Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Higher level
Paper 1

Wednesday 14 November 2018 (afternoon)

1 hour

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 **[40 marks]**.

8818–6001

1. 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

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

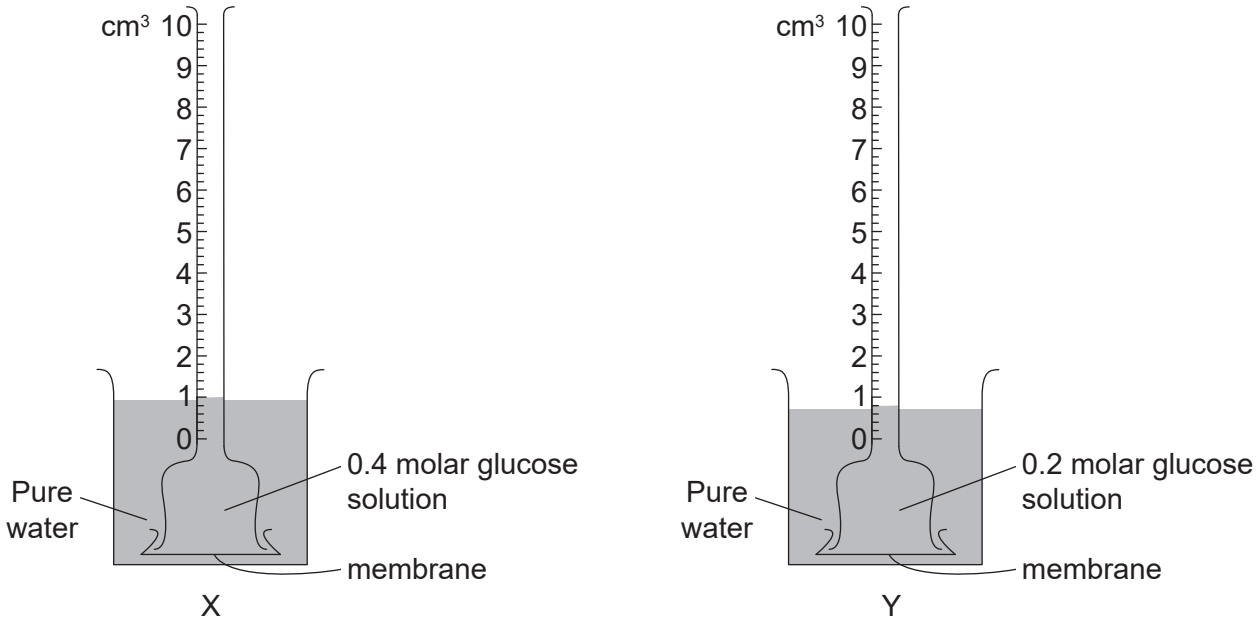
A. Observation with a light microscope

B. Observation with an electron microscope

C. Examination of the DNA sequence

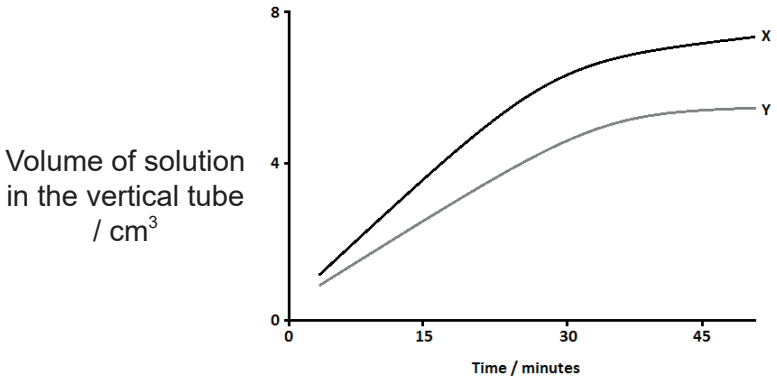
D. Analysis of the proteins

3. 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

4. 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?

