

P530/1  
BIOLOGY  
Paper 1  
AUGUST, 2025  
2½ hours



## JINJA JOINT EXAMINATIONS BOARD

*Uganda Advanced Certificate of Education*

MOCK EXAMINATIONS – AUGUST, 2025

**BIOLOGY**

**Paper 1**

2 hours 30 minutes

### INSTRUCTIONS TO CANDIDATES

Answer all questions in section **A** and **B**.

Write the answers to section **A** in the **boxes** provided, answers to section **B** must 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
Section A: 1-40	
Section B 41	
42	
43	
44	
45	
46	
TOTAL	

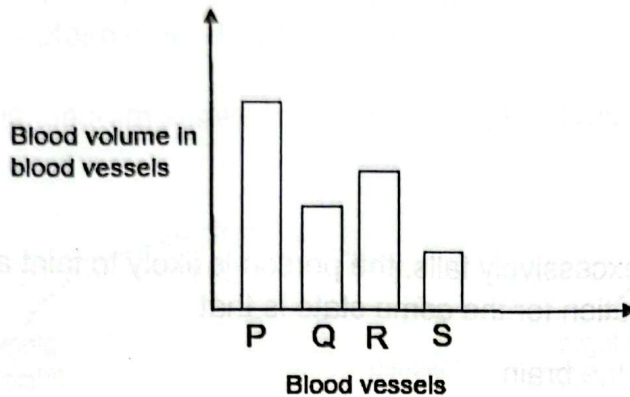
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Turn Over

**SECTION A (40 MARKS)**

1. Which of the following respiratory pigments does not contain iron
- A. Haemoerythrin  
B. Haemoglobin  
C. Chlorocruorin  
D. Haemocyanin
2. Which of the structures in the ruminant digestive system secretes hydrochloric acid and digestive enzymes?
- A. abomasum  
B. omasum  
C. reticulum  
D. rumen
3. A polar bear has a lower lethal temperature than the kangaroo rat because of:
- A. Body colour  
B. Better insulation mechanisms in kangaroo rat  
C. Better insulation mechanisms in polar bear  
D. Large body size of the polar bear
4. Which of the statements describes vernalisation in flowering plants?
- A. Exposure to high temperatures for an extended time period to encourage flowering.  
B. Exposure to high temperatures for an extended time period to encourage germination.  
C. Exposure to low temperatures for an extended time period to encourage flowering.  
D. Exposure to low temperatures for an extended time period to encourage germination.
5. The molecules that link the light dependent and light independent reactions of photosynthesis are
- A. RuBP and CO<sub>2</sub>  
B. ADP and water  
C. ATP and RuBP  
D. NADPH<sub>2</sub> and ATP

6. The figure below shows the distribution of blood by volume in the arteries, veins, capillaries and aorta in the human vascular system while at rest.



Which of the blood vessels represents the volume in capillaries?

- A. P  
B. Q  
C. R  
D. S
7. Which of the following molecules reduces the permeability of the plasma membrane to most substances?

- A. carbohydrate  
B. cholesterol  
C. glycoprotein  
D. protein

8. Which feature of mammals explains why they need mass transport systems to move substances around the body?

- A. low metabolic rates  
B. large surface area to volume ratios  
C. short diffusion distances  
D. small surface area to volume ratios

