

SECTION A

QUESTION 1

- 1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.
- 1.1.1 A relationship in which organisms of two species interact and both benefit, is known as ...
 A. Commensalism
 B. Parasitism
 C. Predation
 D. Mutualism
- 1.1.2 The social organization that enhances the survival of a species is
 A. External fertilization
 B. Division of labour amongst members of a colony
 C. Symbiosis between members of a species
 D. The emigration rate exceeds the immigration rate
- 1.1.3 In a logistic growth form.....
 A. The graph is J - shaped
 B. The population grows like the way money grows by compound interest
 C. The second phase is called the geometric phase
 D. The lag phase is where growth is slow because of environmental resistance

QUESTIONS 1.1.4 AND 1.1.5 ARE BASED ON THE INFORMATION BELOW.

Population size can be estimated using the formula below:

$P = \text{population estimate}$

$M = \text{number of organisms captured and marked}$

$C = \text{number of organisms recaptured (second capture)}$

$R = \text{number of marked organisms in second capture}$

$$P = \frac{M \times C}{R}$$

In an investigation to estimate the fish population in a certain dam, the following data was obtained:

Fish captured, marked and released = 40

Marked fish in the second capture = 12

Unmarked fish in the second capture = 48

Please turn over / 1.1.4 The

- 1.1.4 The estimated size of the fish population is.....

A. 1920
 B. 160
 C. 200
 D. 100

- 1.1.5 The validity of the investigation could be decreased if the

A. Investigation was repeated and the average estimate calculated
 B. Mark used was harmless to the fish
 C. Second capture was done long after the first capture
 D. Owner of the dam did not grant permission for the investigation to be done

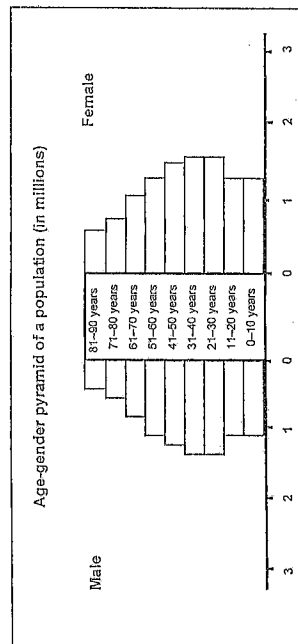
- 1.1.6 The table below shows the birth and death rates of four different countries in a particular year.

Country	Birth rate (per 1 000 of population)	Death rate (per 1 000 of population)
1	15	16
2	60	24
3	40	15
4	42	10

Which country showed the highest population growth in the year?

A. Country 1
 B. Country 2
 C. Country 3
 D. Country 4

QUESTIONS 1.1.7 AND 1.1.8 ARE BASED ON THE AGE-GENDER PYRAMID SHOWN BELOW.



Please turn over / 1.1.7 The age.....

1.1.7 The age-gender pyramid shown above is for a developed country since.....

- A. The number of newborn are high
- B. There are more young people than old people
- C. There are more females than males in each age group
- D. The life expectancy of the population is high

1.1.8 Which ONE of the following can be correctly deduced from the age-gender pyramid shown on page 3?

- A. There are less than 2 million people between 0 to 10 years
- B. There are more males than females in the age group 11 to 20 years
- C. The birth and death rates are about the same
- D. There are more females than males who are 50 years and older

1.1.9 All the organisms in a given area as well as the abiotic factors with which they interact are best described as a/an.....

- A. Community
- B. Ecosystem
- C. Habitat
- D. Population

1.1.10 Which of the following is an example of predation?

- A. Bees visiting a flower
- B. Ticks on a dog
- C. A lion catching a zebra
- D. A bird's nest in a tree

(10 x 2) (20)

1.2 Give the correct biological term for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.5) in the ANSWER BOOK.

- 1.2.1 The process in animal cells when lactic acid is formed.
- 1.2.2 The use of latest advancements in technology to promote research and development in the biological sciences.
- 1.2.3 Organelle responsible for cellular respiration.
- 1.2.4 Elongated mesophyll tissues in the leaf organ.
- 1.2.5 Chemical used to extract the chlorophyll when testing a leaf for starch

(5)

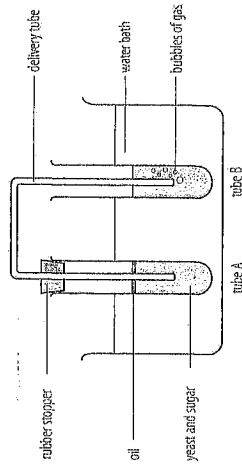
Please turn over / 1.3 Indicate.....

1.3 Indicate whether each of the statements in COLUMN I applies to A ONLY, B ONLY, BOTH A AND B or NONE of the items in COLUMN II. Write A only, B only, both A and B or none next to the question number (1.3.1 to 1.3.5) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Use of the same resources by two species, but in different ways.	A. Resource partitioning B. Competitive exclusion
1.3.2 Colonisation of a habitat that was previously unoccupied.	A. Primary succession B. Secondary succession
1.3.3 Competition between cows and goats for grass.	A. Inter-specific B. Intra-specific
1.3.4 The mature community of plants that remains relatively stable with few, if any, changes over time.	A. Pioneer B. Climax
1.3.5 Controlled factors in a commercial greenhouse	A. Amount of chlorophyll B. Transpiration

5 x 2 = (10)

1.4 A test tube containing some yeast and sugar solution was placed in a water bath as shown in the diagram. After 10 minutes the rate of bubble production in tube B was measured.



The experiment was repeated with the water bath at different temperatures. The results are recorded in the table below.

