

Write your name here

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Centre Number

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Candidate Number

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Biology

Unit: KBI0/4BI0

Science (Double Award) KSC0/4SC0

Paper: 1B

Wednesday 7 January 2015 – Afternoon

Time: 2 hours

Paper Reference

KBI0/1B 4BI0/1B
KSC0/1B 4SC0/1B

You must have:

Ruler

Calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Show all the steps in any calculations and state the units.
- Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Information

- The total mark for this paper is 120.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions.

- 1** (a) The table lists the effects of some hormones.

Complete the table by naming each hormone and its source.

The first one has been done for you.

(5)

Effect	Name of hormone	Source
converts glucose to glycogen	insulin	pancreas
stimulates male secondary sexual characteristics		testis
increases permeability of the collecting duct		
repairs the uterus lining		

- (b) Cells do not store glucose. Instead it is converted into glycogen to be stored.

Suggest why cells do not store glucose.

(2)

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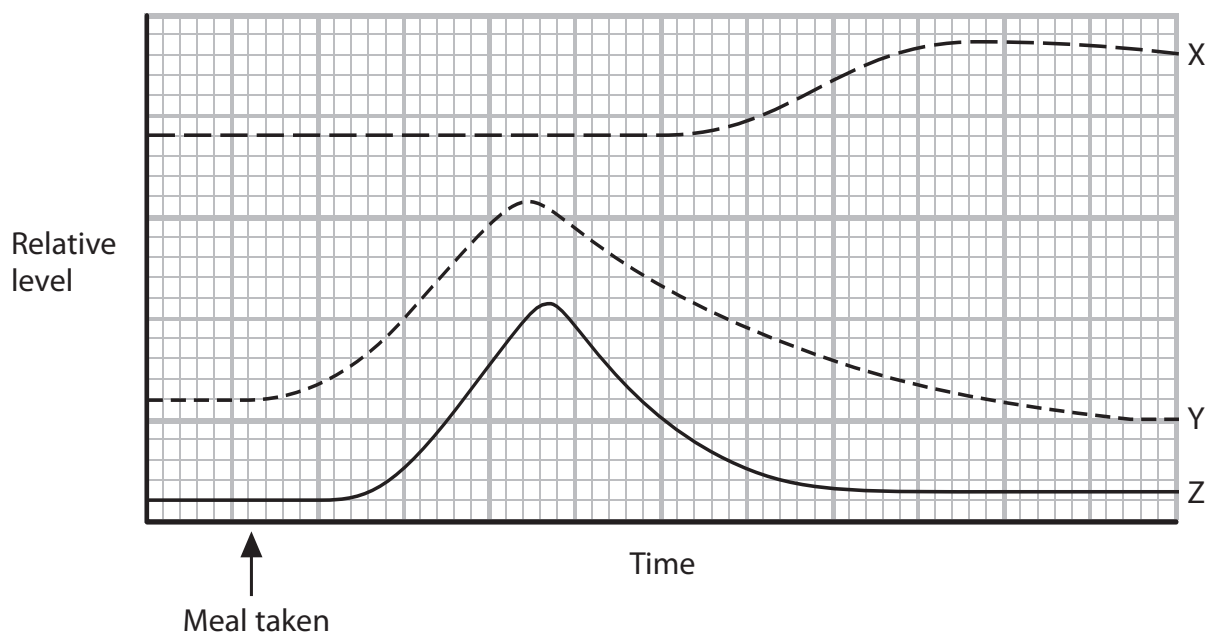
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- (c) The graph shows changes in the relative level of glucose, glycogen and insulin before and after a meal.



Give the letter of the line which represents changes in the relative level of glycogen.

(1)

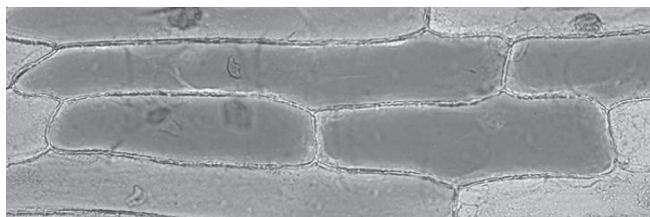
(Total for Question 1 = 8 marks)



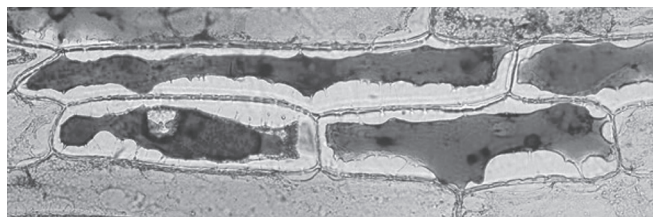
P 4 4 2 4 8 A 0 3 2 8

- 2 A student takes two strips from the epidermis of an onion and places one in distilled water and the other in concentrated salt solution.

