

Name Stream.....

Signature

P530/1

BIOLOGY

(Theory)

Paper 1

AUGUST 2024

2 ½ hours



NATIONAL EDUCATION RESEARCH & EXAMINATIONS BUREAU

UACE NEREB NATIONAL MOCKS 2024

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: *Write answers to this section in the boxes provided*

SECTION B: *Write answers to this section in the spaces provided.*

No additional sheets of paper should be inserted in this booklet

FOR EXAMINERS USE ONLY	
Section	Marks
A	
41	
42	
43	
44	
45	

46	
Total	

SECTION A (40 MARKS)

- Which one of the following phyla consists of organisms with guts having only one opening?
 A. Cnidaria and Platyhelminthes
 B. Porifera and Annelida
 C. Porifera and Platyhelminthes
 D. Cnidaria and Porifera
 ☐
- Most of the digestive enzymes that digest food in the small intestine are synthesized in the
 A. Ileum
 B. Pancreas
 C. Stomach
 D. Duodenum
 ☐
- Which of the following is stimulated by the hormone secretin?
 A. secretion of HCO_3^- from the pancreas
 B. secretion of HCL from the stomach epithelium
 C. secretion of digestive enzymes from the pancreas
 D. uptake of glucose from the blood stream by cells throughout the body
 ☐
- Oral rehydration therapy with a solution of sodium chloride and glucose is effective because they both
 A. decrease urine output
 B. facilitate water absorption by the small intestine
 C. help kill the intestinal bacteria
 D. make the person thirsty so stimulate him/her to take more water
 ☐
- If the gross primary production (GPP) of a grassland is $5000 \text{ kcal/m}^2\text{yr}$ and 55% is used up by cellular respiration then its net primary productivity (NPP) in $\text{Kcal/m}^2\text{/yr}$ will be
 A. 2250
 B. 2750
 C. 5000
 D. 7750
 ☐
- The glomerular filtrate is identical with the tissue fluid in the lumen of the

- A. Loop of Henle
B. Distal convoluted tubule
C. Proximal convoluted tubule
D. Bowman's capsule
7. Most of the net primary productivity that is consumed is used for
A. Respiration by primary consumers
B. Respiration by secondary consumers
C. Growth by primary consumers
D. Growth by secondary consumers
8. Which of the following terms best describes bio magnification
A. Biological imaging that provides images or data at fine special scales
B. Conversion of an energy input e.g sunlight to chemical energy in the form of sugars by primary producers
C. Accumulation of certain molecules at high concentration at upper trophic levels
D. Increase in nutrients that lead to pollution
9. Which of the following forces are responsible for capillarity?
A. Adhesion of water molecules to the sides of xylem cells, cohesion of water molecules to each other and surface tension
B. Surface tension created by transpiration and cohesion of water molecules in a continuous flow from leaf to root
C. High solute potential created by the entry of ions during the night when transpiration rates are low, followed by an influx of water
D. Gravity and wall pressure from the sides of xylem cells
10. Why the transport of phloem sap is considered an active transport process?
A. The manufacture of sucrose via photosynthesis is driven by the energy in sunlight
B. Transpiration is driven by the energy in sunlight
C. ATP is used to transport sucrose into companion cells near sources against a concentration gradient
D. In spring phloem sap moves against the force of gravity
11. A decrease in which of the following promotes oxygen release from hemoglobin
A. Temperature
B. Carbon dioxide level
C. Ph.
D. Carbonic anhydrase
12. Which of the following is **not** a function of the transport medium in a mammal?

☐☐☐☐☐☐

- A. Transport respiratory gases
- B. Distribute heat/temperature regulation
- C. Produce new red blood cells
- D. Buffer against PH changes