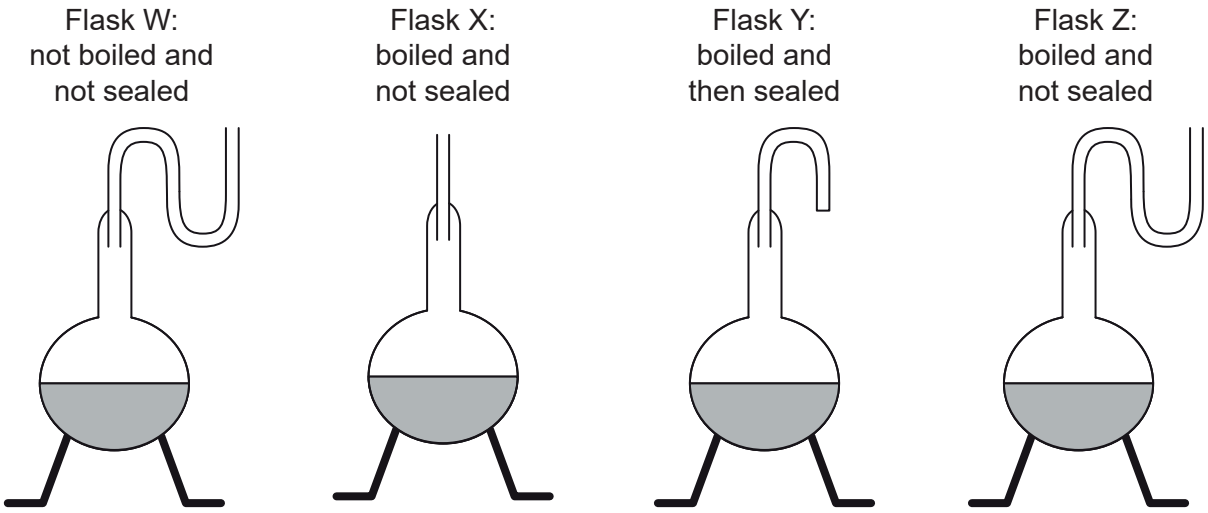
A. Active transport

B. Simple diffusion

C. Osmosis

D. Facilitated diffusion

5. In a copy of Louis Pasteur's famous experiment, broth was put into flasks as shown in the diagrams.



[Source: © International Baccalaureate Organization 2018]

What results would be expected with no spontaneous generation of life?

A. Decomposition of broth by microbes occurred only in Flask W.

B. Decomposition of broth by microbes occurred only in Flasks W and X.

C. Decomposition of broth by microbes occurred only in Flasks W, X and Y.

D. Decomposition of broth by microbes occurred only in Flasks W, X and Z.

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

A. Nucleus

B. Nucleolus

C. Golgi apparatus

D. Ribosomes

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

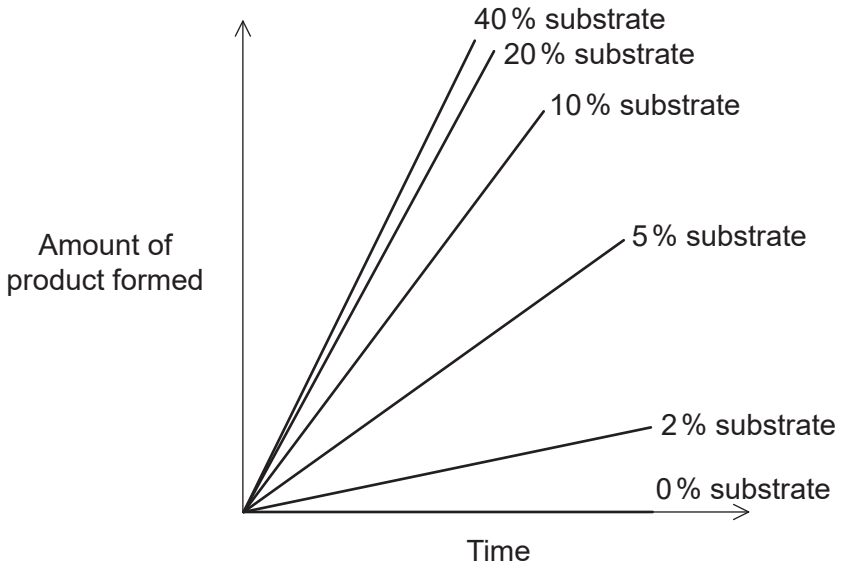
A. Photolysis

B. Combustion

C. Hydrolysis

D. Condensation

8. The graph shows the effect of changing the substrate concentration on the early stages of an enzyme-catalysed reaction.



[Source: © International Baccalaureate Organization 2018]

What can be interpreted about the rate of reaction from the graph?

A. Rate of reaction increases up to a point and then remains constant.

B. Rate of reaction increases linearly with increasing substrate concentration.

C. Rate of reaction increases non-linearly with increasing substrate concentration.

D. Rate of reaction is not affected by any change in the substrate concentration.

9. 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.