She then uses a camera to photograph a sample of these cells under a microscope.



cells in distilled water



cells in salt solution

- (a) Suggest why a red onion is often used when carrying out this investigation.

(1)

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- (b) (i) The differences in the appearance of the plant cells are due to osmosis.

Explain what is meant by the term **osmosis**.

(2)

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(ii) Explain why the cells in distilled water look different when compared to the cells in salt solution.

(4)

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(c) If red blood cells are placed in distilled water and examined under a microscope no cells are seen.

Explain why no red blood cells would be seen.

(2)

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(Total for Question 2 = 9 marks)

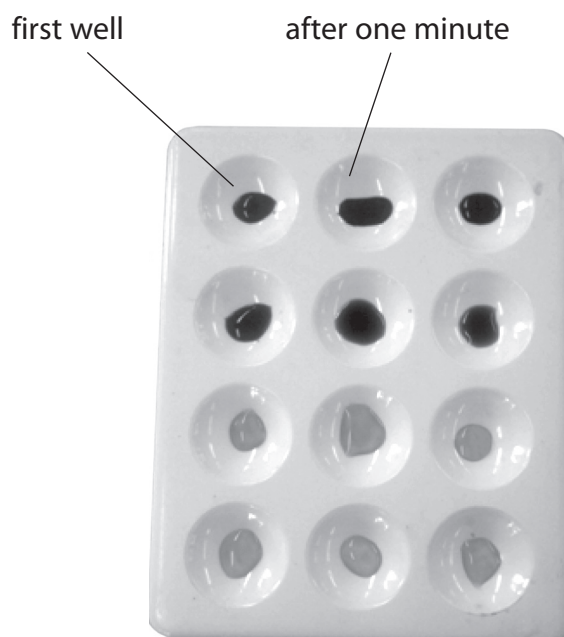


3 A student investigates the effect of temperature on the rate of starch digestion by amylase. He carries out the first trial of his investigation at a room temperature of 20°C.

He carries out the following steps in his investigation.

- 1 He puts one drop of iodine suspension into each of 12 wells on a spotting tile.
- 2 He then takes up 10 cm³ of 10% starch suspension into a syringe.
- 3 He adds one drop of the starch suspension from the syringe to the first well in the spotting tile and records the colour change.
- 4 He rinses the outside of the syringe with water from a tap.
- 5 He then takes up exactly 5 cm³ of 5% amylase suspension into the same syringe containing the 10% starch suspension.
- 6 He starts a stopwatch.
- 7 He then rocks the syringe containing the mixture gently backwards and forwards for one minute.
- 8 He adds one drop of the mixture from the syringe to the next well in the spotting tile and records the colour change.
- 9 He repeats this at intervals of one minute until he has added starch and amylase mixture to all of the wells.
- 10 He then repeats steps 1–9 but this time he uses iodine, amylase and starch suspension that have been stored in a water bath at 40°C.
- 11 He also keeps the syringe containing the mixture in the water bath at 40°C between drops.

The photograph shows his results for 20°C at the end of the experiment when all the wells have mixture added.



(a) (i) Give one safety precaution the student should take when carrying out this investigation.

(1)

(ii) How many minutes do the samples of mixture added to the spotting tile in the photograph represent?

(1)

(b) Explain the purpose of the following steps in the student's experiment.

(i) step 4

(1)

(ii) step 7

(1)

(iii) step 11

(1)

(c) (i) Identify two variables that the student controls in his experiment.

(2)

1

2

(ii) Name the independent variable that the student is investigating.

(1)



P 4 4 2 4 8 A 0 7 2 8

(d) Using the photograph, explain how many minutes it took for the reaction to be completed at 20°C.

(3)

(e) The results for the spotting tile at 40°C would be different from the trial carried out at 20°C.

(i) Describe how the appearance of the results will be different.

(2)

(ii) Explain the difference in the appearance of the results.

(2)

(Total for Question 3 = 15 marks)



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4 Arteries and veins are important blood vessels in the circulatory system.

(a) Describe two ways in which the structure of an artery differs from the structure of a vein.

