

Examples of examination questions for BIOL 266

1st midterm test:

Questions:

- Q1.** Define the term “resolution of a microscope”.
- Q2.** Briefly describe the properties of mitochondria suggesting that these organelles originated in the evolution from “aerobic” bacteria (prokaryotes) that were engulfed by an ancient “anaerobic” eukaryotic cell.
- Q3.** What advantage does the use of green fluorescent protein (GFP) have over the use of fluorescent-labeled antibodies for studying the localization and movement of a protein in cells?
- Q4.** Name a group of small proteins, rich in arginine and lysine, which form 10 nm nucleosome filaments of chromatin in the nucleus.
- Q5.** Name a complex of DNA, histones and non-histone proteins found in the nucleus of eukaryotic cells.
- Q6.** Name a group of proteins that are involved in the formation of 30 nm fibers and looped domains of chromatin in the nucleus.
- Q7.** Name a type of microscope that uses a beam of electrons to create a magnified image of the specimen.
- Q8.** Name a technique which allows to determine the subcellular location of a protein using the electron microscope.
- Q9.** Why do certain mutations in emerin cause nuclear lamina diseases?
- Q10.** Name a sub-organelle in the nucleus where the 40S and 60S ribosomal subunits are assembled.
- Q11.** Name a protein which seals the DNA wrapped around the nucleosome core particle.
- Q12.** Name two processes that define whether mitochondria exist as a branched network or as many individual organelles separated from each other.
- Q13.** Name three organelles in a plant cells that contain DNA encoding certain proteins and RNAs.
- Q14.** Briefly explain how the proton gradient established across the inner mitochondrial membrane can be used to synthesize ATP in mitochondria.
- Q15.** Name the internal compartment of the chloroplast in which the molecules of ATP and NADPH synthesized during the “light reactions” of the photosynthesis are used to synthesize carbohydrates.

Q16. Name three different type of the ER.

Q17. Name five different compartments of the Golgi apparatus.

Q18. Briefly describe 3 morphological features that distinguish primary lysosomes from secondary lysosomes.

Q19. Name 2 lenses that are used to create a magnified image of the specimen in a light microscope.

Q20. Briefly describe a role of the first barrier filter in a fluorescence microscope.

Answers:

A1: The ability of a microscope to distinguish between two very closely positioned objects.

A2. Mitochondria: 1) have 2 membranes, 2) are similar to bacteria in size, 3) like bacteria, reproduce by dividing in two, 4) contain their own DNA, 5) contain their own ribosomes.

A3. Allows to follow the localization and movement of a protein in living cells.

A4. Histones.

A5. Chromatin.

A6. Non-histone proteins.

A7. An electron microscope.

A8. Immunogold electron microscopy.

A9. Because emerin is required for the correct interaction of lamins with the nuclear envelope. This interaction is essential for normal tissue-specific transcription of certain genes.

A10. The nucleolus.

A11. Histone H1.

A12. Mitochondrial fusion and fission.

A13. The nucleus, mitochondria and chloroplasts.

A14. The protons can flow from the intermediate space to the matrix of mitochondria. This releases the energy needed for ATP synthesis by ATP synthase residing in the inner mitochondrial membrane.

A15. The stroma of the chloroplast.

A16. The rough, smooth and transitional ER.

A17. The cis Golgi network, cis cisterna, medial cisterna, trans cisterna, and trans Golgi network.

A18. Primary lysosomes are small, spherical and do not contain visible particles or membrane debris. Secondary lysosomes are larger, irregularly shaped and contain visible particles or membrane debris.

A19. The objective and ocular lenses.

A20. The first barrier filter lets through only light with a wavelength approximately equal to the excitation wavelength of a fluorescent molecule detected.