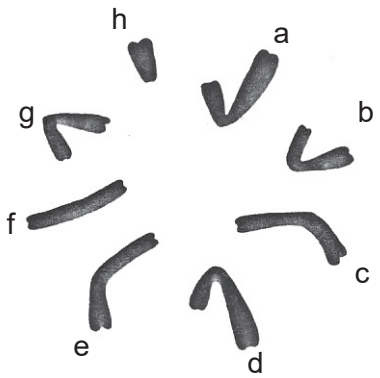
C. pH affects osmosis.

D. Control of active transport is achieved by pH.

10. What are final products of photosynthesis and of aerobic respiration?

	Photosynthesis	Aerobic respiration
A.	carbon dioxide, water and ATP	glucose and ADP
B.	glucose and oxygen	carbon dioxide, water and ATP
C.	glucose, water and ADP	carbon dioxide, ADP and urea
D.	carbon dioxide, water and ADP	pyruvate, carbon dioxide and ATP

11. The image shows chromosomes from an insect ($2n = 8$).



[Source: © International Baccalaureate Organization 2018]

Which pair of chromosomes are the sex chromosomes of this insect species?

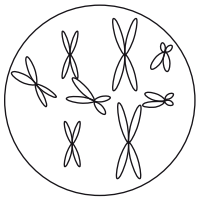
A. c and e

B. a and h

C. f and h

D. a and e

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



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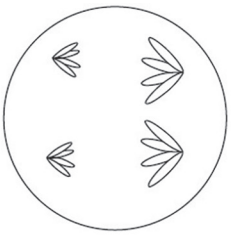
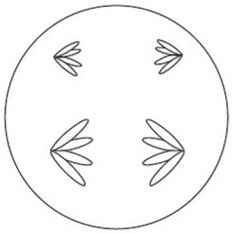
Which diagram represents a cell from the same species in anaphase II of meiosis?

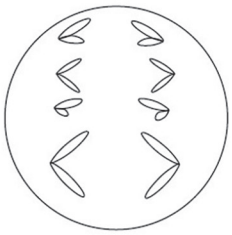
A.



B.



C.



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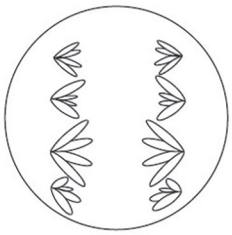


13. A human gene has two alleles. One allele, P, is dominant over the recessive allele p. Embryos that are homozygous for the dominant allele die in the uterus. What is the expected ratio of genotypes for the **live** offspring of a heterozygous man and a heterozygous woman?

A. 1 : 1

B. 2 : 1

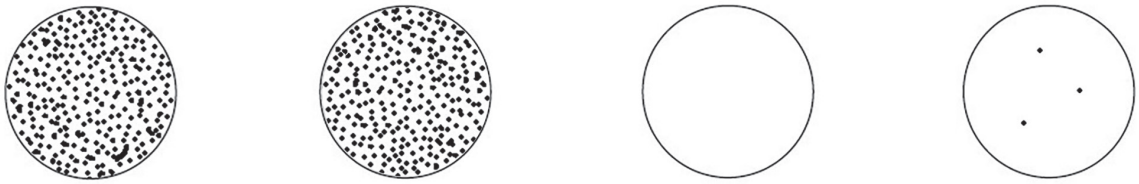
C. 3 : 1

D. 4 : 0

14. Ampicillin (Amp) is an antibiotic. A plasmid carrying a gene for Amp resistance was used to transform bacteria in a tube of broth. A control tube without plasmid was also produced. The results were plated as shown. Which plate has **only** colonies of transformed bacteria?

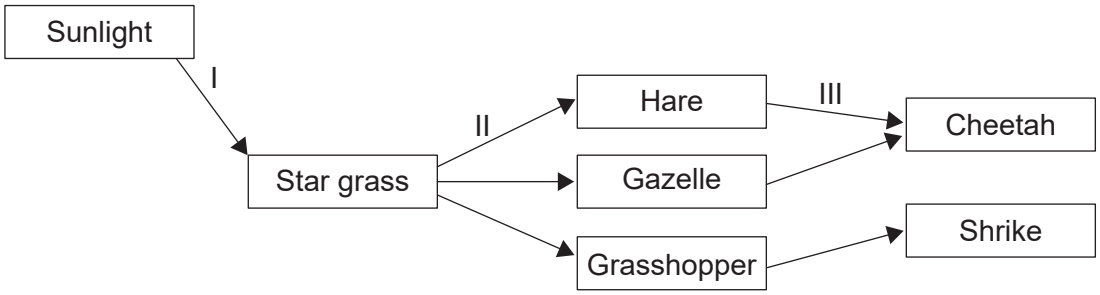
Plates

A.	B.	C.	D.
No plasmid. Plate contains no Amp	Plasmid added. Plate contains no Amp	No plasmid. Plate contains Amp	Plasmid added. Plate contains Amp



[Source: © International Baccalaureate Organization 2018]

15. 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

16. 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

17. 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

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?