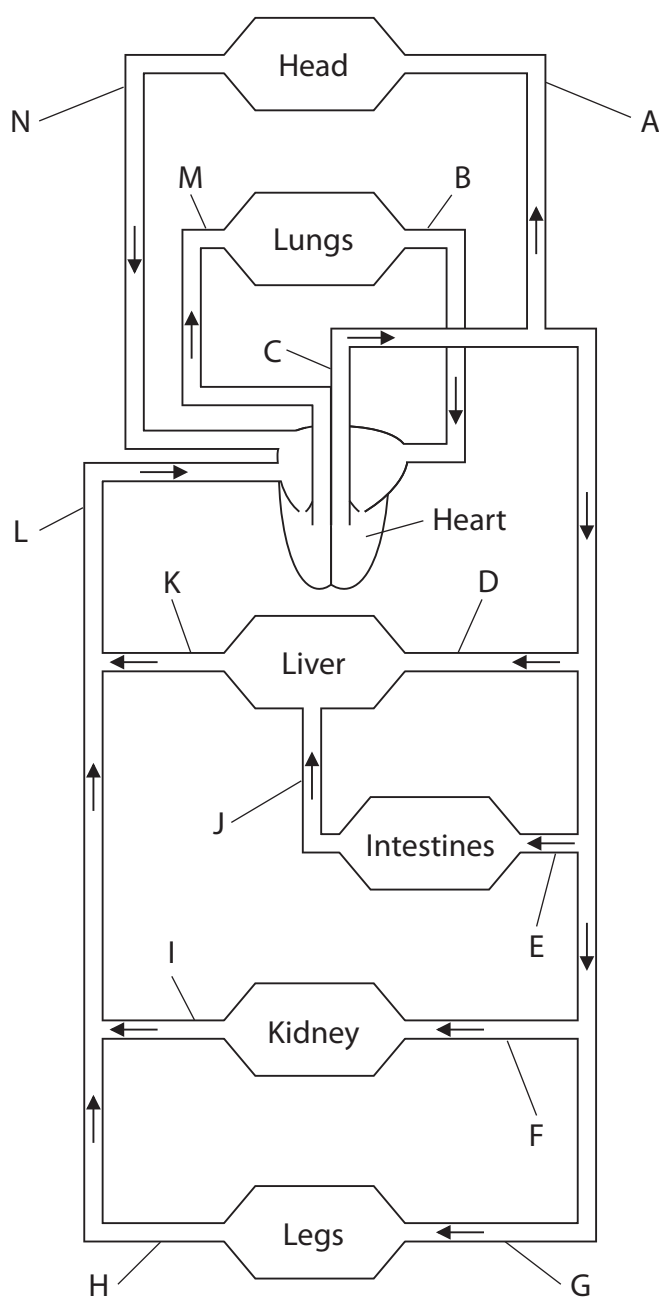
(2)

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(b) The diagram shows the human circulatory system.

The blood vessels are labelled with letters.



- (i) The table names some of the blood vessels in this circulatory system.

Complete the table by giving the letter for each blood vessel.

The first one has been done for you.

(4)

Name of blood vessel	Letter
vena cava	L or N
aorta	
pulmonary vein	
hepatic artery	
renal vein	

- (ii) The plasma in the blood vessels can contain different concentrations of substances.

Complete the table by giving the letter for the blood vessel that matches the contents.

(3)

Contents of blood vessel	Letter of blood vessel
contains the most glucose after a meal	
contains the least urea	
contains the least oxygen	

(Total for Question 4 = 9 marks)



5 Explain how the rate of transpiration is affected by changes in the environment.

(5)

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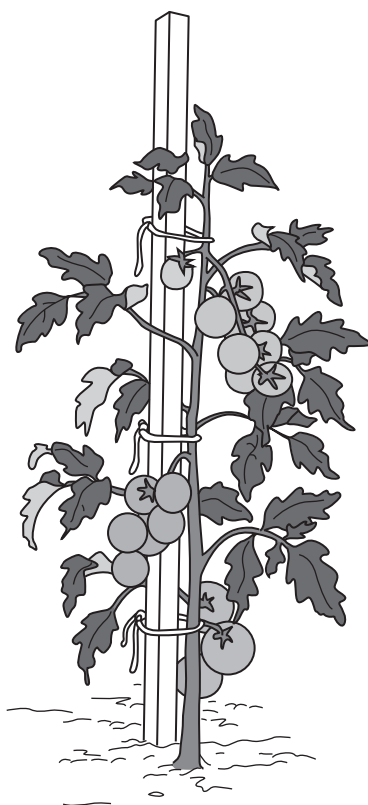
(Total for Question 5 = 5 marks)



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- 6 The picture shows a tomato plant grown in a glasshouse.



The production of tomatoes is affected by an insect pest called the tomato leaf miner. The photograph shows a tomato leaf that has been damaged by the tomato leaf miner.



The adult female leaf miner lays eggs on tomato leaves that develop into maggots (larvae). These maggots feed on leaf mesophyll tissue inside the leaf.