9. Which polysaccharide contains only alpha 1,4 glycosidic bonds?

- A. amylose  
B. amylopectin  
C. glycogen  
D. cellulose

10. How does sucrose move from chloroplasts to the phloem?

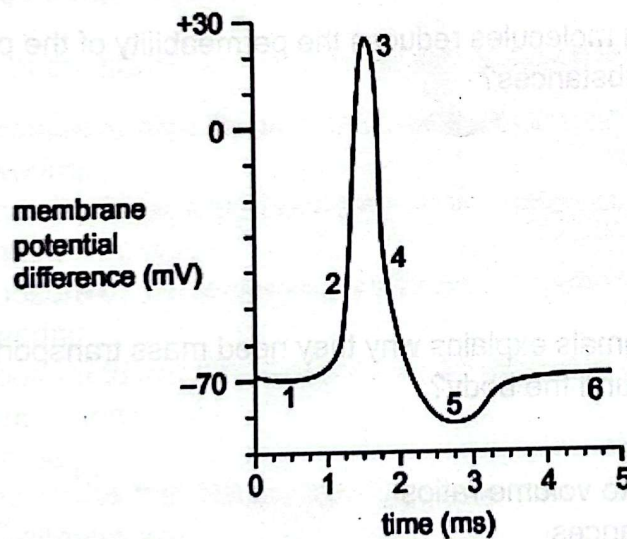
- 1 mass flow
- 2 apoplast pathway
- 3 symplast pathway

- A. 1, 2 and 3
- B. 1 and 2 only
- C. 1 and 3 only
- D. 2 and 3 only

11. When blood glucose level excessively falls, the person is likely to faint and go into coma. The best explanation for the coma state is that

- A. Blood does not move to the brain
- B. neurons in the brain are unable to store glycogen
- C. Glycogen is converted into glucose in brain neurons
- D. Glucose is converted into glycogen in brain neurons

12. The graph represents the potential difference across the membrane of an axon during an action potential.



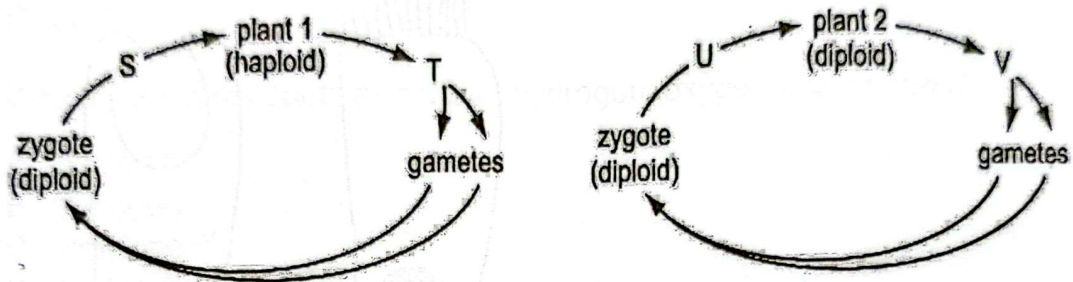
Which of the statements about the graph is correct?

- A. Depolarisation is occurring at 4 and hyperpolarisation is occurring at 6.
- B. Depolarisation is occurring at 2 and hyperpolarisation is occurring at 5.
- C. Hyperpolarisation is occurring at 5 and repolarisation is occurring at 6.
- D. Repolarisation is occurring at 4 and hyperpolarisation is occurring at 6.

13. Which one of the following does not involve mass flows?

- A. Transport of water and mineral salts by the xylem
- B. Blood flow in arteries
- C. Movement of food and water in the gut
- D. Uptake of food by tape worm

14. The diagram shows the life-cycles of two types of simple plant.



Where will reduction divisions occur in the life cycles?

- A. at S and U
- B. at S and V
- C. at T and U
- D. at T and V

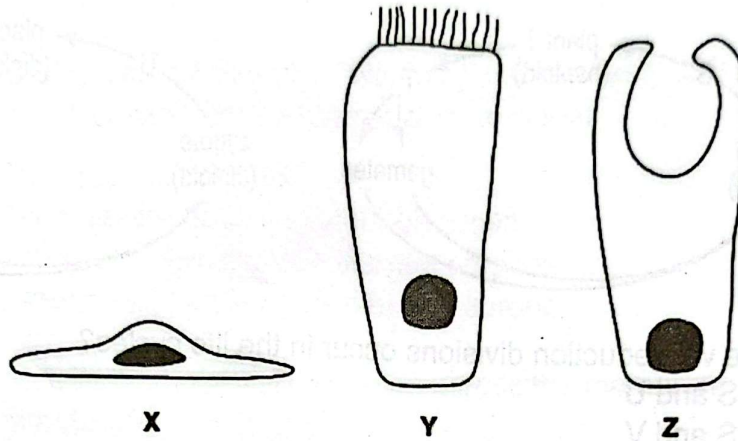
15. What explains why a diabetic person produces a large volume of urine during the course the day?

