國立政治大學　104　學年度碩士班招生考試試題

考試科目	細胞與分子生物學 8151A	所別	神經科學研究所 8151	考試時間	02月28日（六）第一節

一、單選題（20題，每題2分）

01. Which of the following is a monosaccharide?
(A). fructose. (B) galactose. (C) glucose. (D) all of the above.

02. Which of the following plays a role in the degradation of proteins?
(A) RNAi. (B) ubiquitin. (C) proteasome. (D) B and C.

03. Protein kinase A is converted from an inactive state to an active state by binding
(A) ATP. (B) calcium. (C) cAMP. (D) A and C.

04. A mutation that changes a cysteine codon to a tryptophan codon is called a
(A) missense mutation. (B) nonsense mutation. (C) frameshift mutation. (D) silent mutation.

05. Which of the following enzymes will produce a blunt end (the cut site is indicated by the * in the recognition sequence)?
(A) *Taq*I (T*CGA). (B) *Eag*I (C*GGCCG). (C) *Eco*RV (GAT*ATC). (D) *Nsi*I (ATGCA*T)

06. Southern blotting is used to detect a specific
(A) DNA. (B) RNA. (C) protein. (D) carbohydrate.

07. A mutation that changes the recognition sequence for the restriction enzyme *Eco*RI from GAATTC to GATTTC is an example of a
(A) single nucleotide polymorphism (SNP). (B) simple sequence repeat (SSR). (C) A and B. (D) all of the above.

08. What method can be used to functionally inactivate a gene without altering its sequence?
(A) gene knockout. (B) RNA interference. (C) dominant negative mutation. (D) B and C.

09. The oxidation of fatty acids occurs in the
(A) mitochondria. (B) rough endoplasmic reticulum. (C) peroxisome. (D) A and C

10. Yeasts use fermentation to synthesize ATP
(A) in the absence of oxygen. (B) because fermentation produces more ATP than oxidative phosphorylation. (C) because yeasts lack mitochondria. (D) to produce lactic acid.

11. Brown-fat mitochondria uncouple oxidative phosphorylation to produce
(A) ADP. (B) oxygen. (C) heat. (D) fat.

12. A major source of reactive oxygen species (ROS) in animal cells is
(A) glycolysis. (B) electron transport in the mitochondria. (C) the reactions catalyzed by catalase and glutathione peroxidase. (D) vitamin E and α lipoic acid

13. In trimeric G proteins, GTP binds to
(A) the α subunit. (B) the β subunit. (C) the γ subunit. (D) the activated trimer.

14. Which of the following is not a common intracellular second messenger?
(A) inositol 1,4,5-trisphosphate (IP_3). (B) 1,2 diacylglycerol (DAG).
(C) adenosine triphosphate (ATP). (D) 3′-5′ cyclic guanine monophosphate (cGMP).

15. DAG activates

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(A) PKC. (B) PKA. (C) PLC. (D) calmodulin.

16. Binding of hormone to a receptor tyrosine kinase causes all of the following except
    (A) dimerization of the receptor.
    (B) autophosphorylation of the receptor.
    (C) activation of Ras through an interaction with GRB2 and Sos.
    (D) hydrolysis of GTP bound to Ras.
17. The resting potential of a typical neuron is
    (A) -60 mV. (B) 0 mV. (C) 20 mV. (D) 50 mV.
18. During an action potential, which happens first?
    (A) opening of voltage-gated Na^+ channels.
    (B) closing of voltage-gated Na^+ channels.
    (C) opening of voltage-gated K^+ channels
    (D) closing of voltage gated K^+ channels.
19. Where do most of the interactions between the cells and molecules required for the immune response occur?
    (A) in the bloodstream. (B) in endothelial tissues.
    (C) in lymph nodes. (D) in the thymus.
20. Micro-RNAs are a new class of oncogenic factors because they function
    (A) as tumor suppressors. (B) as oncogenes.
    (C) to induce errors during DNA replication. (D) A and B

二、問答題（6 題，每題 10 分）

01. What is Western blotting? How can this technique be used to detect proteins?
02. What is the difference between a nucleoside and a nucleotide?
03. RNAi is used to functionally inactivate genes in cells and whole organisms. Describe the basics of how you would knock down the expression of a gene required for muscle formation and what method could you use to confirm that your results were specifically attributed to the RNAi?
04. What is the underlying mechanism behind why gene mutations that lead to Huntington's disease act as dominant mutations?
05. Explain the differences between endocrine, paracrine, and autocrine signaling.
06. Name the six fundamental properties of malignant tumors. Which of these properties are amenable to study in a cell culture model of cancer?

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。