

## E.O.T I 2024 BIOLOGY P530/1 MARKING GUIDE

### SECTION A (40 MARKS)

Write the letter corresponding to the right answer in the box provided. Each question in this section carries one mark.

- Which one of the following determines the number of map units between two genes on a chromosome?  
A. Frequency of parentals  
B. Frequency of recombinants.  
C. Number of linkage groups  
D. Size of the chromosomes
- Which one of the following properties of water is important in the dispersal of spores?  
A. High tensile strength  
B. High surface strength  
C. High relative density.  
D. Incompressibility
- Which one of the following events marks the beginning of the spermatogenesis?  
A. Enlargement of the germ cells  
B. Differentiation of the spermatozoa  
C. Halving of nucleic acid content in each germ cell  
D. Division of the germ cells
- Which one of the following doesn't adapt the stratified tissue for its function?  
A. Toughness  
B. Impervious  
C. Greater thickness  
D. Single layer of cells
- Which one of the following factors will least affect the rate of synthesis of a protein in a plant?  
A. Relative humidity  
B. Temperature  
C. Light intensity  
D. Carbon dioxide concentration

**B**

**C**

**D**

**D**

**A**

6. The surface area and volume of the four mammals A,B,C and D are given in table 1. Which of these mammals would survive better in a cold environment?

**Table 1.**

<b>Mammal</b>	<b>Surface area (cm<sup>2</sup>)</b>	<b>Volume (cm<sup>3</sup>)</b>
A	20	5
B	40	80
C	60	60
D	80	100

**B**

7. Which one of the following plant tissues lacks fibres?

- A. Xylem
- B. Phloem
- C. Sclerenchyma
- D. Collenchyma

**D**

8. Which one of the following structures prevents the mammalian heart from being over stretched?

- A. Chordae tendinae
- B. Mitral values
- C. Pericardium
- D. Cardiac muscles.

**C**

9. Which one of the following features is not common to both arthropods andannelids?

- A. Metameric segmentation
- B. Bilateral symmetry
- C. Triploblastic coelomate
- D. Jointed appendages

**D**

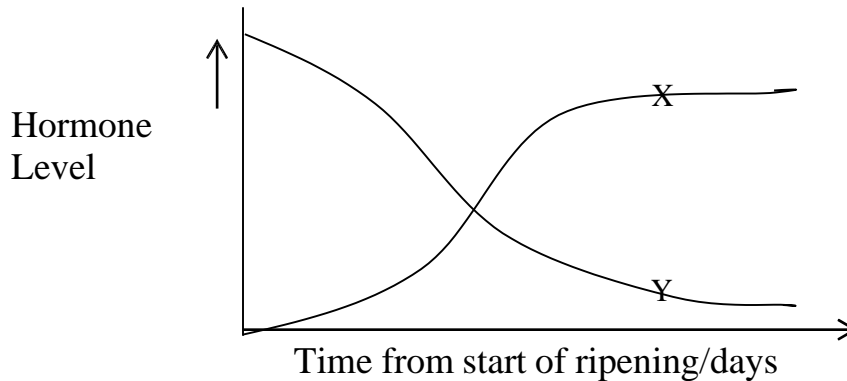
10. The most efficient vertebrate respiratory system is found in

- A. Birds
- B. Mammals
- C. Fish

**A**

D. Reptiles

11. Figure 1 shows the changes in levels of hormones X and Y in a ripening seed.



Hormones X and Y respectively are;

- A. Ethane and cytokinin
- B. Ethane and gibberellins
- C. Abscissic acid and auxins
- D. Auxins and gibberellins

**C**

12. Which one of the following may limit an organism from colonizing a terrestrial habitat?

- A. Development of pollen tube
- B. Shelled eggs
- C. Internal fertilization
- D. Flagellated gametes

**D**

13. Which one of the following is the significance of the fluffy nature of down feathers during flight in birds?

- A. Minimize drag
- B. Increase strength of each wing
- C. Improves on the streamlining of the body
- D. Provide high levels of insulation.

**D**

14. Which one of the following is correct about the venous end of a capillary bed?

- A. Blood pressure is high
- B. Water moves out of the capillaries
- C. Solute potential of plasma proteins decreases.

