

IB Diploma

BIOLOGY

HL P1
2017 — 2024

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1 - (BIOLO/11_HL_Summer_2017_Q1) - *Cell Biology*

Which structure found in eukaryotes has a single membrane?

- A. Nucleus
- B. Lysosome
- C. Chloroplast
- D. Mitochondrion

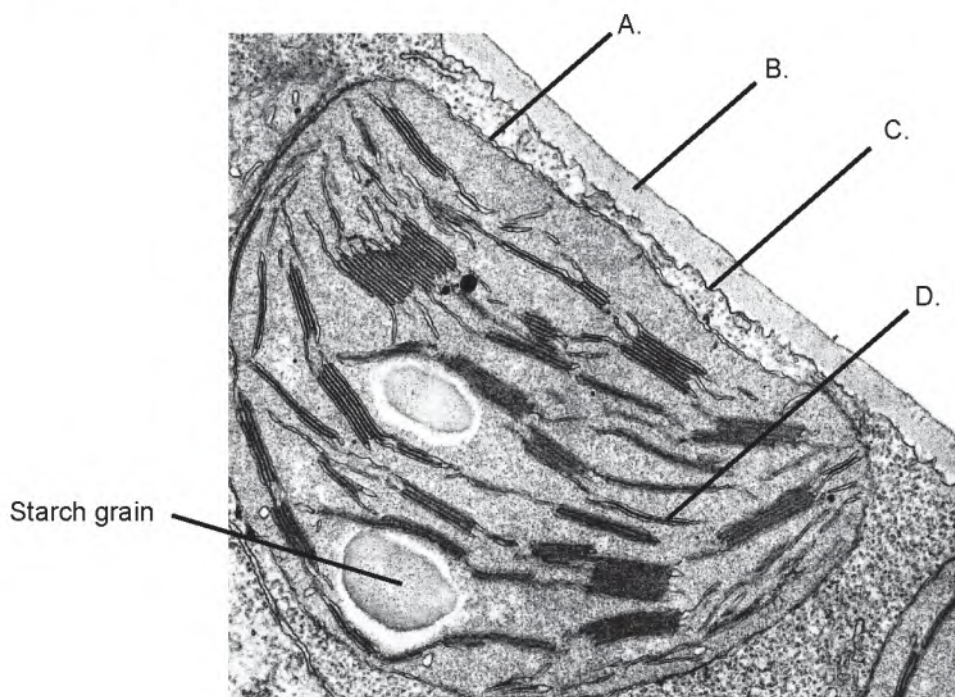
2 - (BIOLO/11_HL_Summer_2017_Q2) - *Cell Biology*

Which evidence falsifies the Davson–Danielli model?

- I. The presence of globular proteins within the phospholipid bilayer
 - II. Non-polar amino acids cause proteins to remain embedded in membranes
 - III. Membrane proteins remain in a fixed position inside a membrane
- A. I only
 - B. I and II only
 - C. II and III only
 - D. I, II and III

3 - (BIOLO/11_HL_Summer_2017_Q3) - Cell Biology

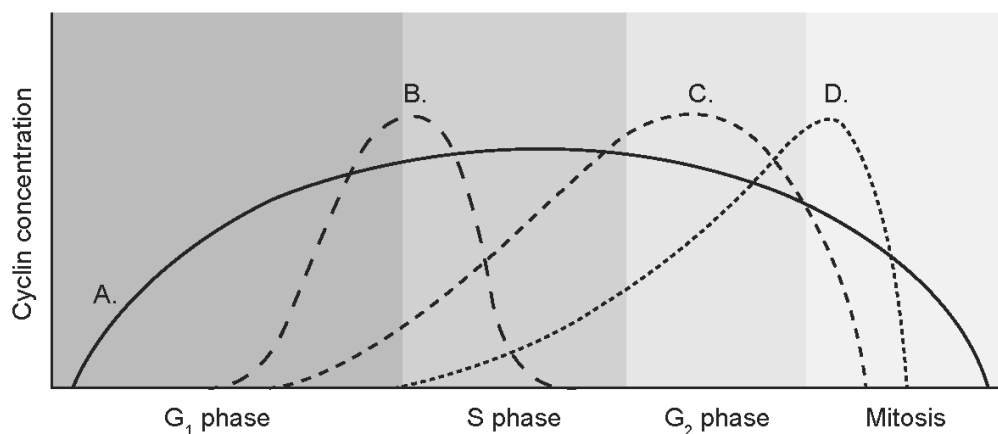
The following electron micrograph shows part of a palisade mesophyll cell. Which of the labelled structures controls the exchange of substances to and from the cell?



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

4 - (BIOLO/11_HL_Summer_2017_Q4) - Cell Biology

The diagram shows the concentration of four cyclins during the cell cycle. Which curve represents the cyclin that promotes the assembly of the mitotic spindle?



[Source: http://upload.wikimedia.org/wikipedia/commons/thumb/c/ce/Cyclin_Expression.svg/400px-Cyclin_Expression.svg.png]

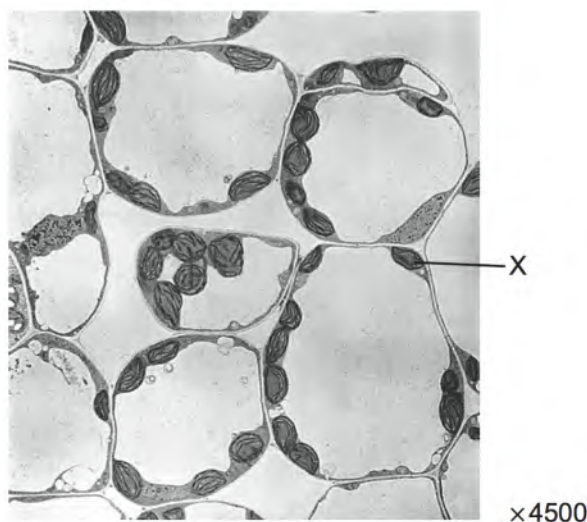
5 - (BIOLO/12_HL_Summer_2017_Q1) - Cell Biology

The giant alga *Acetabularia* has a feature that suggests it is an exception to the cell theory. What feature is this?

