

SET A

Name

Signature

P530/1
BIOLOGY
Paper 1
July 2016
2½ hours

Uganda Advanced Certificate of Education
External Facilitation Exams 2016

BIOLOGY
(THEORY)
Paper 1
2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of sections A and B.

*Answer **all** questions in both sections.*

SECTION A:

Answers to this section must be written in boxes provided.

SECTION B.

Answers to this section should be written in the spaces provided and not anywhere else. No additional sheets of paper should be inserted in this booklet.

For Examiner's use only	
Section	Marks
A: 1-40	
B: 41	
42	
43	
44	
45	
46	
Total	

SECTION A :(40 MARKS)

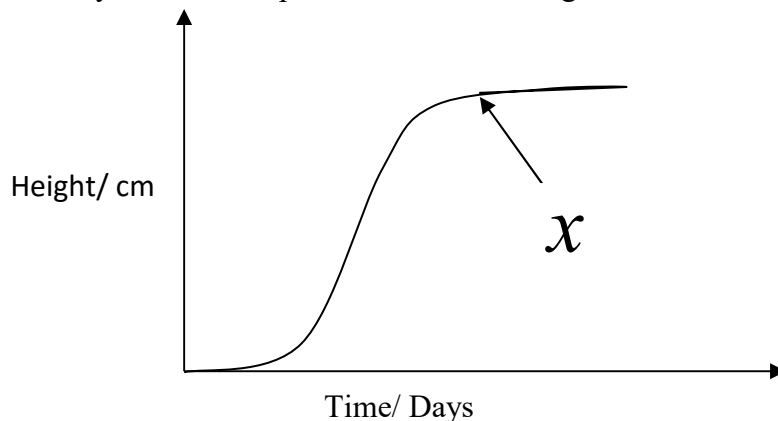
1. Which of the following structures would **not** be found in prokaryotic cells?

- A. Cell wall
- B. Nuclear area
- C. Ribosomes
- D. Nucleus

2. The main function of the acrosome reaction is to

- A. activate the egg
- B. improve sperm motility
- C. prevent interspecific fertilisation
- D. facilitate sperms to penetrate the egg.

3. Figure 1 shows the increase in the height of maize seedlings that were placed in the dark for 4 days and then exposed to continuous light.



Which of the following is the correct explanation for the shape of the curve after point X?

- A. cells enter the resting phase before mitosis
- B. Cell division has ceased
- C. Cells have matured and are incapable of elongating
- D. Seedling growth is inhibited by continuous light.

4. Which one of the following associations between the **R**-groups are the strongest?

- A. Ionic bonds
- B. Hydrophobic interactions
- C. Disulfide bridges
- D. Hydrogen bonds

5. Which one of the following forms the basis of the taxonomy of fungi?

- A. Type of cell wall
- B. Mode of nutrition
- C. Possession of sexual structures
- D. Level of organization

6. In *E. coli* at 37⁰C mRNA is synthesized at a rate of about 55 nucleotides per second and proteins at a rate of about 17 amino acids per second. If a typical protein is made of 300 amino acids how long does it take to transcribe its messenger RNA and to synthesize one protein molecule

- A. 16 and 18 seconds respectively
- B. 18 and 16 seconds respectively
- C. 18 seconds in both cases
- D. 16 seconds in both cases

7. Which one of the following is the most common type of spatial population distribution?

- A. uniform
- B. Clumped regular
- C. Random
- D. Clumped irregular

8. The normal order of whorls from the flowers periphery to the center is

- A. sepals → petals → carpels → stamens
- B. Stamens → carpels → sepals → petals
- C. Sepals → petals → stamens → carpels
- D. Petals → carpels → stamens → sepals

9. Which one of the following is the immediate source of energy for DNA replication?

- A. Hydrolysis of ATP
- B. Oxidation of reduced NAD
- C. Hydrolysis of the nucleotides
- D. Breakage of hydrogen bonds

10. Insects with elongated mouth parts usually pollinate long tubular flowers where as those with short mouth parts pollinate short flowers. This phenomenon is best explained by

- A. parallel evolution
- B. natural selection
- C. co-evolution
- D. differential adaptation

11. Which of the following processes is not directly involved in the hydrological cycle?

- A. Evaporation
- B. Precipitation
- C. nitrification
- D. condensation

12. Fresh water bony fishes maintain water balance through

- A. eating salty foods
- B. excreting hypotonic urine
- C. drinking water periodically
- D. excreting salts across their gills

