Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Standard level
Paper 1

Wednesday 14 November 2018 (afternoon)

45 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The maximum mark for this examination paper is **[30 marks]**.

8818 – 6004

1. If cells of a multicellular organism have the same genes, how can there be many different cell types in a body?

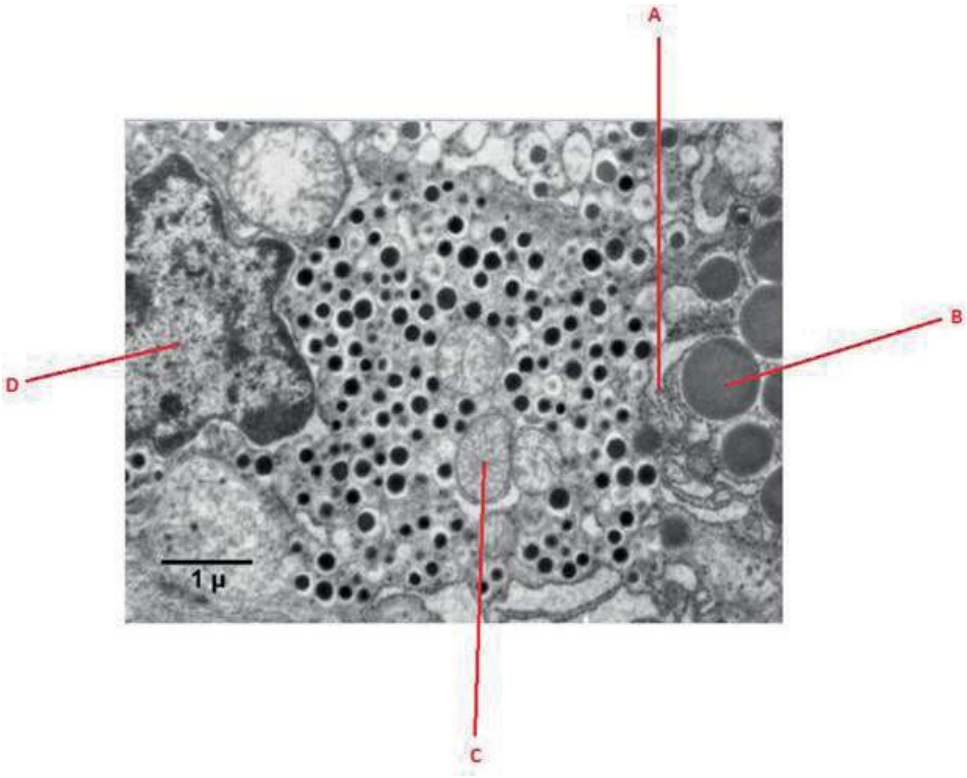
A. Some genes but not others are expressed in each cell type.

B. Cells lose some genes as development occurs.

C. Genes do not determine the structure of a cell.

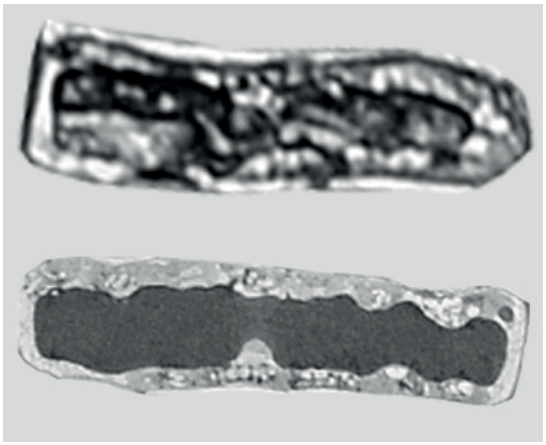
D. Cells must practice division of labour in order to survive.