(a) Explain how feeding on mesophyll tissue will affect tomato production.

(3)

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(b) (i) Pesticide are no longer successful in controlling the pest because the population of resistant forms of the leaf miner has increased.

Use your knowledge of natural selection to explain why the population of resistant forms of the leaf miner has increased.

(4)

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(ii) Suggest one other reason why using pesticide spray to control the leaf miner has not been successful.

(1)

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- (c) The release of an insect species called *Trichogramma* has been successful in controlling the leaf miner. *Trichogramma* feeds on the leaf miner.

Name this type of pest control.

(1)

- (d) Suggest why the release of sterile male tomato leaf miners has also been successful in controlling the leaf miner.

(2)



- Design an investigation to find out if a pheromone trap would help to control the leaf miner.

Your answer should include experimental details and be written in full sentences.

(6)

[illegible]

(Total for Question 6 = 17 marks)



7 When plants die they may decompose.

(a) Explain what is meant by the term **decompose**.

(2)

(b) The dead plant material in soil is called humus and is used as food by earthworms.
These worms are eaten by birds.

Use this information to draw a food chain.

(2)



- (c) It is possible to measure the mass of humus in soil. The method involves drying the soil and then burning the dried soil.

The formula below can then be used to calculate the percentage humus.

$$\frac{\text{mass of dried soil} - \text{mass of burnt soil}}{\text{mass of dried soil}} \times 100$$

A robbery took place at a bank. The robber used the garden to gain entry to the bank. Three people were suspected of robbing the bank. The table gives data about the soil in the garden and on the shoes of suspects A, B and C.

- (i) Complete the table by using the formula to calculate the percentage humus in the soil from the shoe of suspect B.

(1)

Soil from	Mass of dried soil in g	Mass of burnt soil in g	Percentage humus
garden	10	9	10
shoe of suspect A	5	4.2	16
shoe of suspect B	5	4	
shoe of suspect C	5	4.5	10

- (ii) Which suspect is most likely to be the robber?

(1)

- (iii) The suspect who was accused of being the robber claimed that the result was not reliable.

Do you agree with the suspect? Give a reason for your answer.

(1)

(Total for Question 7 = 7 marks)



8 In digestion large food molecules are broken down into small food molecules by enzymes.

(a) Use this information to complete the table.

(5)

Large food molecule	Enzyme involved in digestion	Small food molecule produced
starch	amylase	
	protease	
lipid		

(b) The small food molecules can be absorbed into the blood by villi in the small intestine.

Give three ways in which villi are adapted to absorb small food molecules.

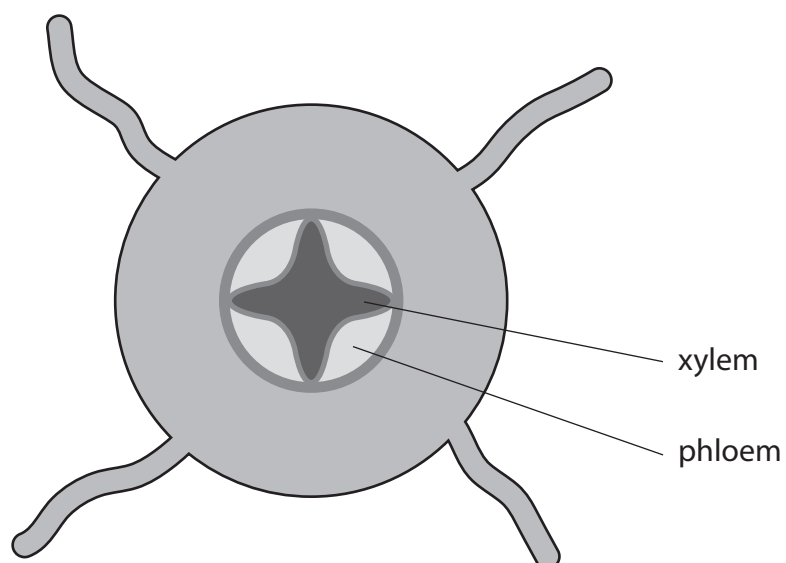
(3)

- 1.....
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- 2.....
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- 3.....
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(Total for Question 8 = 8 marks)



9 The diagram shows a section through the root of a plant.



(a) Name two substances that are transported in the xylem.

(2)

1

2

(b) Draw and label a root hair cell in the following space.