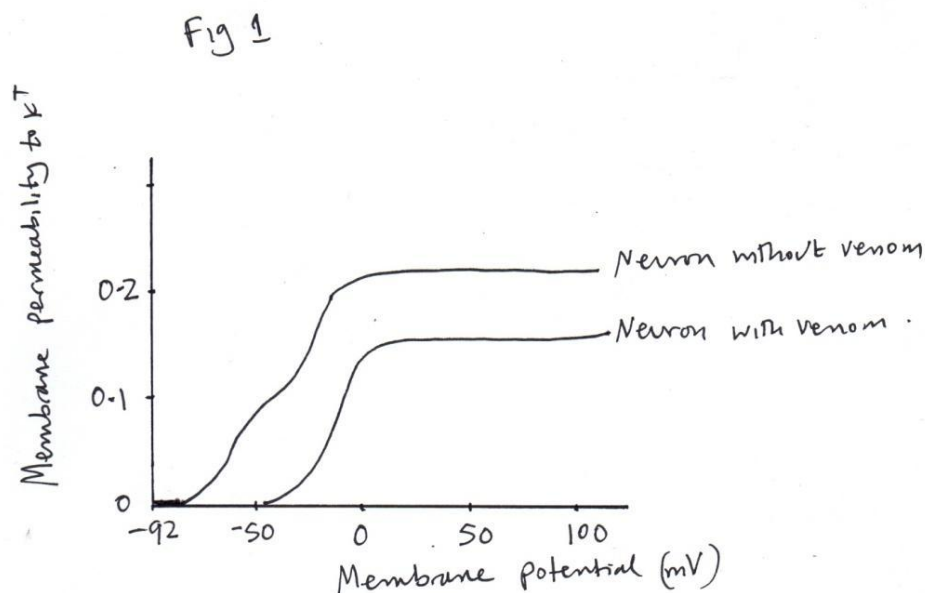
☐

13. The adaptive significance of spiracles in insects is that they

- A. Dilate and constrict during flight or other types of movement functioning as a breathing mechanism
- B. Open into the body cavity allowing direct contact between haemolymph and tissues
- C. They are highly branched offering a large surface area for gas exchange
- D. They close off trachea to minimize water loss

☐

14. Figure 1 shows the membrane permeability to K^+ at different membrane potentials with two similar neurons one with snake venom added to the surrounding medium and the other without



Which of these conclusions can you draw from the data?

- A. The venom opens all K^+ channels
- B. The venom blocks all k^+ channels
- C. There is more than one type of K^+ channel
- D. Snake volume does not affect K^+ movement

☐

15. Which one of the following is a neurotransmitter that stimulates contraction of skeletal muscle

- A. Noradrenalin

☐

- B. Adrenalin
- C. Acetylcholine
- D. Calcium

16. In muscle cells myosin molecules continue moving along actin molecules as long as

- A. ATP is present and troponin is not bound to Ca^{2+}
- B. ADP is present and tropomyosin is released from intracellular stores
- C. ADP is present and intracellular acetylcholine is high
- D. ATP is present and intracellular Ca^{2+} is high

☐

17. Which of the following is critical to the function of most skeletons?

- A. Muscles interact with the skeleton in antagonistic groups
- B. Muscles attach to skeletons by tendons
- C. Muscles extend joints by pushing against skeletal elements
- D. Segments of the body or limb are extended when paired muscles relax in unison

☐

18. A doctor supervising a patient recovering from the surgical removal of the posterior pituitary should expect which of the following symptoms

- A. Cessation of the menstrual cycle
- B. Cessation of growth
- C. Dehydration
- D. High blood glucose level

☐

19. What is the primary difference between the innate and adaptive response in immunity

- A. The innate response does not distinguish between pathogens while the adaptive response does
- B. Only the innate response is triggered by antigens
- C. The adaptive response generates immunological memory and is more specific than the innate response
- D. The innate response does not kill cells the adaptive response does

☐

20. Which of the following describes best the phenomenon of echolocation?

- A. Use of echoes from high frequency vocalizations to detect objects
- B. Use of extremely low frequency vocalizations to communicate over long distances
- C. Vision based on many independent lenses
- D. Variation in the structure of opsin proteins which allow animals to see different colours

☐

21. Considering that sounds and odors both trigger changes in the patterns of action potentials from sensory cells how does the brain perceive which sense is which when the action potential reach the brain

- A. The action potentials stimulated by sounds are different in size and shape from those stimulated by odor
- B. The axons from different sensory neurons go to different areas of the brain
- C. Mechanoreception is not consciously perceived by the brain whereas chemoreception is
- D. Chemoreception is not consciously perceived by the brain whereas mechanoreception is

☐

22. Which of the following is **not** a function of abscissic acid in plants?

- A. Promote seed germination
- B. Are stress hormones
- C. Induce stomatal closure
- D. Inhibit bud growth

☐

23. Which of these best describes a sieve tube element?

- A. Sugar conducting cell found in the phloem
- B. The widened perforation containing water conducting cell found in angiosperms
- C. The nutrients and water absorbing cells found in root hairs
- D. The nucleated and organelle rich support cell found in the phloem

