Examples of examination questions for BIOL 266

1st midterm test:

Questions for Part A (Multiple choice questions)

Circle clearly ONE correct answer per question.

Q1. Resolution in light microscopy can be improved by:
A. increasing the speed of light
B. decreasing the angular aperture
C. using light with longer wavelength
D. increasing the magnification of the lens
E. not using condenser lenses
F. increasing the angular aperture

Q2. Immunogold electron microscopy:
A. is used to detect a green fluorescence emitted by the green fluorescent protein
B. uses antibodies attached to a fluorescent molecule
C. observes the light that is scattered by various components of a living cell
D. is used to examine cytochemically stained samples
E. is used to determine the subcellular localization of proteins
F. uses a chemical stain that binds to basic amino acids to increase contrast

Q3. The nucleus communicates with the cytosol via:
A. the inner nuclear membrane
B. the smooth endoplasmic reticulum
C. nuclear pore complexes
D. the rough endoplasmic reticulum
E. the nucleolus
F. the nuclear lamina

Q4. The nucleolus is:
A. the site of phospholipid synthesis
B. the most prominent membrane-bound organelle in the nucleus
C. the site of protein synthesis
D. the assembly centre for chromatin
E. the assembly centre for ribosomes
F. the site of sphingolipid synthesis

Q5. Free ribosomes in the cytosol synthesize proteins for:
A. the endoplasmic reticulum
B. the cis-Golgi network
C. the trans-Golgi network
D. the nucleus
E. lysosomes
F. the plasma membrane

Q6. Histone H3:
A. binds to linker DNA
B. seals the molecule of DNA wrapped around nucleosome core particle
C. is a component of nucleosome core particle
D. binds to non-histone proteins
E. contains a high proportion of hydrophobic amino acids phenylalanine and leucine
F. contains a high proportion of negatively charged amino acids glutamate and aspartate

Q7. Complex III of the electron transfer chain in mitochondria transfers two electrons directly to:
A. ubiquinone (also known as coenzyme Q)
B. complex II (also known as succinate dehydrogenase)
C. complex IV (also known as cytochrome oxidase)
D. complex I (also known as NADH dehydrogenase)
E. molecular oxygen
F. cytochrome *c*

Q8. Complex V (also known as ATP synthase) of the electron transfer chain in mitochondria releases ATP molecules into:
A. the inner mitochondrial membrane
B. the intermembrane space between the inner and outer mitochondrial membranes
C. the cytosol
D. the matrix of mitochondria
E. the cristae of mitochondria
F. the outer mitochondrial membrane

Q9. The cytochrome bf complex of the electron transfer chain in the thylakoid membrane:
A. catalyzes the synthesis of ATP
B. is a protein attached to chlorophylls involved in light absorption
C. catalyzes the synthesis of NADPH
D. transfers two electrons directly to ATP synthase
E. transfers two electrons directly to photosystem II (PS II)
F. transfers two electrons directly to plastocyanin

Q10. NADP reductase of the electron transfer chain in in the thylakoid membrane releases NADPH molecules into:
A. the thylakoid lumen
B. the stroma of the chloroplast
C. the intermembrane space between the inner and outer membranes of the chloroplast
D. the inner membrane of the chloroplast
E. the outer membrane of the chloroplast
F. none of the above

Q11. In plant cells, the rough ER serves as the site at which ribosomes synthesize proteins destined for incorporation into:
A. the mitochondrion
B. the nucleus
C. the plasma membrane
D. the chloroplast

E. the peroxisome
F. the nucleolus

Q12. In mammalian cells, the smooth ER serves as the site at which the following lipids are synthesized:
A. glycolipids
B. plasmalogens
C. sphingomyelins
D. phospholipids
E. all of the above
F. none of the above

Q13. In mammalian cells, the complex polysaccharides of the cell wall are synthesized in:
A. the rough ER
B. the smooth ER
C. the transitional ER
D. the mitochondrion
E. the Golgi apparatus
F. none of the above

Q14. The cytoskeleton performs the following function or functions:
A. moves cellular organelles
B. determines cell shape
C. moves the entire cell
D. determines the general organization of the cytoplasm
E. all of the above
F. none of the above

Q15. The resolution of a microscope can be improved by:
A. increasing the value of the wavelength of incident light
B. decreasing the value of angular aperture
C. decreasing the value of refractive index
D. increasing the speed of light
E. decreasing the value of numerical aperture
F. none of the above

