M09/4/BIOLO/SPM/ENG/TZ2/XX+

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22096016

BIOLOGY
STANDARD LEVEL
PAPER 1

Wednesday 6 May 2009 (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.

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1. The *t*-test is used to test the statistical significance of a difference. What is that difference?

A. Between observed and expected results

B. Between the means of two samples

C. Between the standard deviation of two samples

D. Between the size of two samples

2. Which of the following structures are found in all cells?

A. Mitochondria

B. Cell walls

C. Chloroplasts

D. Ribosomes

3. By what process do most bacteria divide?

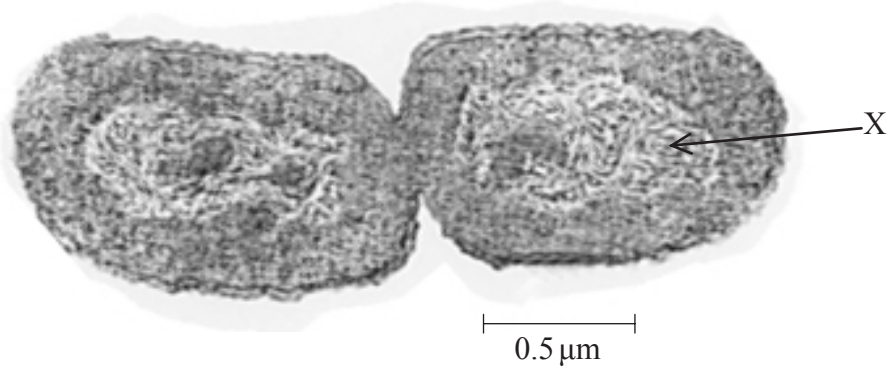
A. Mitosis

B. Meiosis

C. Conjugation

D. Binary fission

Questions 4 and 5 refer to the following micrograph of an E.coli bacterium undergoing reproduction.



[Source: www.bio.mtu.edu/campbell/prokaryo.htm]

4. The scale bar represents 0.5 μm. How long are both cells in total?

A. 5.0×10^{-6} m

B. 5.0×10^{-9} m

C. 2.5×10^{-6} m

D. 2.5×10^{-9} m

5. In the diagram what does label X identify?

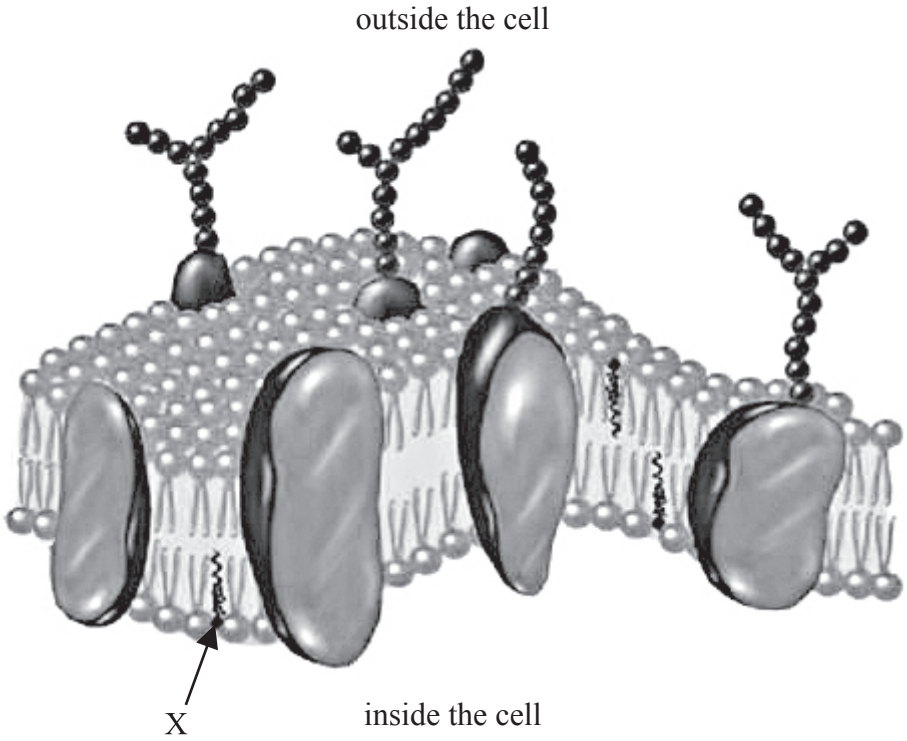
A. Nucleoid region

B. Chromatin

C. Histones

D. Endoplasmic reticulum

6. The diagram below shows a plasma membrane. What is molecule X?



A. Cholesterol

B. Peripheral protein

C. Glycoprotein

D. Polar amino acid

7. What is a difference between a cell in the G_1 phase and a cell in the G_2 phase of the cell cycle?

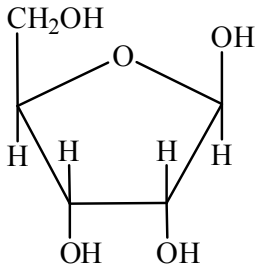
A. A cell in the G_2 phase would be smaller than a cell in the G_1 phase.

