Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Higher level
Paper 1

Wednesday 6 May 2015 (morning)

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]**.

2215 – 6013

1. What happens to the cell surface area to volume ratio as a cell grows?

A. It decreases, so production of waste material is reduced.

B. It increases, so mineral ion absorption is increased.

C. It increases, so osmosis is reduced.

D. It decreases, so rate of gas exchange is too low.

2. What is a function of the plant cell wall?

A. Formation of vesicles for transport of large molecules

B. Prevention of excessive water uptake

C. Communication with other cells by means of glycoproteins

D. Active transport of ions

3. What distinguishes prokaryotic cells from eukaryotic cells?

	Prokaryotic cells	Eukaryotic cells
A.	no plasma membrane	plasma membrane
B.	80S ribosomes	70S ribosomes
C.	Golgi apparatus	mitochondria
D.	no internal membrane compartments	internal membrane compartments

4. What is an example of binary fission?

A. Cell division in prokaryotes

B. Production of haploid gametes

C. Separation of chromatids in prokaryotic cells

D. Replication of prokaryotic DNA occurring simultaneously in two directions

5. What are the **most** frequently occurring elements in living organisms?

A. calcium, phosphorus, iron and sodium

B. calcium, sodium, nitrogen and phosphorus

C. carbon, phosphorus, oxygen and nitrogen

D. nitrogen, carbon, oxygen and hydrogen

6. Where are proteins synthesized by free ribosomes used?

A. Outside the cell after secretion

B. Within the nucleus

C. Within the lysosomes

D. Within the cytoplasm

7. What is a consequence of the specific heat capacity for liquid water, ice and water vapour?

State	Specific heat capacity / $kJ\,kg^{-1}\,K^{-1}$
liquid water	4.187
ice	2.108
water vapour	1.996

A. Less energy is needed to warm water vapour than liquid water.

B. Salt dissolves more readily in liquid water than in ice.

C. Small insects can walk on liquid water.

D. Ice floats on liquid water.

8. What is a characteristic of the human Y chromosome?

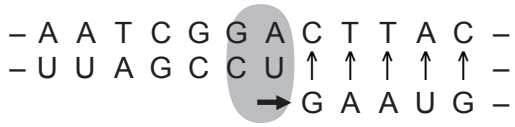
A. It is made of DNA and histones covered by phospholipids.

B. It contains some genes that are not present on the X chromosome.

C. It is the largest chromosome in the human karyotype.

D. It has a condensed length of approximately 100 µm.

9. Which model represents transcription?

A.


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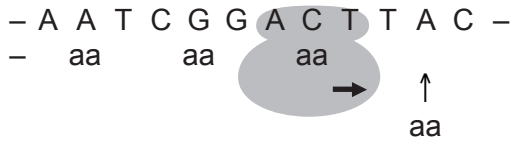

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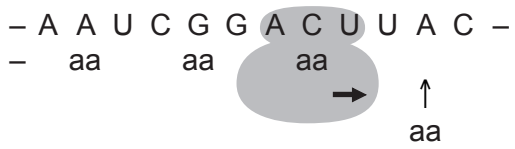

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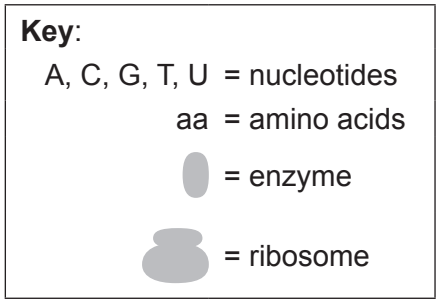
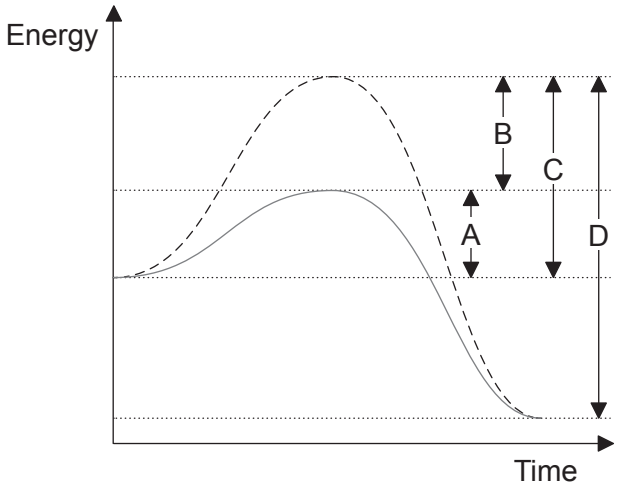


