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BIOLOGY
STANDARD LEVEL
PAPER 1

Tuesday 2 November 2010 (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.

1.

[Question and image removed for copyright reasons]

2. What is the sequence of stages during the cell cycle?

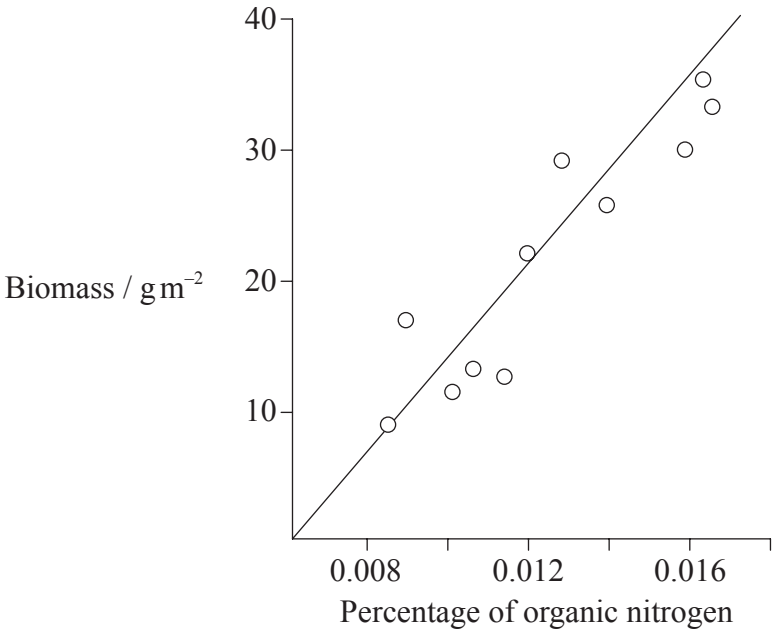
A. G_1 → S → G_2 → mitosis → cytokinesis

B. mitosis → G_1 → G_2 → cytokinesis → S

C. G_1 → G_2 → S → mitosis → cytokinesis

D. G_1 → G_2 → mitosis → cytokinesis → S

3. The graph below shows the correlation between the biomass of a marine worm, *Arenicola*, and the percentage of organic nitrogen in the sand where it lives.



[Reproduced with permission from PJ Hayward "Animals of Sandy Shores" (1994) The Richmond Publishing Co. Ltd.]

What statement can be made from the data?

A. The increase in the biomass of the worm is due to an increase in the percentage of organic nitrogen.

B. There is no relationship between the biomass of the worm and the percentage of organic nitrogen.

C. The increase in the percentage of organic nitrogen is due to an increase in the biomass of the worm.

D. As the biomass of the worm increases so does the percentage of organic nitrogen.

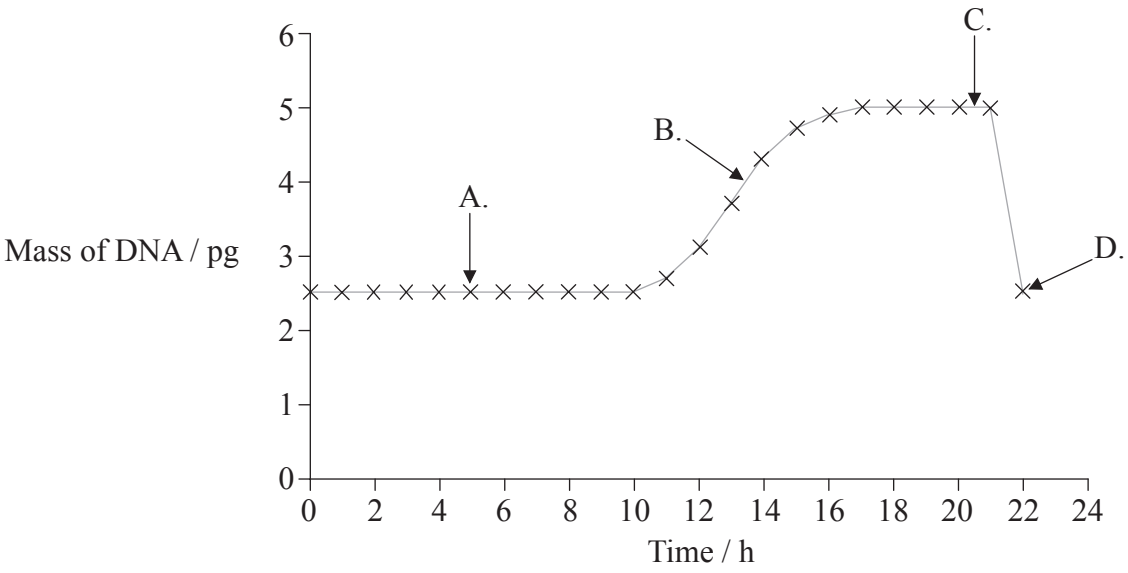
4. What is the difference between the structure of **all** prokaryotes and **all** eukaryotes?