2. The electron micrograph shows part of a cell. Which organelle is the site of aerobic respiration?



[Source: adapted from C. Shugrue and F. Gorelick, Yale University-adult mouse Islet cell (adjacent acinar cell with zymogen granules on right side of the panel)]

3. The images are microscopic views of two similar cells.



[Source: Images adapted from https://www.researchgate.net/figure/Microscopic-response-of-Vitis-vinifera-cv-Aleatico-to-ozone-treatment-observed-by-light_fig9_281393249. Licensed under CC BY 4.0 https://creativecommons.org/licenses/by/4.0/]

What is a reason for the differences between the two micrographs?

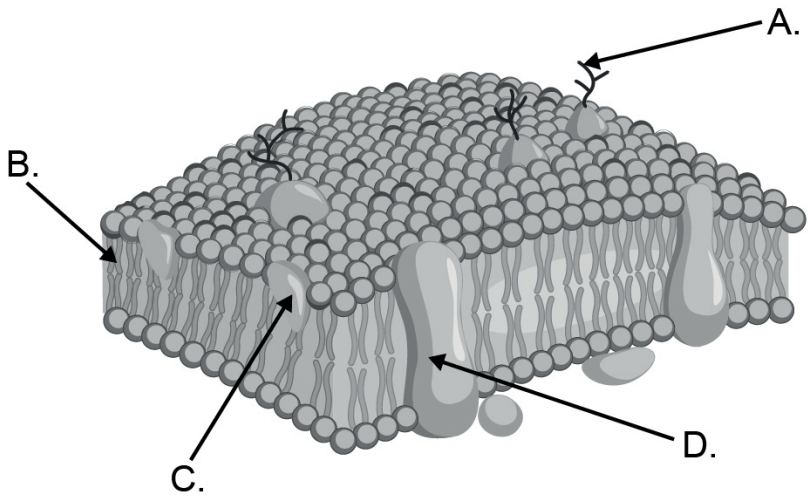
A. The lower image has a higher magnification.

B. The lower image has greater resolution.

C. A nucleus can only be seen in the upper image.

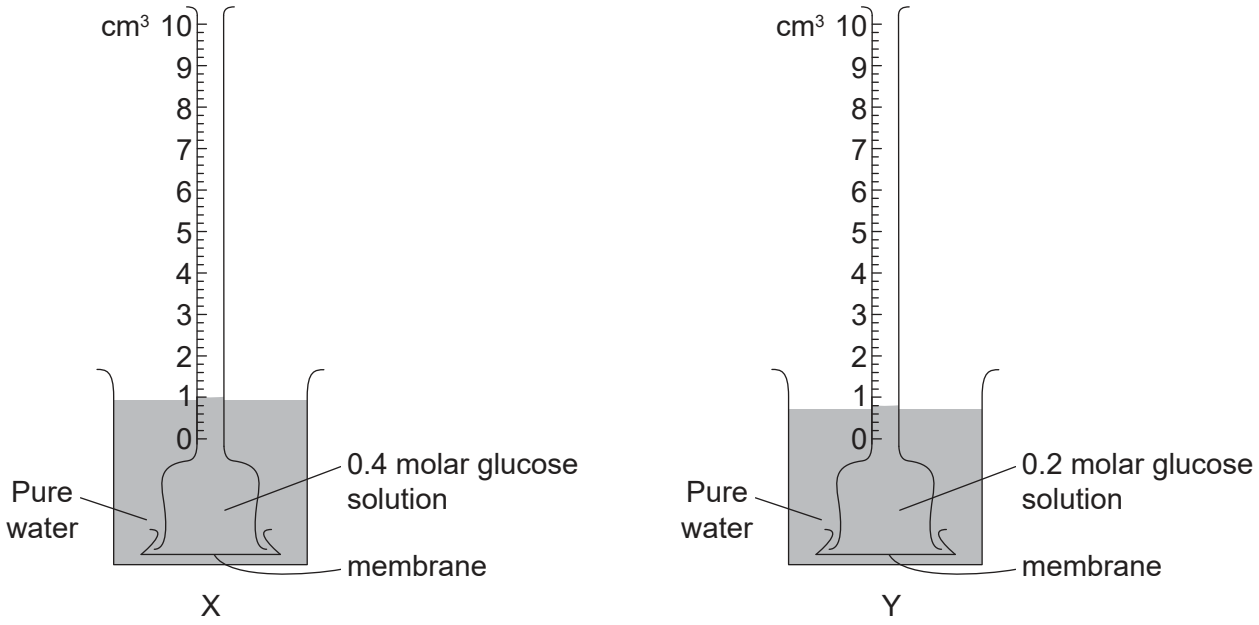
D. The upper image is an electron micrograph.