10. Which sequence represents the order of events in protein synthesis?

	Earlier →		**Later**
A.	small and large subunits of a ribosome are joined	a first tRNA with the amino acid methionine joins the ribosome	the ribosome reaches a stop codon
B.	an amino acid binds to tRNA	the tRNA moves from a binding site to another binding site on the ribosome	the ribosome reaches a stop codon
C.	an amino acid binds to mRNA	a peptide bond is made between the amino acids	the tRNA moves from a binding site to another binding site on the ribosome
D.	the tRNA moves from a binding site to another binding site on the ribosome	a peptide bond is made between the amino acids	the anticodon of a mRNA pairs with the tRNA

11. Which is the activation energy of a reaction when it is catalysed by an enzyme?



12. How can the rate of photosynthesis be measured?

I. By the amount of oxygen produced
II. By the increase in biomass
III. By the amount of carbon dioxide produced

A. I only

B. I and II only

C. I and III only

D. I, II and III

13. What happens during glycolysis for one molecule of glucose?

A. Two pyruvates are formed.

B. There is a net gain of two NADPH + H^+.

C. There is a net loss of two ATP.

D. Two acetyl CoA are formed.

14. What happens in both respiration and photosynthesis?

A. Triose phosphates are decarboxylated.

B. NADPH is produced.

C. ATP is produced.

D. Electrons pass through ATP synthase.

15. The table shows the monthly CO_2 concentrations in $mg\,L^{-1}$ taken at two monitoring stations.

Station \ Month	Jul 2011	Aug 2011	Sept 2011	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012
Cape Grim, Australia	388	389	389	389	389	389	389	389	389	389	389	390
Mauna Loa, Hawaii, USA	392	390	389	389	390	392	393	394	394	396	397	396

[Source: © International Baccalaureate Organization 2015]

What is directly indicated by the data?