	Prokaryotes	Eukaryotes
A.	cell wall	no cell wall
B.	chloroplasts	no chloroplasts
C.	flagellum	no flagellum
D.	nucleoid	nuclear envelope

5. What does facilitated diffusion across a cell membrane require?

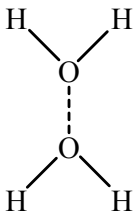
	A pore protein	ATP	A concentration gradient
A.	yes	no	no
B.	no	no	yes
C.	yes	no	yes
D.	no	yes	no

6. The graph below represents the amount of DNA during the cell cycle. Which part of the graph represents metaphase?

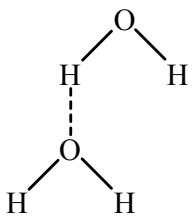


7. Which diagram best illustrates the interactions between water molecules?

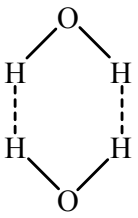
A.



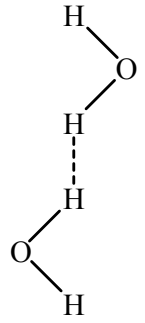
B.



C.



D.



8. What chemical reaction is taking place when a dipeptide becomes two amino acids?

A. Condensation

B. Hydrolysis

C. Denaturation

D. Polymerization

9. The base ratios in the DNA and RNA for an onion (*Allium cepa*) are given below.

Bases	**A / %**	**G / %**	**C / %**	**T / %**
DNA	31.8	18.4	18.2	31.3

Bases	**A / %**	**G / %**	**C / %**	**U / %**
RNA	24.9	29.8	24.7	20.6

What is the reason for the difference between these figures?

A. DNA is only found in the nucleus but RNA is found throughout the cell.

B. DNA is made entirely of double helix but RNA is not.

C. In DNA bases A and T are complementary but in RNA bases A and C are complementary.

D. RNA comes in three forms but DNA only comes in one form.

10. Which of the following will cause an enzyme to permanently lose its properties?

I. Hydrolysis

II. Freezing to –20°C

III. Dissolving it in water

A. I only

B. II only

C. I and II only

D. I and III only

11. What is lactase used for?

A. It is used to make sugar-free milk.

B. It hydrolyses lactose to glucose and fructose.

C. It improves the digestion of milk by some people.

D. It decreases the acidity of the milk.

12. How can the rate of photosynthesis of a plant be directly measured?

A. By measuring the rate of oxygen produced

B. By measuring the rate of carbon dioxide produced

C. By measuring the rate of plant growth

D. By measuring the rate of light absorbed

13. What does the nucleus of a human lymphocyte contain?

A. Only the genes to produce a specific antigen

B. Only the genes to produce a range of antibodies

C. Only the genes that control the growth and development of a lymphocyte

D. The whole genetic information for a human

14. A cell in the testis of a male chimpanzee (*Pan troglodytes*) contains 48 chromosomes. It is about to undergo meiosis. How many molecules of DNA will be present in the nucleus of the sperm cells just after meiosis?

A. 96

B. 48

C. 24

D. 12

15. What is chorionic villus sampling?

A. Sampling cells from the placenta

B. Sampling cells from the fetal digestive system

C. Sampling fetal cells from the amniotic fluid

D. Sampling stem cells from the umbilical cord

16. How can fragments of DNA be separated?

A. Using polymerase chain reaction (PCR)

B. Using gel electrophoresis

C. Using gene transfer

D. Using gene cloning

17. To produce artificial erythrocytes for use in blood transfusions, tobacco plants have been genetically modified to produce human hemoglobin. The first three triplets of the human hemoglobin gene are:

ATG GTG CAT

What would be the first three triplets of the hemoglobin gene inserted into the genome of the modified tobacco plants?

A. TAC GTG GTA

B. ATG GTG CAT

C. TAC CAC GTA

D. GCA ACA TGC

18. Why can DNA profiling be used to determine paternity?

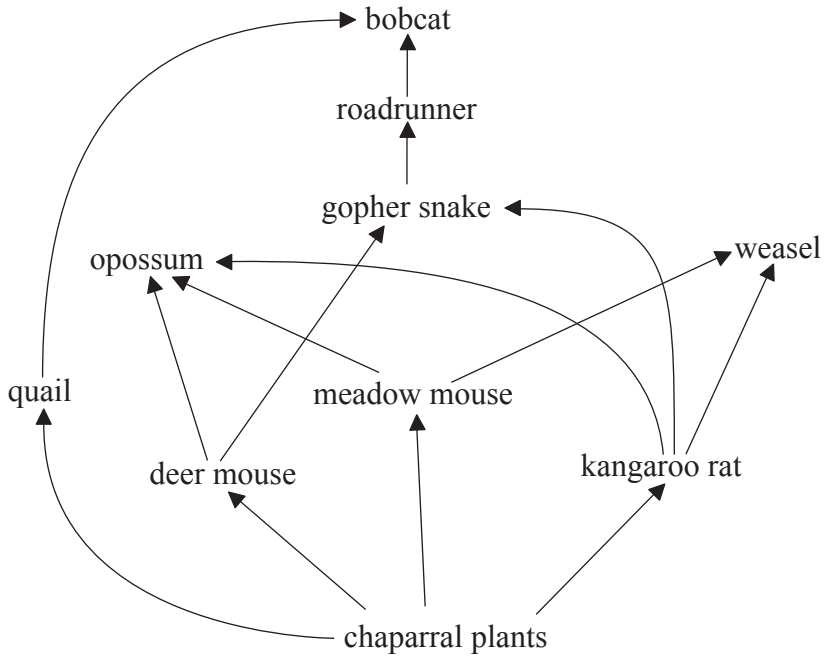
A. Genes of children are exactly the same as their father's.