B. A cell in the G_2 phase would have more mitochondria than a cell in the G_1 phase.

C. A cell in the G_1 phase would have more DNA in its chromosomes than a cell in the G_2 phase.

D. DNA replication occurs in the G_1 phase but not in the G_2 phase.

8. Which molecule is shown below?



A. Glucose

B. Galactose

C. Ribose

D. Sucrose

9. If the haploid number of a species is 14, how many chromatids will there be in metaphase I in a dividing diploid cell?

A. 7

B. 14

C. 28

D. 56

10. Blood is a water-based transport medium. Which property of water makes it a good transport medium?

A. High specific heat

B. Transparency

C. Versatility as a solvent

D. It has its greatest density at 4 °C

11. What is replicated by a semi-conservative process?

A. Messenger RNA (mRNA) only

B. Messenger RNA (mRNA) and transfer RNA (tRNA) only

C. Messenger RNA (mRNA), transfer RNA (tRNA) and DNA only

D. DNA only

12. If 15 % of a sample of DNA is thymine, what percentage of the DNA is guanine?

A. 15 %

B. 30 %

C. 35 %

D. It cannot be determined from the information given.

13. On which molecule is a codon found?

A. Polypeptide

B. mRNA

C. tRNA

D. rRNA

14. Which of the following processes produces CO_2?

I. Glycolysis

II. Alcohol (ethanol) fermentation

III. Lactic acid production

A. I only

B. II only

C. I and II only

D. I, II and III

15. Which structure releases glucagon?

A. α cells of the pancreas

B. β cells of the pancreas

C. Liver cells

D. Hypothalamus

16. Which event directly leads to an action potential?

A. Fusion of vesicles with the pre-synaptic membrane

B. Diffusion of neurotransmitter across the synaptic cleft

C. Membrane potential reaches the threshold potential

D. Breakdown of the neurotransmitter

17. Which muscle action is associated with an increase in the volume of the thoracic cavity during inspiration?

A. The diaphragm contracts.

B. The external intercostal muscles relax.

C. The internal intercostal muscles contract.

D. The abdominal muscles contract.

18. Which term describes a molecule capable of triggering an immune response?

A. Antibody

B. Antigen

C. Pathogen

D. Antibiotic

19. What is the main function of the large intestine?

A. Absorption of water

B. Digestion of fats and proteins

C. Absorption of nutrients

D. Recycling of digestive enzymes

20. To which group do sponges belong?

A. Cnidaria

B. Filicinophyta

C. Porifera

D. Mollusca

21. Which process tends to reduce variety within a population?

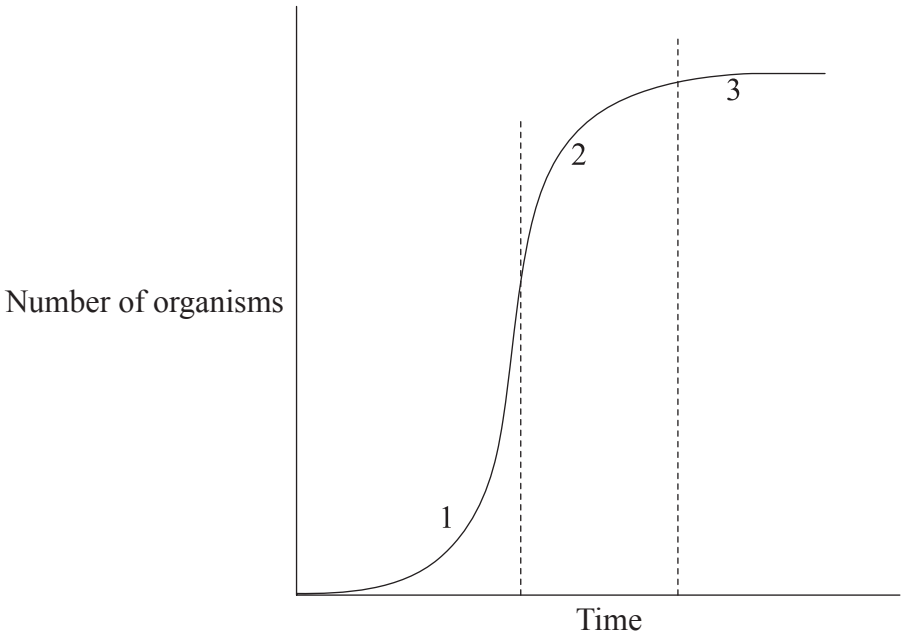
A. Natural selection

B. Random fertilization

C. Independent assortment

D. Crossing over

22. The diagram below shows a population growth curve.



At which time in the population growth curve does the population size begin to decline?