13. Which one of the following is the advantage of territoriality in mammals? It

- A. encourages monogamy
- B. leads to formation of pair bonds
- C. promotes reproductive success
- D. allows them to evolve

14. Some bacteria are metabolically active in hot springs because
- A. they use molecules other than proteins as their main catalysts
 - B. they are able to maintain an internal temperature much cooler than that of the surrounding water
 - C. the high temperatures facilitate active metabolism without the need of catalysts.
 - D. their enzymes have high optimal temperatures

15. Which of the following conditions would stimulate plants to utilize only cyclic electron pathway?
- A. low oxygen levels
 - B. Period of darkness
 - C. Hot dry conditions
 - D. Low carbon dioxide levels

16. The homozygosity of an offspring may be determined by using a
- A. Multiple cross
 - B. Back cross
 - C. Test cross
 - D. Reciprocal cross

17. Which one of the following is true about animals that feed discontinuously?
- A. have digestive tracts that permit storage
 - B. Are always filter feeders
 - C. Exhibit extremely rapid digestion
 - D. Have non specialized digestive tracts

18. A quadrat measuring 25cm x 25cm was used to measure population abundance of barnacles on a rocky shore. Table 1 shows the data collected

Quadrat	1	2	3	4	5	6	7	8	9	10
Number of barnacles	0	4	5	2	9	0	10	8	2	10

The density /m² of the barnacles studied in the area is;

- A. 36
- B. 80
- C. 20
- D. 34

19. In most vertebrates, the excretory, reproductive and alimentary systems share the

- A. testes
- B. urethra
- C. vasdeferens
- D. cloaca

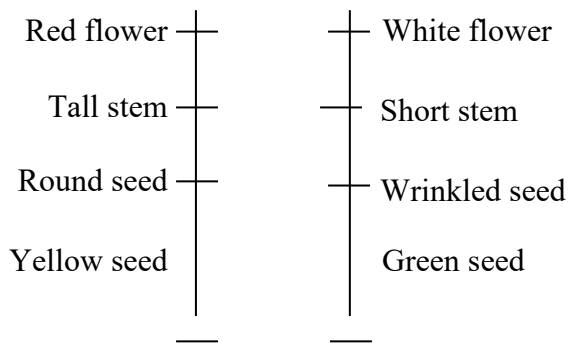
20. Which one of the following is the main source of progesterone in the early stages of pregnancy?

- A. Placenta
- B. interstitial cells
- C. Graafian follicles
- D. Corpus Luteum

21. In which one of the following adult animals would brown fat tissue most likely to be found?

- A. elephants
- B. Rodents
- C. Lung fishes
- D. Crocodiles

22. Figure 2 shows a chromosome map for a dicotyledonous plant?



In which of the following pairs is crossing over likely to occur most commonly?

- A. Flower colour and height of plant
- B. seed texture and colour of testa
- C. Flower colour and colour of testa
- D. Height of plant and seed texture

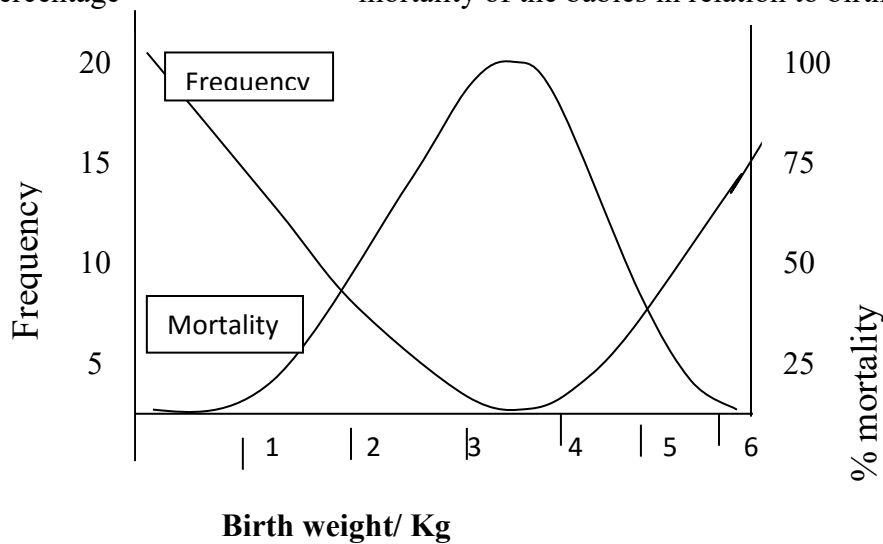
23. If a plant is sprayed with a substance containing auxins and gibberellins, which one of the following is likely to result?

