

系所組別：生物資訊與訊息傳遞研究所甲組

考試科目：細胞分子生物學

考試日期：0220，節次：3

※ 考生請注意：本試題 可 不可 使用計算機

I. 單選題 (每題 2 分，題號 1-15；總共佔 30 分)
Single-choice questions, 2% per each, total score =30%

1. Select the correct statement about nucleosome
 - A. contains only DNA and nonhistone proteins
 - B. has a core of histones with DNA wound around it
 - C. is fully responsible for DNA packaging into chromosomes
 - D. surround nuclear pores
 - E. all nuclear DNA is in regularly spaced nucleosomes

2. Which of the following properties are "NOT" part of the normal functioning of aminoacyl tRNA synthetases ?
 - A. recognition of the codon
 - B. recognition of the anticodon of a tRNA molecule
 - C. ability to distinguish one amino acid from another
 - D. ability to remove an incorrectly coupled amino acid from a tRNA molecule

3. To begin translation, the ribosome binds near the
 - A. 5' end of the promoter.
 - B. 3' end of the promoter.
 - C. 5' end of the mRNA.
 - D. 3' end of the mRNA.
 - E. 3' end of the operator.

4. If two adjacent genes are transcribed in the same direction and the two genes overlap, then
 - A. the two genes must be encoded in the same reading frame.
 - B. the two genes could be encoded in either the same or different reading frames.
 - C. the two genes must be encoded in different reading frames.
 - D. the two genes must be transcribed into a poly-cistronic mRNA.
 - E. the promoters for the two genes must overlap.

5. "G" proteins in membranes
 - A. act as tyrosine protein kinases
 - B. bind only to GTP but not to GDP

(背面仍有題目,請繼續作答)

系所組別：生物資訊與訊息傳遞研究所甲組

考試科目：細胞分子生物學

考試日期：0220，節次：3

※ 考生請注意：本試題 可 不可 使用計算機

- C. can bind to both a receptor and an effector
D. cannot act at a gated channel
6. Chloroplasts are disrupted and the stroma separated from the lamellae. The isolated stroma will fix CO_2 if it is supplied with
- A. ATP and NADPH
B. carotenoids
C. light
D. oxygen
7. The molecular biology of protein synthesis in the nucleus-cytoplasm and mitochondrial systems use the same
- A. genetic code
B. structures of amino acids
C. linearity of DNA
D. size of ribosomes
8. The granular component of the nucleolus is mostly
- A. DNA
B. mRNA
C. incomplete ribosomes
D. nucleosomes
E. microtubules
9. The ground substance of the extracellular matrix of mammalian fibrous tissues is composed of
- A. polycationic hyaluronic acid
B. proteins linked to sulfated glucosaminoglycans
C. crosslinked collagen
D. elastin and desmosine
10. The reason that a mutation carried on human mitochondrial DNA is inherited through the mother only is that
- A. paternal mitochondrial DNA does not enter the egg
B. egg cells do not contain mitochondrial DNA

系所組別： 生物資訊與訊息傳遞研究所甲組

考試科目： 細胞分子生物學

考試日期：0220 · 節次：3

※ 考生請注意：本試題 可 不可 使用計算機

- C. sperm cell mitochondria lack DNA
D. maternal mitochondrial DNA is degraded in the zygote
11. The major type of enzyme present in the lysosome catalyzes
A. condensation
B. polymerization
C. hydrolysis
D. proton pumping
E. RNA splicing
12. Cells in G_0 phase
A. can be stimulated to enter S phase
B. have the tetraploid amount of DNA
C. occur in rapidly dividing tissues
D. must accumulate division potential before entering M phase
13. Meiosis is a division mechanism that produces
A. two cells
B. two nuclei
C. eight cells
D. four nuclei
14. Modification of proteins as they pass through the Golgi include all of the following except
A. proteolysis
B. glycosylation
C. signal sequence removal
D. sulfation
15. A possible role for intermediate filaments is in
A. ciliary movements
B. movements of whole cells
C. slow active transport across the plasma membrane
D. the Z line of muscle

(背面仍有題目,請繼續作答)