4. What part of the plasma membrane is fluid, allowing the movement of proteins in accordance with the fluid mosaic model?



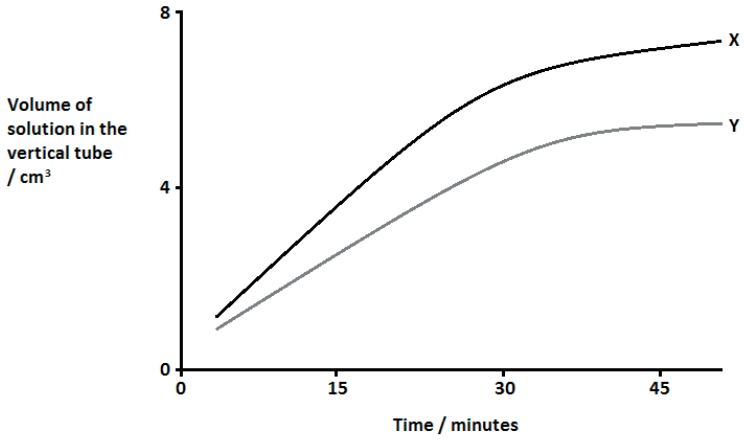
[Source: Vecton/Vector images/Shutterstock]

5. 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

6. How does mitosis produce two genetically identical nuclei?

A. By separation of homologous chromosomes

B. By separation of sister chromatids

C. By division of the cytoplasm into two equal cells

D. By division of the nuclear membrane into two equal parts

7. Which type of chemical reaction is an example of anabolism?

A. Photolysis

B. Combustion

C. Hydrolysis

D. Condensation

8. Where are amino acids joined together to make polypeptides?

A. Nucleus

B. Nucleolus

C. Golgi apparatus

D. Ribosomes

9. The table shows some codons for five amino acids.

mRNA codons	Amino acids
CGU	arginine
GGA, GGU, GGC	glycine
AGC, AGU, UCU	serine
GCA	alanine
GAG, GAA	glutamine

Which of these DNA strands will code for the amino acid sequence glycine-serine-glycine?

A. CCUUCGCCG

B. CCTTCGCCG

C. GGAAGCGGA

D. CCUUCGCCU

10. Living organisms control pH within their tissues. What is a reason for regulating pH?

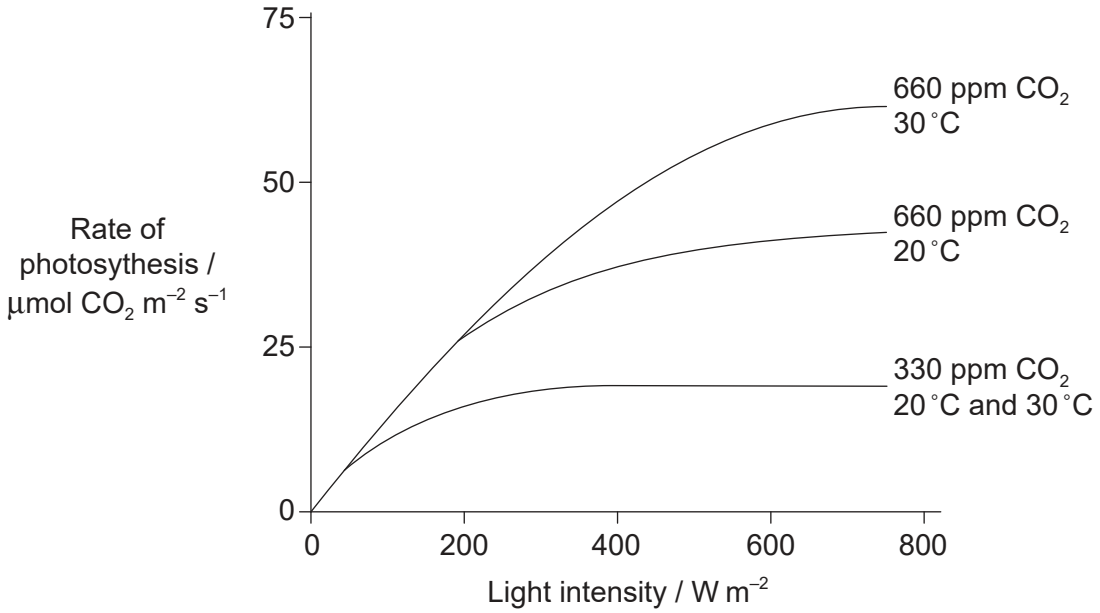
A. All parts of a body must be kept at the same pH to survive.