- A. Senescence is delayed
- B. Fruits begin to ripen
- C. Broad leaves will die
- D. Fruit growth retards

24. Which of the following does not contribute to the high solute content of the medulla of the kidney?

- A. Reabsorption of salts from the Bowmans capsule
- B. Counter flow of fluid through the loop of Henle
- C. Diffusion of salts from the ascending limb of the loop of Henle
- D. Diffusion of urea out of the collecting ducts.

25. Figure 3 represents the proportion of newly born babies in the number of birth weight and the percentage mortality of the babies in relation to birth weight.



Which one of the following is a correct conclusion from the figure?

- A. Birth weight is subject to stabilising selection
- B. Birth weight is discontinuously determined
- C. Infant mortality is inversely proportional to birth weight
- D. Birth weight is genetically linked to infant mortality.

26. The significance of the cylindrical shape of plant roots is to

- A. ensure that their size coordinate with that of the stem.
- B. Provide a larger surface area for water and mineral salt uptake
- C. keep them intact on to the main plant body
- D. Permit them absorb water from different directions

27. Which of the following does not alter the thickness of a bone?

- A. Ageing
- B. Exercise
- C. Hormonal imbalance
- D. Deficiency of iodine

28. During the formation of a blood clot, coagulation is initiated by

- A. secretion of regulatory substance from endothelial cells
- B. exposure of blood to collagen fibres in the damaged vessel walls
- C. blood escaping from the vessels at the site of a wound.
- D. a rise in level of heparin in the plasma

29. Which one of the following activities would not increase the ventilation rate in mammals?

- A. Release of adrenaline into the blood
- B. Production of more acetylcholine
- C. Accumulation of lactic acid in blood
- D. Increase in the glucose levels in the blood

30. Which of the following compounds cannot be broken down further?

- A. Maltose
- B. Glycogen
- C. Galactose
- D. Lactose

31. Which one of the following is characteristic of all vertebrates?

- A. Endothermy
- B. Double circulation
- C. Pentadactyl limb
- D. Cephalisation

32. A decrease in the rate of development of Graafian follicles in mammalian ovaries is caused by

- A. high levels of Oestrogen
- B. low levels of luteinizing hormone
- C. high levels of progesterone
- D. low level of Oestrogen

33. Which one of the following factors does **not** influence the location of a particular biome?

- A. Altitude
- B. Latitude
- C. Average annual temperature
- D. Species generation time

34. Which one of the following features does **not** aid a red blood cell to absorb much oxygen?

- A. Thin flexible membrane
- B. Biconcave disc shape
- C. Rich supply of haemoglobin
- D. High rate of production

35 The rate of photosynthesis reduces during water stress because of;

- A. mineral deficiency
- B. carbondioxide shortage
- C. reduced light absorption
- D. water shortage

36. A plant cell that has a Ψ_s of -0.7Mpa and a Ψ of 0Mpa is first immersed in distilled water then into an open beaker of solution that has a Ψ of -0.4Mpa . What would be the cells Ψ_p at equilibrium?

- A. -0.3Mpa
- B. 0.3Mpa
- C. 0.7Mpa
- D. 0.4Mpa

37. Which one of the following trophic levels possess organisms which have the **greatest** effect on changes in predator populations?

- A. Producers
- B. Decomposers
- C. Primary consumers
- D. Secondary consumers

38. Which of the following is the major source of electrons for the electron transport system?

- A. Coenzyme A
- B. Water
- C. ATP synthesase
- D. Reduced NAD

39. Because there are more codons than amino acids, some

- A. codons do not specify any amino acid
- B. codons specify more than one amino acid
- C. amino acids are specified by more than one codon
- D. amino acids do not have codons