- A. It lacks a nucleus.
- B. It lacks a cell wall.
- C. It has only one mitochondrion.
- D. It lacks subdivision into separate cells.

6 - (BIOLO/12_HL_Summer_2017_Q2) - Cell Biology

The image shows an electron micrograph of mesophyll cells.



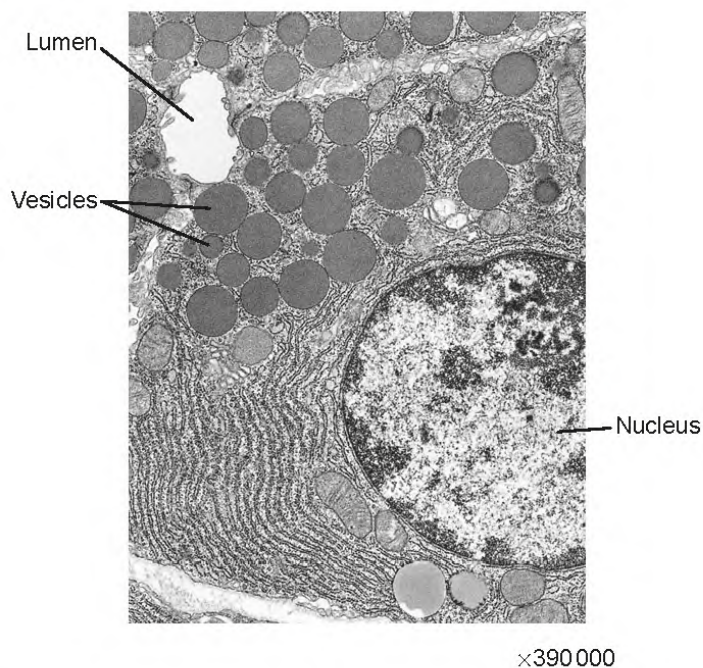
[Source: BIOPHOTO ASSOCIATES/SCIENCE PHOTO LIBRARY]

What is the name of the structure labelled X?

- A. Cytoplasm
- B. Mitochondrion
- C. Nucleus
- D. Chloroplast

7 - (BIOLO/12_HL_Summer_2017_Q3) - Cell Biology

The image shows an electron micrograph of pancreatic exocrine cells.



[Source: Meschner AL, *Junqueira's Basic Histology: Text and Atlas*, 12th edition. Copyright McGrawHill Education.]

What is the role of the vesicles shown in the micrograph?

- A. To transport hormones between the rough endoplasmic reticulum and the Golgi apparatus
- B. To store glycogen when blood glucose levels are high
- C. To move enzymes out of the cell by exocytosis
- D. To digest cellulose

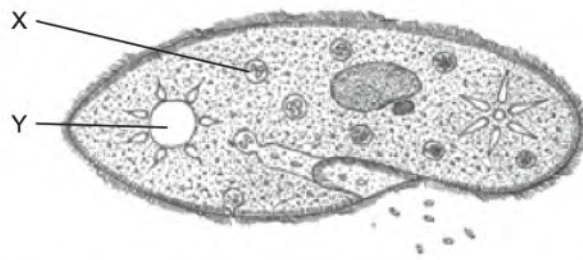
8 - (BIOLO/12_HL_Summer_2017_Q4) - Cell Biology

What is evidence for the endosymbiotic theory?

- A. RNA can catalyse metabolic reactions.
- B. Meteorites contain organic molecules.
- C. Amino acids can be synthesized from inorganic compounds.
- D. Mitochondria possess their own DNA.

9 - (BIOLO/10_HL_Winter_2017_Q1) - Cell Biology

The image of a *Paramecium* refers to question 1 and question 2.



[Source: Adapted from www.biology-resources.com. Copyright 2004–2017 D G Mackean & Ian Mackean. All rights reserved.]

Which function is accomplished by structures X and Y in the *Paramecium*?

	X	Y
A.	digestion	homeostasis
B.	feeding	metabolism
C.	food storage	movement
D.	DNA replication	respiration

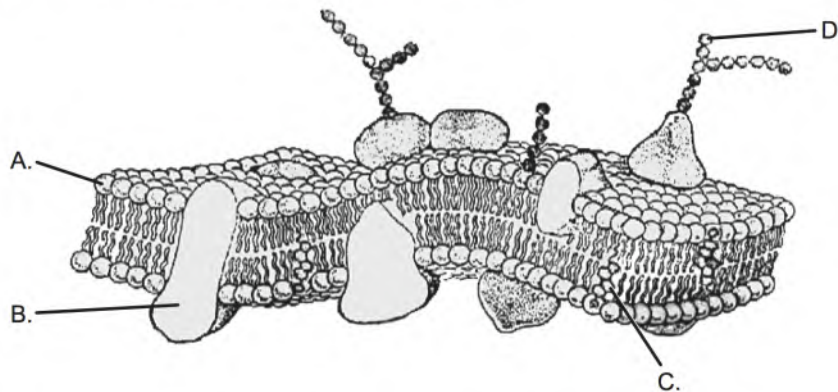
10 - (BIOLO/10_HL_Winter_2017_Q2) - Cell Biology

The salt concentration inside the *Paramecium* is 1.8%. The salt concentration in the surrounding medium suddenly drops to 0.2%. What will be the likely response?

- A. The cell will lose salt to the medium.
- B. The contractile vacuole will expel more water.
- C. The cell will swell and eventually burst.
- D. The membrane will become more permeable to salt.