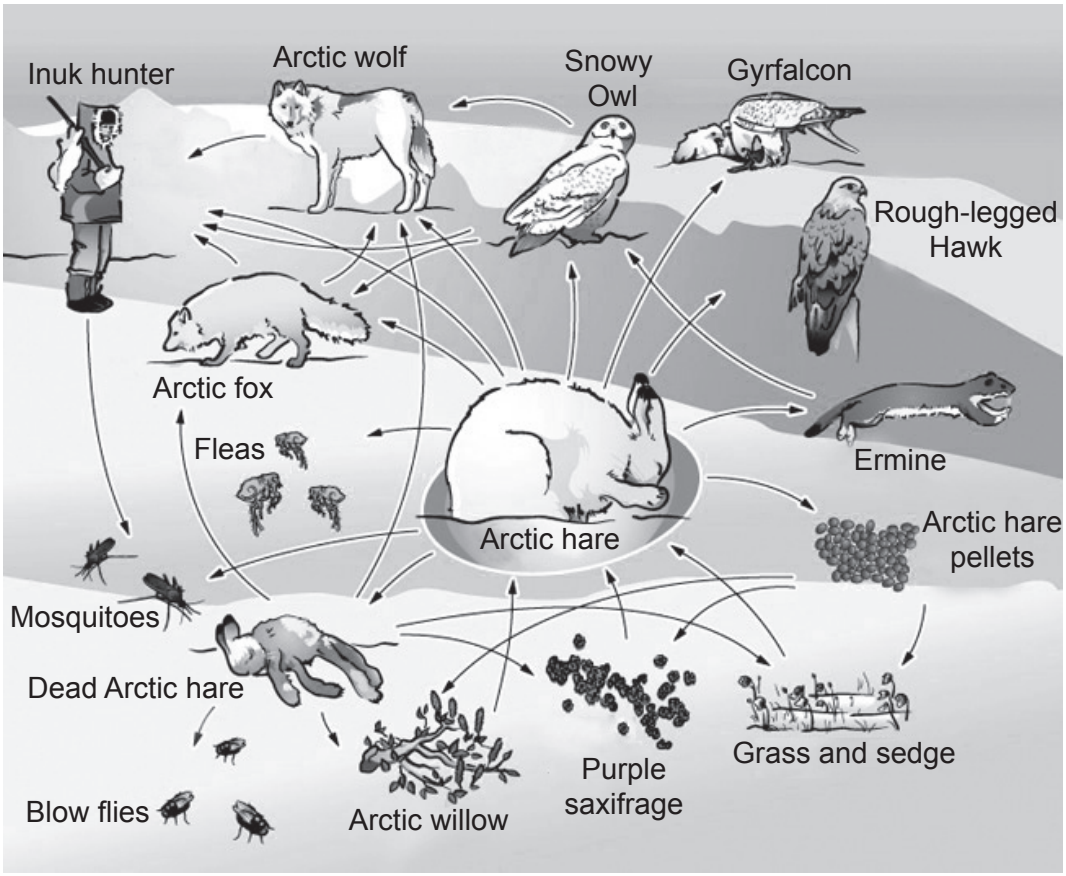
A. CO_2 concentration in the atmosphere varies from place to place.

B. Cape Grim is less affected by global warming than Mauna Loa.

C. CO_2 creates a greenhouse effect at both locations.

D. The standard deviation for Cape Grim is higher than standard deviation for Mauna Loa.

16. The image shows an Arctic food web.



[Source: Ukaliq, the Arctic Hare (http://nature.ca/ukaliq/) © Canadian Museum of Nature]

What is the role of the Arctic hare?

A. Detritivore

B. Primary consumer

C. Secondary consumer

D. Saprotroph

17. Which example provides evidence of evolution?

A. White wings of a peppered moth turn black in industrial areas.

B. Antibiotic resistant bacteria replace non-resistant bacteria over time.

C. Some Galapagos finches' beaks become smaller during dry years.

D. Polar bears are found in warmer latitudes following global warming.

18. What promotes natural selection?

I. Overpopulation
II. Competition
III. Variation

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

19. The photograph shows a flowering plant.

[Source: © International Baccalaureate Organization 2015]

What can be concluded from this photograph?

A. This plant is monocotyledonous because the flower organs are in multiples of three.

B. This plant is dicotyledonous because it is animal pollinated.

C. This plant is monocotyledonous because the petals are symmetrical.

D. This plant is dicotyledonous because the eggs are within the ovary.

20. What causes a long-day dicotyledonous plant to grow in height?

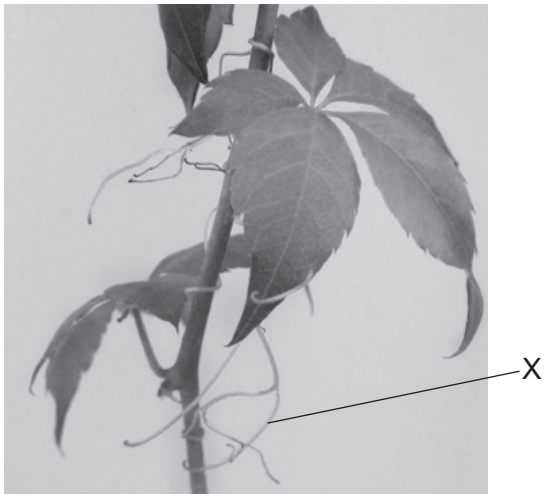
A. The increased turgor caused by the transpiration pull

B. The stimulation of apical meristem by auxin

C. The stimulation of lateral meristem by gibberellin

D. The conversion of P_{fr} into P_r

21. The photograph shows a *Parthenocissus quinquefolia.*



[Source: © International Baccalaureate Organization 2015]

What structure is identified by the letter X?