40. Which of these environmental conditions would minimize the transpiration: photosynthesis

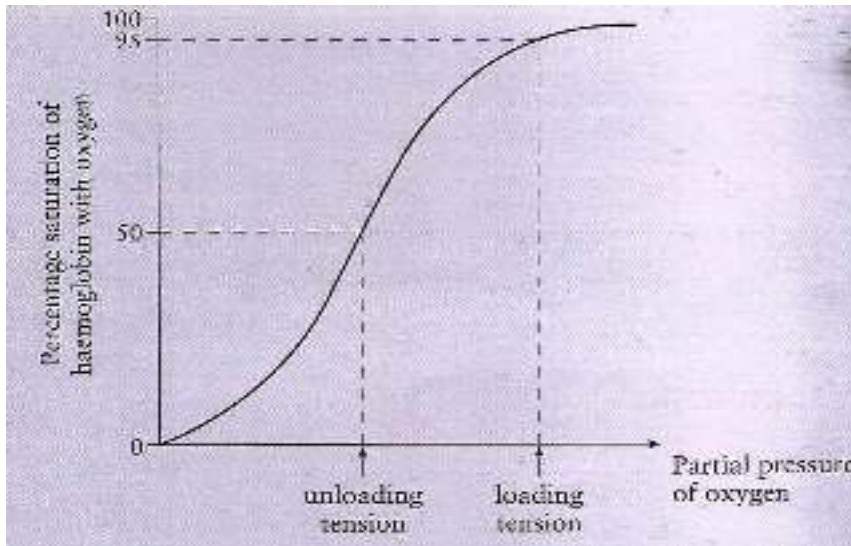
ratio for a C₃ plant

- A. sunny warm
- B. Hot and dry
- C. Low wind speed
- D. High humidity



SECTION B: (60 MARKS)

41. Figure 4 shows the oxygen dissociation curve for human hemoglobin



a) State what is represented by unloading and loading tensions (02 marks)

(i) Unloading tension

.....

.....

.....

(ii) Loading tension

.....
.....
.....

b) Draw a line on the graph to represent the expected hemoglobin dissociation curve *(01 mark)*

c) i) What would be the effect on the unloading tension of an increase in the partial pressure of carbon dioxide? *(01 mark)*

.....
.....
.....

ii) Explain how this may be of any value in supplying tissues with oxygen *(02 marks)*

.....
.....
.....
.....
.....

d) The prairie dog is small mammal that spends much of its life in an extensive system of burrows where the air may have a low partial pressure of oxygen

i) Draw another curve on the graph which would represent an oxygen dissociation curve for the prairie dog hemoglobin *(01 mark)*

ii) Explain why you have drawn the curve in this position *(02 marks)*

.....
.....
.....
.....

e) Explain why hemoglobin binds oxygen more readily once it has already bound some oxygen
(02 marks)

.....

.....

.....

.....

.....

.....

42. Table 2 shows the effect of applying three different concentrations of an insecticide on a plant pest.

Concentration of insecticide	Efficacy (% of insect pests killed per year)		
	Year 1	Year 2	Year 3
1 (Weakest)	95	72	18
2 (intermediate)	98	90	43
3 (strongest)	99	91	47

(a) Suggest an explanation for the change in the efficacy of the insecticide during the experimental period. (04 marks)

.....

.....

.....

.....

.....

.....

(b). Suggest with a reason, the insecticide concentration that is most suitable to control this pest (03 marks)

.....

.....

.....

.....

.....

(c). Explain the evolutionary significance of the results of this experiment. (03 marks)

.....

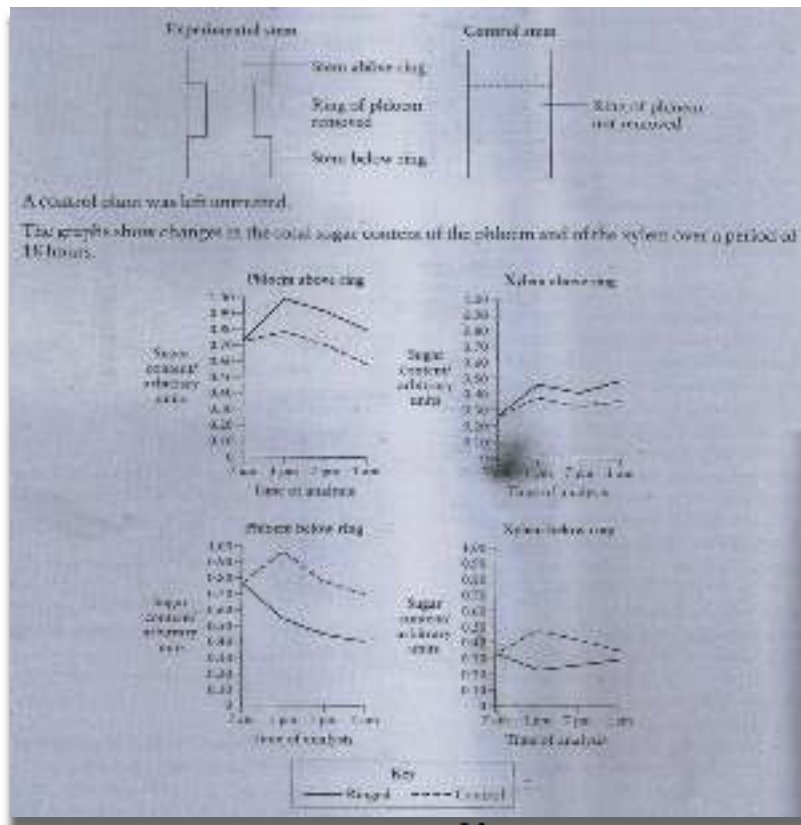
.....

