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BIOLOGY
STANDARD LEVEL
PAPER 1

Thursday 17 May 2012 (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]*.

1.

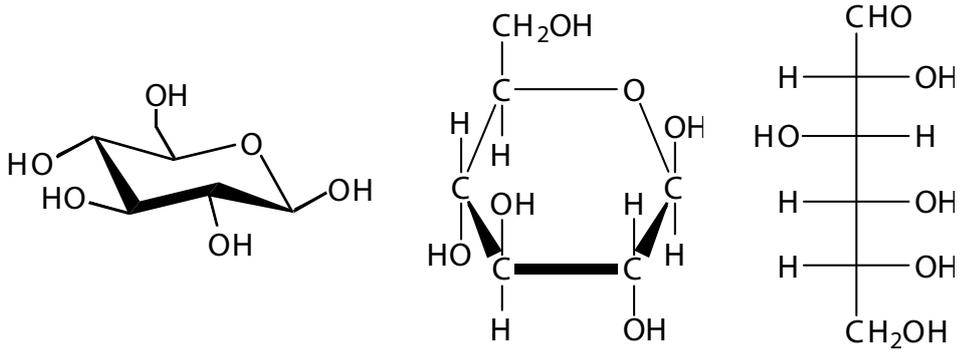
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2. How do cells in multicellular organisms differentiate?

- A. Some cell types divide by mitosis more often than others.
- B. They express some of their genes but not others.
- C. Some of their proteins denature but not others.
- D. Their DNA content changes with time.

3. What is the function of the Golgi apparatus?
- A. Transport of lipids
 - B. Synthesis of polypeptides
 - C. Processing of proteins for secretion
 - D. Generation of most of the cell's supply of ATP
4. Which structure is present in a prokaryotic cell?
- A. Plasma membrane
 - B. 80S ribosome
 - C. Nucleus
 - D. Chloroplast
5. What is the approximate thickness of the plasma membrane of a cell?
- A. 10 nm
 - B. 50 nm
 - C. 10 μm
 - D. 50 μm

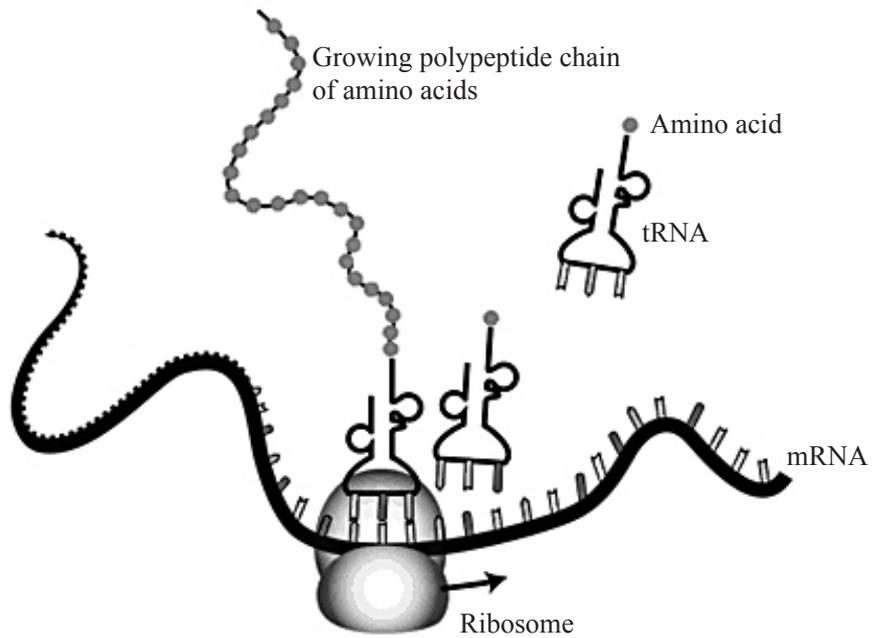
6. The diagrams show three representations of the structure of the **same** chemical substance.



What chemical substance is shown?

- A. Ribose
- B. Glucose
- C. Fatty acid
- D. Amino acid

7. The diagram shows the translation of a mRNA molecule.

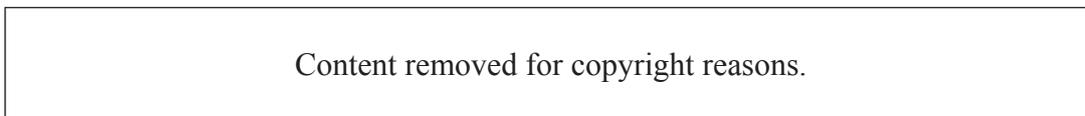


[Content provided by The National Human Genome Research Institute.]

A tRNA molecule with anticodon CAG carries the amino acid phenylalanine. Which codon of mRNA will the tRNA join?