**C**

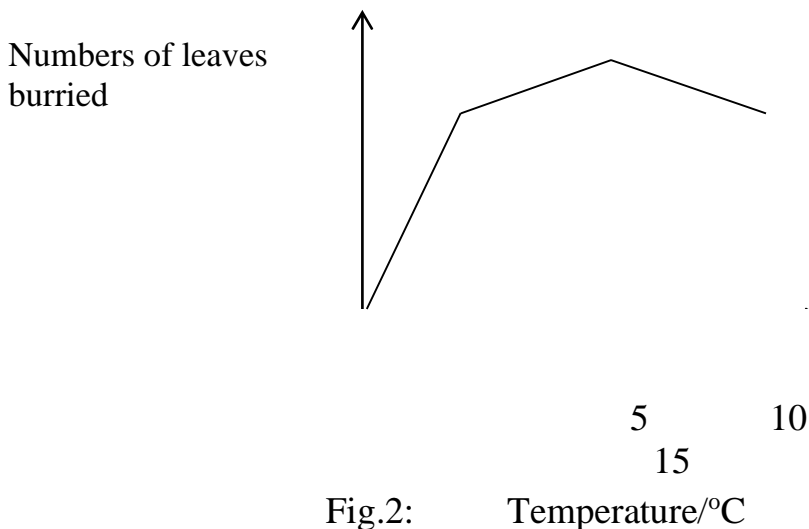
- D. Solute are actively transported into the capillaries
15. Which one of the following would occur immediately following entry of sodium ions into the post synaptic neurone?
- A. Hyper polarization  
 B. Depolarization  
 C. Repolarization  
 D. Generation of action potential
16. The cause of negative growth at the onset of seed germination is;
- A. Imbibition of water  
 B. Mobilization of foods reserves  
 C. Rupturing of the seed coat  
 D. Formation of foliage leaves
17. Which one of the following parts of a nephron contributes most to the survival of the desert rat?
- A. Bowman's capsule  
 B. Proximal convoluted tubule  
 C. Distal convoluted tubule  
 D. Loop of Henle
18. Which one of the following structures of a moss contains the same genetic condition as that of a spermatozoan?
- A. Spores  
 B. Spore mother cells  
 C. Zygote  
 D. Sporangium
19. Figure 2 shows the effect of temperature on leaf burial by earthworms.

**B**

**B**

**D**

**A**



- Which is the best conclusion from this figure?
- A. Activity of earthworms increases with increase in temperature
  - B. Activity of earthworms decreases with increase in temperature
  - C. Temperature of earthworm's habitat vary seasonally
  - D. Low temperatures make earthworms dormant.
- D**
20. Which one of the following preserves existing allele frequencies in a population?
- A. Stabilizing selection
  - B. Disruptive selection
  - C. Directional selection
  - D. Prevalent selection
- A**
21. What type of behaviours enables small mammals to become familiar with their home territories?
- A. Latent learning
  - B. Insight learning
  - C. Imprinting
  - D. Habituation
- A**
22. Which one of the following is true about meiosis? It involves
- A. two divisions and two rounds of DNA replication
  - B. two divisions and one round of DNA replication
  - C. one division and two rounds of DNA replication
  - D. one division and one round of DNA replication
- B**
23. Which one of the following is the effect of removing carnivores from an ecosystem?
- A. Increase in productivity of pastures
  - B. Decrease in the number of herbivores
  - C. Increase in productivity of tertiary consumers
  - D. Decrease in the amount of vegetation cover
- D**

24. Which one of the following physiological processes doesn't require calcium ions?
- A. Response to gravity
  - B. Muscular contraction
  - C. Transmission of nerve impulse across synapses
  - D. Transmission of nerve impulse along axons
- D**
25. Which one of the following cell structures promotes the growth of bacteria on other surfaces?
- A. Cilia
  - B. Nucleoid
  - C. Flagella
  - D. Fimbriae
- D**
26. Which one of the following tissues is most likely to be the source of nutrients for insects that parasitise trees?
- A. Primary xylem
  - B. Vascular cambium
  - C. Secondary xylem
  - D. Cork
- C**
27. Which one of the following is not an advantage of breathing air over breathing water?
- A. Air is less dense than water, so it takes less energy during ventilation
  - B. Oxygen diffuses faster through air than in water
  - C. Oxygen content of air is greater than that of an equal volume of water
  - D. Air breathing leads to high evaporation rates from the respiratory surface
- D**
28. Which one of the following enzymes is not secreted by the lining of the ileum?
- A. Enterkinase
  - B. Lactase
  - C. Lipase
  - D. Sucrase
- B**
29. Wearing a hairy shirt causes unpleasant sensation at first but later the discomfort disappears because;
- A. the post synaptic membrane cease to release the transmitter substance
  - B. the sensory system becomes overloaded with sensory impulses
  - C. there is continuous transmission of nerve impulses across synapses
- D**