- A. Urea increases water potential of filtrate
- B. Urea lowers water potential of filtrate
- C. Glucose lowers water potential of filtrate
- D. Glucose increases water potential of filtrate

16. Which one of the following is not a non-specific defense mechanism against germs?

- A. Mucus membranes
- B. Skin
- C. Antibodies
- D. Gastric juice

17. Which of the following greenhouse gases in atmosphere are the most significant in contributing to global warming?
- A. Methane and nitrogen oxide  
 B. Carbon dioxide and water vapour  
 C. Ozone and carbon dioxide  
 D. Methane and water vapour
18. The diagram shows three types of cells.



Which cells are found in alveoli and in bronchi?

	Alveoli	Bronchi
A	X	Y and Z
B	X and Y	Z
C	Y and Z	X
D	Z	X and Z

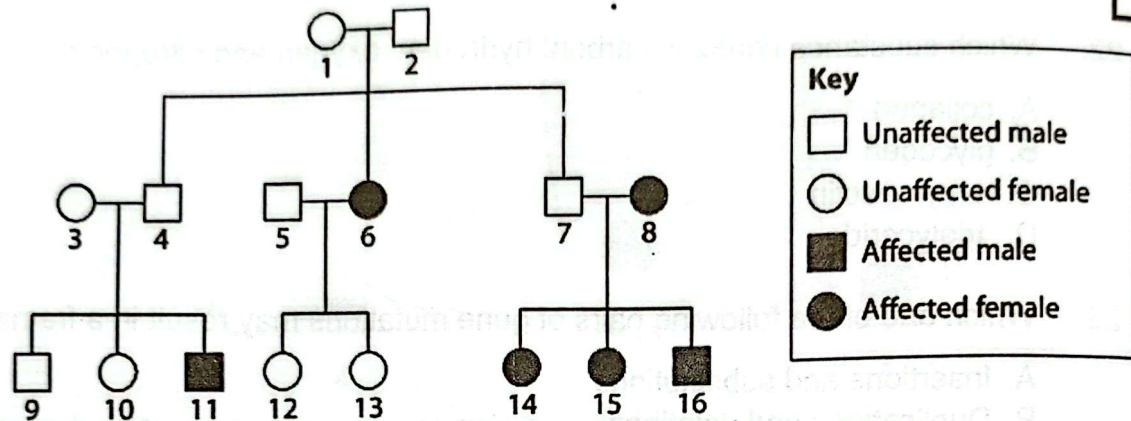
19. Which part of a germinating seed produces gibberellin hormone to stimulate germination?
- A. Scutellum  
 B. Aleurone layer  
 C. Endosperm  
 D. Embryo
20. Which one of the following types of plants is likely to have thickest cuticle?
- A. Mesophytes  
 B. Halophytes  
 C. Hydrophytes  
 D. Xerophytes

21. Polydactyly in cats is an inherited condition in which cats have extra toes. The allele for polydactyly is dominant. In a population, 19% of the cats had extra toes. What is the frequency of the recessive allele for this gene in the cat population?
- A. 81%  
B. 90%  
C. 44%  
D. 32%
22. Which substance contains carbon, hydrogen, oxygen and nitrogen?
- A. collagen  
B. glycogen  
C. amylopectin  
D. triglyceride
23. Which one of the following pairs of gene mutations may result in a frame shift?
- A. Insertions and substitutions  
B. Duplications and deletions  
C. Substitutions and insertions  
D. Deletions and insertions
24. B-lymphocytes and T-lymphocytes are often unable to respond to the antigens on pathogens that are intracellular parasites.
- What is the reason for this?
- A. The antigens are constantly mutating.  
B. The antigens can destroy the lymphocytes.  
C. The lymphocytes do **not** encounter the antigens.  
D. The lymphocytes do **not** recognise the antigens.
25. The following equation summarizes anaerobic respiration of glucose in man
- $$\text{Glucose} \longrightarrow 2 \text{ lactate} + 2 \text{ ATP}$$
- The total energy released by conversion of glucose to lactate is 150 kJ per mole and one ATP contains 30.6 kJ per mole, what is the percentage efficiency of anaerobic respiration of glucose in the equation?
- A. 40%  
B. 40.8%  
C. 29.1%  
D. 38%