11 - (BIOLO/10_HL_Winter_2017_Q3) - Cell Biology

The diagram of a membrane refers to question 3 and question 4.



[Source: © International Baccalaureate Organization 2017]

In the diagram, which structure is an intrinsic or integral protein?

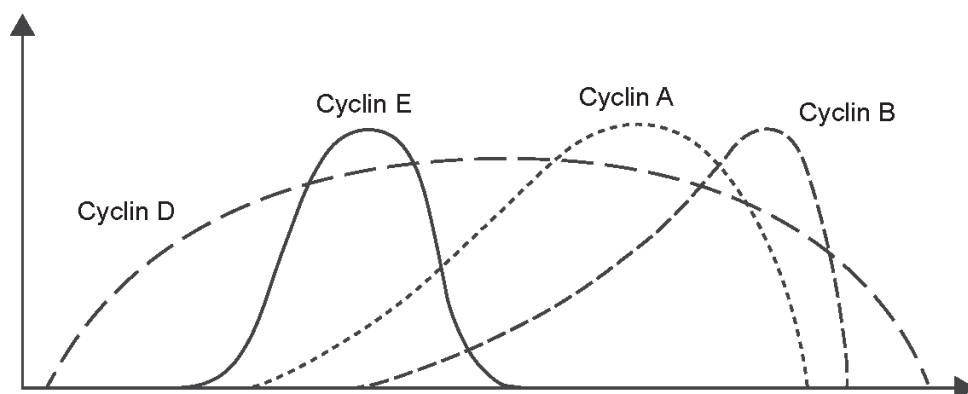
12 - (BIOLO/11_HL_Summer_2018_Q3) - Cell Biology

Which organelle provides evidence that eukaryotic cells originated when large prokaryotes engulfed small free-living prokaryotes?

- A. Chloroplast
- B. Nucleoid
- C. 80S ribosome
- D. Vacuole

13 - (BIOLO/11_HL_Summer_2018_Q4) - *Cell Biology*

The concentrations of cyclins rise and fall in cells at certain times.



[Source: https://en.wikipedia.org/wiki/Cyclin#/media/File:Cyclin_Expression.svg]

What times are these?

- A. Day and night
- B. Seasons of the year
- C. Stages of mitosis and interphase
- D. Developmental stages in the life cycle

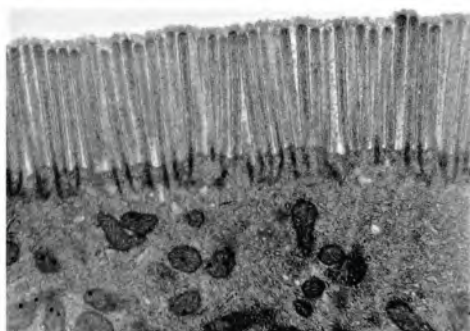
14 - (BIOLO/12_HL_Summer_2018_Q1) - *Cell Biology*

When compared to other body cells, which characteristic of stem cells is the most important for therapeutic uses?

- A. Less differentiation
- B. Less excretion
- C. Lower rate of reproduction
- D. Lower rate of metabolism

15 - (BIOLO/12_HL_Summer_2018_Q2) - *Cell Biology*

The micrograph shows part of a cell.



[Source: Louisa Howard/Katherine Connolly <https://commons.wikimedia.org/wiki/File:Microvilli.jpg>]

Which principal function is this cell likely to have, as judged by its cell structure and organelles?

- A. High rate of protein processing
- B. High rate of absorption
- C. High rate of photosynthesis
- D. High rate of movement

16 - (BIOLO/12_HL_Summer_2018_Q3) - *Cell Biology*

Which molecule regulates the fluidity of cell membranes?

- A. Phospholipid
- B. Cholesterol
- C. Glycoprotein
- D. Peripheral protein

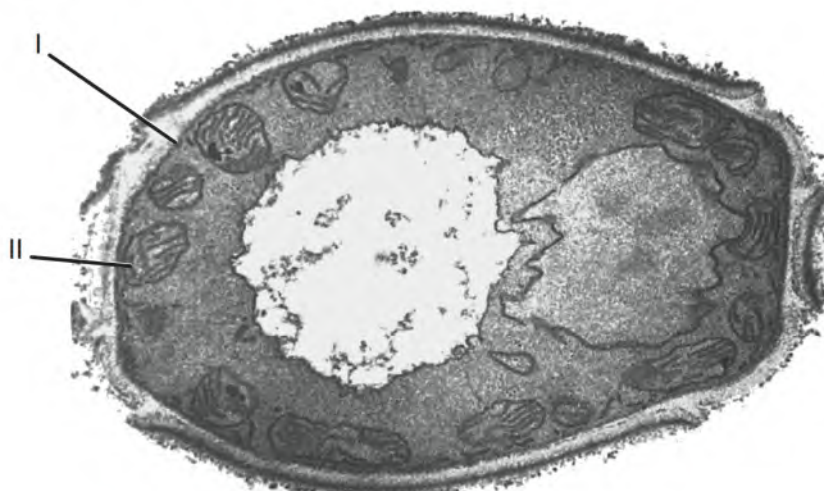
17 - (BIOLO/12_HL_Summer_2018_Q4) - *Cell Biology*

Which type of transportation happens in the sodium–potassium pump?

- A. Facilitated diffusion
- B. Osmosis
- C. Simple diffusion
- D. Active transport

18 - (BIOLO/10_HL_Winter_2018_Q1) - Cell Biology

The image shows an electron micrograph of a fungus, *Candida albicans*.



[Source: adapted from Centers for Disease Control and Prevention]

Which terms identify the structures labelled I and II in the image?