B. Many reactions can only happen at specific pH levels.

C. pH affects osmosis.

D. Control of active transport is achieved by pH.

11. The graph shows the relationship between rate of photosynthesis and light intensity as influenced by both temperature and CO_2 concentration.



[Source: © International Baccalaureate Organization 2018]

What conclusion can be drawn from the data in the graph?

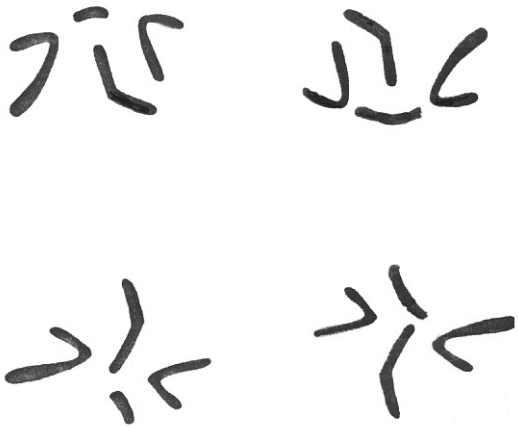
A. CO_2 is always the limiting factor at low light intensities and temperatures.

B. Light intensity is only the limiting factor at high light intensities.

C. Temperature is only the limiting factor at high light intensities and CO_2 concentrations.

D. Both temperature and light intensity are limiting factors at 660 ppm CO_2 and less than 200 W m^{-2} light intensity.

12. The image shows the chromosomes in four cells of an insect at the end of meiosis.



[Source: © International Baccalaureate Organization 2018]

What is the diploid number of this insect?

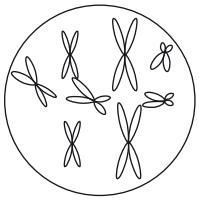
A. 16

B. 8

C. 4

D. 2

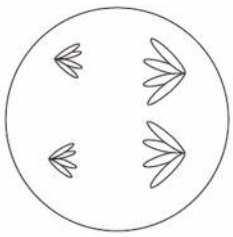
13. The diagram represents the nucleus of a cell $2n = 8$ in late prophase of mitosis.



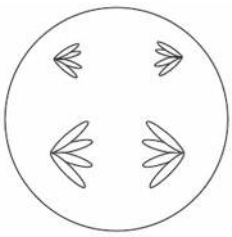
[Source: © International Baccalaureate Organization 2018]

Which diagram represents a cell from the same species in anaphase II of meiosis?

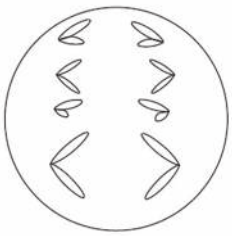
A.



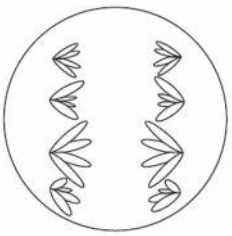
B.



C.



D.



14. A human gene has two alleles. One allele, P, is dominant over the recessive allele p. Embryos that are homozygous for the dominant allele die in the uterus. What is the expected ratio of genotypes for the **live** offspring of a heterozygous man and a heterozygous woman?

