参考习题

CHAPTER 1. INTRODUCTION TO CELL BIOLOGY

1.What does cell biology concern?

2.Why we say the cell is a complex system?

3.What is cell theory?

4.What are the contemporary views on cell biology?

5.What cause cell diversity?

6.How many modern techniques are employed in cell biology research?

CHAPTER 2 CHEMICAL COMPONENTS OF CELLS

1. What is the polar covalent bond?

2. How water is held together?

3. How do sugars play roles in cells?

4.What are roles of lipids in cells?

5.What are functions of proteins in the body?

CHAPTER 3 BIOMEMBRANE: STRUCTURE AND TRANSPORT

1. When viewed by electron microscopy, the lipid bilayer is often described as looking like a railroad track. Explain how the structure of the bilayer creates this image.

2. Biomembranes contain many different types of lipid molecules. What are the three main types of lipid molecules found in biomembranes? How are the three types similar, and how are they different?

3. Lipid bilayers are considered to be two-dimensional fluids; what does this mean? What drives the movement of lipid molecules and proteins within the bilayer? How can such movement be measured? What factors affect the degree of membrane fluidity?

4. Explain the following statement: The structure of all biomembranes depends on the chemical properties of phospholipids, whereas the function of each specific biomembrane depends on the specific proteins associated with that membrane.

5. Name the three groups into which membrane-associated proteins may be classified. Explain the mechanism by which each group associates with a biomembrane.

6. One of the defining features of eukaryotic cells is the presence of organelles. What are the major organelles of eukaryotic cells, and what is the function of each? What is the cytosol? What cellular processes occur within the cytosol?

7. Compare the features distinguish uniport transport from passive diffusion.

CHAPTER 4 INTRACELLULAR COMPARTMENTS AND TRANSPORT

1.What are the main functions of membrane-enclosed organelles in a typical eucaryotic cell?

2.How proteins synthesized at the ribosomes are transported to various organelles?

3.How do the clathrin-coated vesicles specifically select cargo molecules?

4.What is the difference between the N-linked and O-linked glycosylation?

5.How is the cholesterol taken by cells?

CHAPTER 5 MITOCHONDRIA AND CHLOROPLASTS

1. Please explain the following terms:

ATP synthase, mitochondrion, matrix, electron-transport chain, cytochrome, quinone, oxidative phosphorylation, chloroplast, stroma, photosynthesis, photosystem, reaction center, light reaction, carbon fixation.

2. Which of the following statements are correct? Explain your answers.

A. Many, but not all, electron-transfer reactions involve metal ions.

B. The electron-transport chain generates an electrical potential across the membrane because it moves electrons from the intermembrane space into the matrix.

C. The electrochemical proton gradient consists of two components: a pH difference and an electrical potential.

D. Ubiquinone and cytochrome c are both diffusible electron carriers.

E. Plants have chloroplasts and therefore can live without mitochondria.

3. Please describe the structure of mitochondria.

4. Please describe the structure of chloroplasts.

5. Please describel the structural differences between leaves of C3 plant and C4plant.

6. Explain the working mechanism of ATP synthase.

CHAPTER 6 CYTOSKELETON

1.Define these key terms: actin filament, myosin, cell cortex, centriole, dynein, kinesin, intermediate filament, nuclear lamina, sarcomere, tubulin

2.Why do eukaryotic cells, especially animal cells have such large and complex cytoskeletons?

3.There are no known motor proteins that move on intermediate filaments, why do you think that is the case?

4.Which of the following changes takes place when a skeletal muscle contracts:

Z discs move farther apart

Actin filaments contract

Myosin filament contract

Sarcomeres become shorter

5.Describe the functions of microtubule.

6.Describe the structure of the sarcomere of a skeletal muscle myofibril and the changes that occur during muscle contraction.

CHAPTER 7 CELL COMMUNICATION AND SIGNALING

1.Please define the following terms: signal molecule, cell signaling, signal transduction, A-kinase (PKA), C-kinase (PKC), G-protein, nitric oxide, phospholipase C, Ras, receptor tyrosine kinase, signaling cascade

2.Describe the basic types of signal molecules and second messengers.

3.Describe the role that the inositol-lipid signaling pathway plays in the activation of protein kinase C.

4.What are the similarities and differences between the reactions that lead to the activation of G proteins and the reactions that lead to the activation of Ras?

5.(1) Compare and contrast signaling by neurons which secrete neurotransmitters at synapses to signaling carried out by endocrine cells, which secrete hormones into the blood.

