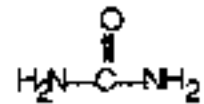


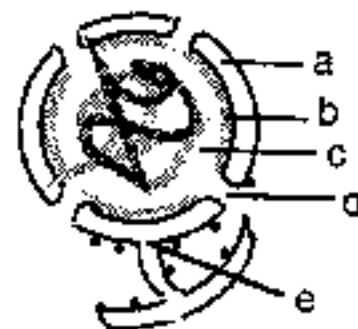
八十五學年度 生命科學 系(所) 分生組甲 生醫組甲 組碩士班研究生入學考試  
 科目 細胞生物學 科號 0907 1207 共 4 頁第 1 頁 \*請在試卷【答案卷】內作答

(一) 選擇題 (單選, 每題2.5分)

1. Which of the following will occur if you place a red blood cell in an isotonic solution of urea?
  - a. Salts will leave the cell
  - b. Sugar will enter the cell
  - c. The cell will undergo osmotic lysis
  - d. The cell will plasmolyze
  - e. Water will move into and out of the cell at an equal rate
2. Cell-free protein synthesis can be observed if the microsomal, cytosol, and mitochondrial fractions are mixed together. The microsomal fraction can be replaced with
  - a. Ribosomes
  - b. Amino acids
  - c. GTP and ATP
  - d. NADH
  - e. Cell membranes
3. All of the following are true about protein synthesis **except**
  - a. The protein grows from the N-terminus to the C-terminus.
  - b. mRNA is read in the 5'→3' direction.
  - c. Ribosomal subunits associate on the mRNA.
  - d. Ribosomes must be attached to a cell membrane.
  - e. None of the above.
4. Which of the following is **not** correctly matched to its function?
  - a. Restriction enzyme—hydrolyzes DNA
  - b. Transposase—insertion and removal of DNA
  - c. DNA polymerase III—synthesizes DNA
  - d. S1 nuclease—hydrolyzes DNA
  - e. DNA primase—synthesizes DNA
5. Isolated inner mitochondrial membranes can perform
  - a. Electron transport
  - b. Oxidative phosphorylation
  - c. Substrate-level phosphorylation
  - d. Krebs cycle reactions
  - e. None of the above



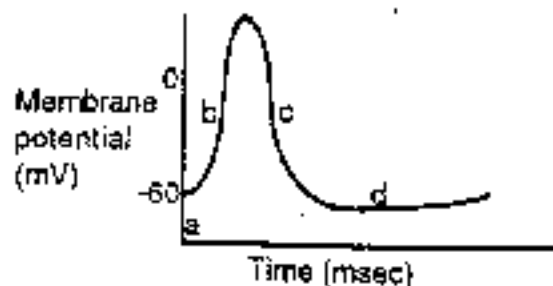
Use this figure to answer questions 6-7.



6. Acts as a gated channel.
7. Nuclear lamina.

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8. An action potential is shown in the graph below. During what time period are the  $\text{Na}^+$  channels open?