☐

24. Which statement best characterizes primary growth

- A. It does not occur in roots only in shoots
- B. It leads to the development of cork
- C. It produced the dermal ground and vascular tissues
- D. It produces rings of xylem and phloem tissue as well as rings of cork tissue

☐

25. In addition to overall shape how do tracheids differ from vessel elements

- A. Tracheids are stacked end to end to form continuous open columns
- B. In tracheids water flows from cell to cell primarily through gaps in the secondary cell wall called pits
- C. Tracheids are dead at maturity
- D. Tracheids have secondary walls reinforced with lignin

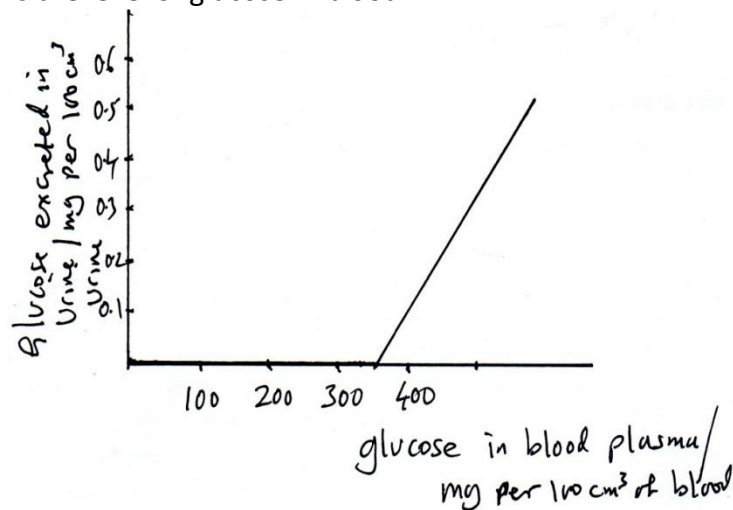
☐

26. Which statement best characterizes secondary growth

- A. It results from the division of the vascular cambium and cork cambium cells
- B. It increases the length of the stem
- C. It results from the division in the apical meristem cells
- D. It often produces phloem cells to the inside and xylem cells to the outside of the vascular cambium

☐

27. Figure 2 shows the level of glucose in blood



From the above figure the threshold at which glucose in the blood is likely to appear in urine is

- A. 100
- B. 90
- C. 250
- D. 350

☐

28. Which of the following would result in better water conservation in desert animals

- A. Thin cortex
- B. Thicker medullar and thin cortex
- C. Thinner medulla
- D. Thinner cortex

☐

29. The section of the nephron which plays an important role in the regard of PH,salt and water burden is

- A. proximal convoluted tubule
- B. Bowman's capsule

☐

- C. distal convoluted tubule
- D. collecting duct

30. What is the advantage of glycolysis since it taps only a small fraction of the energy available in the glucose molecule

- A. It may be used when oxygen is unavailable
- B. It is cyclical so that less substrate is required
- C. It requires no investment of ATP
- D. It is composed only of spontaneous reaction

☐

31. The iron containing cytochrome pigments are involved in which metabolic pathway

- A. Glycolysis
- B. Krebs cycle
- C. Gluconeogenesis
- D. Electron transport chain

☐

32. A fully turgid plant cell was found to have a solute potential value of -350kPa . Its water potential is

- A. $+700$
- B. -350
- C. -330
- D. 0

☐

33. What effect does the antidiuretic hormone have on the nephron

- A. It increases water permeability of the descending limb of the loop of Henle
- B. It decreases water permeability of the descending limb of the loop of Henle
- C. It increases water permeability of the collecting duct
- D. It decreases water permeability of the collecting duct

☐

34. Which of the following organisms would you expect to have the highest concentration of proteins that protect cells from the toxic effects of ammonia

- A. Shark
- B. Fresh water bony fish
- C. Terrestrial reptile
- D. Mammal

☐

35. Which of the following statements is true of fishes that live in freshwater

- A. The environment is isotonic with respect to their tissues. As a result they do not require specialized organs to maintain water and salt balance
- B. They lose water to their environment primarily through the gills which they replace by drinking