26. What is the immune system's first line of defence against invading microorganisms?

- A. ingestion of the microorganisms by B-lymphocytes
- B. ingestion of the microorganisms by phagocytes
- C. production of antibodies
- D. production of antigens

27. The diagram below shows the inheritance of cystic fibrosis in a family



Which of these individuals are heterozygous for this condition?

- A. 3 and 4
- B. 5 and 6
- C. 10 and 11
- D. 15 and 16

28. A quadrat measuring  $2.5 \text{ m}^2$  was randomly thrown different times in an area and each time the number of plants obtained were recorded as 50, 12, 36, 18, 26 and 33. What is the population density of the area?

- A. 35
- B. 175
- C. 437
- D. 70

29. Which group could be a single population?

- A. all the animals and plants on an isolated island
- B. all the birds counted in one day in a garden
- C. all the bacteria in a colony of *Bacillus subtilis*
- D. all the insects occupying three hectares of farmland

30. Within an ecosystem, the top consumers in a food chain are few in number. Which statement explains this?

- A. Energy losses occur at each trophic level.
- B. Energy losses occur within the consumers' digestive systems.
- C. Top consumers have a low reproductive rate.
- D. Top consumers are large in size.

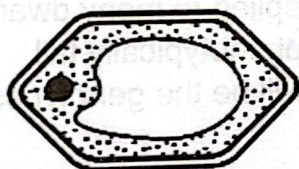
31. Which statement describes events during interphase of mitosis?

- A. Chromosomes start to coil, becoming shorter and fatter.
- B. Chromosomes line up on the equator of the spindle.
- C. Chromatids are pulled apart by spindle fibres.
- D. Chromosomes are replicated ready for the next division.

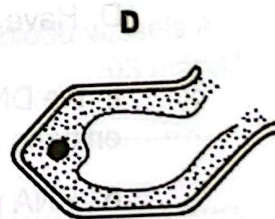
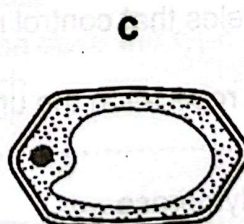
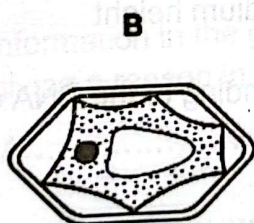
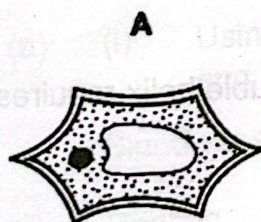
32. Which components are present in prokaryotic cells?

- A. chloroplasts, DNA, nuclear envelope
- B. chromosomes, mitochondria, nuclear envelope
- C. cytoplasm, DNA, mitochondria
- D. cytoplasm, DNA, ribosomes

33. The diagram shows a plant cell.



The plant cell is put into a solution with a water potential less negative than the cell contents. What will happen to the appearance of the cell?