- A. CTG
- B. CAG
- C. GTC
- D. GUC

8. The graph shows the absorption spectrum of three different pigments.



[Please refer to the graph at <http://www.uic.edu/classes/bios/bios100/lecturesf04am/lect10.htm> under the heading of “The light-dependent reactions”]

What is shown in the graph?

- A. The pigments absorb almost all green and yellow light.
 - B. Carotenoids absorb best in orange light.
 - C. The rate of photosynthesis is lowest in blue light.
 - D. Chlorophyll b absorbs best in blue light.
9. What is formed during transcription?
- A. RNA strand complementary to DNA strand, formed by RNA polymerase
 - B. DNA strand complementary to DNA strand, formed by DNA polymerase
 - C. RNA strand complementary to RNA strand, formed by DNA polymerase
 - D. DNA strand complementary to RNA strand, formed by RNA polymerase

10. How does an increase in temperature affect enzyme activity?

	Movement of molecules	Chance of collision between enzyme and substrate
A.	increases	increases
B.	decreases	decreases
C.	increases	decreases
D.	decreases	increases

11. What are the effects of changing carbon dioxide concentration on the rate of photosynthesis?

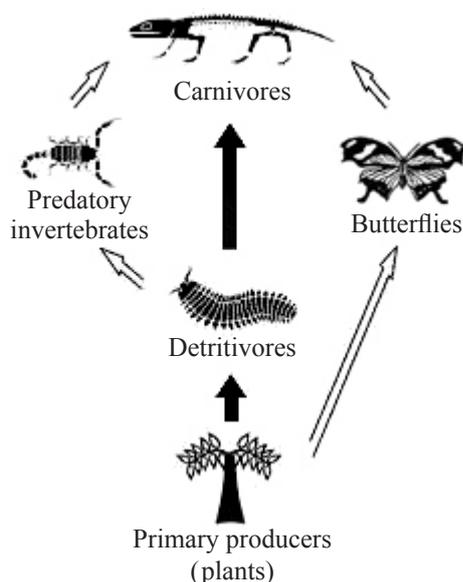
- I. At low and moderate carbon dioxide concentrations, decreases cause the rate of photosynthesis to fall.
 - II. At high carbon dioxide concentrations, increases do not alter the rate of photosynthesis.
 - III. At high carbon dioxide concentrations, increases cause the rate of photosynthesis to fall.
- A. I only
 - B. I and II only
 - C. I and III only
 - D. III only

12. What is a gene mutation?

- A. Failure of chromosome pairs to separate properly during cell division
- B. Changes to genes caused by natural selection
- C. Changes to the nucleotide sequence of the genetic material
- D. Changes in karyotypes

13. Which is a source of chromosomes for pre-natal diagnosis of abnormalities by karyotyping?
- A. Sperm
 - B. Ovaries
 - C. Erythrocytes
 - D. Chorionic villi
14. Which is a feature of sex-linked genes in humans?
- A. Males can only be heterozygous for the gene.
 - B. Females can only be homozygous for the gene.
 - C. Males can be either heterozygous or homozygous for the gene.
 - D. Females can be either heterozygous or homozygous for the gene.
15. What is amplified using the polymerase chain reaction (PCR)?
- A. Large amounts of RNA
 - B. Small amounts of DNA
 - C. Small amounts of protein
 - D. Large amounts of polymers
16. What is a plasmid?
- A. Chloroplast DNA
 - B. Mitochondrial DNA
 - C. Small circle of DNA that can transfer genes to or from a prokaryote
 - D. The bacterial chromosome

17. What best describes the mode of nutrition of a heterotroph?
- A. It ingests only non-living organic matter.
 - B. It obtains organic molecules from other organisms.
 - C. It synthesizes its organic molecules from inorganic substances.
 - D. It produces its organic molecules from chemical reactions using light.
18. The energy passing from the detritivores to the predatory invertebrates in this food web is $14\,000\text{ kJ m}^{-2}\text{ year}^{-1}$.



[Adapted with permission from <http://jogginsfossilcliffs.net/cliffs/biodiversity/>]

Approximately how much energy (in $\text{kJ m}^{-2}\text{ year}^{-1}$) passes from the predatory invertebrates to the carnivores?