e. None of the above

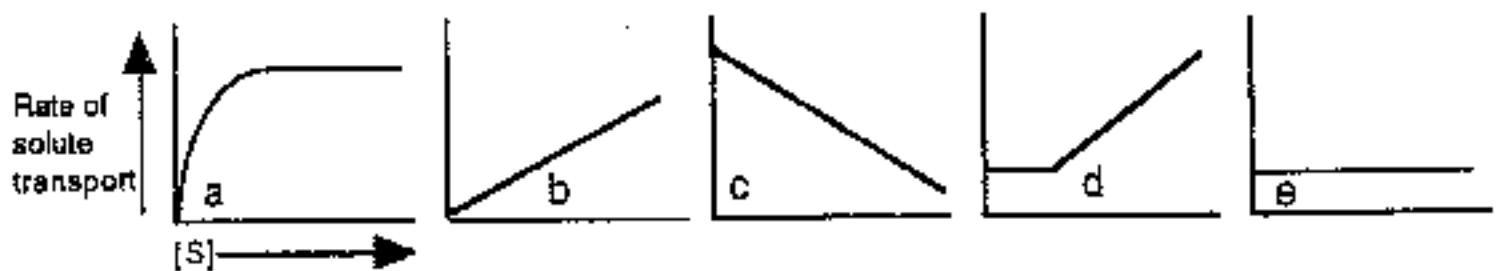
9. Which event is responsible for stopping the action of adenylyl cyclase?  
 a. A hormone binds to its receptor  
 b.  $G_s$  protein picks up GTP  
 c.  $G_s$  activates adenylyl cyclase  
 d. GTP is hydrolyzed to GDP  
 e. None of the above
10. All of the following are true about the chemiosmotic hypothesis **except**  
 a. Energy released during electron transfer is used to pump  $\text{H}^+$  from the matrix into the intermembrane space.  
 b. Protons create an electrochemical proton gradient consisting of  $\Delta\psi$  and  $\Delta\text{pH}$ .  
 c. Uncoupling creates the burst of energy required for phosphorylation of ADP.  
 d. The electrochemical gradient exerts a proton motive force which drives protons down their concentration gradient.  
 e. ATP is synthesized as the protons move down their electrochemical gradient.
11. Which one of the following reactions produces the most new ATP molecules under aerobic conditions?  
 a.  $3 \text{NADH} + \text{H}^+ \rightarrow 3 \text{NAD}^+ + 3 \text{H}_2\text{O}$   
 b.  $\text{FADH}_2 \rightarrow \text{FAD}^+ + \text{H}_2\text{O}$   
 c.  $\text{Glucose} \rightarrow 2 \text{ethyl alcohol} + 2 \text{CO}_2$   
 d.  $2 \text{pyruvic acid} \rightarrow 2 \text{acetyl CoA}$   
 e.  $2 \text{cytochrome}_{\text{reduced}} + 4\text{H}^+ \rightarrow 2 \text{H}_2\text{O} + \text{cytochrome}_{\text{oxidized}}$
12. The following physical characteristics describe DNA. Prokaryotic DNA differs from eukaryotic DNA in that prokaryotic DNA is  
 a. A double helix  
 b. Wrapped around histones  
 c. Folded into solenoids  
 d. Arranged into nucleosomes  
 e. Supercoiled to fit into cells
13. All of the following organelles may have arisen from symbionts **except**  
 a. Mitochondria  
 b. Peroxisomes  
 c. Chloroplasts  
 d. Lysosomes  
 e. None of the above

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14. If you supply a  $C_4$  plant cell with 300 molecules of  $^{14}CO_2$ , where do you expect to find the  $^{14}C$  next?
- Phosphoglycolate
  - Malate
  - 3-PGA
  - Serine
  - None of the above
15. The hormone glucagon stimulates the breakdown of stored glycogen in target cells. Protein kinase is necessary for glycogen degradation. Which of the following activates protein kinase?
- G protein binds to receptor
  - $G_s$  protein binds to receptor
  - Adenylyl cyclase makes cAMP
  - Glucagon binds to receptor
  - None of the above
16. Mitochondria are similar to prokaryotic cells in all of the following **except**
- Affected by antibiotics that inhibit protein synthesis.
  - Cell wall composition.
  - RNA polymerases inhibited by rifampicin.
  - Similar protein synthesis initiation and elongation factors.
  - Translate certain viral mRNAs.

17. Which of these graphs best represents active transport of a solute into a cell?



18. Cell-free protein synthesis can be observed if the microsomal, cytosol, and mitochondrial fractions are mixed together. The mitochondrial fraction can be replaced with
- $O_2$
  - Cytochromes
  - GTP and ATP
  - NADH
  - None of the above, intact mitochondria are required
19. Which of the following can move a substance against the concentration gradient?
- Ion channel
  - Anion-exchanger
  - Mobile carrier
  - Proton-linked lactose transport
  - Transmembrane channel
20. Which of the following would **not** occur if photosystems I and II were uncoupled?
- Splitting water
  - Replacing electrons to P700
  - Reduction of NADP<sup>+</sup>
  - Replacing electrons to P700
  - None of the above

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(二) 簡答題

Depict how cells are studied by using following techniques: (20%)

1. immunofluorescence labeling
2. confocal microscopy
3. electroporation
4. enzyme cytochemical labeling
5. flow cytometry
6. freeze fracture
7. hybridoma
8. in situ hybridization
9. microfluorimetry
10. negative stain

(三) 申論題

1. Depict the biogenesis of lysosomes and their functions in autophagy (6%)
2. Draw a typical animal cell with all the organelles involved in the process of exocytosis. (6%)
3. Depict the process of transmission of a signal across a cholinergic synapse. (8%)
4. How does a fertilized *Drosophila* egg give rise to discrete groups of cells? (10%)