

# 臺北醫學大學九十學年度研究所碩士班招生考試題目卷

科目：生物學

藥研所  
醫研所  
生材研

九十學年度研究所碩士班招生筆試

所別：醫研、生材、藥研

考科：生物學

題目試卷共 6 張，本試卷為第 1 張

## Part I: Choose only one best answer (40%)

- All living things share certain key characteristics:
  - order and sensitivity
  - growth, development and reproduction.
  - regulation and homeostasis
  - a and c
  - a and b
  - a through c
  - b and c
- The chemistry of life is \_\_\_\_\_ chemistry. Water molecules are very \_\_\_\_\_ and cling to other \_\_\_\_\_ molecules, causing them to be soluble in water solution, but exclude \_\_\_\_\_ molecules.
  - organic, polar, napoleon, polar
  - salt, polar, polar, nonpolar
  - water, nonpolar, polar, nonpolar
  - water, polar, polar, nonpolar
  - none of the above
- Proteins carry out a diverse array of functions including catalysis, \_\_\_\_\_, transport of substances, support, \_\_\_\_\_, and \_\_\_\_\_ of cell and body functions
  - storage, energy, control
  - defense, motion, regulation
  - metabolism, action, respiration
  - defense, oxidation, circulation
  - reproduction, sensitivity, restore
- What are the fundamental properties of life
  - cellular organization, sensitivity, and growth
  - development, reproduction, homeostasis
  - movement
  - all of above
  - a and b
  - b and c
- \_\_\_\_\_ cells function more effectively, enabling more rapid communication between the center of the cell and the environment. The \_\_\_\_\_ of a eukaryotic cell contains the cells hereditary apparatus-chromosomes. The endoplasmic reticulum (ER) synthesis \_\_\_\_\_, while smooth ER organizes the synthesis of \_\_\_\_\_ and other biosynthetic activities. The \_\_\_\_\_ collects, packages, modifies and distribute molecules. \_\_\_\_\_ contain specific genes related to some of their functions. Elements of the \_\_\_\_\_ support the cell shape and anchoring \_\_\_\_\_ in place.
  - Eukaryotic; DNA; proteins for export; carbohydrates; mitochondria; Golgi apparatus; extracellular matrix; cells
  - Large; nucleus; proteins for export; lipids; Golgi; apparatus; chloroplasts; cytoskeleton; molecules.
  - small; nucleus; proteins for export; lipids; Golgi apparatus; mitochondria and chloroplast; cytoskeleton; organelles
  - Prokaryotic; DNA; lipid for export; carbohydrates; Golgi apparatus mitochondria and peroxisom; cytoskeleton; organelles
  - small; nucleus; DNA; proteins; lipids; lysosomes mitochondria and chloroplasts; extracellular matrix; cells.

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題目試卷共 6 張，本試卷為第 2 張

6. The lipid bilayer of cell membrane is \_\_\_\_\_ within which membrane proteins are embedded by their \_\_\_\_\_ segments. The key class of membrane protein are \_\_\_\_\_.
- fluid mosaic; protein; transport channel proteins, cell surface receptors, cell surface markers, cell adhesion proteins
  - solid mosaic; lipid; transport proteins, cell surface receptor; cell markers; proteins attached to the cytoskeleton.
  - Sugar mosaic; polar; cell surface marker, enzymes; cell surface receptors, transport channel proteins, proteins attached to the extracellular matrix.
  - Solid mosaic; nonpolar; enzymes; cell surface marker, cell surface receptors, cell adhesion molecules, protein attach to cytoskeleton.
  - Fluid mosaic; nonpolar; transport channel proteins, enzymes, cell surface receptors, cell surface markers, cell adhesion proteins, proteins attached to cell cytoskeleton or extracellular matrix.
7. Most receptors are located on the surface of the plasma membrane. Enzymes receptors typically activate intracellular proteins by \_\_\_\_\_. G protein-linked receptors activate an intermediary protein, which then effects the intracellular change. \_\_\_\_\_ and \_\_\_\_\_ often behave as second messengers, intracellular substances that relay message from \_\_\_\_\_ to target proteins.
- GTP binding; cyclic AMP,  $Ca^{2+}$ , acceptor
  - phosphorylation; cyclic AMP,  $Ca^{2+}$ , receptor
  - GTP binding; phospholipase, adenylyl cyclase, substrate
  - adenylation; c-AMP,  $IP_3$ , receptor
  - none of the above
  - b and d are correct
8. Enzymes have an optimal \_\_\_\_\_ and \_\_\_\_\_, at which the enzyme functions most effectively. The activity of enzyme is facilitated by coenzyme, which can be \_\_\_\_\_ or other substances. Cofactors that are nonprotein organic molecules are called \_\_\_\_\_.
- temperature, pH; metal ions; coenzymes
  - ionic strength, activation; organic; activators
  - ions, pH; nonorganic; coenzymes
  - ionic strength, pH; protein; activators
  - temperature, ions; metal ions; coeffectors
9. Most plants incorporate carbon dioxide into sugars by means of a cycle of reactions called the \_\_\_\_\_, which is driven by the \_\_\_\_\_ and \_\_\_\_\_ produced in the light-dependent reactions but which can itself take place in the dark.
- TCA cycle; ATP production,  $O_2$
  - kreb cycle; ATP, NADPH
  - calvin cycle; ATP, NAD
  - TCA cycle;  $CO_2$ ,  $H_2O$
  - glycolysis; ATP, NADPH
  - calvin cycle; ATP, NADPH