- A. 140
- B. 1400
- C. 14 000
- D. 140 000

19. Which are decomposers?
- A. Fungi
 - B. Viruses
 - C. Porifera
 - D. Mollusca
20. What do records from the twentieth and twenty-first century show about the concentration of carbon dioxide in the atmosphere?
- A. An upward trend with annual fluctuations
 - B. An upward trend with no annual fluctuations
 - C. Annual fluctuations but no overall trend
 - D. Random fluctuations and no overall trend
21. What term refers to organisms of the same species, living in a specified area and time?
- A. Population
 - B. Community
 - C. Family
 - D. Genus
22. What type of process causes antibiotic resistance to develop in bacteria?
- A. Competition with viruses
 - B. Overproduction of offspring
 - C. Evolution due to environmental change
 - D. Response by bacteria to an epidemic

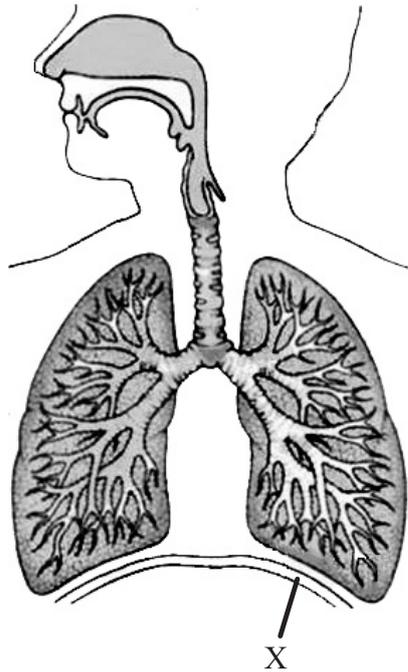
23. The Punnett grid shows the inheritance of blood groups.

	I^A	I^B
I^A	$I^A I^A$	$I^A I^B$
i	$I^A i$	$I^B i$

What is the ratio of phenotypes of the offspring?

- A. 1 : 1 ratio of blood groups A : B
 - B. 1 : 2 : 1 ratio of blood groups A : AB : B
 - C. 1 : 1 : 1 ratio of blood groups A : AB : B
 - D. 2 : 1 : 1 ratio of blood groups A : AB : B
24. What is a consequence of AIDS?
- A. Excess production of lymphocytes to help fight disease
 - B. Excess erythrocytes in capillaries
 - C. Loss of ability to produce antibodies
 - D. Loss of ability to produce antigens

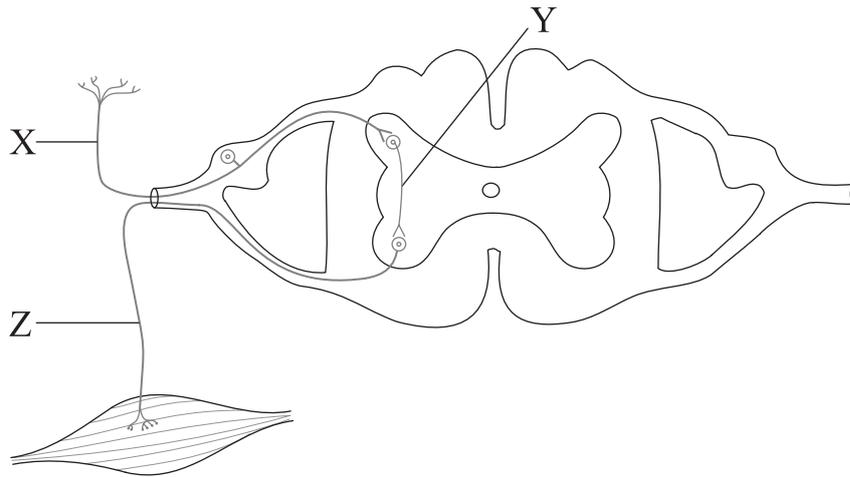
25. The diagram shows the ventilation system in humans.



What is the function of the structure labelled X?

- A. Protect the lungs
 - B. Contract to cause inhalation
 - C. Become flatter to move the ribcage up
 - D. Relax in order to increase the thoracic capacity
26. Which of the following are controlled by homeostasis?
- I. Blood pH
 - II. Water balance
 - III. Blood glucose concentration
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

27. The diagram shows the pathway in a reflex arc.



Which are the correct labels for the neurons involved?

	X	Y	Z
A.	motor	sensory	relay
B.	sensory	motor	relay
C.	motor	relay	sensory
D.	sensory	relay	motor

28. What is an important function of the lacteal in the villus?

- A. Secretion of mucus
- B. Secretion of enzymes
- C. Transport of glucose
- D. Transport of fats

29. How is epinephrine (adrenaline) carried to the pacemaker of the heart and what effect does it have on heartbeat rate?

	Epinephrine carried to the pacemaker	Effect of epinephrine on heartbeat rate
A.	in the bloodstream	increases it
B.	in the bloodstream	decreases it
C.	by nerves	increases it
D.	by nerves	decreases it

30. What is a function of LH (luteinizing hormone)?

- A. It stimulates the release of an egg from the follicle.
 - B. It stimulates the development of corpus luteum into a follicle.
 - C. It causes an increase in the production of estrogen by the follicle.
 - D. It causes a decrease in the production of progesterone by the follicle.
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