.....

.....

.....

(43). Figure 5 shows the effect of ringing the stem of a cotton plant with time



a) Explain the variation in the sugar content of the phloem of the plant over the period shown i) above the ring (03 marks)

.....

.....

.....

.....

.....

.....

ii) below the ring (02 marks)

.....

.....

.....

.....

.....

.....

b) What evidence from the graphs supports the hypothesis that sugars can move laterally but not downwards in the stem ? (02 marks)

.....

.....

.....

.....

.....

.....

c) Explain why

i) both plants survive in the short run

(01 mark)

.....

.....

.....

.....

ii) one of the plants eventually dies

(02 marks)

.....

.....

.....

.....

44. (a) Explain the importance of the following hormones in animal nutrition

i) Gastrin

(02 marks)

.....

.....

.....

.....

.....

ii) Secretin

(02 marks)

.....

.....

.....

.....

.....

iii) Cholecystokinin

(03 marks)

.....

.....

.....

.....

.....

(b). What are the key functions of HCL in the digestive system?

(03 marks)

.....

.....

.....

.....

.....

(c). Explain how the pancreas times its secretion of digestive juice to mix with partially digested food in the duodenum.

(04 marks)

.....

.....

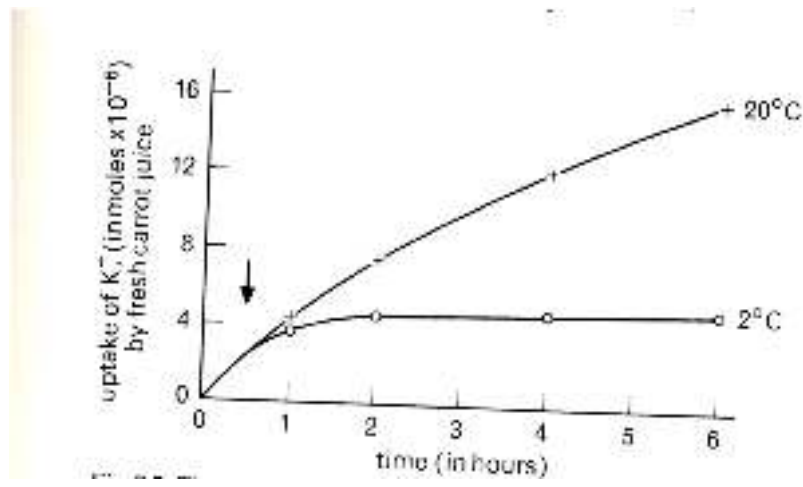
.....

.....

.....

.....

Figure 6 shows the uptake of K^+ by carrot tissue at two temperatures



a) Compare K^+ uptake at both temperatures (04 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

b) Suggest with a reason the process by which the ions are taken up

i) Before the point indicated by the arrow (02 marks)

.....

.....

.....

.....

.....

.....

ii) After the arrow (03 marks)

.....

.....

.....

.....

.....

.....

c) On the axes provided draw the likely uptake of K^+ if cyanide or carbon monoxide is added (01 mark)

46. In humans the allele **a** for albinism is autosomal and recessive while blood group is due to gene **I** which has multiple alleles where alleles **A** and **B** are codominant and at the same time dominant to allele **O**

a) What is meant by the following terms?.(04 marks)

i) **Autosomal**

.....

.....

.....

.....

ii) **Recessive**

.....

.....

.....

.....

iii) **Multiple alleles**

.....

.....

.....

.....

iv) **Codominant**

.....

.....

.....
.....

b) In a marriage between two humans who are both heterozygous for albinism and are both of blood type **AB** what is the possible phenotypic combination of these characters in their children (05 marks)

c) What pattern of inheritance is illustrated here?(01 mark)

.....
.....
.....

END