34. What would be the proportions of the  $F_1$  generation of a double recessive parent if test crossed with a double heterozygous parent?
- A. 1:1:1:1
  - B. 1:2:2:1
  - C. 9:3:3:1
  - D. 1:3
35. The amount of DDT in phytoplankton was measured as 0.006ppm and that of carnivorous fish as 0.81 ppm. The DDT bio accumulated in the carnivorous fish by
- A. 300
  - B. 135
  - C. 0.00486
  - D. 0.0074
36. Fronds are plant organs with reproductive structures called sori. These are typical of phylum
- A. Coniferophyta
  - B. Angiospermatophyta
  - C. Bryophyta
  - D. Filicinophyta
37. When low concentrations of gibberellic acid are applied to many dwarf plant varieties, they may grow to become tall. If these phenotypically tall homozygous short plants are self fertilized, what will be the genotypes of their offspring?
- A. Have alleles for tallness
  - B. Have alleles for only dwarfness
  - C. Have alleles for both tallness and dwarfness
  - D. Have alleles that control medium height
38. In the DNA replication the unwinding of the DNA double helix requires the enzyme
- A. RNA polymerase
  - B. DNA ligase
  - C. Helicase
  - D. DNA polymerase

39. Aphids during their life cycle reproduce by diploid parthenogenesis, where by the eggs are produced by

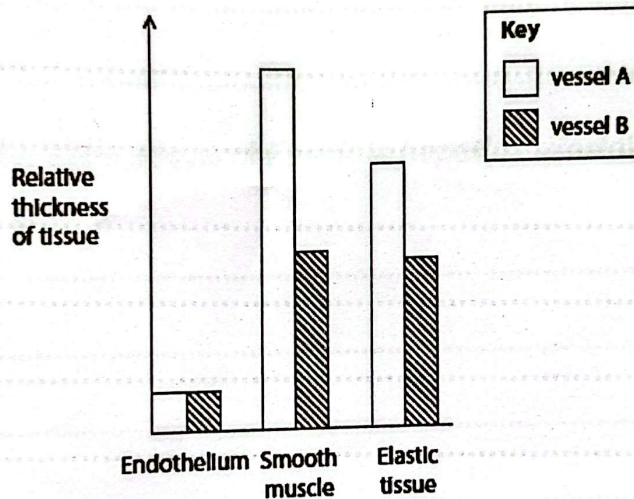
- A. Mitosis and develop without being fertilized
- B. Mitosis and develop after being fertilized
- C. Meiosis and develop without being fertilized
- D. Meiosis and develop after being fertilized

40. A fall in the osmotic pressure of blood leads to

- A. An increase in the volume of water absorbed
- B. An increase in blood volume
- C. Inhibition of ADH production
- D. An increase in production of ADH

**SECTION B (60 MARKS)**

41. The graph below shows the relative thickness of tissues in the walls of blood vessels A and B with a similar diameter.



(a) (i) Using information in the graph state the type of blood vessels A and B giving a reason in each. (03 marks)

Blood vessel A.....

Reason.....

Blood vessel B.....

Reason.....

(ii) Explain the roles of each of these tissues in the walls of the blood vessels. (03 marks)

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(b) Suggest the significance of the relative differences between the walls of blood vessels A and B. (02 marks)

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(c) Describe how the structure of veins ensures one directional flow of blood. (02 marks)

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- (c) Suggest three measures that can be considered to control the human infestation by *Fasciola hepatica* (03 marks)