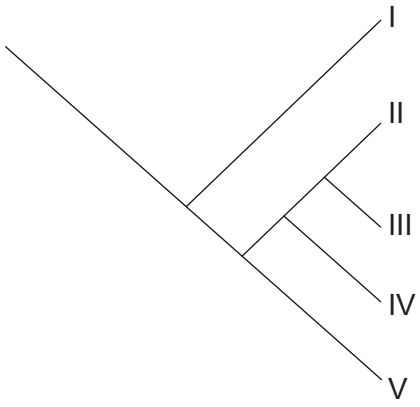
A. Producer and saprotroph

B. Autotroph and detritivore

C. Autotroph and heterotroph

D. Consumer and saprotroph

19. 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

20. 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

21. 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

22. How are villi, alveoli and nephrons similar?

A. They are internal organs.

B. They provide large surface areas for molecular exchange.

C. They secrete hormones.

D. They have a role in excretion.

23. 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.

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

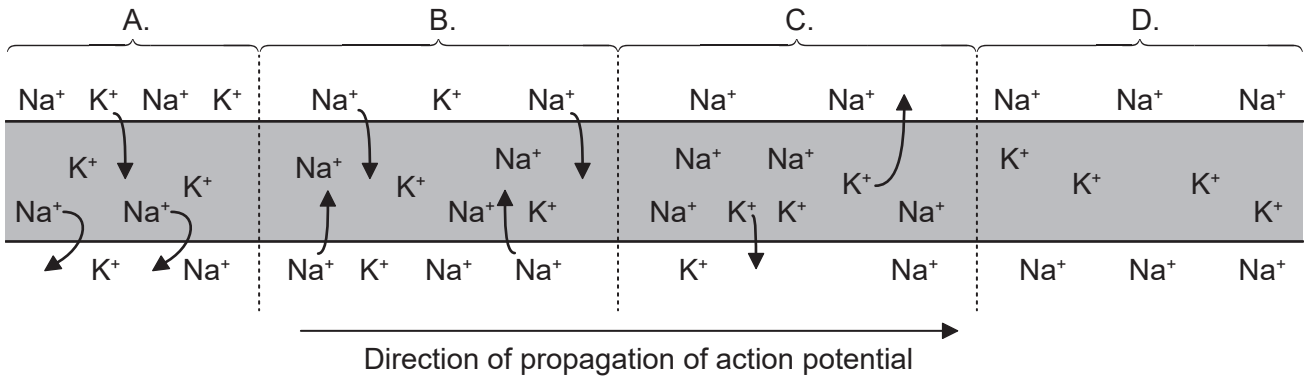
A. Insulin and glucagon

B. Kidneys and liver

C. Glycogen and insulin

D. Digestion and respiration

25. The diagram shows an action potential moving along a neuron. Which part of the diagram represents depolarization?



[Source: © International Baccalaureate Organization 2018]

26. Current understanding of DNA is an example of the accumulated discoveries of many scientists. Which scientists are credited with establishing that DNA is the genetic material?

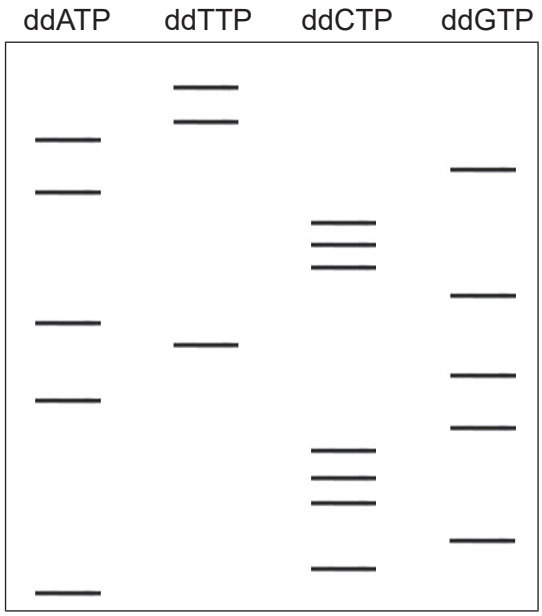
A. Franklin and Wilkins

B. Watson and Crick

C. Meselson and Stahl

D. Hershey and Chase

27. Sanger developed a method for determining DNA base sequences using terminating nucleotides called dideoxyribonucleotides. After an incubation period, the DNA samples are run on an electrophoresis gel. Results are shown in the diagram.