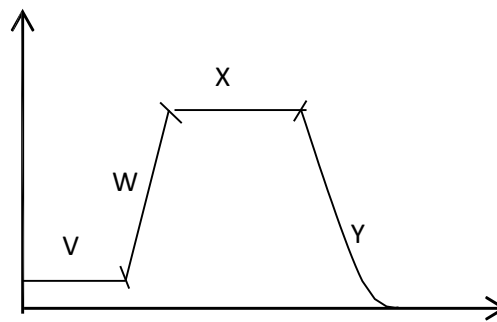
D. there is a decline in the generator potentials provided by sensory receptors

30. Which one of the following is not correct about tetraploid organisms? They

- A. have two complete sets of homologous chromosomes
- B. can form homologous pairings during gamete formation
- C. can be propagated by both sexual and asexual means
- D. are usually sterile

**D**

31. Figure 3 shows the change in numbers of pathogenic bacteria during an infection of the human body.



**Fig.3:Time**

In which region of the curve is the rate of the immune response of the body equal to the reproductive rate of the bacteria?

- A. V
- B. X
- C. W
- D. Y

**C**

32. Which one of the following is absent in the matrix of the mitochondrion?

- A. Ribosomes
- B. Traces of DNA
- C. Lipids
- D. Stalked particles

**D**

33. Hydrophytes do not have support tissues because they

- A. lack roots where support tissues are found.
- B. have parenchyma tissue which makes them buoyant
- C. obtain support from the higher density of water
- D. have a lignified epidermis that provides additional support

**C**

34. Which one of the following methods is suitable for estimating the population size of animals that congregate in open places?
- A. Capture – recapture
  - B. Quadrat
  - C. Aerial photographs
  - D. Removal method

**C**

35. Table 2 shows the rate of oxygen consumption by different tissues of a dicotyledonous plant.

	Tissue	Oxygen consumption ( $\text{mm}^3 \text{O}_2 \text{S}^{-1} \text{hr}^{-1}$ )
A	Vascular tissue	800
B	Whole leaves	400
C	Petioles	200
D	Taproots	40

**A**

Which of these tissues would be most affected by a metabolic poison?

36. Which one of the following factors limits cartilaginous fishes from having efficient gaseous exchange systems?
- A. Possession of small sized gill plates
  - B. Parallel flow of water and blood across the gill plate
  - C. Absence of an operculum to enclose the gills
  - D. Are surrounded with salty water of low oxygen content

**B**

37. Mutualistic associations are important in the following processes except;
- A. production of enzymes
  - B. production of vitamins
  - C. fixation of nitrogen
  - D. recycling of carbon

**D**

38. Which one of the following events occurs at the beginning of ventricular systole?
- A. Ventricular pressure exceeds atrial pressure
  - B. Atrial pressure exceeds ventricular pressure
  - C. Atrioventricular valves are opened
  - D. Semilunar valves are closed

**A**



39. One reason why starch lacks structural properties possessed by cellulose is that it
- A. lacks cross linkages
  - B. lacks folded chains
  - C. has fewer micro fibrils
  - D. has shorter chains

A

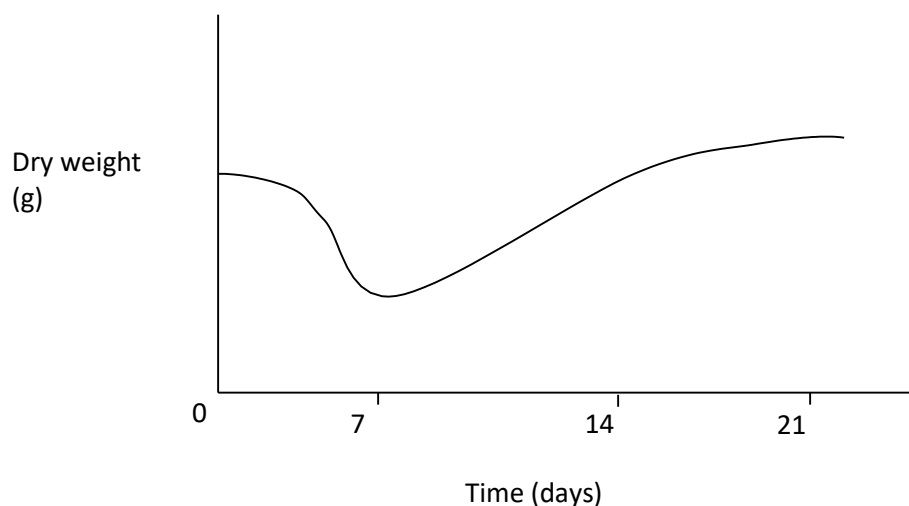
40. Which one of the following events of photosynthesis is not directly affected by light intensity?
- A. Photolysis of water
  - B. Emission of electrons from chlorophyll
  - C. Chemiosmotic synthesis of ATP
  - D. Conversion of PGA to PGAL

