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22136007

BIOLOGY
HIGHER LEVEL
PAPER 1

Monday 13 May 2013 (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]*.

1. A student investigated the growth of 100 cress seedlings in 2 normally distributed populations and carried out a *t*-test on the data. The calculated value of *t* was equivalent to a probability of between 0.15 and 0.25. What conclusion can be drawn from this?

A. The difference between the two populations is significant.

B. The difference between the two populations is not significant.

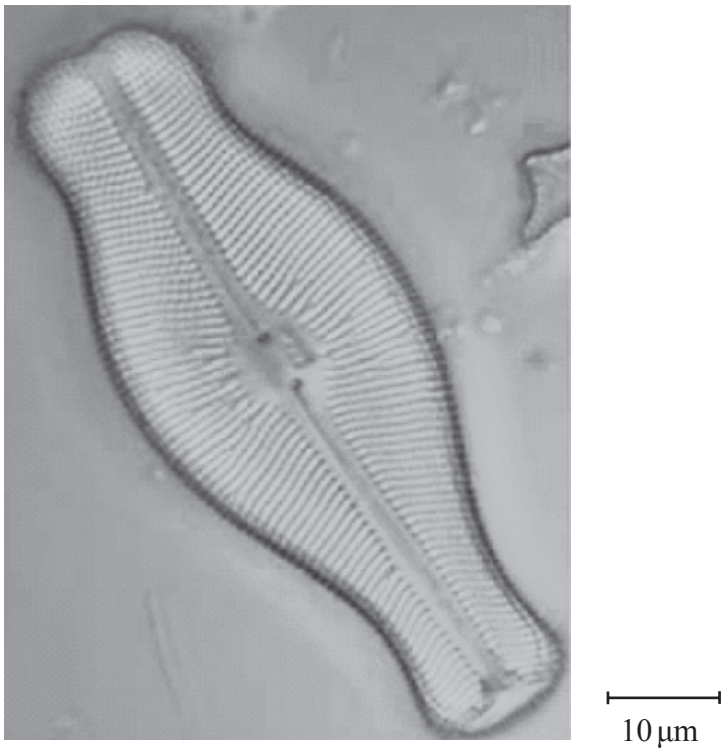
C. The data is positively correlated.

D. The data is negatively correlated.

2. Which functions of life are carried out by **all** unicellular organisms?

A.	photosynthesis	nutrition	homeostasis
B.	nutrition	reproduction	response
C.	metabolism	photosynthesis	growth
D.	growth	reproduction	photosynthesis

3. The diatom *Didymosphenia geminata* is a species of single-celled alga that lives in warm, shallow water. In the light microscope image below, the scale bar is equal to 10 micrometres (10 μm). What is the actual length of the cell?



[Source: United States Environmental Protection Agency
http://www.epa.gov/region8/water/didymosphenia/White%20Paper%20Jan%202007.pdf
EPA white paper]