A. 1 : 1

B. 2 : 1

C. 3 : 1

D. 4 : 0

15. In cats, black coat colour is dominant over gray. A female black cat, whose mother is gray, mates with a gray male. What is the predicted ratio of phenotypes in the offspring?

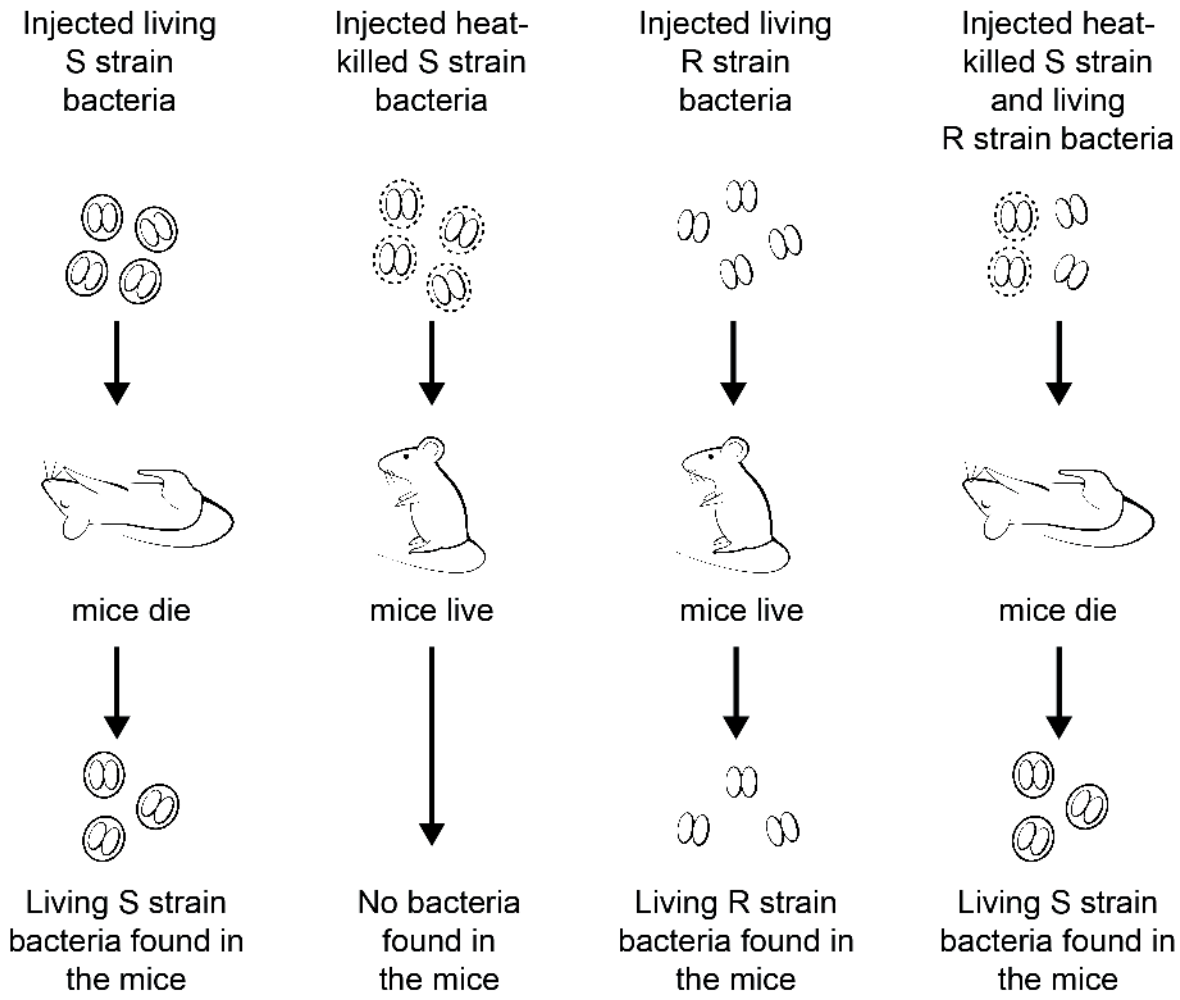
A. 100 % black

B. 50 % black to 50 % gray

C. 75 % black to 25 % gray

D. 100 % gray

16. The image shows the results of Griffith's experiment with S and R strains of *Streptococcus pneumoniae* in mice (*Mus musculus*).