D

**SECTION B: (60 MARKS)**

*Write answers in the spaces provided*

41. (a) 41. (a). Figure 3 below shows the changes in dry weight of a germinating bean.



- (a) Explain the changes

- (i) In the first seven days

(03 marks)

*Dry weight decreases gradually and then rapidly up to the 7<sup>th</sup> day; food reserves in the cotyledon are being hydrolyzed by enzymes to soluble products; transported to actively growing regions; where they're respired o provide energy.*

@ = 1 mark, max=03 marks

(ii) Between the seventh and twenty first day (04 marks)  
*Dry mass increases/increases gradually; sprouting of the seedling /First foliage leaves emerge; and begin to photosynthesize; more sugars formed than those respired; leading to net increase in dry weight;*

@ = 1 mark, max=03 marks

(b) Give the major factors that cause seed dormancy. (03 marks)  
*Immature embryo;*

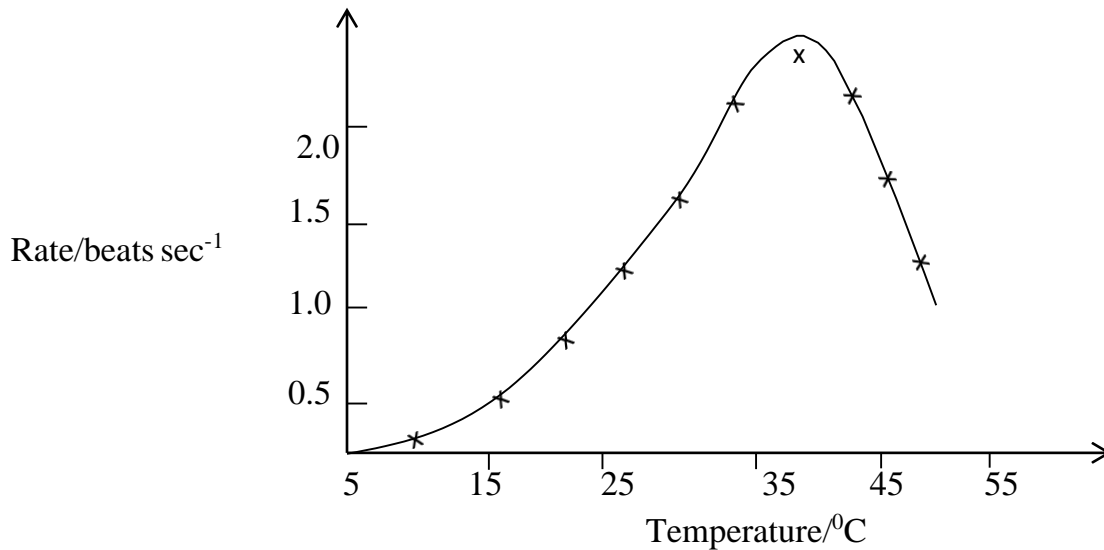
*Unfavorable conditions;*

*Presence of germination inhibitor like abscisic acid;*

*Hard seed coat;*

Any THREE @ = 1 mark

42. Figure 4 shows the effect of temperature on the heart rate of a locust.



(a) Describe the changes in the rate of heart beat (04 marks)

*From 0°C to 15°C; heart rate increases slowly. From 15°C to 35°C, heart rate increases rapidly; reaching a peak;*

*From 35°C to 47°C heart rate decreases rapidly.*  
*mark*

@ = 1

- (b) Explain the effect of temperature on the rate of heart beat.  
(04 marks)

(02 marks)

*Between 5°C to 35°C heart rate increases to a peak; because the increase in temperature raises the metabolism; so heart rate raises to increase the supply of glucose to active / respiring cells / tissues;*

*Between 35°C to 47°C heart rate decreases because enzymes are denatured at higher temperature;*

*@ = 1 mark = Total = 5*

*Max = 04 marks*

- (c) Explain how the rate of heart beat of a rat would differ from that of a locust.