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10. Two groups of proteins, \_\_\_\_\_ and \_\_\_\_\_, interact to regulate cell cycle. Some growth factors accelerate the cell cycle by promoting these proteins, others suppress it by inhibiting their function. A cell cycle can be briefly divided into interphase (including G<sub>1</sub>, S and G<sub>2</sub> phases), \_\_\_\_\_ and \_\_\_\_\_ three phases.
- cdk, cyclins; mitosis, cytokinesis
  - MPF, Rb; prophase, prometaphase
  - cdk, cyclins; telophase, prometaphase
  - cdk, MPF; synapses, mitosis
  - Rb, kinetochore; metaphase, anaphase
11. Sexual reproduction increases genetic variability through (1) \_\_\_\_\_ in prophase I; (2) \_\_\_\_\_ in metaphase I and (3) \_\_\_\_\_. Chiasma observed during prophase I must occur after formation of synaptonemal complex during \_\_\_\_\_.
- independent assortment, chiasma, crossing over; pachytene
  - crossing over, independent assortment, random fertilization; pachytene
  - chiasma, homologous pairing, synapsis; diplotene
  - homologous pairing, synapsis, random fertilization; diakinesis
  - crossing over, synapsis, independent assortment; leptotene
12. DNA replication is \_\_\_\_\_. \_\_\_\_\_ replicates the leading strand while \_\_\_\_\_ synthesis only portions of the lagging strand DNA.
- conservative; DNA polymerase I, DNA polymerase II
  - de novo; DNA polymerase I, DNA polymerase III
  - semiconservative; DNA polymerase III, DNA polymerase I
  - semiconservative; DNA ligase, DNA polymerase III
  - conservative; DNA polymerase III, DNA polymerase III
13. Transcription is carried out by the enzymes RNA polymerase \_\_\_\_\_ for m-RNA, \_\_\_\_\_ for r-RNA and \_\_\_\_\_ for t-RNA. The amino acid sequence of a particular protein is specified by a corresponding sequence of nucleotides in the DNA of a \_\_\_\_\_. An amino acid residue in a protein is determined by the nucleotide sequence of a \_\_\_\_\_ in m-RNA.
- I, II, III; codon, template
  - II, III, I; template, gene
  - III, I, II; gene, codon
  - III, II, I; template, codon
  - II, I, III; gene, codon
  - I, III, II; gene, triplate
14. Gene expression may be controlled by \_\_\_\_\_. Regulatory proteins usually contain structure motifs such as \_\_\_\_\_. The processing of primary RNA transcript requires multiple snRNPs combine to form a larger complex called a \_\_\_\_\_.
- regulating promotor access; helix-turn helix and homeodomain; spliceosome
  - transcriptional regulation; zinc finger; spliceosome
  - post transcriptional regulation; leucine zipper; spliceosome
  - all of the above are correct
  - b and c are correct
  - only a and b are correct

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15. Mutation in \_\_\_\_\_ results in accelerating the cell cycle while mutation in \_\_\_\_\_ promotes cell proliferation.
- proto-oncogenes, tumor-suppressor genes
  - oncogenes, tumor-suppressor genes
  - germline genes, proto-oncogenes
  - structural genes, oncogene
  - structural genes tumor-suppressor genes
16. The hemoglobin alleles, responsible for sickle cell anemia in \_\_\_\_\_, is maintained by balancing selection in central Africa, where \_\_\_\_\_ for the S allele are \_\_\_\_\_ to malaria.
- homozygotes, heterozygotes, sensitive
  - homozygotes, heterozygotes, resistant
  - heterozygotes, homozygotes, resistant
  - homozygotes, heterozygotes, sensitive
  - none are correct
17. Total reproductive value is a \_\_\_\_\_ between investment in current reproduction and in growth that \_\_\_\_\_ future reproduction. Life history adaptations involve many trade-offs between \_\_\_\_\_ and investment in survival. Different kinds of animals and plants employ quite different approaches
- result, suppresses, reproductive cost
  - link, increases, individual growth
  - trade of, promotes, reproductive cost
  - reciprocals, decreases, community interest
  - relationship, promotes, society pressure.
18. Animals defend themselves against predators with \_\_\_\_\_.
- warning coloration
  - camouflage
  - chemical defenses
  - dancing and-a
  - b and c
  - a through c
  - a and c
19. Human activity is placing the environment under increasing stress. Among the environmental challenge we face are:
- developing appropriate energy sources
  - preserving the stratospheric ozone layer to reduce the dangerous level of ultraviolet radiation
  - preserving tropical rain-forest, avoiding pollution and acid precipitation
  - reduce production of CO<sub>2</sub> to prevent greenhouse effect which leads to global warming
  - a, b and d
  - b, c and d
  - a through d
20. \_\_\_\_\_ contains at least half of all species of plants, animals, fungi and microorganisms.
- Tropical monsoon forests
  - Temperate evergreen forests
  - Tropical rainforests
  - Savannas
  - Warm, moist evergreen forests
  - none of the above