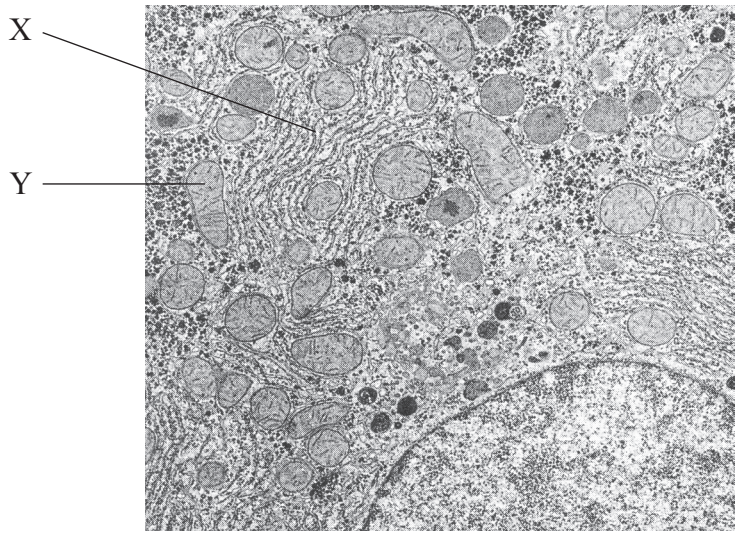
A. 0.007 mm

B. 0.07 mm

C. 0.7 mm

D. 7.0 mm

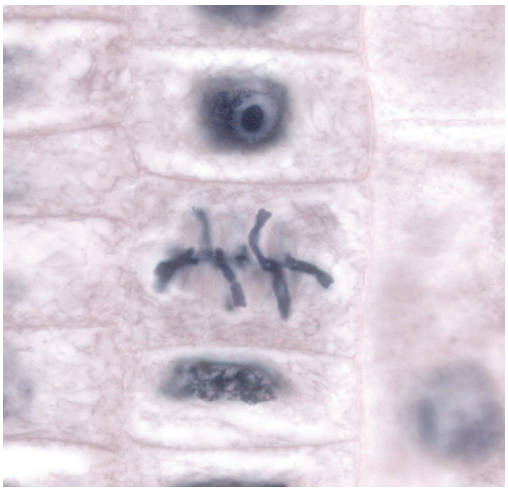
4. In the electron micrograph of a rat liver cell below, what are the structures labelled X and Y?



[Source: ©Principia Cybernetica. Used with permission.]

	X	Y
A.	rough endoplasmic reticulum	mitochondrion
B.	smooth endoplasmic reticulum	nucleus
C.	Golgi apparatus	vesicle
D.	chromosome	vacuole

5. Which phase of mitosis is shown in the photomicrograph?



[Source: http://commons.wikimedia.org/wiki/File:Allium-Mitose03-DM100x_BL28.jpg]

A. Anaphase

B. Metaphase

C. Prophase

D. Telophase

6. Which molecules are monosaccharides?

A. starch, glycogen, cellulose

B. sucrose, maltose, lactose

C. fructose, glucose, galactose

D. glucose, lactose, cellulose

7. The base sequence of a fragment of DNA is:

ACC GTG CAG GAT

What is the base sequence on the messenger RNA (mRNA) molecule transcribed from it?

A. TGG CAC GTC CTA

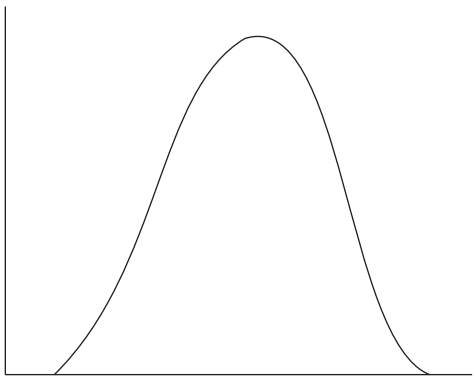
B. TGG CUC GTC CTU

C. UGG CTC GUC CUT

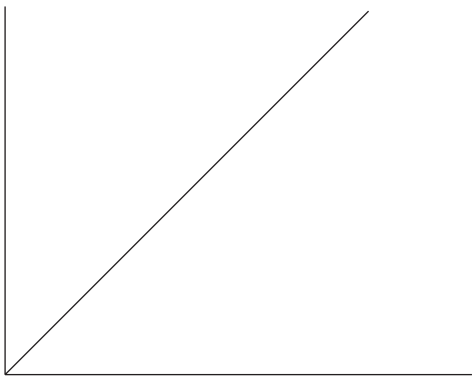
D. UGG CAC GUC CUA

8. Which graph shows the effect of increasing substrate concentration on enzyme activity?

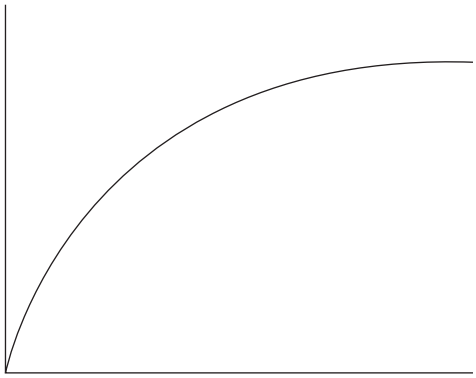
A.