(02 marks)

*A rat would have a higher rate of heart beat than a locust; because a rat has a higher rate of metabolism than the locust.*

*@ = 1 mark*

43. (a) Distinguish between primary productivity and secondary productivity

*Primary productivity is the rate at which producers store solar energy as organic matter per unit area per unit time; while secondary productivity is the rate at which consumers / heterotrophs accumulate energy in their tissues / cells / assimilate plant biomass.*

*Award 2 marks or zero if both sides are not correct.*

(b) Give five reasons why much of the solar energy doesn't contribute to primary productivity in plants. (05 marks)

- *Much of the light does not fall on leaves.*
- *Not all the wavelength of light are suitable for photosynthesis;*
- *Some of the (solar energy) is reflected by the ground / dust / earth surface / leaf surface;*
- *Some energy is transmitted through the leaves;*
- *Some energy is transmitted through the leaves;*
- *Some energy is absorbed by water bodies;*
- *Some energy is lost as heat of vaporization;*
- *Some energy is absorbed by ozone and water vapour / atmosphere;*
- *Some leaves shade each other;*
- *Some factors may limit photosynthesis*
- *Producers may lose energy as heat during respiration;*

***Accept any 4 correctly reasoned points @ 1 mark***

(c) Explain why carnivores have a higher productivity than herbivores. (03 marks)

*Their protein rich diet is more readily and efficiently digested;*

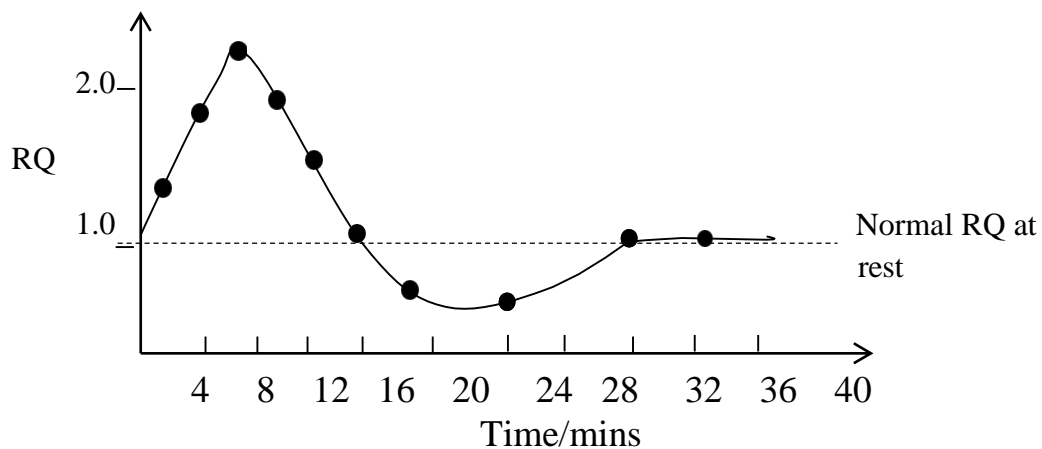
*They lack energy consuming symbiotic microbes in their digestive tracts;*

*Absorb almost twice as much energy per unit mass of food eaten than herbivores;*

*Their faecal matters contain little undigested food / lose only 20% of the energy intake in faeces and urine / wastes;*

***Accept any 3 correctly reasoned points.***

44. An individual was made to undertake a vigorous exercise and his respiratory quotient (RQ) was measured immediately after the exercise for one hour. **Figure 5** shows the results of the investigation.