☐

- C. Water enters epithelial cells in their gills by osmosis and salt leaves the same cells by diffusion
- D. They have specialized cells that actively pump Na and Cl from blood into epithelial cells so the ions can be excreted
- 36.** A cell can carry out its constant and intensive metabolic cavity with relatively small amounts of such vital components as ATP, NAD⁺, coenzyme A because it can
- A. By pass reactions that require these compounds
- B. Rapidly recycle these compounds
- C. Incur an oxygen debt until these compounds become available
- D. Utilize substitute molecules in place of these components
- 37.** Photorespiration involves the oxidation of the following
- A. Phosphoglyceric acid
- B. Phosphoglyceraldehyde
- C. Ribulose biphosphate
- D. Chlorophyll
- 38.** In the Calvin cycle five of the six Phosphoglyceraldehyde molecules formed by three turns of the cycle are used for the formation of
- A. sugar
- B. more Ribulose biphosphate
- C. more Phosphoglyceraldehyde
- D. more Phosphoglyceric acid
- 39.** If on one day an ecologist caught and marked 90 butterflies in a population. A week later the same ecologist in the same area caught 80 butterflies including 16 that had been marked previously what is the size of the butterfly population
- A. 170
- B. 450
- C. 154
- D. 186
- 40.** Uniform dispersion pattern implies that members of a population
- A. Cooperate in rearing their offspring
- B. Work together to escape from predators
- C. Use resources that are patchily distributed
- D. May experience intraspecific competition for natural resources

☐☐☐☐☐

SECTION B: (60 MARKS)

41. (a) Distinguish between the terms *immunity* and *autoimmunity*. (02 marks)

.....

.....

.....

.....

.....

.....

(b) Suggest *three* key roles played by the body's immune system. (03 marks)

.....

.....

.....

.....

.....

.....

(c) State *three* ways body openings are protected from entry of pathogens. (03 marks)

.....

.....

.....

.....

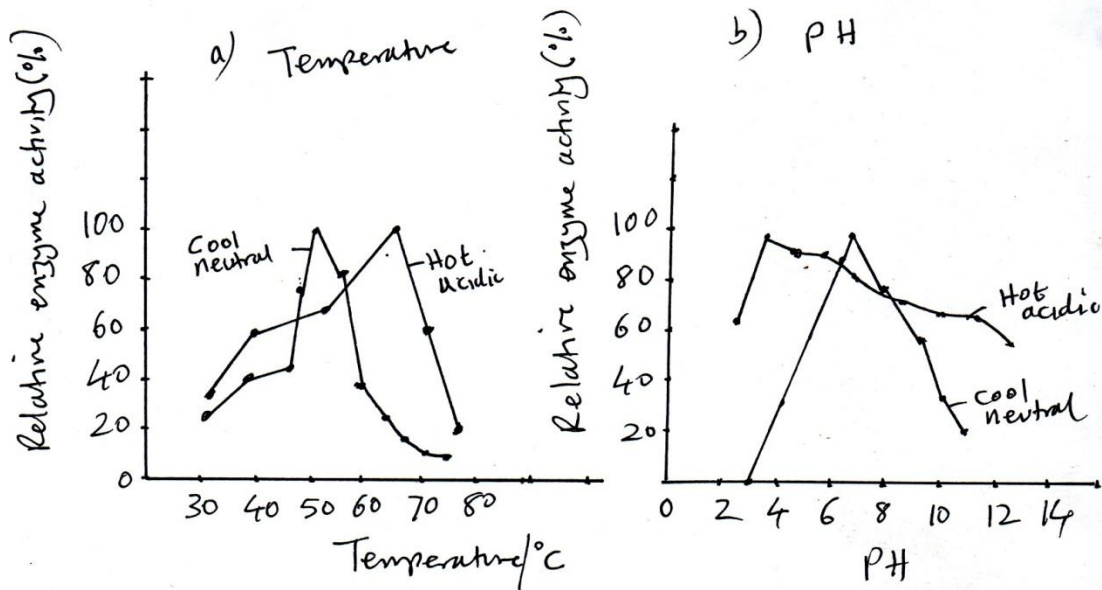
(d) State **two** human diseases resulting from autoimmune disorders. (02 marks)

.....

.....

42. Figure 3 shows the activity of bacterial enzymes at different pH and temperature:

Fig 3



(a) Which graph represents the bacteria that live in:

(i) Cool and neutral conditions..... (½ marks)

(ii) Hot and acidic conditions..... (½ marks)

(b) Compare the changes in enzyme activity with temperature and pH for organisms that live in hot and acidic environment to those that live in cool and neutral environment.

(04 marks)

.....

.....

.....

.....

.....

.....

.....

.....

(c) With reference to enzyme structure explain how the following factors affect enzyme activity:

(i) pH. **(02 marks)**

.....

.....

.....

.....

.....

(ii) Temperature. **(01 mark)**

.....

.....

.....

.....

.....