A. A modified stem to defend against predators

B. A modified root to absorb water from the air

C. A leaf modified as a tendril to attach the plant to a surface

D. A stem modified as a tuber for air exchange

22. Which individuals are colour blind in this Punnett grid?

	X^B	Y
X^B	$X^B X^B$	$X^B Y$
X^b	$X^B X^b$	$X^b Y$

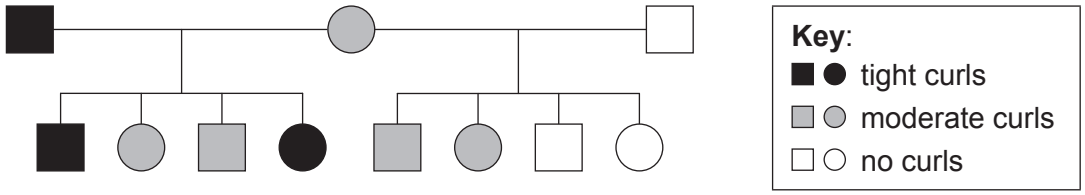
A. $X^B Y$

B. $X^B X^B$

C. $X^b Y$

D. $X^B X^b$

23. The curly hair of the coat of Selkirk Rex cats is due to the presence of the allele S^C. These cats can either have tight curls or be moderately curly, whereas the coat of other cats is usually made of straight hair with no curls because of the allele S^S. Circles indicate female cats and squares indicate males.



What are the phenotypes of cats with these genotypes?

	$S^S S^S$	$S^S S^C$
A.	no curls	moderate curls
B.	tight curls	no curls
C.	tight curls	moderate curls
D.	no curls	tight curls

