger.
(C) The buoyant density of RNA is higher than DNA.
(D) Salt concentration is unimportant for gel filtration chromatography.
(E) Nuclear proteins can be extracted by high salt buffer in conjunction with acetone powder technique.

21. Which animals are frequently used as a model system to do biomedical researches?
(A) Mice
(B) Zebrafish
(C) C. elegans
(D) Earth worms
(E) Drosophila

22. In terms of molecular weight which order is CORRECT?
(A) dsDNA (10 kb)> dsRNA (10 kb)> Protein> Amino Acid
(B) dsRNA (10 kb)> dsDNA (10 kb)> Protein> Amino Acid
(C) Protein> dsDNA (10 kb)> dsRNA (10 kb)> Amino Acid
(D) Protein> dsRNA (10 kb)> dsDNA (10 kb)> Amino Acid
(E) Protein>Amino Acid> dsDNA (10 kb)> dsRNA (10 kb)

23. Signal transduction is critical for cells to respond to various stimuli. Which statements regarding to signal transduction are CORRECT?
(A) Conformational changes of receptors on the cells occur upon ligand binding
(B) Post-translational modifications of signal mediators are accompanied by the change of receptor conformation
(C) Proteins can be recruited to the receptors after the modifications

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(D) Transcriptional factors are eventually activated and translocated into nucleus
(E) Downstream genes are induced by the end of the signaling

24. Cell cycle progression is in a well controlled manner. Which statements regarding to cell cycle are CORRECT?
(A) Cell cycle can be divided into four phases, namely G1, S and G2/M
(B) Cells in G2/M phase contain 2N DNA
(C) CDKs and cyclins are critical molecules for regulating cell cycle progression
(D) Tumor cells are usually in G1 phase
(E) UV irradiation will result in cell cycle arrest

25. Which statements regarding to X-linked diseases are CORRECT?
(A) The causative gene is located in Y-chromosome
(B) Such diseases are frequently found in male individuals
(C) The disease found in children is inherited from their mother
(D) It is usually fetal
(E) The inheritance of the disease is still following the Mendelian law

26. Influenza virus infection in humans are one of the most common diseases because
(A) It spreads via aerosol route
(B) Humans have no immunity to this virus
(C) Influenza virus can change its genome from time to time
(D) Influenza virus can escape or evade immune responses
(E) It is difficult to make vaccines to influenza virus due to its genomic instability

27. Program cell death or apoptosis is important during development and for maintaining homeostasis. Which statements regarding to apoptosis are CORRECT?
(A) Apoptosis can be triggered by external or internal stimuli
(B) It only happens in vertebrate but not in invertebrate animals
(C) Caspases and Bcl-2 family members are key regulators for apoptosis
(D) DNA fragmentation is one feature of apoptosis
(E) Phosphatidylserine is exposing to outer leaflet of the plasma membrane when cells are undergoing apoptosis

28. Regarding to protein synthesis in a cell which statements are CORRECT?
(A) Proteins are synthesized in the nucleus of a cell
(B) Each amino acid is encoded by one or more codons
(C) Usually protein sequence begins with Met because the start codon is AGG
(D) Termination of translation happens when a ribosome reaches a stop codon such as UGA
(E) A mutation in the coding region resulting in formation of a stop codon is called silent mutation

29. Regarding to microscopy which statements are CORRECT?
(A) Phase-contrast microscopy are used to view the details of live, unstained cells
(B) When using fluorescent microscope, one needs to wear glasses to avoid the injury of the fluorescent light

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emitted from the samples
(C) Confocal microscopy gets a sharper fluorescent images than that in regular fluorescent microscope
(D) Inverted microscope is used for viewing cultured cells in a dish because it has greater working distance than that in regular microscope
(E) Electronic microscopy can generate the largest magnification of the image of a sample

30. Which ones are commonly used as a reporter gene in basic researches?
(A) GFP
(B) Luciferase
(C) β-actin
(D) α-tubulin
(E) Albumin

31. Methods apply polymerase chain reaction
(A) Yeast two-hybrid
(B) Mutagenesis of a gene
(C) Western blotting
(D) Real-Time PCR
(E) ELISA.

32. Which properties of gene-knockout mouse are true ?
(A) Gene introduced into genome by random insertion
(B) Gene introduced into genome by homologous recombination
(C) Gene introduced into genome by equilibrium insertion-recombination
(D) Gene study for gain of function
(E) Gene study for loss of function.

33. In controlling gene expression, the N-terminal tails of histones are modified by
(A) Acetylationn
(B) Alkylation
(C) Methylation
(D) Phosphorylation
(E) Sulfution.

34. Methods are used to reveal apoptotic cells
(A) TUNEL assay
(B) Annexin V staining assay
(C) RNA interference (RNAi)
(D) Propidium iodide (PI) staining assay
(E) Coombs tests

35. Which of the following genetic triplet codes are termination codons?
(A) AUG
(B) UAA

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(C) UAG
(D) UCC
(E) UGA.

36. Which of the following statements about cancer and oncogenes are true?
(A) Tumor cells are immortalized
(B) Tumor cells are transformed
(C) Transforming viruses carry oncogens
(D) ras genes are oncogenes
(E) p53 is a oncoprotein.

37. Which of the following events in signal transduction are mediated by receptor tyrosine kinase?
(A) Ligand-mediated receptor dimerization
(B) Activation of SHP-1 and SHP-2
(C) Activation of signal mediators
(D) Activation of transcription factors
(E) Translocation of transcription factors into nucleus and transactivation.

38. Which of following small nuclear RNAs (snRNAs) are involved for splicing?
(A) U1
(B) U2
(C) U4
(D) U5
(E) U6.

39. Which of the following statements about enhancers are correct?
(A) An enhancer activates the nearest promoter to it
(B) An enhancer can be located only at the downstream of the promoter
(C) Enhancers contain the same elements found at promoters
(D) Enhancers work by decreasing the concentration of activators near the promoters
(E) Enhancers can work as insulators.

40. Which of the followings are the stages of RNA polymerase mediated transcription?
(A) Template recognition
(B) Initiation
(C) Elongation
(D) Polyadenylation
(E) Termination.

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