[Source: © International Baccalaureate Organization 2018]

What is the base sequence of the original DNA template strand?

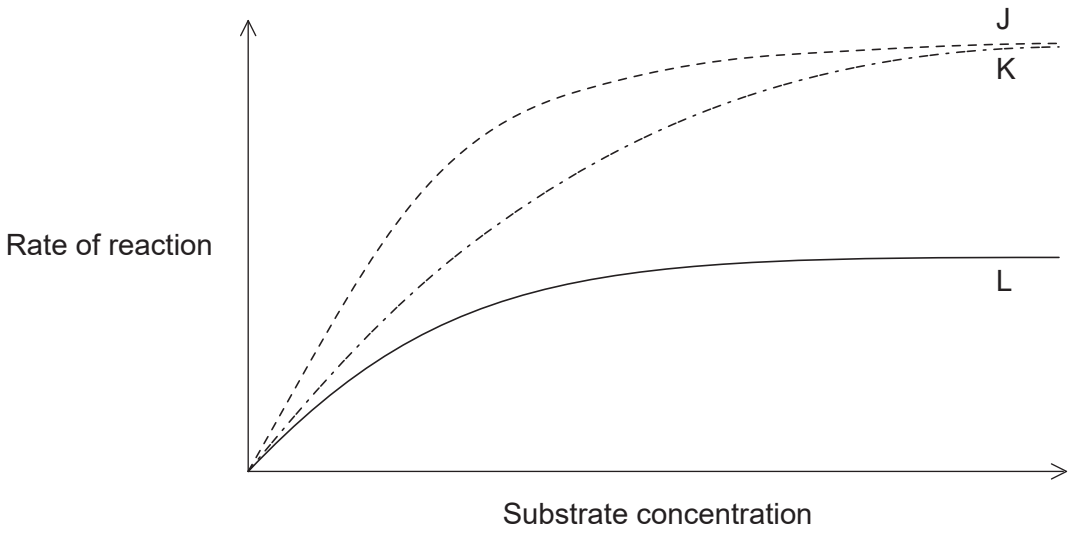
A. A C G C C C G A G T A G C C C A G A T T

B. U G C G G G C U C A U C G G G U C U A A

C. A C G C C C G A G U A G C C C A G A U U

D. T G C G G G C T C A T C G G G T C T A A

28. The graph shows the effect of substrate concentration on the rate of an enzyme-catalysed reaction with and without an inhibitor.



[Source: © International Baccalaureate Organization 2018]

What do the curves J, K and L on the graph indicate?

	Competitive inhibitor	Non-competitive inhibitor	Normal enzyme activity
A.	J	K	L
B.	K	L	J
C.	L	J	K
D.	L	K	J

29. What term is used for ATP synthesis coupled to electron transport and proton movement?

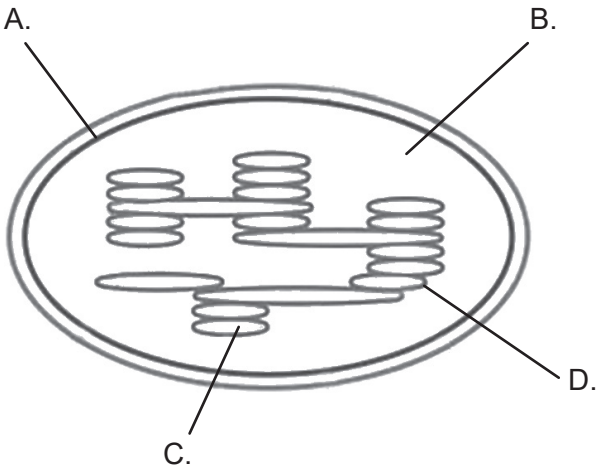
A. Chemiosmosis

B. Oxidation

C. Glycolysis

D. Cell respiration

30. The diagram shows the structure of a chloroplast. Where is chlorophyll located?



[Source: © International Baccalaureate Organization 2018]

31. Which is a reduction reaction?

A. ATP changing to ADP

B. Maltose changing to glucose

C. FAD changing to $FADH_2$

D. NADPH changing to NADP

32. A fungicide dissolved in water was applied to the soil in which a rose plant was growing. It later appeared in the leaves. How did the fungicide reach the leaves?