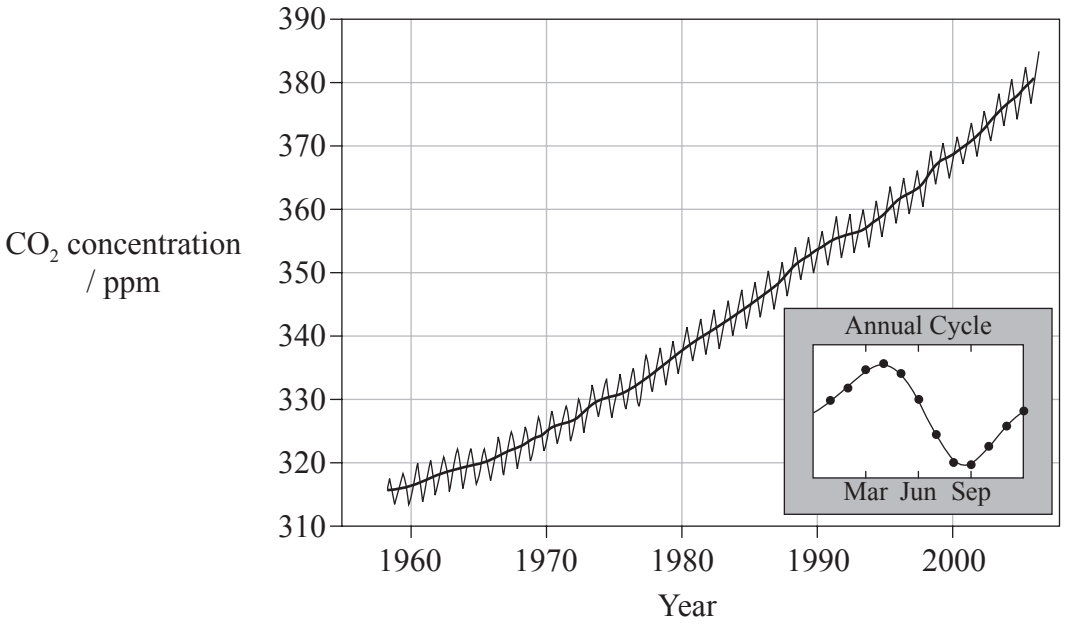
A Between the time marked 1 and 2

B. During the time marked 2

C Between the time marked 2 and 3

D. The graph does not show a time when population size declines

23. The graph below shows variation in the concentration of CO_2 in the atmosphere as measured at Mauna Loa in Hawai'i. The small inset graph shows the variations in CO_2 during a one year period.



[Source: adapted from Dr P Tans, NOAA Earth System Research Laboratory]

Why does the amount of CO_2 fall between April and August?

A. Seasonal increase in the rate of photosynthesis in the northern hemisphere forests

B. Seasonal decrease in the rate of photosynthesis in the northern hemisphere forests

C. Seasonal decrease in the rate of fossil fuel consumption

D. Seasonal increase in the amount of CO_2 dissolved in the oceans

24. The scarlet cup fungus (*Sarcoscypha coccinea*) obtains its nutrition from decaying wood by releasing digestive enzymes into the wood and absorbing the digested products.

Which of the following terms describe(s) the fungus?

I. Autotroph

II. Heterotroph

III. Saprotroph

A. III only

B. II and III only

C. I and III only

D. I, II and III

25. Which enzymes are needed to incorporate genes into plasmids to create recombinant plasmids?

A. DNA polymerase and ligase

B. DNA polymerase and restriction enzymes

C. Restriction enzymes and ligase

D. Helicase and restriction enzymes

26. What could be achieved by DNA profiling using gel electrophoresis?

A. The chromosome number of an organism could be counted.

B. It could be shown that human tissue found at the site of a crime did not come from a person suspected of having committed the crime.

C. A karyotype could be produced.

D. Extinct species of living organisms could be brought back to life.

27. If an organism that is homozygous recessive for a trait is crossed with a heterozygote, what is the chance of getting a homozygous recessive phenotype in the first generation?

A. 0%

B. 25%

C. 50%

D. 100%

28. Which of the following colours of light is absorbed the most by chlorophyll?

A. Blue

B. Green

C. Yellow

D. Orange

29. What is placed into the uterus after the process of *in vitro* fertilization (IVF)?

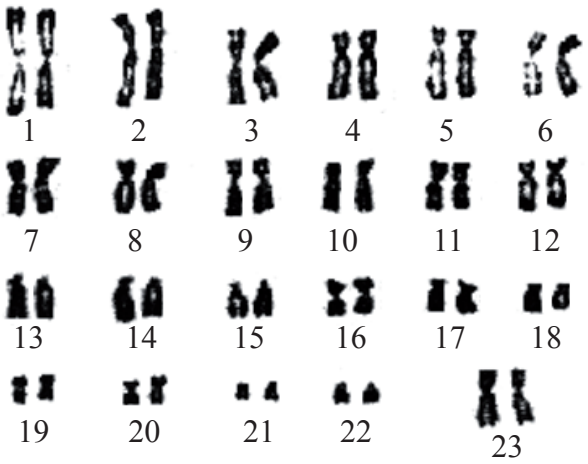
A. Eggs

B. Sperm

C. Embryos

D. Fetuses

30. What can be concluded from the karyotype provided below?



[Source: www.ds-health.com/trisomy.htm]

A. There was non-disjunction during meiosis in the mother.

B. There was non-disjunction during meiosis in the father.

C. The fetus is male.

D. The fetus is female.