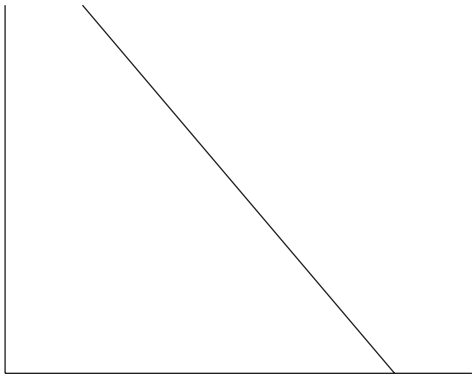
B.



C.



D.



9. What is produced when the enzyme lactase is added to milk?

A. Glucose and galactose

B. Lactose

C. Glucose and fructose

D. Lactic acid

10. In cell respiration, what is the name of the process where glucose is broken down into pyruvate?

A. Electron transport chain

B. Krebs cycle

C. Link reaction

D. Glycolysis

11. What term describes the failure of sister chromatids to separate during anaphase II?

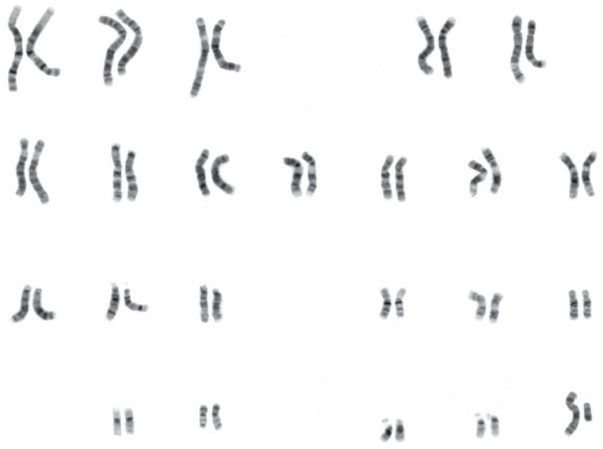
A. Sex linkage

B. Karyotyping

C. Non-disjunction

D. Semi-conservative replication

12. What information can be concluded from the karyotype?



[Source: http://en.wikipedia.org/wiki/File:NHGRI_human_male_karyotype.png]

A. The person is a normal male.

B. The person is a normal female.

C. The person is a male with Down syndrome.

D. The person is a female with Down syndrome.

13. In humans the ABO blood groups are an example of inheritance involving multiple alleles. In a family the parents have blood group A and blood group B respectively. Their first child has blood group O. What is the probability that their next child will have blood group B?

A. 100 %

B. 75 %

C. 50 %

D. 25 %

14. Organisms can be genetically modified to produce the human blood clotting factor IX. What characteristic of the genetic code makes this possible?

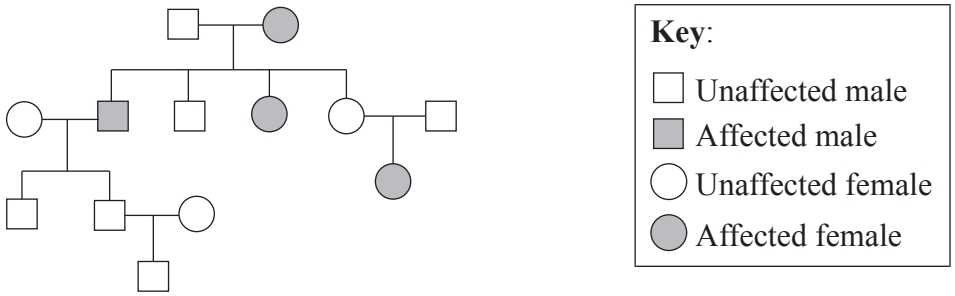
A. It is conservative.