(d) Explain why the same enzyme may be able to work at different optimum PH and temperature conditions in similar organisms living in different environments. **(02 marks)**

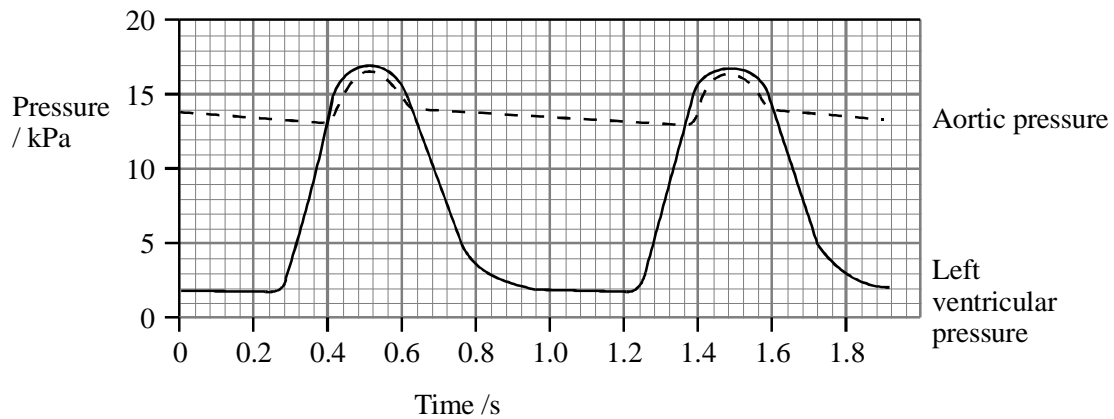
.....

.....

.....

43. Figure 4 shows changes in the blood pressure in the aorta and the left ventricle during two complete cardiac cycles.

Fig 4



- (a) On the graph, draw an arrow to show when the left atrioventricular (mitral) valve closes. **(01 mark)**

- (b) Use the information in the graph to calculate the heart rate. Show your working.

.....

.....

.....

.....

.....

(03 marks)

- (c) During the cardiac cycle, the pressure in the left ventricle falls to a much lower level than in the aorta. Suggest an explanation for this difference. **(03 marks)**

.....

.....

.....

.....

(d) During the cardiac cycle, the pressure in the right ventricle rises to a maximum of about 3.3 KPa. Suggest reasons for the difference between this pressure and the maximum pressure in the left ventricle. **(03 marks)**

.....

.....

.....

.....

.....

44. Carbohydrates in the human diet are important sources of energy. Much of the carbohydrate is supplied in the form of starch. It is now known that the type of starch present in potatoes, bread and some breakfast cereals is more rapidly digested than the starch found in beans, peas and lentils, pasta and wholegrain cereals. The latter is referred to as 'slow release' starch.

(a) Explain **one** way in which the structure of a starch molecule is related to its function of storage. **(01 mark)**

.....

.....

.....

.....

.....

(b) Complete the table¹ below by writing in the names of the two enzymes involved in the complete digestion of starch in the human gut, and their sources. **(02 marks)**

Table 1

Name of enzyme	Source of enzyme
	S

(c) An investigation was carried out into the changes in blood glucose levels that occur after eating meals containing different types of starch. The blood glucose levels of two groups of volunteers, Group **A** and Group **B**, were measured and recorded immediately before eating a meal and then at 30 minute intervals for 240 minutes afterwards. None of the volunteers had diabetes.

The meal eaten by Group **A** contained cornflakes and white bread toast.

The meal eaten by Group **B** contained pasta and beans.

(d) Suggest **one** reason why the starch stored in wholegrain cereals and beans may not be digested as readily as the starch in bread and potatoes. **(01 mark)**