24. Which genotype is a recombinant from a test cross with the genotype shown below?

$$\frac{G\ R}{g\ r}$$

A. $\frac{g\ r}{g\ r}$

B. $\frac{G\ G}{r\ r}$

C. $\frac{G\ r}{g\ r}$

D. $\frac{G\ r}{g\ R}$

25. Which is a statement of Mendel's law of independent assortment?

A. Allele pairs separate during gamete formation and recombine during fertilization.

B. Allele pairs for different genes separate independently during gamete formation.

C. Unlinked alleles are assorted with a 9 : 3 : 3 : 1 ratio in a dihybrid cross.

D. Allele pairs for the same gene are assorted independently during gamete formation.

26. What is a definition of a clone?

A. A group of cells derived from a single parent cell

B. Differentiated cells that retain the capacity to divide

C. A fetus developed specifically for medical use

D. A group of cells that have lost the ability to differentiate

27. What was an aim of genetic modification of organisms?

A. To provide stem cells from embryos for medical use

B. To make crop plants resistant to herbicides

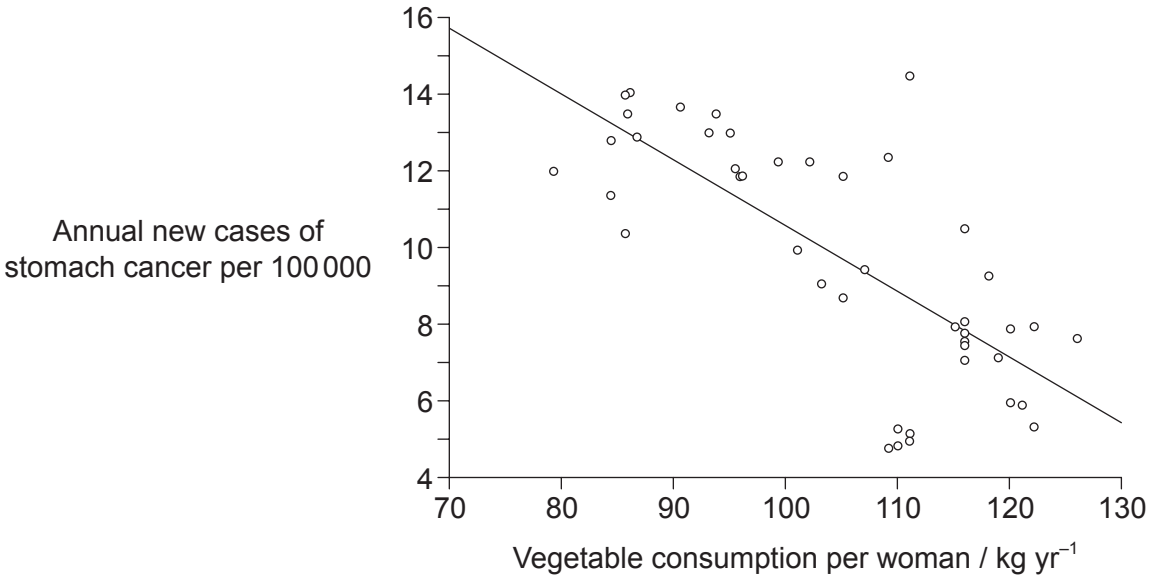
C. To provide sperm cells for *in vitro* fertilization (IVF)

D. To produce genetically identical sheep

28. What are functions of the stomach, small intestine and large intestine?

	Stomach	Small intestine	Large intestine
A.	digest proteins	absorb glucose	absorb water
B.	digest starch	digest proteins	digest lipids
C.	digest proteins	assimilate glucose	excrete cellulose
D.	assimilate alcohol	digest starch	absorb water

29. The graph shows a correlation between the number of new cases of stomach cancer and vegetable consumption for women in Poland.



[Source: "Impact of diet on long-term decline in gastric cancer incidence in Poland", Miroslaw Jarosz, Wlodzimierz Sekula, Ewa Rychlik and Katarzyna Figurska. *World J Gastroenterol* **17**(1): 89–97. Figure 4. Published online 2011 January 07. doi:10.3748/wjg.v17.i1.89.]

What can be stated from the graph?

A. Vegetable consumption causes stomach cancer

B. 68 % of the data are gathered around the trend line

C. Causality cannot be stated from the graph alone

D. Only that the correlation is positive

30. What results from the fusion of tumour cells with B-cells?

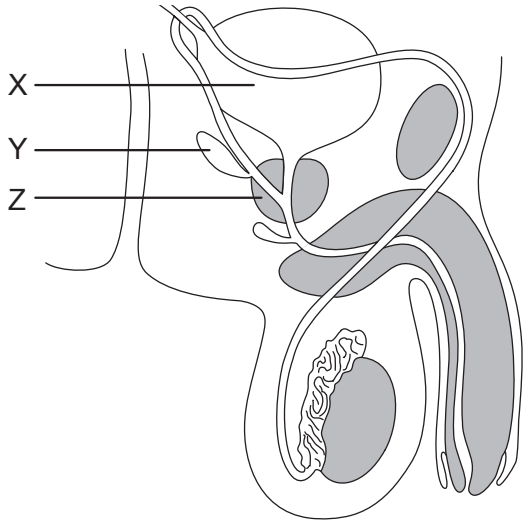
A. The inability of B-cells to divide

B. The production of monoclonal antibodies

C. The production of antigens

D. The activation of helper T-cells

31. The image shows the male reproduction system.



[Source: © International Baccalaureate Organization 2015]

Where is prostate cancer likely to start developing?