系所組別： 生物資訊與訊息傳遞研究所甲組

考試科目： 細胞分子生物學

考試日期：0220，節次：3

※ 考生請注意：本試題 可 不可 使用計算機

II. 填入正確文字 (每空格 2 分，題號 1-10，總共佔 20%，請注意專有名詞拼字，錯一英文字母即不予計分。)

Fill the right word(s) in each blank, Total score=20%

You will refer to the following library to fill in each blank: (填字參考)

(MTT assay, FISH, Ames test, tyrosines, phosphotyrosines, serines, threonines, prolines, methylation, glycosylation, ubiquitylation, crisis, autophagy, anoikis, aneuploidy, gene linkage, telomere, centrosome, centromere, dominant-negative, nonsense mutation, immunohistochemistry, chromatography, EMSA, Chromatin immunoprecipitation, agonist, cycloheximide, colchicines, antagonist, Euchromatin, Heterochromatin)

1. The _____ makes it possible to quantitatively assess the mutagenic potency of a test compound.
2. Src has three homology domains : SH1 harbors the catalytic function; SH2 acts as an intracellular "receptor" for specific _____ whose unique identities are determined by the particular oligopeptide sequence on their C' side; and SH3 recognizes and binds certain proline-rich domains of substrates.
3. While the levels of the D cyclins are controlled primarily through extracellular signals, the other cyclins' gradual accumulation followed by their rapid destruction (via _____) dictates that the cell cycle clock can move in only one direction.
4. State arising when cells lose telomeres of adequate length, resulting in the end-to-end fusion of chromosomes, karyotypic chaos, and widespread cell death by apoptosis are called _____.
5. The term _____ is usually reserved for the types of deviation from a normal karyotype that involve changes in chromosome number and/or structures of individual chromosomes.
6. _____ is region of a chromosome that holds the two chromatids together and that binds, via a kinetochore, with mitotic or meiotic spindle fibers.
7. The _____ is referring to a mutant allele of a gene that, when co-expressed with

系所組別： 生物資訊與訊息傳遞研究所甲組

考試科目： 細胞分子生物學

考試日期：0220，節次：3

※ 考生請注意：本試題 可 不可 使用計算機

the wild-type allele of the gene, is able to interfere with the functioning of the latter.

8. _____ is a technique by which chromosomal DNA bound by a particular protein can be isolated and identified by precipitating it by means of an antibody against the bound protein.

9. The _____ is a molecule, often synthetic, that blocks the biologic function of a natural molecule (e.g., hormone) and is widely used research on cell surface or nuclear receptors.

10. _____ is region of a chromosome that remains in the form of unusually condensed chromatin; generally transcriptionally inactive.

III. 問答題 (題號 1-7; 總共佔 50 分)

Answer the following questions; total score =50%

1. Please describe one of the hypotheses to explain how an enhancer can act on a promoter hundreds of base pairs away? (4%)

2. Please describe the role and mechanism of microRNA in cells (5%)

3. Please define the term "Epigenetics". (5%)

4. Please list three different methods you know to study protein-protein interactions in vitro or in vivo, and give a brief description. (6%)

5. Posttranslational modification (PTM) is the chemical modification of a protein after its translation. Please describe 3 examples of histone modification, and briefly describe how "histone code" regulates gene expression. (10%)

6. What are "Telomere" and "Telomerase"? Please describe their roles in cancer biology and aging. (10%)

(背面仍有題目,請繼續作答)

系所組別：生物資訊與訊息傳遞研究所甲組

考試科目：細胞分子生物學

考試日期：0220，節次：3

※ 考生請注意：本試題 可 不可 使用計算機

7. Control of enzyme activity requires communicating information from one location to another. In multi-cellular organisms, the two locations may be in different cells and the communication may involve hormones, growth factors, neurotransmitters, and so forth. These molecules often need not enter a cell to elicit a response; the information is carried along the signaling pathway by a second messenger.

- (a) List three different forms of “second messengers”. (3%)
- (b) Identify what molecule receives the “information” carried by the second messenger. (3%)
- (c) Briefly explain how one molecular form of a second messenger can elicit different responses in two different cells. (4%)