[Source: © International Baccalaureate Organization 2018]

What is an explanation for the results?

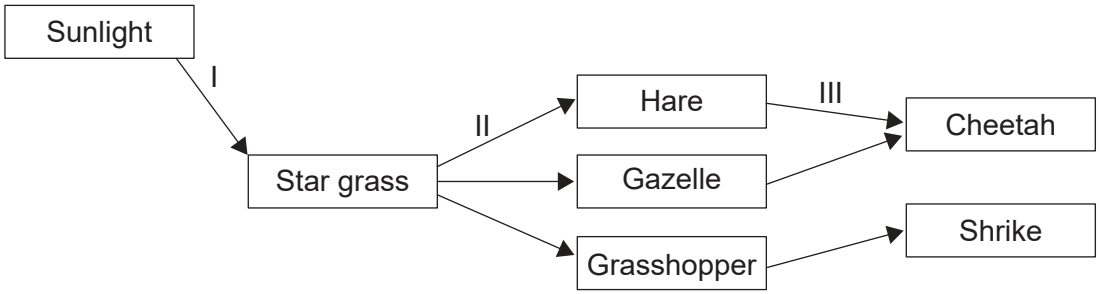
A. Mice vary in their resistance to bacteria.

B. The R strain and S strain mated.

C. R strain bacteria are more heat-stable than S strain.

D. DNA was transferred from heat-killed S cells to R cells.

17. The diagram shows interactions between food chains in an ecosystem in the African savannah.



[Source: © International Baccalaureate Organization 2018]

Which arrows indicate the flow of chemical energy?

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

18. The Australian pitcher plant (*Cephalotus follicularis*) is a green plant that traps and feeds on flies and other live insects. What is this plant's mode of nutrition?

A. Producer and saprotroph

B. Autotroph and detritivore

C. Autotroph and heterotroph

D. Consumer and saprotroph

19. In 1789 Gilbert White, a naturalist, observed eight breeding pairs of swifts (*Apus apus*) in the English village of Selborne. On average, each pair of swifts produces two offspring per year. This would allow the population to rise to 1030 swifts over 200 years. A bird survey carried out in 1983 revealed only 12 breeding pairs in this village.

What could have prevented the numbers rising to 1030?

I. The number of nesting sites remained the same.
II. The food supply of the swifts remained constant.
III. Predatory birds in the area were exterminated.

A. I only

B. I and II only

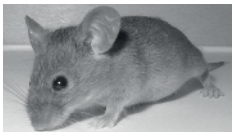
C. II and III only

D. I, II and III

20. The images show a guinea pig, a mouse, a horse and a whale.

Guinea pig
(*Cavia porcellus*)

[Source: pixabay]



Mouse
(*Mus musculus*)

[Source: Roger McLassus/ Wikimedia. Image licensed under CC BY-SA 3.0 (https://creativecommons.org/licenses/by-sa/3.0/)]

Horse
(*Equus caballus*)

[Source: pixabay]

Whale
(*Orcinus orca*)

[Source: pixabay]

Which features support the classification of these four species in the same class?

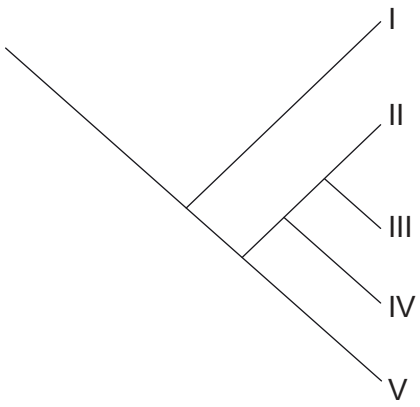
A. All are warm-blooded and breathe air.