	I	II
A.	cell membrane	vesicle
B.	cell wall	chloroplast
C.	plasma membrane	mitochondrion
D.	cell wall	mitochondrion

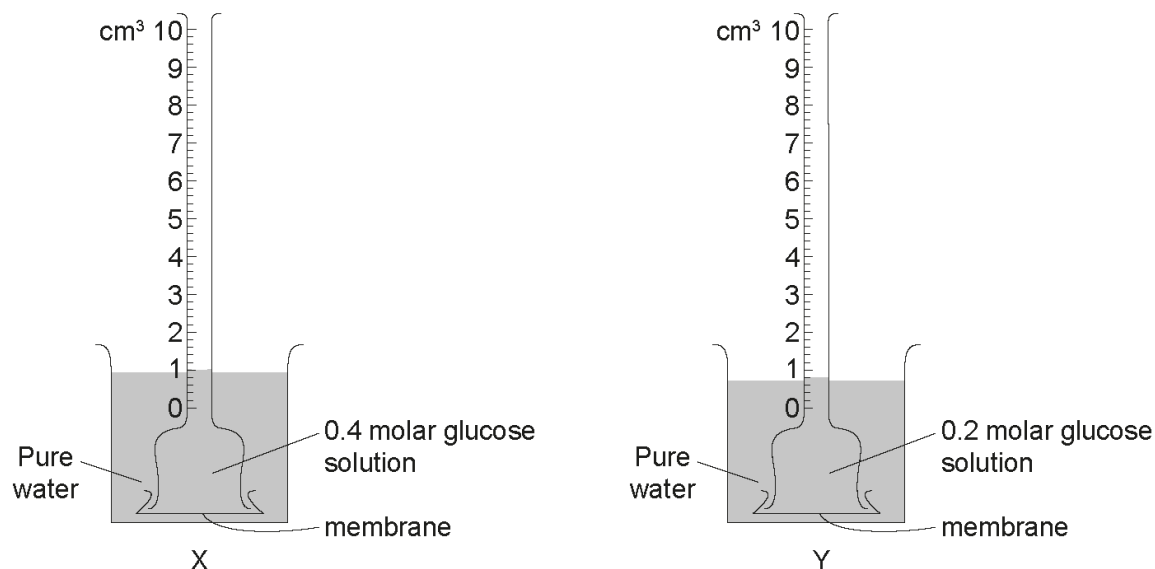
19 - (BIOLO/10_HL_Winter_2018_Q2) - Cell Biology

Which method provides biochemical evidence that cells have begun to differentiate?

- A. Observation with a light microscope
- B. Observation with an electron microscope
- C. Examination of the DNA sequence
- D. Analysis of the proteins

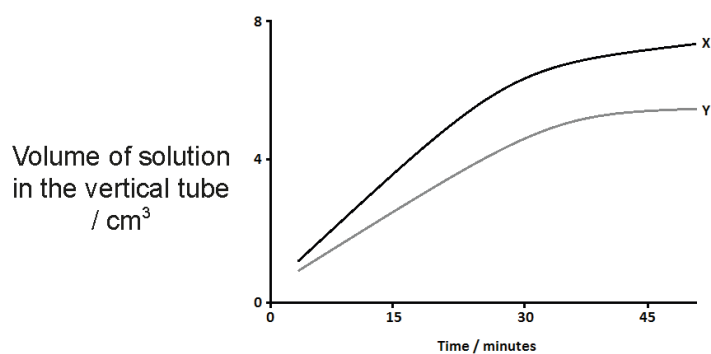
20 - (BIOLO/10_HL_Winter_2018_Q3) - Cell Biology

Apparatus was set up as shown to collect data.



[Source: © International Baccalaureate Organization 2018]

The graph shows the results after 47 minutes of data collection.



[Source: © International Baccalaureate Organization 2018]

What causes the rates to differ?

- I. Different concentration gradients at the start
- II. Diffusion of sugar is initially greater in Y than in X
- III. The systems are reaching equilibrium over time

- A. I only
- B. II only
- C. I and III only
- D. II and III only

21 - (BIOLO/10_HL_Winter_2018_Q4) - Cell Biology

A cell was placed into a solution containing a dye. After two hours the concentration of the dye inside the cell was higher than in the solution. This was repeated in the presence of a substance that inhibits ATP. In this case the dye did not enter the cell. What is the probable mechanism by which the dye entered the cell?

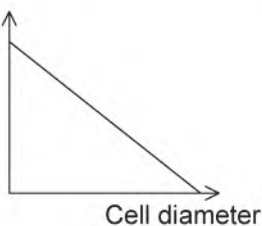
- A. Active transport
- B. Simple diffusion
- C. Osmosis
- D. Facilitated diffusion

22 - (BIOLO/11_HL_Summer_2019_Q1) - Cell Biology

Which graph represents the change in cell surface area to volume ratio with increasing cell diameter?

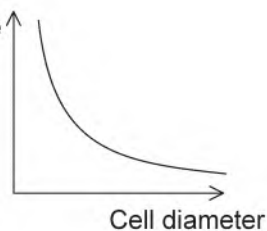
A.

Surface area : volume



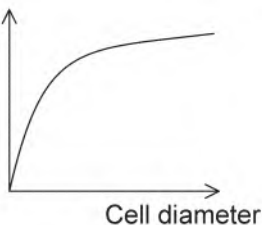
B.

Surface area : volume



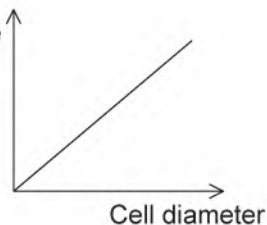
C.