B. It is degenerate.

C. It is complementary.

D. It is universal.

15. Alkaptonuria is an inherited condition in humans that affects phenylalanine and tyrosine metabolism, resulting in the production of black-coloured urine. What deduction can be made about the allele for this condition from the pedigree chart?



A. It is autosomal dominant.

B. It is autosomal recessive.

C. It is X-linked recessive.

D. It is Y-linked recessive.

16. In ecosystems the amount of energy that passes from one trophic level to the next is called the conversion efficiency. What is the average conversion efficiency from primary to secondary consumers in most ecosystems?

A. 1%

B. 10%

C. 50%

D. 90%

17. Global warming caused by the enhanced greenhouse effect is likely to have major consequences for arctic ecosystems. Which of the following are likely to occur in the arctic if the Earth's surface temperature rises?

I. Decreased rates of decomposition of detritus

II. Increased range of predators from temperate regions

III. Increase in numbers of pest species and pathogens

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

18. *Ranunculus repens* and *Hypericum repens* both have yellow flowers. Which statement is true?

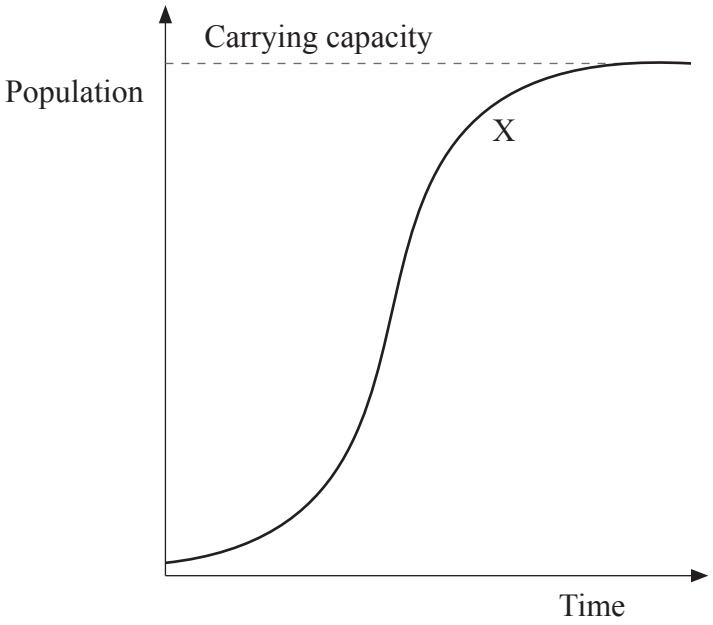
A. They are angiospermophytes.

B. They are coniferophytes.

C. They are members of the same species.

D. They are members of the same genus.

19. In the sigmoid (S-shaped) population growth curve below, what phase is indicated by label X?



A. Plateau

B. Growth

C. Lag

D. Transitional

20. Which enzyme is amylase?

	Source	Substrate	Product(s)
A.	pancreas	starch	maltose
B.	stomach	protein	peptides
C.	pancreas	peptides	amino acids
D.	small intestine	maltose	glucose

21. What is the state of the atrio-ventricular and semilunar valves when the left ventricle contracts?

	Atrio-ventricular valves	Semilunar valves
A.	open	closed
B.	open	open
C.	closed	closed
D.	closed	open

22. What are the conditions of the blood travelling through the pulmonary vein?

	Oxygen level	CO_2 level	Pressure
A.	high	low	low
B.	low	low	high
C.	low	high	low
D.	high	low	high

23. Immediately after an action potential, which event causes the neuron membrane to repolarize?

A. Voltage-gated sodium channels open.

B. Voltage-gated potassium channels open.

C. Voltage-gated calcium channels close.

D. Voltage-gated potassium channels close.

24. What is a characteristic of type II diabetes?

A. Liver cells are less sensitive to insulin.

B. Insulin is no longer produced.

C. α cells in the pancreatic islets are destroyed.

D. β cells in the pancreatic islets are destroyed.

25. What is the function of LH (luteinizing hormone) in the menstrual cycle?

A. Development of follicles in the ovary

B. Repair of the uterus lining following menstruation

C. Stimulation of ovulation

D. Preparation of the uterus for implantation

26. A channel protein is used to transport ions across a membrane. What would you expect to find lining the inside of the channel?