A. In X only

B. In Y and Z only

C. In Z only

D. In X, Y and Z

32. What is a role of the coronary arteries?

A. To supply information about blood temperature to the hypothalamus

B. To supply the heart muscle with oxygen and nutrients

C. To carry blood away from the heart

D. To monitor blood pH

33. What characterizes type I diabetes?

A. It can be controlled by diet alone.

B. Risk factors such as obesity increase its frequency.

C. The alpha cells of the pancreas are destroyed, usually during adulthood.

D. The beta cells of the pancreas are destroyed, usually during childhood.

34. What happens when human body temperature rises during exercise?

A. The arterioles move closer to the skin.

B. The hypothalamus decreases cell respiration.

C. The skin capillaries close up.

D. The water from sweat evaporates to cool the body.

35. What happens during synaptic transmission?

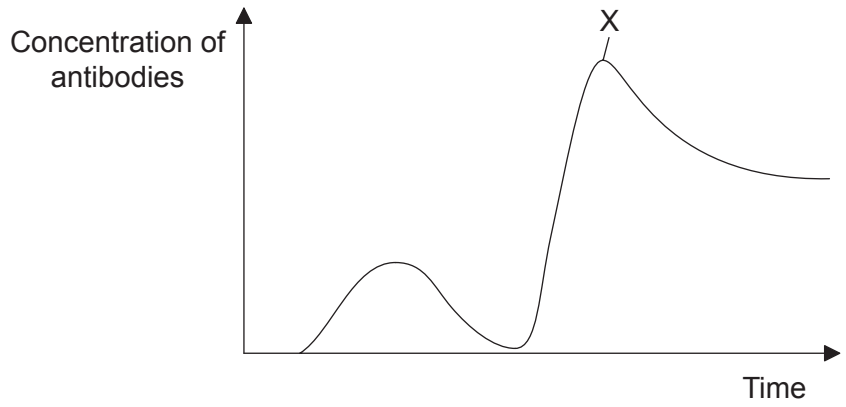
A. K^+ enters the postsynaptic membrane.

B. A neurotransmitter is absorbed through the presynaptic membrane.

C. Na^+ is released from the presynaptic membrane.

D. A neurotransmitter binds to a postsynaptic membrane receptor.

36. The graph is about defence against infectious disease.



[Source: CAMPBELL, NEIL A.; REECE, JANE B., *BIOLOGY*, 7th Edition, © 2005, p. 908. Reprinted by permission of Pearson Education, Inc., Upper Saddle River, NJ. Used by permission.]

What is likely to be indicated by the letter X?

A. The increase in lymphocytes following HIV infection

B. The peak of the infection

C. The secondary response to a vaccine

D. The first appearance of AIDS symptoms

37. What is the main role of nerves in human movement?

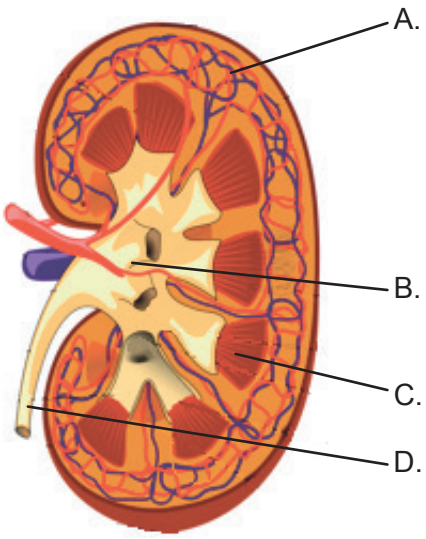
A. To cause muscles to stretch

B. To move joints

C. To transport pain signals that indicate muscle injuries

D. To stimulate muscle contraction

38. Which letter correctly identifies the medulla?



[Source: "KidneyStructures PioM" by Piotr Michał Jaworski; PioM EN DE PL – Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons – https://commons.wikimedia.org/wiki/File:KidneyStructures_PioM.svg#/media/File:KidneyStructures_PioM.svg]

39. The image shows a section of a testis under the microscope.

Image removed for copyright reasons

What structure is identified with the letter X?

A. Interstitial cells (Leydig cells)

B. Germinal epithelium cell

C. Developing spermatozoon

D. Sertoli cell

40. Which event takes place during normal fertilization?

A. The acrosome fuses with the egg membrane.

B. The entire sperm cell enters the egg cytoplasm.

C. The egg divides to form a blastocyst.

D. The cortical granules fuse with the egg membrane.