

一、單選題(每題 2 分，共 60 分) ※ 注意：請於試卷內之「選擇題作答區」依序作答。

Questions 1-5

To determine the intracellular pathways of three proteins, X, Y, and Z, four identical cultures of cells were labeled with ³H-amino acids for 5 minutes. One culture was harvested at the end of the 5-minute labeling period. The other three cultures were rinsed and then were put into media with twentyfold excess of unlabeled amino acids for 10 minutes, 20 minutes, and 40 minutes, respectively, before harvesting. After harvesting, the cells were put on ice and broken open, and the cellular fractions were obtained by differential centrifugation. The cellular fractions harvested include: mitochondria, rough ER, Golgi apparatus, plasma membranes, free ribosomes, and soluble cellular supernatant (cytosol). In each of these fractions, the amount of newly synthesized protein was determined. The data, expressed as the percentage of the total newly synthesized protein of a particular type in each fraction, were recorded into table below.

Harvest Time	5 min.			10 min.			20 min.			40 min.		
	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
<u>Fraction</u>												
Mitochondria	0	0	0	0	0	0	0	0	50	0	0	100
Rough ER	0	100	0	0	80	0	0	20	0	0	0	0
Golgi apparatus	0	0	0	0	20	0	0	50	0	0	20	0
Plasma membrane	0	0	0	0	0	0	0	30	0	0	80	0
Ribosomes	100	0	100	30	0	0	10	0	0	0	0	0
Cytosol	0	0	0	70	0	100	90	0	50	100	0	0

- The association of proteins X and Z with free ribosomes at a harvest time of 5 minutes indicates which of the following about the proteins?
 (A) They are ribosomal proteins. (B) They are at the site of synthesis.
 (C) There is an artifact in the measurement. (D) They are glycosylated proteins.
 (E) They are identical.
- Protein Z would be consider a
 (A) ribosomal protein (B) cytosolic protein (C) plasma membrane protein
 (D) Golgi apparatus protein (E) mitochondrial protein
- At a harvest time of 10 minutes, which of the following statements is correct about protein Z compared with protein X?
 (A) Protein X is synthesized more rapidly than protein Z.
 (B) Protein X is degraded more rapidly than protein Z.
 (C) Protein X is degraded more slowly than protein Z.
 (D) Protein X is released from ribosome more rapidly than protein Z.
 (E) Protein X is released from ribosome more slowly than protein Z.
- Protein X would be consider a
 (A) ribosomal protein (B) cytosolic protein (C) plasma membrane protein
 (D) Golgi apparatus protein (E) mitochondrial protein
- Protein Y would be the component of
 (A) actin filament (B) ribosome (C) insulin receptor (D) spliceosome (E) microtubule
- Members of which of the following classes of macromolecules are known to exhibit enzymelike (catalytic) properties?
 I. RNA II. Glycoproteins III. Lipoproteins
 IV. Polysaccharides V. Phospholipid
 (A) I and II only (B) II and III only (C) III and IV only (D) I, II and III only (E) V only

見背面

7. In the DNA sequence 5' CGA TCG GCT 3', which of the following is considered a transition type mutation?
- (A) 5' CGA CCG GCT 3'
(B) 5' CGA TGG CT 3'
(C) 5' CGA TCG CCT 3'
(D) 5' CGA TCG GCA 3'
(E) 5' CGA UCG GCU 3'
8. Which of the following statements about circadian rhythms is correct?
- (A) They are expressed during cell division only.
(B) They occur only in mammals.
(C) They are not found in humans.
(D) They are generated exogenously.
(E) They have a periodicity of about 24 hours.
9. In animals, the first structural and biochemical changes immediately after fertilization in the egg are initiated by
- (A) new gene transcription
(B) the release of Ca^{2+} from internal reservoirs
(C) the initiation of DNA synthesis
(D) a lowering of cytosolic pH
(E) a sudden drop in ATP levels
10. An animal with a coelom, jointed appendages, and metameric segmentation would be classified in the phylum
- (A) Mollusca (B) Cnidaria (C) Platyhelminthes
(D) Arthropoda (E) Chordata
11. Which of the following animal phyla is diploblastic, that is, exhibits only two embryonic germ layers?
- (A) Rotifera (B) Mollusca (C) Nematoda
(D) Platyhelminthes (E) Cnidaria
12. How many different types of gametes could be produced by an individual with the arbitrary genotype of *AAbbCCDdEe*?
- (A) Two (B) Four (C) Six (D) Eight (E) More than eight
13. During cytokinesis in an animal cell, a constricting ring pinches the dividing cell into the two daughter cells. This contractile ring is formed by which of the following structures?
- (A) Centrioles
(B) Microtubules
(C) Microfilaments
(D) Z discs
(E) The spindle apparatus
14. The physiological role of restriction endonucleases is to
- (A) allow the in vitro construction of recombinant DNA molecules
(B) methylate host DNA
(C) remove RNA primer during DNA synthesis
(D) allow mapping of gene location
(E) cleave foreign DNA molecules that enter the cell
15. The process of speciation can be prevented by
- (A) genetic differentiation
(B) geographical barriers
(C) inhibition of gene exchange
(D) gene flow
(E) behavioral barriers