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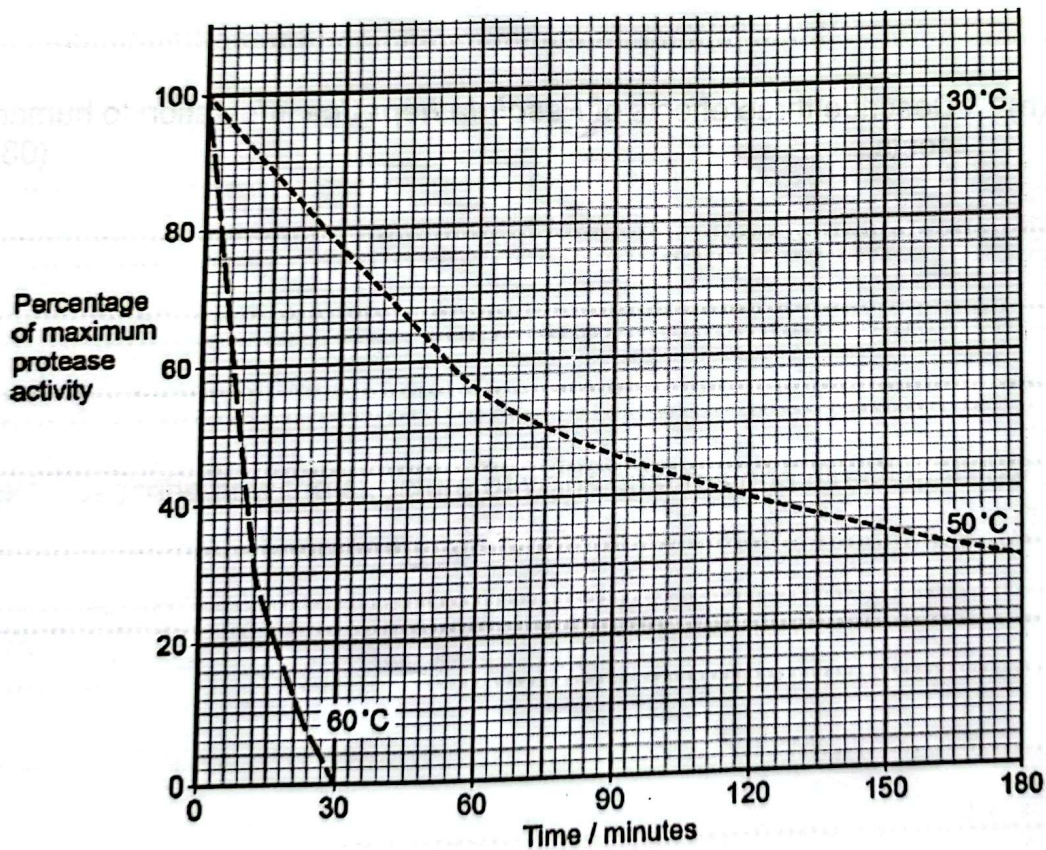
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43. Washing powders often contain enzymes from bacteria. These enzymes include proteases that hydrolyse proteins in clothing stains.

Figure below shows the effect of temperature on a protease that could be used in washing powder.

Figure 1



(a) Explain the shape of the curves at 50 °C and 60 °C. (04 marks)

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(b) Suggest **one** advantage to a bacterium of secreting an extracellular protease in its natural environment. Explain your answer. (02 marks)

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(c) In man brush border villi in ileum have cells with membrane-bound dipeptidases. Describe the action of these membrane-bound dipeptidases and explain their importance. (02 marks)

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(b) Suggest an explanation for the cause of death of aquatic plants as a result of adding sewage to a water body. (04 marks)