B. Half the genes of children are the same as their father's.

C. The father passes on all of his genes to each of his children.

D. The father passes on a fraction of his genes equal to the number of his children.

Questions 19 and 20 refer to the food web shown below.



19. What is the trophic level of the bobcat in the food web above?

A. Primary and secondary level consumer

B. Secondary and tertiary level consumer

C. Tertiary and quaternary level consumer

D. Secondary and quaternary level consumer

20. What is the energy transfer level from the kangaroo rat to the weasel shown in the food web above?

A. Three times greater than the energy transfer from the roadrunner to the bobcat

B. Half the energy transfer from chaparral plants to the meadow mouse

C. A quarter of the energy transfer from the quail to the bobcat

D. Approximately the same as the energy transfer from the meadow mouse to the opossum

21. Which of the following will promote variation in a species?

I. Meiosis
II. Fertilization
III. Natural selection

A. I only

B. II only

C. I and II only

D. I, II and III

22. Why has antibiotic resistance evolved in bacteria?

A. All bacteria reproduce very quickly.

B. Bacteria exposed to antibiotics developed a resistance to them.

C. Varieties of bacteria resistant to antibiotics reproduce faster than non-resistant varieties.

D. Bacteria showing resistance to antibiotics survive after antibiotics are used.

23. What features distinguish Platyhelminthes from Annelida?

	Platyhelminthes	**Annelida**
A.	segmented body	non-segmented body
B.	non-segmented body	segmented body
C.	bilateral symmetry	no bilateral symmetry
D.	no bilateral symmetry	bilateral symmetry

24. What is true of the source, products and optimum pH of the lipase found in the human digestive system?

	Source	Products	Optimum pH
A.	salivary glands	fatty acids	8
B.	stomach	starch	2
C.	pancreas	fatty acids	8
D.	liver	amino acids	2

25. Which chamber of the heart has the thickest walls?

A. Left atrium

B. Right atrium

C. Left ventricle

D. Right ventricle

26. What causes air to be breathed out by the lungs?

A. The diaphragm relaxes and the ribs fall.

B. The ribs rise and the external intercostal muscles relax.

C. The internal intercostal muscles contract and the ribs rise.

D. The diaphragm contracts and internal intercostal muscles contract.

27. What causes the formation of a nerve impulse on the post-synaptic membrane?

A. Ca^{2+} binding with a receptor site

B. K^{+} leaking into the post-synaptic membrane

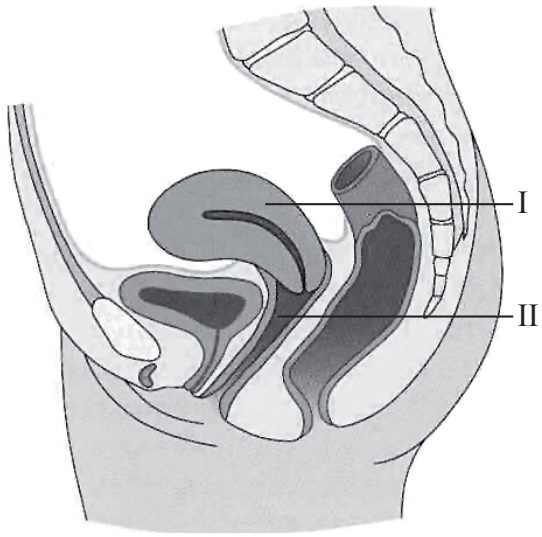
C. Neurotransmitter binding with receptor sites

D. Neurotransmitter being removed from the synapse

28. What is the difference between the origin of type I and type II diabetes?

	Type I	Type II
A.	caused by an autoimmune reaction	target cells fail to respond to insulin
B.	occurs in adults only	starts in childhood
C.	too much insulin secreted	too little insulin secreted
D.	caused by dietary problems	caused by hereditary factors

29. The following diagram shows the human female reproductive system as seen from the side.



[Diagram adapted from Human Reproductive Biology, 3rd ed, Jones & Lopez, Academic Press, p. 52.
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What are the names of the organs labelled I and II?

	I	II
A.	uterus	vagina
B.	bladder	ovary
C.	urethra	oviduct
D.	clitoris	cervix

30. The hormones progesterone and LH were measured in a woman's blood over 40 days. When did her menstrual bleed start?