Surface area : volume



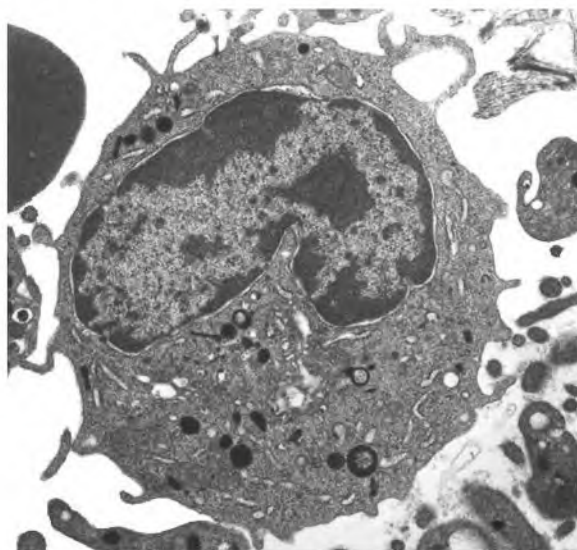
D.

Surface area : volume



23 - (BIOLO/11_HL_Summer_2019_Q2) - *Cell Biology*

The image shows a phagocytic white blood cell as seen with a transmission electron microscope.



[Source: http://www.wikidoc.org/index.php/File:Monocyte_TEM_0002.jpg, by Cafer Zorkun is licensed under the Creative Commons Attribution/Share-Alike License]

Which features can be found both within this cell and in a photosynthetic bacterium?

- A. Chloroplasts
- B. Multiple nuclei
- C. 70S ribosomes
- D. Lysosomes

24 - (BIOLO/11_HL_Summer_2019_Q3) - *Cell Biology*

Which is an essential feature of the Davson–Danielli model of membrane structure?

- A. A phospholipid monolayer with intrinsic and extrinsic proteins
- B. A layer of protein sandwiched between two layers of lipid
- C. A phospholipid bilayer with intrinsic and extrinsic proteins
- D. A layer of lipid sandwiched between two layers of protein

25 - (BIOLO/11_HL_Summer_2019_Q4) - *Cell Biology*

Which process(es) occur(s) by osmosis?

- I. Uptake of water by cells in the wall of the intestine
 - II. Loss of water from a plant cell in a hypertonic environment
 - III. Evaporation of water from sweat on the skin surface
- A. I only
- B. I and II only
- C. II and III only
- D. I, II and III

26 - (BIOLO/12_HL_Summer_2019_Q1) - *Cell Biology*

The magnification of the micrograph is 2000 $\times$.



[Source: https://upload.wikimedia.org/wikipedia/commons/6/6c/HeLa_cells_stained_with_Hoechst_33258.jpg
by TenOfAllTrades.]

What is the maximum diameter of the nucleus in the cell labelled X?

- A. 10 μm
- B. 10 nm
- C. 20 μm
- D. 20 nm

27 - (BIOLO/12_HL_Summer_2019_Q2) - *Cell Biology*

The image shows a micrograph of a cell.



[Source: © 2014, [https://commons.wikimedia.org/wiki/File:Mitosis_\(261_13\)_Pressed;_root_meristem_of_onion_\(cells_in_prophase,_metaphase,_anaphase,_telophase\).jpg](https://commons.wikimedia.org/wiki/File:Mitosis_(261_13)_Pressed;_root_meristem_of_onion_(cells_in_prophase,_metaphase,_anaphase,_telophase).jpg) by Doc. RNDr. Josef Reischig, CSc.]

What explains the appearance of the cell in the micrograph?

- A. The cell is dying.
- B. The DNA is replicating.
- C. The cell is in metaphase.
- D. The cell is in telophase.

28 - (BIOLO/12_HL_Summer_2019_Q3) - *Cell Biology*

Which processes are involved in the development of cancer?

- I. Mutations occur in oncogenes.
 - II. Oncogenes prevent cancer.
 - III. Oncogenes affect cell cycle regulatory proteins.
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

29 - (BIOLO/12_HL_Summer_2019_Q4) - Cell Biology

The table shows concentrations of potassium ions and sodium ions inside and outside human cells.

Ions	Concentration of ions / $10^{-3} \text{ mol dm}^{-3}$	
	Intracellular	Extracellular
Potassium ions	135	4
Sodium ions	10	145

[Source: © International Baccalaureate Organization 2019]

What explains these concentrations?

- A. Potassium ions diffuse in and sodium ions diffuse out.
- B. Sodium ions diffuse in and potassium ions diffuse out.
- C. Active transport pumps sodium ions in and potassium ions out.
- D. Active transport pumps sodium ions out and potassium ions in.

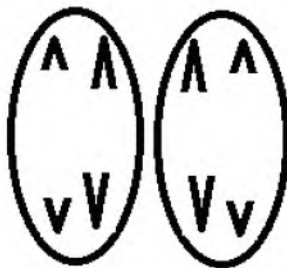
30 - (BIOLO/12_HL_Summer_2019_Q5) - Cell Biology

Where do hydrogen bonds form?

- A. Between the slight negative charge of hydrogen and slight positive charge of oxygen within a water molecule
- B. Between the slight positive charge of hydrogen and slight negative charge of oxygen within a water molecule
- C. Between the slight positive charge of hydrogen and slight negative charge of oxygen in different water molecules
- D. Between the slight negative charge of hydrogen and slight positive charge of oxygen in different water molecules

31 - (BIOLO/12_HL_Summer_2019_Q17) - *Cell Biology*

The diagram shows a stage in cell division.



[Source: © International Baccalaureate Organization 2019]

What is the stage shown?

- A. Anaphase I of mitosis
- B. Anaphase II of mitosis
- C. Anaphase I of meiosis
- D. Anaphase II of meiosis

32 - (BIOLO/10_HL_Winter_2019_Q1) - *Cell Biology*

Stargardt's disease, a genetic disorder that causes vision loss, is being treated using retinal cells derived from human embryonic stem cells. Why are embryonic stem cells used?