**Fig.5**

- (a) What is meant by respiratory quotient? (01 mark)

*A measure of the ration of carbon dioxide evolved / expired to the oxygen consumed; during respiration of an organism in the same period of time; @ 1 mark*

- (b) Explain the;

- (i) rise in RQ up to the 6<sup>th</sup> minute (03 marks)

*During this period; aerobic respiration is sustained by oxygen released from myoglobin; this oxygen is not measures as oxygen consumed; yet the carbon dioxide evolved is measurable; (Causing the RY to rise) @ = 1 mark*

- (ii) fall in RQ from the 6<sup>th</sup> to 16<sup>th</sup> minute (04 marks)

*The oxymyoglobin stores become depleted; thus aerobic respiration is sustained by the oxygen inhaled / breathed in; These is also synthesis of high energy phosphate compounds / ATP from sources other than lactic acid; which involves more oxygen consumption than carbon dioxide evolution; @ = mark*

- (c) Explain why the **RQ** falls below the normal **RQ** of a resting human. (02 marks)

*The lactic acid transported to the liver is converted to carbohydrate; which involves the uptake of oxygen without evolving carbon dioxide; @ = 1 mark*

45. (a) State the difference between a  $C_3$  and a  $C_4$  plant. (02 marks)

*In  $C_3$ , the first product of carbon dioxide fixation is a 3 – carbon organic acid; while that of  $C_4$  plants is a 4 – carbon organic acid;*

**@ 1 mark Both must be correct 2 marks**

- (b) Explain how the structure of  $C_4$  plants adapts them to avoid photo respiration. (04 marks)

*There bundle sheath chloroplast lack grana; prevent oxygen production; Bundle sheath cells are tightly surrounded with mesophyll cells leaving no space; through which carbon dioxide can enter the sheath cells; / lose carbon dioxide molecule.*

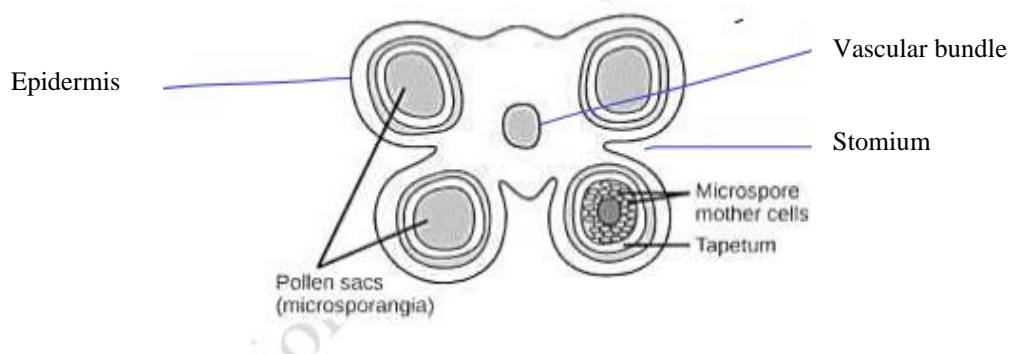
- (d) Explain the photosynthetic pathway that operate in plants living in the following areas (02 marks)
- (i) Hot dry areas (02 marks)

*$C_4$  pathway; their photosynthetic enzymes are more efficient at fixing carbon dioxide at higher temperatures;*

- (ii) High altitude areas (02 marks)

*$C_3$  pathway; their enzymes of photosynthesis fix carbon dioxide better at lower temperatures / cooler temperatures*

46. (a) Draw and label a transverse section of an anther head. (03 marks)



(b) State four differences between gametogenesis in plants and that in animals. (02 marks)

<i>Feature</i>	<i>Gametogenesis in plants</i>	<i>Gametogenesis in animals</i>
<i>Time of initiation</i>	<i>Upon sexual maturity</i>	<i>During embryonic stages of development</i>
<i>Site of occurrence</i>	<i>Embryo sac</i>	<i>Ovary</i>
<i>Period of growth after meiosis I</i>	<i>Shorter</i>	<i>Very long</i>
<i>Polar bodies</i>	<i>Not formed</i>	<i>Always formed</i>
<i>Completion</i>	<i>Before fertilization</i>	<i>During fertilization</i>

**Any TWO @ = 1 mark Both must be correct**

(c) Briefly explain how a young embryo sac develops into a mature ovule. (05 marks)

- *The embryo sac nucleus divides mitotically; to form 2 nuclei which migrate to the opposite poles; Each of the two at either end divides mitotically twice; to form four haploid nuclei at each pole; One nucleus from either pole migrate to the center; fuse to form a diploid primary endosperm nucleus; The remaining six each, gets enclosed by the thin cell wall; One of the three nuclei near the micropyle forms the egg nucleus; the remaining two cells at the micropyle form the synergids; which degenerate while the other nuclei at the opposite pole to the micropyle become the antipodal cells;*

@ = 1/2 mark = Total = 05marks

**END**