16. Small body size often allows animals to exploit desert habitats because it
- (A) decreases the ratio of surface area to volume and hence the tendency to lose water
 - (B) promotes heat gain
 - (C) enhances thermal inertia
 - (D) enables exploitation of favorable microhabitats
 - (E) enables prolonged reliance on internal water stores

Questions 17-19 refer to the following.

- (A) Myelin
- (B) Synaptic vesicle
- (C) Dendrite
- (D) Axon
- (E) Efferent neuron

17. Increases the speed of nerve impulse propagation
18. Transmits nerve impulses to the cell body
19. The storage place for neurotransmitters
20. Sexual reproduction patterns include the example of
- (A) fragmentation. (B) budding. (C) hermaphroditism.
 - (D) parthenogenesis. (E) fission.
21. Which part of the vertebrate nervous system is most involved in preparation for the fight-or-flight response?
- (A) sympathetic (B) somatic (C) central (D) visceral (E) parasympathetic
22. Which of the following statements about retrotransposons is correct?
- (A) They transpose via an RNA intermediate.
 - (B) They contain genes for ribosomal proteins.
 - (C) They possess a gene for RNA-dependent RNA polymerase.
 - (D) They possess genes that encode proteins that integrate RNA into chromosomes.
 - (E) They are found only in bacteria.
23. Eukaryotic cells with DNA damage often cease progression through the cell cycle until the damage is repaired. This type of control over the cell cycle is referred to as
- (A) proteasome control
 - (B) damage control
 - (C) checkpoint control
 - (D) anticyclin control
 - (E) transcriptional control
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25. In mammals, which of the following are produced after rearrangement of DNA sequences in specific cells?
- (A) Actins (B) Antigens (C) Antibodies
 - (D) Hemoglobins (E) Heparin

26. In which of the following human female cells are there only chromosomes that are non-homologous to each other?
(A) Chondrocytes (B) Oocytes (C) Hepatocytes
(D) Leukocytes (E) Fibroblasts
27. Which of the following would best support the hypothesis that mitochondria and chloroplasts evolved from certain bacteria that existed as endosymbiotic organism in early cells?
(A) Both organelles have membrane
(B) Both organelles contain DNA
(C) Both organelles lack mRNA
(D) Both organelles have microtubules
(E) Both organelles are able to synthesize proteins
28. Among the ecological relationship below, which is most different from the other four?
(A) Cellulose-digesting protozoa in a termite gut
(B) Algal cells embedded in coral tissues
(C) Fungal mycelia around algal cells in lichen
(D) *Salmonella* in the human gut
(E) Nitrogen-fixing bacteria in the nodules of a bean plant
29. Which combination of hormones helps a mother to produce milk and nurse her baby?
(A) prolactin and calcitonin (B) oxytocin and prolactin
(C) follicle-stimulating hormone and luteinizing hormone
(D) luteinizing hormone and oxytocin
(E) oxytocin, prolactin, and luteinizing hormone
30. Which of the following synthesizes short segments of RNA during DNA replication?
(A) helicase (B) DNA polymerase III (C) ligase
(D) DNA polymerase I (E) Primase

二、名詞解釋 (每題 5 分，共 40 分)

1. Epigenetics
2. Non-coding RNA
3. Functional MRI (fMRI)
4. Antigen presenting cells
5. Gene drift
6. Metazoan
7. Blood-brain barrier
8. Metastasis

試題隨卷繳回