- A. They are already specialized for this function.
- B. They are able to differentiate into the required cell type.
- C. They retain stem cell properties after specialization.
- D. There are no ethical issues concerning their use.

33 - (BIOLO/10_HL_Winter_2019_Q2) - *Cell Biology*

By which process do potassium ions move through potassium channels in axons?

- A. Active transport
- B. Exocytosis
- C. Facilitated diffusion
- D. Simple diffusion

34 - (BIOLO/10_HL_Winter_2019_Q3) - *Cell Biology*

Which statement provides evidence for endosymbiosis?

- A. Early prokaryotes contributed to a large increase in oxygen in the atmosphere.
- B. Eukaryotic mitochondria and chloroplasts have their own circular DNA.
- C. Certain groups of ancient prokaryotes developed mechanisms to carry out aerobic respiration.
- D. Experiments by Miller and Urey produced simple organic molecules in abiotic conditions.

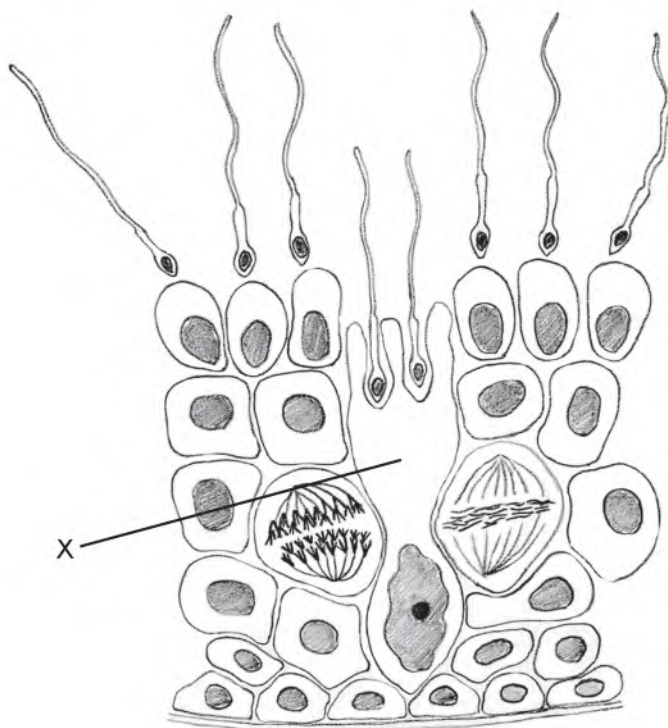
35 - (BIOLO/10_HL_Winter_2019_Q35) - *Cell Biology*

Which event happens in meiosis II but not in meiosis I?

- A. Spindle microtubules attach to centromeres.
- B. Crossing over occurs.
- C. Sister chromatids move to opposite poles.
- D. Chromosomes become shorter and thicker by coiling.

36 - (BIOLO/10_HL_Winter_2019_Q40) - Cell Biology

The diagram shows a section through the seminiferous tubules. What is the cell labelled X?



[Source: © International Baccalaureate Organization 2019]

- A. Spermatid that will differentiate into sperm
- B. Primary spermatocyte that will undergo meiosis to form secondary spermatocytes
- C. Sertoli cell that provides nutrients
- D. Stem cell that will divide by mitosis to form spermatogonia

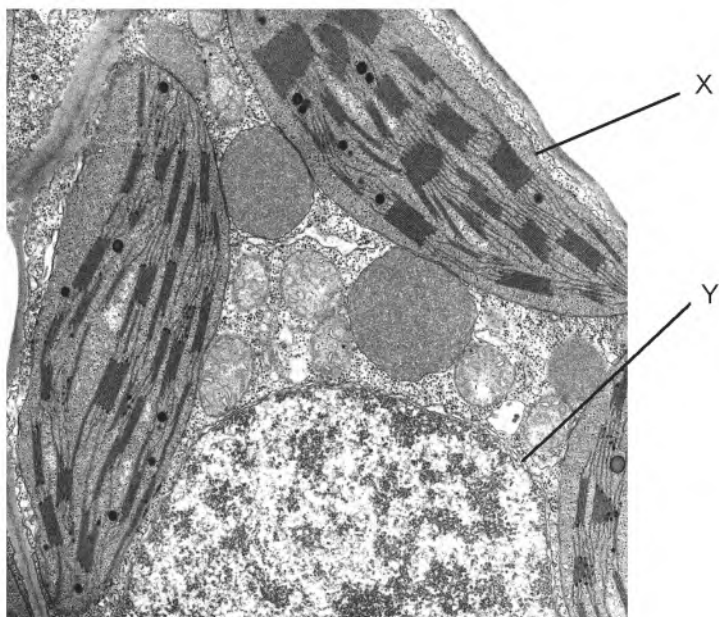
37 - (BIOLO/10_HL_Winter_2020_Q1) - Cell Biology

Chlorella and *Paramecium* are both unicellular eukaryotic organisms living in freshwater. *Chlorella* is photosynthetic and has a cell wall. Which organelle will be found in *Paramecium* but not in *Chlorella*?

- A. Chloroplast
- B. Contractile vacuole
- C. Rough endoplasmic reticulum
- D. Mitochondrion

38 - (BIOLO/10_HL_Winter_2020_Q2) - Cell Biology

The electron micrograph shows a section through a cell.



Which feature of the cell in the micrograph is consistent with the endosymbiotic theory?

- A. X has a single membrane.
- B. Y has a double membrane.
- C. X contains 70S ribosomes.
- D. Y contains 80S ribosomes.