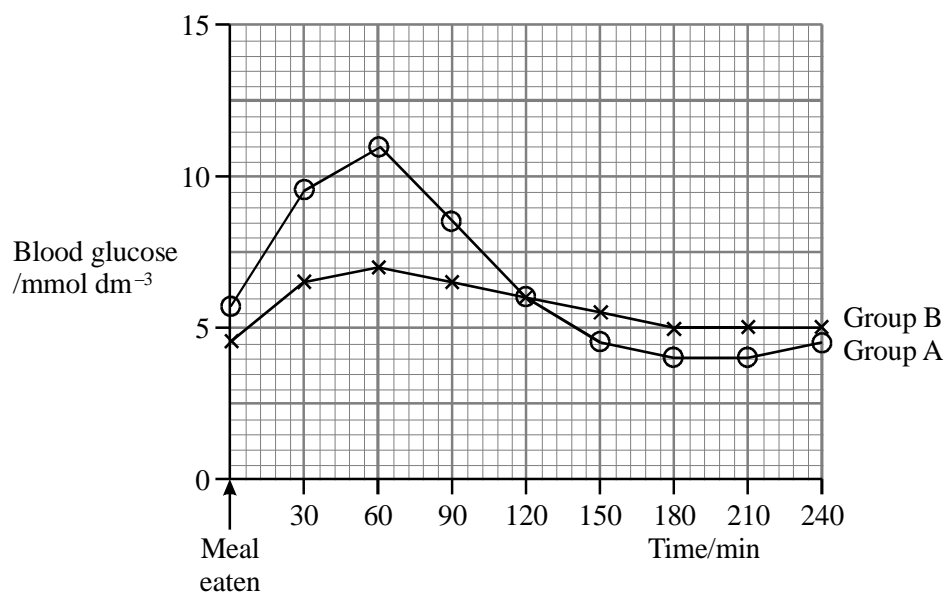
.....

.....

.....

The mean blood glucose levels, in mmol dm^{-3} , for each group were calculated and the results are shown on the graph in figure 5. The normal level of glucose in the blood is about 5.0 to 5.5 mmol dm^{-3} .

Figure 5



- (i) Compare the changes in the blood glucose levels of Group A with those of Group B throughout the period of the investigation. **(03 marks)**

.....

.....

.....

.....

.....

- (ii) Suggest explanations for the differences in the blood glucose levels of the two groups. **(03 marks)**

.....

.....

.....

.....

.....

.....

45. Locusts are insects that are capable of flying for relatively long periods of time.
When flying, locusts use carbohydrates and lipids as energy sources.

An experiment was carried out to investigate changes in the concentration of monosaccharides and lipids in the blood of a locust, during flight.
Measurements were made of the concentrations of monosaccharide and lipid at the beginning of the flight and at 60 minute intervals during the flight.

The results are shown in the table **2** below.

Table 2

Time during flight/min	Concentration of monosaccharide / g mm ⁻³	Concentration of lipid / g mm ⁻³
0	30.0	3.0
60	13.0	10.0
120	12.0	19.0
180	11.5	20.0
240	11.0	20.0
300	11.0	20.0

(a) Compare the changes in the concentration of monosaccharide with the changes

in the concentration of lipid during the flight.

(04 marks)

.....

.....

.....

.....

.....

(b) Suggest an explanation for the changes in the concentrations of both of these compounds during the flight.

(04 marks)

.....

.....

.....

.....

.....

(c) In this investigation, the mass of stored glycogen in the locust was also measured and was found to decrease by 390 g during the flight. Suggest an explanation for this change in the mass of glycogen.

(02 marks)

.....

.....

.....

46. Raw sewage from homes is taken to sewage works for treatment. The sewage enters large tanks where the solids settle to the bottom. The water is removed and treated. Any ammonia present is oxidized to nitrate. The effluent (treated water) is released into a local river.

The quality of the effluent has to meet certain standards. For example, the biochemical oxygen demand must not be greater than 20 mg per dm³ and suspended solids must not exceed 30 mg per dm³. The effluent is tested regularly to ensure that the limits are not exceeded.

Table 3 shows the results of an analysis of the effluent from a sewage treatment works over a six-month period.

Table 3	March	April	May	June	July	August
Suspended solids/mg dm ⁻³	26	26	33	28	21	12
Biochemical oxygen demand/mg dm ⁻³	15	21	25	32	10	7
Nitrate/mg dm ⁻³	4.7	9.1	17.0	20.0	0.5	14.0

- (a) During this six-month period, the pumping equipment at the sewage works failed and raw sewage entered the river. In which month did the pumping equipment fail? Give **one** reason for your answer. **(01 mark)**

.....

.....

(b) Effluent may contain suspended solids. Describe the effects that the suspended solids may have on the aquatic plants in the river. **(02 marks)**

.....

.....

.....

.....

.....

(c) Explain why the effluent had a high biochemical oxygen demand (BOD) during the months of May and June. **(02 marks)**

.....

.....

.....

.....

.....

(d) Describe **two** adaptations shown by aquatic invertebrates to a low oxygen environment. **(02 marks)**

.....

.....

.....

(e) Describe the changes that might have taken place in the aquatic community

following the discharge of raw sewage into the river.

(03 marks)

.....

.....

.....

.....

.....

END