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**PART II : Please choose only ONE BEST answer for each question. (30%)**

- Which of the following apparatus is more sensitive to angular acceleration?  
(A) semicircular canals (B) utricle (C) saccule  
(D) cochlea (E) none of the above
- Which of the following statements is correct?  
(A) Rods are responsible for black and white vision.  
(B) Cones are responsible for black and white vision.  
(C) Rhodopsin is the photopigment in cones.  
(D) Photopsin is the photopigment in rods.  
(E) none of the above.
- The order of light stimulus processed by the cells of the retina is \_\_\_\_\_.  
(A) ganglion cell → bipolar cell → photoreceptors  
(B) ganglion cell → photoreceptor → bipolar cell  
(C) photoreceptor → ganglion cell → bipolar cell  
(D) photoreceptor → bipolar cell → ganglion cell  
(E) bipolar cell → ganglion cell → photoreceptor.
- In the endocrine system, what organ functions exclusively as an endocrine gland?  
(A) the pineal gland (B) the pituitary gland (C) the pancreas  
(D) the ovaries (E) two of the above.
- Which of the following statements about skeletal muscle is **NOT CORRECT**?  
(A) Sarcomere is the smallest subunit of muscle contraction.  
(B) The thick myofilaments are stacked together to produce Z bands  
(C) The thin myofilaments alone form A bands.  
(D) H bands are located at the center of the A bands.  
(E) More than one of the above.
- Which of the following factors contribute(s) to the membrane potential?  
(A) the action of the sodium-potassium pumps  
(B) the different degrees of permeability of the plasma membrane to different ions  
(C) the presence of fixed anions-proteins and organic phosphates that are negatively charged and unable to leave the cell  
(D) all of the above  
(E) two of the above
- What is the neurotransmitter released by the parasympathetic postganglionic neuron?  
(A) dopamine (B) acetylcholine (C) norepinephrine  
(D) serotonin (E) none of the above.
- Which of the following is the most common type of connective tissue in the typical human body?  
(A) adipose tissue (B) loose connective tissue  
(C) fibrous connective tissue (D) loose adipose tissue (E) bone
- The parietal cells of the stomach's gastric glands secrete \_\_\_\_\_.  
(A) mucus. (B) lactic acid. (C) hydrochloric acid.  
(D) pepsinogen. (E) pepsin.
- During which phase of the heartbeat does the heart fill with blood?  
(A) resting phase (B) diastole (C) systole  
(D) atrial phase (E) Interphase

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11. Mammals are thought to have evolved from \_\_\_\_\_.  
(A) thecodonts                      (B) therapsids                      (C) dinosaurs  
(D) marsupials                      (E) poikilothermics
12. The reptile heart is distinguished from the amphibian heart by the presence of \_\_\_\_\_.  
(A) two separate atria                      (B) systemic and pulmonary circulation  
(C) cutaneous respiration                      (D) a partially divided ventricle  
(E) two separate ventricles
13. The antibodies that bind to antigens on a cell and cause the aggregation of complement proteins to ultimately burst the cell are \_\_\_\_\_.  
(A) IgG                      (B) IgA                      (C) IgD                      (D) IgM                      (E) IgE
14. Which of the following genes were not studied as part of the elegant research work on the segmentation pattern of the *Drosophila* embryonic development?  
(A) bicoid gene                      (B) Hox gene                      (C) gap genes  
(D) segment polarity genes                      (E) pair-rule genes
15. All of the following are events in the physiology of intercourse except \_\_\_\_\_.  
(A) excitement                      (B) plateau                      (C) orgasm  
(D) coitus                      (E) resolution

## **PART III : Answer the following questions. (30%)**

1. Please list the different features between eukaryotes and bacteria in term of cell and genome level (6%)
2. The prevalence of mad-cow disease reveled a most striking molecule, which can be an infective agent in the human society. What is the name of this molecule? \_\_\_\_\_ (3%), and what is the chemical structure of this molecule? (a) DNA, (b) DNA with protein, (c) protein, (d) RNA with protein, (e) RNA (choose one) (2%)
3. Why fungus is not a plant? Please list the reasons in brief (5%)
4. Please list at least two kinds of plant hormone and their major function in regulating the growth of plant (8%)
5. What do you think about the idea that we make new species of plant or generate mass production of a plant for economic reasons using genetic technique? What are the advantages and the disadvantages? (6%)