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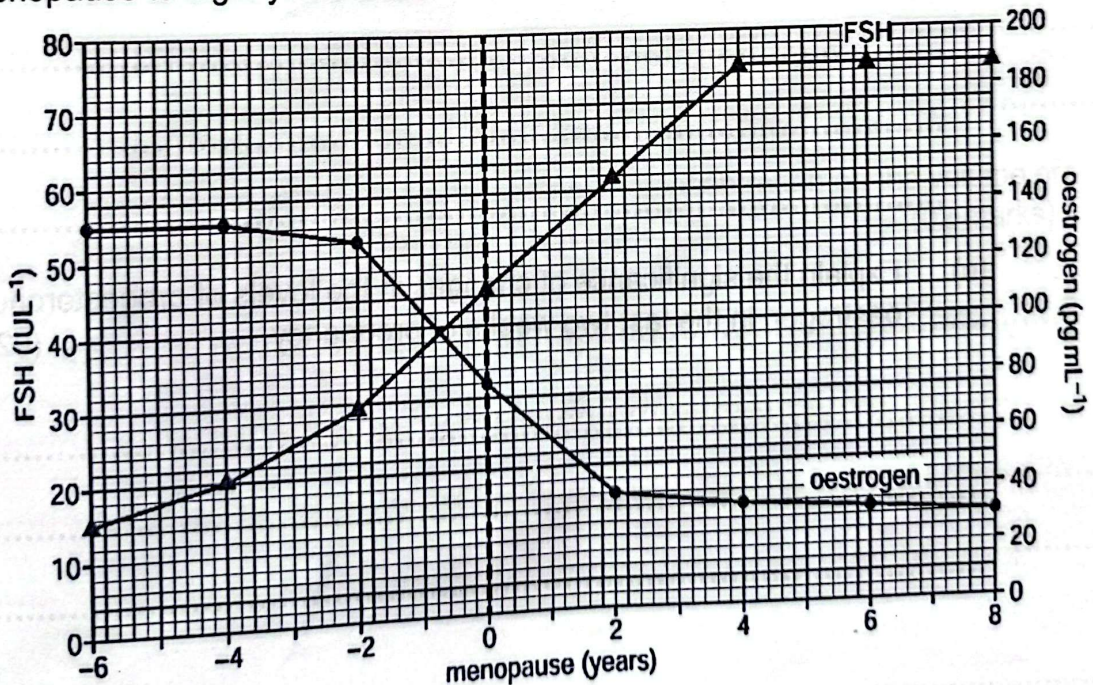
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45. During the menopause in women, menstruation becomes irregular and eventually ceases. The menopause is associated with changes in the blood concentrations of some hormones.

Figure below shows the mean blood concentrations of follicle-stimulating hormone (FSH) and oestrogen in a group of women from six years before the menopause to eight years after.



- (a) Describe and explain the changes in blood FSH and oestrogen concentrations shown in Figure. (06 marks)

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- (b) Briefly describe one medical use for each of the hormones used in this experiment. (02 marks)

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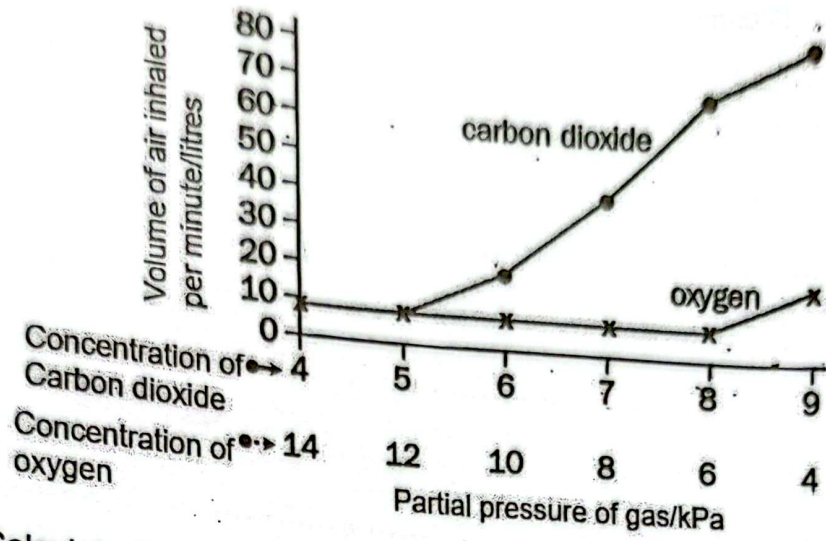
- (c) Explain the significance of changes in the levels of progesterone and oestrogen in the last two weeks of pregnancy. (02 marks)

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46. The graph below shows the effects of changing the concentration of oxygen and carbon dioxide in the air on the volume of air inhaled in 1 minute by a person



(a) Calculate the percentage increase in volume of air inhaled per minute when the partial pressure of carbon dioxide rises from 5 kPa to 8 kPa. (02 marks)

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(b) Describe the effect of changing oxygen concentration on the volume of air breathed in per minute. (02 marks)

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