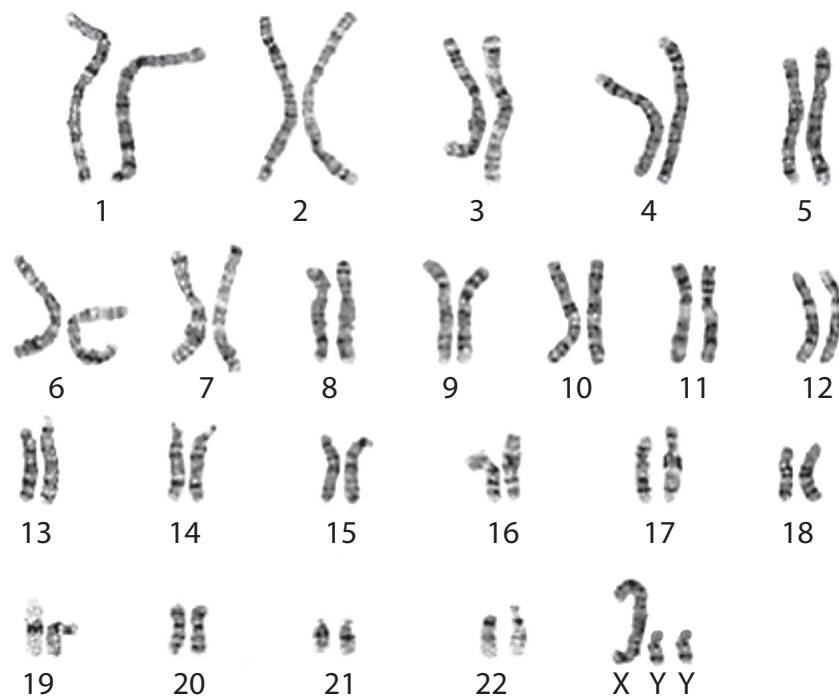
(5)

(Total for Question 9 = 7 marks)



P 4 4 2 4 8 A 0 2 1 2 8

- 10** The photograph shows the chromosomes from a body cell of a person. This person has a rare condition that affects their chromosomes.



- (a) (i) How many chromosomes are shown in this photograph?

(1)

- (ii) State the sex of the person the chromosomes were taken from.

(1)

- (b) Describe how the chromosomes in the photograph differ from those found in a typical human body cell.

(2)



(c) The rare condition leads to the formation of abnormal sperm cells.

(i) Name the cell division that produces sperm cells.

(1)

(ii) Suggest how an individual with the chromosomes shown could be produced.

(2)

(Total for Question 10 = 7 marks)



P 4 4 2 4 8 A 0 2 3 2 8

11 Marfan syndrome is a rare genetic condition of the body's connective tissues. It can result in a person being tall with abnormally long and slender limbs, fingers and toes. It may also affect the heart and eyes.

Children with the condition usually inherit it from one of their parents. It is caused by a dominant allele (M) and not the recessive allele (m).

(a) A homozygous recessive male mates with a heterozygous female.

Use a genetic diagram to show the parental genotypes, the gametes produced and the possible genotypes and phenotypes of the offspring.

(4)

Parents genotypes

Gametes

Offspring genotypes

Offspring phenotypes



(b) A person wanted to find out if he had Marfan syndrome. He asked his doctor for advice.

- (i) Use the information about the symptoms of Marfan syndrome to explain why it is difficult for the doctor to decide if the person has the condition.

(1)

- (ii) Suggest what other information the doctor could use to decide if the person has Marfan syndrome.

(2)

- (c) Many genetic disorders are caused by a recessive allele rather than a dominant allele.

Explain how examining a family pedigree would enable you to tell if a condition was caused by a recessive allele.

(3)

(Total for Question 11 = 10 marks)



12 The passage describes the study of organisms and their ecosystems.

Complete the passage by writing a suitable word in each of the spaces.

(8)

Ecology is the study of the interaction of the organisms in an ecosystem with their This is made up of biotic or living factors and abiotic or non-living factors.

In an ecosystem a group of organisms of the same species living in one place is a Different groups of species living in the same place or habitat is called a

To study the number and distribution of plants in an area, a wooden or metal frame is used. This is called a To compare numbers of organisms in two areas several frames need to be placed at places in each area.

The numbers in each frame are combined and then divided by the total number of frames.

This is done to calculate the for each area. By using several frames we improve the of the data and make it easier to detect any results.

(Total for Question 12 = 8 marks)



14 Bacteria, fungi and viruses have different structures.

The table lists some structures.

In each box, place a tick (✓) if the structure is present or a cross (✗) if the structure is absent.

One has been done for you.

(3)

Structure	Group		
	bacteria	fungi	viruses
cell wall			
nucleus			
chloroplast	✓		

(Total for Question 14 = 3 marks)

TOTAL FOR PAPER = 120 MARKS

