Full Name:	Civics group:	Index no.:	Date:
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Core Idea 1: The Cell and Biomolecules of Life Tutorial 1 Cell Ultrastructure

MCQ ANSWERS 2 3 4 5 6 7 8 9 10 1 11 12 13 14 15 16

1 Which size ranges can be viewed using a light microscope?



- A 4 only
- **B** 1 and 2 only
- **C** 2 and 3 only
- D 3 and 4 only
- 2 The diagram shows a chloroplast drawn from an electronmicrograph.



The length of the chloroplast from X to Y is 5000 nm.

What is the magnification of the drawing of the chloroplast?

- **A** x100
- **B** X1000
- **C** X10 000
- **D** X100 000

3 The electronmicrograph is of a chloroplast.



The length of the chloroplast image along the line shown is 90 mm. The magnification of the organelle is x300,000.

What is the actual length of the chloroplast?

- **A** 0.3 μm
- **B** 3.0 μm
- **C** 30 μm
- **D** 300 µm
- 4 You are told that the cells on a microscope slide are plant, animal, or bacterial. You look at them through a microscope and see cell walls <u>and</u> membrane-bound organelles. You conclude that the cells are
 - A Bacteria cells
 - B Plant cells
 - C Bacteria and plant cells
 - D Bacteria, plant, and animal cells

- 5 Which features enable an organism to be identified as a prokaryote?
 - 1 cell wall
 - 2 circular DNA
 - 3 nucleus
 - 4 ribosomes
 - A 2 only
 - B 3 only
 - **C** 1 and 4 only
 - D 2 and 4 only
- 6 A scientist carried out an experiment to separate the organelles in an animal cell by mass.

The scientist mixed the cells with a buffer solution which had the same water potential as the cells. He then broke the cells open with a blender to release the organelles.

The extracted mixture was filtered and then spun in a centrifuge at a high speed to separate the heaviest organelle. This sank to the bottom, forming a solid pellet, 1.



The liquid above pellet 1 was poured into a clean centrifuge tube and spun in the centrifuge at a higher speed to separate the next heaviest organelle. This organelle sank to the bottom, forming a solid pellet, 2.

He repeated this procedure twice more to obtain pellet 3 and pellet 4, each containing a single organelle.

What is the function of the organelle extracted in pellet 2?

- A digestion of old organelles
- B production of ATP
- **C** production of mRNA
- **D** synthesis of protein

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In-class activity Arrange the following organelles in the order that they will be separated via cell fractionation: Endoplasmic reticulum, chloroplasts, nucleus, ribosomes, lysosomes, mitochondria

- Thinking questions:
- 1. What do 70S and 80S mean?
- 2. And why does 30S+50S not add up to 70S, and 40S+60S not add up to 80S?

1 What do 70S and 80S mean?

S = sedimentation coefficient of a particle (its behaviour during a sedimentation process – centrifugation)

What is centrifugation?

Application of the centripetal force for the sedimentation of mixtures with a centrifuge



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2 And why does 30S+50S not add up to 70S, and 40S+60S not add up to 80S?

Sedimentation coefficients are <u>not</u> additive (they do not add up together). This is because they represent a rate of sedimentation, and the rate of sedimentation of a molecule depends upon its size and shape, rather than simply its molecular weight.



Which of the labelled features enable these cells to be identified as eukaryotic?

- A W only
- B X only
- **C** W and X only
- **D** W, X and Y

8 The electronmicrograph shows part of a cell.



Which organelles shown in the electronmicrograph have more than one membrane?

- A 1, 2 and 5
- **B** 1, 3 and 5
- **C** 2, 3 and 4
- **D** 3, 4 and 5
- 9 What is the function of nucleoli?
 - A formation and breakdown of the nuclear envelope
 - **B** formation of centromeres
 - C formation of ribosomes
 - **D** formation of the spindle during nuclear division
- 10 Which cell organelles contain DNA?
 - 1 centriole
 - 2 mitochondrion
 - 3 nucleolus
 - 4 ribosome
 - A 1 and 2
 - **B** 1 and 4
 - **C** 2 and 3
 - **D** 3 and 4

- **11** Which statement is correct?
 - A Prokaryotes and chloroplasts have circular DNA where genes carrying the code for cell walls are located.
 - **B** Prokaryotes and chloroplasts have 70S ribosomes that are the sites for translation and polypeptide synthesis.
 - **C** Prokaryotes and mitochondria have an outer membrane and a separate inner, folded membrane where ATP synthesis occurs.
 - **D** Prokaryotes and mitochondria have double-stranded linear DNA where genes carrying coded information are located.
- **12** A gland cell capable of producing large quantities of sex hormone testosterone would be likely to have well developed
 - A Lysosome
 - **B** Centrioles
 - **C** Rough endoplasmic reticulum
 - D Smooth endoplasmic reticulum
- **13** Where are cisternae found in a cell?
 - 1 endoplasmic reticulum
 - 2 Golgi body
 - 3 mitochondrion
 - A 1 and 2
 - **B** 1 and 3
 - C 1 only
 - **D** 2 and 3
- 14 Which of the following statements correctly characterize(s) bound ribosomes?
 - 1 Bound ribosomes are enclosed in their own membrane.
 - 2 Bound ribosomes are structurally different from free ribosomes.
 - 3 Bound ribosomes are concentrated in the cisterna space of rough endoplasmic reticulum.
 - 4 Bound ribosomes generally synthesize membrane proteins and secretory proteins.
 - A 4 only
 - **B** 1 and 3
 - **C** 2 and 4
 - **D** 3 and 4

15 The electron micrograph below depicts organelle X.



Which of the following options is not a function of organelle X?

- A Chemical modification of proteins
- **B** Synthesis of steroids
- **C** Formation of secretory vesicles
- **D** Formation of lysosomes
- 16 The photo electron micrographs show early and late stages in the development of the cell wall in a young plant cell.



Which statement describes the events leading to the development of the cell wall?

- A Complex carbohydrates assembled in the Golgi body are exported to the cell wall by the Golgi vesicles.
- **B** Enzymes in the cell surface membrane synthesise the cell wall components from soluble carbohydrates brought by the Golgi vesicles.

- **C** Polysaccharides are exported to the cell wall and synthesized into wall components by the Golgi body.
- **D** Ribosomes synthesise glycoproteins that are exported by Golgi vesicles to be used in the cell wall.

STRUCTURED QUESTIONS

QUESTION 1

Each of the statements **A** – **C** describes a structure found in eukaryotic cells.

(a) Identify the structure that is described in each statement.

[3]

(i) A thread-like structure composed of DNA and histone proteins.

(ii) The structure in which rRNA is synthesised and combined with proteins.

(iii) The structure occur in pairs at each pole and their position is important in determining the polarity of the cells during mitosis.

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(b) One theory about the evolution of organelles is the endosymbiotic theory. This theory suggests that the mitochondria and chloroplasts found in eukaryotic cells represent formerly free-living bacteria that were absorbed into a larger cell.

Outline the evidences that support the theory that mitochondria evolved from prokaryotic cells.

[3]



[Source: adapted from Eldon Newcomb, http://botit.botany.wisc.edu/about.html]

- Fig. 1.1
- (c) Name the parts of a plant cell labelled A to E in Fig. 1.1.





(d) Fig. 1.2 shows an electronmicrograph of lysosomes (labelled L).

With reference to Fig.1.2 and your own knowledge, describe the structural differences between lysosomes and ribosomes.

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QUESTION 2

Fig. 2 is an electron micrograph of part of an animal cell.



[6]



(d) What are the main differences between rough endoplasmic reticulum and smooth endoplasmic reticulum?