B. All have evolved from primates.

C. All have hair or fur and feed their young with milk.

D. All have a notochord, vertebrae and give birth to live young.

21. The cladogram shows the relationships of five species I to V.



[Source: © International Baccalaureate Organization 2018]

Which species is/are most closely related to IV?

A. V only

B. II and III

C. III and V

D. II, III and V

22. The chart shows features of three organisms X, Y and Z.

	Organism		
Feature	**X**	**Y**	**Z**
Cell wall	absent	made of peptidoglycan	not made of peptidoglycan
Proteins associated with DNA	histones	not present	present
Type of lipid in membrane	glycerol-ester	glycerol-ester	glycerol-ether

To which domain does each organism belong?

	X	**Y**	**Z**
A.	Animalia	Eukaryote	Prokaryote
B.	Eukaryote	Eubacteria	Archaea
C.	Eubacteria	Archaea	Plantae
D.	Eukaryote	Archaea	Eubacteria

23. Which products are formed by the action of the enzymes protease and amylase?

	Protease	**Amylase**
A.	fatty acids	glucose
B.	glycerol	fatty acids
C.	proteins	starch
D.	amino acids	maltose

24. Limpets are molluscs with conical shells that cling tightly to rocks on seashores. In a study of two species of limpets found on rocks along the Oregon coast, 30 randomly placed quadrats were used to determine how often the two species occurred together. The table shows the data that were collected.

		Lottia pelta		
		Present	**Absent**	**Total**
Lottia scutum	**Present**	15	5	20
	Absent	5	5	10
	Total	20	10	30

Which statistical method will determine whether these two species occur together by chance or by some kind of interaction?

A. Chi-squared test

B. *t*-test

C. Standard deviation

D. Means and ranges

25. Florey and Chain's penicillin experiments would not be compliant with current protocols on testing. How was their work out of compliance with today's standards?

A. They did animal testing.

B. They tested on humans after animal testing with only eight mice.

C. They did not use sterile technique for culturing the bacteria.

D. They used lethal quantities of bacteria during their tests.

26. Why are antibiotics effective in curing diseases against some pathogens but not others?

I. Antibiotics interrupt processes found in some but not all pathogen cells.

II. Some pathogens have no metabolic processes to interrupt.

III. Some pathogens have developed genetic resistance to specific antibiotics.

A. I only

B. II only

C. III only

D. I, II and III

27. What helps to regulate the levels of glucose in blood?

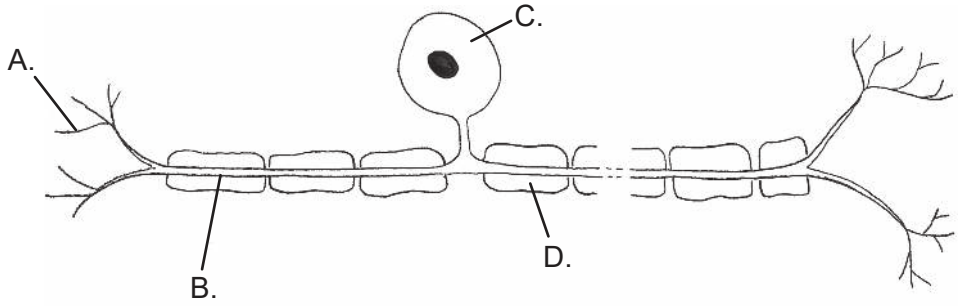
A. Insulin and glucagon

B. Kidneys and liver

C. Glycogen and insulin

D. Digestion and respiration

28. The image shows a neuron. Which letter shows the myelin sheath?



[Source: © International Baccalaureate Organization 2018]

29. Which hormone controls metabolic rate?

A. Glucagon

B. Insulin

C. Thyroxin

D. Melatonin

30. Which pituitary hormones regulate the human menstrual cycle?

A. FSH and LH

B. Progesterone and estrogen

C. HCG and estrogen

D. FSH and oxytocin