A. Movement up a water potential gradient

B. Transpiration pull in xylem

C. Translocation in phloem

D. Facilitated diffusion

33. What is a difference between pollination and fertilization in flowering plants?

A. Pollination is movement of pollen from one flower to another whereas fertilization occurs after self-pollination.

B. Pollination is movement of seeds away from the parent plant whereas fertilization is union of two seeds.

C. Pollination is movement of pollen from anther to stigma whereas fertilization depends on the growth of a pollen tube from the stigma to the ovule.

D. Pollination is movement of pollen whereas fertilization is movement of gametes from flower to flower.

34. The diagram shows results of experiments into flowering in a species of plant.

[Source: © International Baccalaureate Organization 2018]

What can be used to promote off-season flowering in long-day plants?

A. Interrupt the day with a period of darkness.

B. Close blinds at the end of the night to delay the start of the light period.

C. Turn on the lights during the night for a brief period.

D. Extend the cycle of light and dark to more than 24 hours.

35. The graph shows a type of selection within the cat family based on tail length.

Removed for copyright reasons

What type of selection is illustrated in the graph?

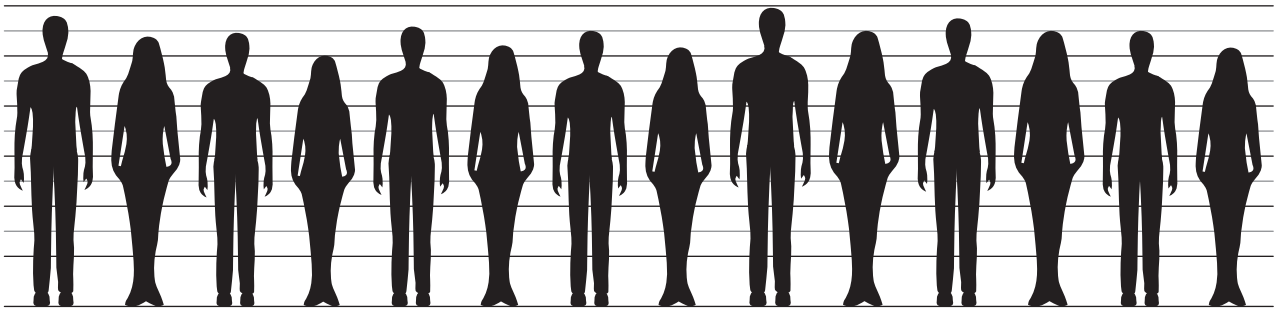
A. Disruptive

B. Normal

C. Directional

D. Stabilizing

36. The image shows variation in height of adult humans.



[Source: © International Baccalaureate Organization 2018]

What can explain the variation?

A. One pair of alleles and age

B. Polygenic inheritance and nutrition

C. Nutrition and age

D. Autosomal inheritance only

37. When activated B cells multiply, what do they produce?

A. Plasma cells

B. Antigens

C. Histamine

D. T lymphocytes

38. Which hormone influences movement of water into blood?

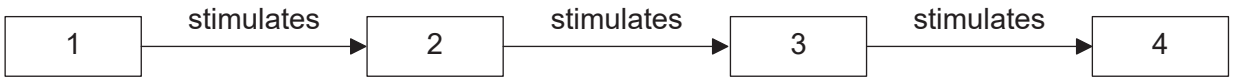
A. Oxytocin

B. Leptin

C. ADH

D. Thyroxin

39. The image shows a flow chart.



Which sequence would correspond to the stages shown in the flow chart?

	1	2	3	4
A.	sexual intercourse	ovulation	pregnancy	maintenance of endometrium
B.	disintegration of corpus luteum	pituitary gland activity	estrogen production	ovulation
C.	implanted embryo	corpus luteum of ovary	progesterone production	maintenance of endometrium
D.	mitosis	growth	differentiation	pregnancy

40. If the ovaries of a pregnant woman have to be removed during the first five months of pregnancy, a miscarriage results and the pregnancy fails. If the ovaries are removed in the last four months of pregnancy, the miscarriage does not occur. What is the reason for this?

A. After the fifth month, the ovaries can regenerate rapidly.

B. The pituitary gland takes over the function of sustaining the pregnancy.

C. The placenta produces sufficient hormones to sustain the pregnancy.

D. Before removal the ovaries produce sufficient hormones to sustain the pregnancy.