(2) Discuss the relative advantages of the two mechanisms.

6. Compare animal cells and plant cells intracellular signaling mechanisms

CHAPTER 8 NUCLEUS AND CHROMOSOMES

1. Give short definitions of the following terms

constitutive heterochromatin and facultative heterochromatin

euchromatin and heterochromatin

fluorescence recovery after photobleaching (FRAP)

matrix-associated regions (MARs) or Scaffold attachment region (SAR)

nuclear envelope

nuclear lamina

nuclear localization signals (NLS)

nuclear matrix or nuclear skeleton

nuclear pore complex (NPC)

nucleolus

nucleosome

nucleosome remodeling

2. Multiple-choice questions

Concerning the nucleus:

The diameter is generally about 5 mm

Euchromatin is not actively expressed

Nucleoli are very active in the synthesis of messenger RNA (mRNA)

All cells in the human body have nuclei

Within the nucleus:

Chromatin consists of DNA and RNA only

Histone proteins are negatively charged

The nucleosome core protein consists of eight histone subunits

H1 histone is not found in the core protein

3. Short-answer questions

What is a nucleosome and what are the proteins present in this structure?

4. Define the following terms and their relationships to one another:

(a) Interphase chromosome; (b) Mitotic chromosome; (c) Chromatin;

(d) Heterochromatin; (e) Histones; (f) Nucleosome

5. If a human nucleus is 10 mm in diameter, and it must hold as much as 2 m of DNA, which is complexed into nucleosomes that during full extension are 11 nm in diameter, what percentage of the volume of the nucleus is occupied by the genetic material?

CHAPTER 9 CELL-CYCLE AND CELL DIVISION

1. Give short definitions of the following terms:

bivalent and tetrad

Cdk-activiting kinase (CAK)

cell cycle and cell cycle control

cell cycle checkpoint

centromere and kinetochore

chiasma (pl. chiasmata) and crossing over

cyclin and cyclin-dependent kinase (Cdk)

homologous chromosome

lampbrush chromosome

maturation-promoting factor (MPF)

microtubule-associated protein (MAP)

mitosis and meiosis

phragmoplast

restriction point

sister chromatid

START

synapsis and synaptonemal complex (SC)

2.Short-answer questions

(1) Describe the chief events of mitosis and show how these differ from meiosis.

(2) Describe the phases of the cell cycle and the events that characterize each phase.

(3) What “checkpoints” occur in the cell cycle? What is the role of each?

3. Essay questions

(1) Describe the function mechanism of cyclin in the regulation of the cell cycle?

(2) What types of force-generating mechanisms might be responsible for chromosome movement during anaphase?

(3) Contrast the events that take place during mitosis and meiosis, and their roles in the lives of a plant or animal?

(4) What is the main formation of the spindle, and their function respectively?

(5) What is the cell cycle? What are the stages of the cell cycle? How does the cell cycle vary among different types of cells?

CHAPTER 10 CELL DIFFERENTIATION

1.What does the differentiation mean in cell biology?

2.What do you know the epigenetic control in cell differentiation?

3.What are stem cells? What are their common features?

4.Please describe established cell differentiation systems.

5.Can cancer cells differentiate into normal cells? Why?

CHAPTER 11 SENESCENCE AND APOPTOSIS

1.What does the senescence mean in cell biology?

2.What do you know the mechanisms in cell apoptosis?

3.What are the roles of mitochondria in senescence and apoptosis?

4.How does cell chose senescence or apoptosis?.

5.How can cancer cells undergo senescence or apoptosis?

CHAPTER 12 CELLS IN IMMUNE SYSTEM

1.What is immune system?

2.What is antigen ?

3.What is humoral immune system?

4.What type of cells produce antibody?

5.Which lymphocytes are involved in the cell mediated immunity.

6.How does the cell mediated immunity differ from humoral immunity?

CHAPTER13 CANCER CELLS

1.Give short definitions of the following terms:

cancer

tumor

transformation

angiogenesis

metastasis

carcinogen

proto-oncogene

oncogene

tumor suppressor gene

gain-of-function mutation

Loss of function mutation

2.What characteristics distinguish benign from malignant tumor?

3.What’s Angiogenesis? Explain the mechanism of Angiogenesis, and its effect on carcinogenesis.

4.Comparing proto-oncogenes and tumor suppressor genes.

5.Loss of function occurs in the majority of human tumors. Name two ways to cause loss of P53 function.

6.Is cancer hereditary?

7.Example two new strategies to anti-cancer treatments.