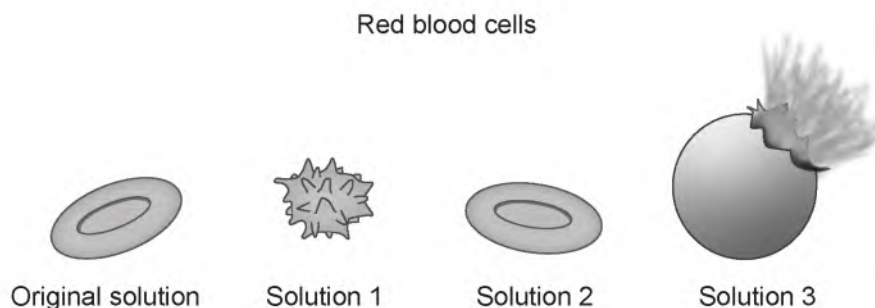
39 - (BIOLO/11_HL_Summer_2021_Q1) - Cell Biology

In mammals, mature red blood cells are specialized in that they lack nuclei, mitochondria or ribosomes. Which statement applies to red blood cells?

- A. No chemical reactions take place within their cytoplasm.
- B. They cannot produce new enzymes.
- C. Materials cannot enter red blood cells.
- D. Materials cannot exit red blood cells.

40 - (BIOLO/11_HL_Summer_2021_Q2) - *Cell Biology*

They show samples of red blood cells that were placed in different concentrations of salt solutions.

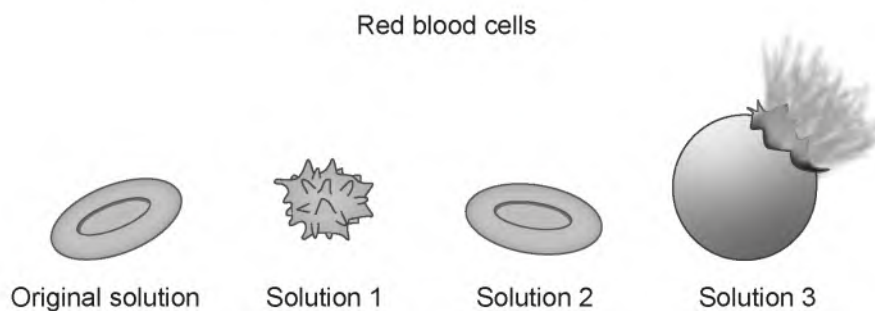


Which process explains the observations shown in the images?

- A. Active transport
- B. Exocytosis
- C. Facilitated diffusion
- D. Osmosis

41 - (BIOLO/11_HL_Summer_2021_Q3) - *Cell Biology*

They show samples of red blood cells that were placed in different concentrations of salt solutions.

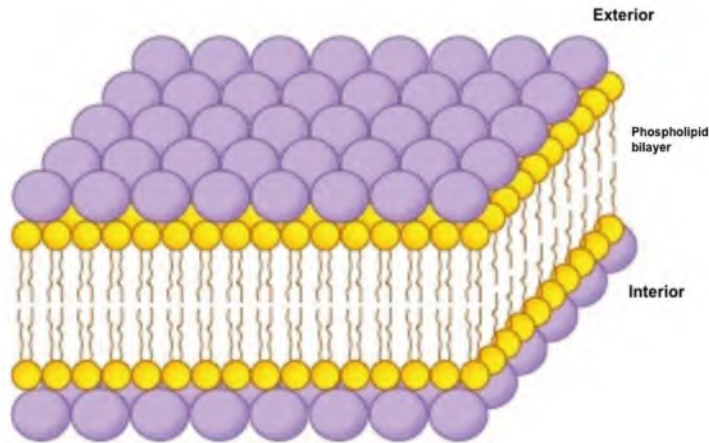


Which solution has the highest salt concentration?

- A. The original solution
- B. Solution 1
- C. Solution 2
- D. Solution 3

42 - (BIOLO/11_HL_Summer_2021_Q4) - Cell Biology

The Davson–Danielli model of membrane structure proposed that membranes were composed of a phospholipid bilayer that lies between two layers of globular proteins, as shown in this diagram.



What evidence supported this model?

- A. An electron micrograph that showed two dark lines with a lighter band in between
- B. Freeze-fracture electron microscopy
- C. Evidence that all membranes are identical
- D. The hydrophobic regions of protein would be in contact with water

43 - (BIOLO/11_HL_Summer_2021_Q5) - Cell Biology

Which living structure is an exception to the cell theory?

- A. Striated muscle fibres
- B. A single-celled alga carrying out all of the functions of life
- C. The artificial synthesis of the organic molecule urea
- D. A multicellular organism with cells undertaking specialized roles

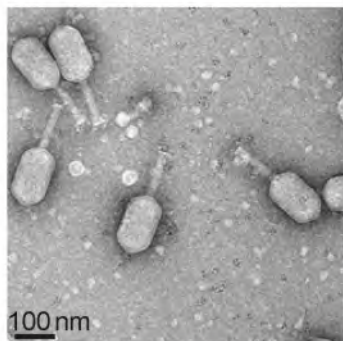
44 - (BIOLO/11_HL_Summer_2021_Q31) - Cell Biology

What does electron tomography allow mitochondria researchers to do?

- A. To produce images of cristae.
- B. To produce images of ATP synthase molecules.
- C. To trace the movement of electrons through the electron transport chain.
- D. To visualize oxidation/reduction reactions.

45 - (BIOLO/12_HL_Summer_2021_Q1) - Cell Biology

The image shows an electron micrograph of virus particles known to infect the bacterium *Vibrio parahaemolyticus*, which is associated with gastroenteritis, wound infections and septicemia in humans and animals.