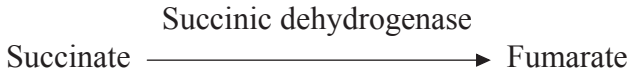
A. Phospholipids

B. Non-polar amino acids

C. Fatty acids

D. Polar amino acids

27. The enzyme succinic dehydrogenase catalyses the conversion of succinate to fumarate.



The addition of malonate to the reaction mixture decreases the rate of the reaction. If more succinate is added, the reaction rate will increase. What is the role of malonate in this reaction?

A. End-product inhibitor

B. Non-competitive inhibitor

C. Catalyst

D. Competitive inhibitor

28. In DNA replication what is the role of the enzyme DNA polymerase I?

A. Excises RNA primers

B. Unwinds the double helix

C. Joins Okazaki fragments together

D. Adds nucleotides in the 3′ to 5′ direction

29. In a chloroplast where are the enzymes of the Calvin cycle located?

A. Thylakoid membranes

B. Stroma

C. Grana

D. Outer membrane of chloroplast

30. In the light-dependent reactions of photosynthesis what supplies low energy electrons to photosystem II?

A. Photolysis of water

B. Reduction of $NADP^+$

C. Chemiosmosis

D. Photosystem I

31. In which modified structures are sugars stored in an onion bulb?

A. Stems

B. Roots

C. Flowers

D. Leaves

32. Which plant hormone causes stomata to close?

A. Auxin

B. Gibberellin

C. Phytochrome

D. Abscisic acid

33. In fruit flies (*Drosophila melanogaster*) grey body is dominant to black body and long wings are dominant to vestigial wings. Two flies heterozygous for both genes were crossed. What proportion of the offspring would be expected to have black bodies and long wings?

A. 1/2

B. 3/16

C. 1/4

D. 1/16

34. Human skin colour shows continuous variation. What does this indicate about the pattern of inheritance of human skin colour?

A. It is dominant.

B. It is sex-linked.

C. It is recessive.

D. It is polygenic.

35. Which is a method of gaining passive immunity?

A. Being vaccinated against hepatitis A before travelling

B. Obtaining antibodies in colostrum

C. Catching influenza while at school

D. Consuming weakened live polio virus particles on a lump of sugar

36. Which ions are released from the sarcoplasmic reticulum when a skeletal muscle fibre contracts?

A. Sodium

B. Potassium

C. Calcium

D. Chloride

37. What is the role of ATP during contraction of a skeletal muscle fibre?

A. To uncover the myosin binding sites on actin filaments

B. To make cross-bridges between actin and myosin filaments

C. To break cross-bridges and re-set myosin heads

D. To cover the myosin binding sites on actin filaments

38. In a healthy kidney which of these substances would you expect to find in the tubular fluid entering the loop of Henle?

I. Glucose

II. Sodium ions

III. Proteins

A. I only

B. I and II only

C. II only

D. II and III only

39. In a mammal that had just ingested a large volume of water, what would be secreted into the bloodstream?

A. More ADH (vasopressin)

B. Less epinephrine (adrenaline)

C. More epinephrine (adrenaline)

D. Less ADH (vasopressin)

40. What is the role of HCG (human chorionic gonadotrophin) in early pregnancy?

A. It stimulates the release of FSH (follicle stimulating hormone).

B. It maintains the corpus luteum.

C. It inhibits the release of progesterone.

D. It stimulates implantation of the blastocyst.