Q16. The electromagnetic objective lenses in an electron microscope:
A. focus a beam of electrons onto the specimen
B. do not create a magnified image of the specimen
C. pick up electrons focused on the focal plane of the objective lenses
D. focus electrons passed through the specimen on the focal plane of objective lenses
E. focus electrons on a viewing screen or a piece of photographic film
F. none of the above

Answers to questions for Part A (Multiple choice questions)

A1: F. increasing the angular aperture

A2: E. is used to determine the subcellular localization of proteins

A3: C. nuclear pore complexes

A4: E. the assembly centre for ribosomes

A5: D. the nucleus

A6: C. is a component of the nucleosome core particle

A7: F. cytochrome *c*

A8: D. the matrix of mitochondria

A9: F. transfers two electrons directly to plastocyanin

Q10. B. the stroma of the chloroplast

A11. C. the plasma membrane

A12. D. phospholipids

A13. F. none of the above

A14. E. all of the above

A15. F. none of the above

A16. D. focus electrons passed through the specimen on the focal plane of objective lenses

Questions for Part B (Short answers)

Q1. Name four sites of protein synthesis in a plant cell.

Q2. Glass lenses are used to bend light paths in light microscopes. What are used to bend the paths of electrons in electron microscopes?

Q3. In light microscopy, placing oil between the specimen and the objective lens increases resolution. Why?

Q4. The function of the inner mitochondrial membrane is:

Q5. Define the term "cytosol".

Q6. Name five functionally distinct compartments of the Golgi apparatus and briefly describe the function of the Golgi compartment that points towards the plasma membrane.

Q7. Define the term "fluorescent molecule".

Q8. Name organelles surrounded by a single membrane.

Q9. Name organelles surrounded by two membranes.

Q10. Mitochondrial morphology depends on a balance between two processes. Name these two processes.

Q11. The interiors of the nucleus and endoplasmic reticulum are called differently. What are the names of these interiors?

Q12. Define the term "the endomembrane system":

Q13. Name membrane-bound compartments of the cell that constitute the endomembrane system.

Q14. Name membrane-bound compartments of the cell that are not included into the endomembrane system

Q15. Define the term "the rough endoplasmic reticulum (ER)".

Q16. Name three pathways for delivering materials to lysosomes. What kind of materials each of these pathways delivers to lysosomes?

Q17. Define the term "resolution of a microscope".

Q18. Define the term "subcellular fractionation".

Q19. What is the function of a vacuum system in an ultracentrifuge?

Answers to questions for Part B (Short answers)

A1. Free ribosomes in the cytosol, ribosomes attached to the rough ER, ribosomes in mitochondria, and ribosomes in the cytosol

A2. Electromagnetic lenses

A3. It increases the value of n (refractive index) and, thus, decreases the value of D (the minimum distance between two distinguishable objects)

A4. To accommodate protein complexes required for electron transport, proton gradient generation and ATP synthesis

A5. An aqueous solution inside of the cell filling the space outside of cellular organelles

A6. The cis Golgi network, cis Golgi cisterna, medial Golgi cisterna, trans Golgi cisterna and trans Golgi network. The trans Golgi network points towards the plasma membrane; its function is to sort proteins into transport vesicles destined to fuse with the lysosome or with the plasma membrane

A7. A molecule that absorbs light at one wavelength (which is called "excitation wavelength") and emits light (i.e., fluoresces) at another, longer wavelength (which is called "emission wavelength")

A8. The ER, Golgi apparatus, lysosomes, peroxisomes

A9. The nucleus, mitochondria, chloroplasts (in plant cells only)

A10. Mitochondrial fusion and fission

A11. Nuclear matrix and the lumen of the endoplasmic reticulum

A12. Membrane-bound compartments of the cell that communicate with one another by means of transport vesicles (also known as secretory vesicles)

A13. The endoplasmic reticulum, Golgi apparatus, lysosome, transport vesicles (also known as secretory vesicles) and the plasma membrane

A14. The nucleus, mitochondria, peroxisomes and chloroplasts

A15. A type of the ER were proteins are glycosylated and ribosomes reside. These ribosomes are attached to the rough ER; they synthesize proteins destined to be secreted as well as proteins delivered to the ER, Golgi, lysosomes, secretory (transport) vesicles and the plasma membrane.

A16. Endocytosis: delivers molecules taken up from outside the cell. Phagocytosis: delivers bacteria, cell debris and aged cells taken up from outside the cell. Autophagy: delivers cell's own organelles, which are aged or defective

A17. The ability of a microscope to distinguish between two very closely positioned objects

A18. The separation of the cell into its functionally active organelles and the subsequent purification of individual organelles

A19. It reduces friction between the rotor and air, thus preventing heating of the rotor and allowing to maintain the sample at low temperature