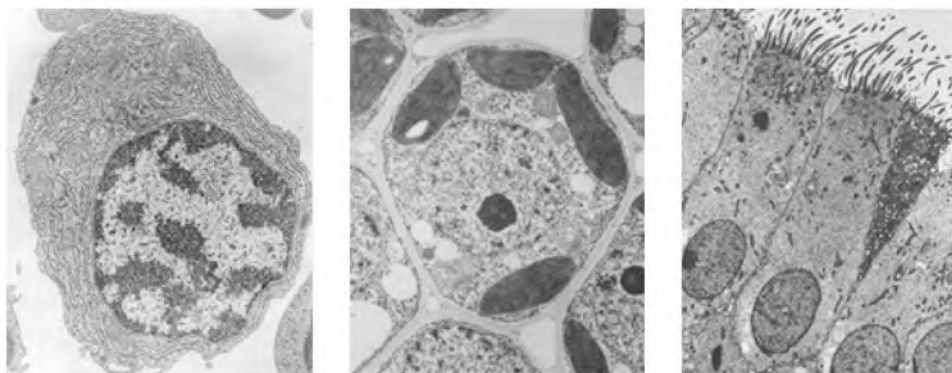


What does a virus have in common with a living cell?

- A. 70S ribosomes
- B. Genetic material
- C. Reproduction by binary fission
- D. Anaerobic respiration

46 - (BIOLO/12_HL_Summer_2021_Q2) - Cell Biology

Three cell types are shown in the micrographs.



What feature distinguishes striated muscle fibres from the three cell types shown in the images?

- A. Mitochondria
- B. Nucleoid regions
- C. Multinucleate structure
- D. Membrane-bound organelles

ANSWERS

1 - (BIOLO/11_HL_Summer_2017_Q1) - *Cell Biology*

B

2 - (BIOLO/11_HL_Summer_2017_Q2) - *Cell Biology*

B

3 - (BIOLO/11_HL_Summer_2017_Q3) - *Cell Biology*

C

4 - (BIOLO/11_HL_Summer_2017_Q4) - *Cell Biology*

D

5 - (BIOLO/12_HL_Summer_2017_Q1) - *Cell Biology*

D

6 - (BIOLO/12_HL_Summer_2017_Q2) - *Cell Biology*

D

7 - (BIOLO/12_HL_Summer_2017_Q3) - *Cell Biology*

C

8 - (BIOLO/12_HL_Summer_2017_Q4) - *Cell Biology*

D

9 - (BIOLO/10_HL_Winter_2017_Q1) - *Cell Biology*

A

10 - (BIOLO/10_HL_Winter_2017_Q2) - *Cell Biology*

B

IB DIPLOMA	BIOLOGY - HL - P1	CH1 - CELL BIOLOGY
11 - (BIOLO/10_HL_Winter_2017_Q3) - <i>Cell Biology</i>		B
12 - (BIOLO/11_HL_Summer_2018_Q3) - <i>Cell Biology</i>		A
13 - (BIOLO/11_HL_Summer_2018_Q4) - <i>Cell Biology</i>		C
14 - (BIOLO/12_HL_Summer_2018_Q1) - <i>Cell Biology</i>		A
15 - (BIOLO/12_HL_Summer_2018_Q2) - <i>Cell Biology</i>		B
16 - (BIOLO/12_HL_Summer_2018_Q3) - <i>Cell Biology</i>		B
17 - (BIOLO/12_HL_Summer_2018_Q4) - <i>Cell Biology</i>		D
18 - (BIOLO/10_HL_Winter_2018_Q1) - <i>Cell Biology</i>		C
19 - (BIOLO/10_HL_Winter_2018_Q2) - <i>Cell Biology</i>		D

20 - (BIOLO/10_HL_Winter_2018_Q3) - *Cell Biology*

C

21 - (BIOLO/10_HL_Winter_2018_Q4) - *Cell Biology*

A

22 - (BIOLO/11_HL_Summer_2019_Q1) - *Cell Biology*

B

23 - (BIOLO/11_HL_Summer_2019_Q2) - *Cell Biology*

C

24 - (BIOLO/11_HL_Summer_2019_Q3) - *Cell Biology*

D

25 - (BIOLO/11_HL_Summer_2019_Q4) - *Cell Biology*

B

26 - (BIOLO/12_HL_Summer_2019_Q1) - *Cell Biology*

A

27 - (BIOLO/12_HL_Summer_2019_Q2) - *Cell Biology*

C

28 - (BIOLO/12_HL_Summer_2019_Q3) - *Cell Biology*

B

29 - (BIOLO/12_HL_Summer_2019_Q4) - *Cell Biology*

D

30 - (BIOLO/12_HL_Summer_2019_Q5) - *Cell Biology*

C

31 - (BIOLO/12_HL_Summer_2019_Q17) - *Cell Biology*

D

32 - (BIOLO/10_HL_Winter_2019_Q1) - *Cell Biology*

B

33 - (BIOLO/10_HL_Winter_2019_Q2) - *Cell Biology*

C

34 - (BIOLO/10_HL_Winter_2019_Q3) - *Cell Biology*

B

35 - (BIOLO/10_HL_Winter_2019_Q35) - *Cell Biology*

C

36 - (BIOLO/10_HL_Winter_2019_Q40) - *Cell Biology*

C

37 - (BIOLO/10_HL_Winter_2020_Q1) - *Cell Biology*

B

38 - (BIOLO/10_HL_Winter_2020_Q2) - *Cell Biology*

C

39 - (BIOLO/11_HL_Summer_2021_Q1) - *Cell Biology*

B

40 - (BIOLO/11_HL_Summer_2021_Q2) - *Cell Biology*

D

41 - (BIOLO/11_HL_Summer_2021_Q3) - *Cell Biology*

B

42 - (BIOLO/11_HL_Summer_2021_Q4) - *Cell Biology*

A

43 - (BIOLO/11_HL_Summer_2021_Q5) - *Cell Biology*

A

44 - (BIOLO/11_HL_Summer_2021_Q31) - *Cell Biology*

A

45 - (BIOLO/12_HL_Summer_2021_Q1) - *Cell Biology*

B

46 - (BIOLO/12_HL_Summer_2021_Q2) - *Cell Biology*

C

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