Temperature (°C)	10	20	30	40	50	60
Number of gas bubbles produced per minute	4	10	18	24	27	12

1.4.1 State the AIM for this experiment.

(1)

1.4.2 State the:

- a) independent variable
- b) dependent variable

(2)

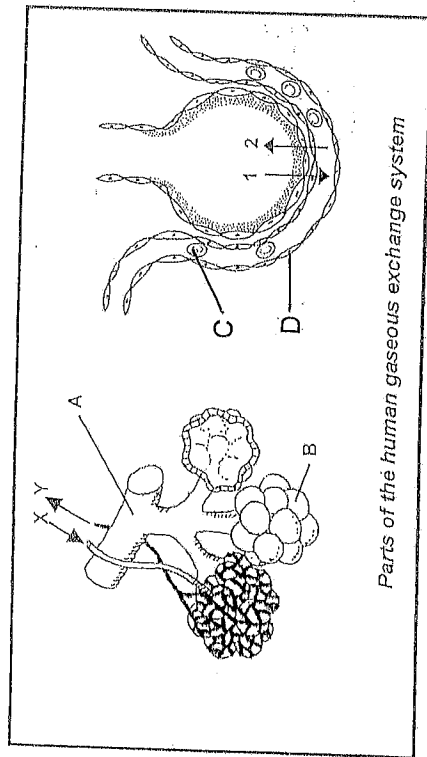
Please turn over / 1.4.3 Name the.....

1.4.3 Name the:

- process taking place in the yeast cells.
- gas that is produced.

(2)
(5)

1.5 Study the diagrams and answer the questions that follow:



1.5.1 Identify:

- parts A and B
- the process represented by 1 and 2

(2)
(1)

1.5.2 With regards to the carbon dioxide and oxygen concentrations, which one will be the highest at:

- X?
- Y?

(1)
(1)

1.5.3 Name the cells at:

- C
- D

(1)
(1)

1.5.4 List THREE features visible in the diagram which make the above structure efficient in its functions.

(3)
(10)

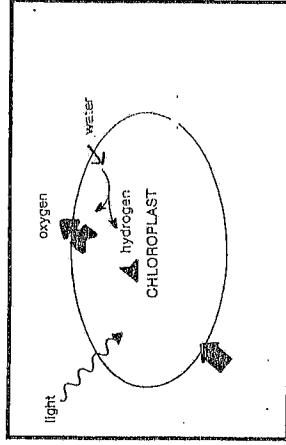
Total Section A : 50

Please turn over / SECTION B ...

SECTION B

QUESTION TWO

2.1 The diagram below is a simplified illustration of a cell organelle involved in a biological process.



2.1.1 Name the STAGE of the biological process illustrated. (1)

2.1.2 Describe what happens to the HYDROGEN mentioned in the diagram, in the next phase of this process. (4)

2.1.3 Draw a fully labelled diagram of the chloroplast. (6)
(11)

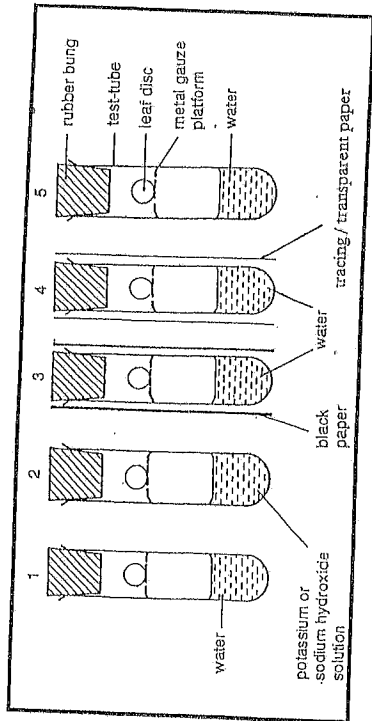
2.2 Two potted plants of different species, A and B were destarched. A leaf from each of the plants A and B was tested for starch using iodine solution. In both cases the leaf became a yellow-brown colour.

With the aid of a cork-borer (a cutting instrument), four leaf discs were cut from another leaf of plant A. One disc was placed in each of the four test tubes numbered 1, 2, 3 and 4, as shown in the diagram on PAGE 8.

A disc was cut from plant B and placed in test tube 5.

The test tubes were set up as shown in the diagram below and were placed at equal distances from a bright light source for several hours.

Please turn over / DIAGRAM



Each leaf disc was then removed from the test tube and tested for starch using iodine solution.

The results for all the test tubes, except for test tube 4, are shown in the table below.

Test tube number	LEAF DISCS CUT FROM PLANT A				LEAF DISCS CUT FROM PLANT B	
	1	2	3	4	5	
Results: colour with iodine	blue-black	yellow-brown	yellow-brown		yellow-brown	

- 2.2.1 Why did both leaves become yellow-brown using iodine at the beginning of the investigation? (2)
- 2.2.2 State ONE precaution the investigator would need to take when setting up the above investigation. (2)
- 2.2.3 Using the results shown in the table, state which leaf disc/s (1, 2, 3, 5) has/have produced starch. (2)
- 2.2.4 Explain why the results in test tube 4 is likely to be different from that in test tube 3. (2)
- 2.2.5 Suggest a reason for the result of the starch test in test tube 2. (2)
- 2.2.6 The leaf discs in test tubes 1 and 5 have been treated in the same way. Provide ONE reason why the results in these test tubes are different. (12)

Please turn over / 2.3 Diabetes

2.3 Diabetes mellitus is usually linked to the body mass index (BMI), which is calculated as follows:

$$\text{BMI} = \frac{\text{mass (kg)}}{\text{Height}^2 (\text{m}^2)}$$

An investigation was done to determine the relative risk of developing diabetes mellitus in females for each BMI.

The results are shown in the table below:

Body mass index (BMI) (kg/m ²)	Relative risk of developing diabetes mellitus in females (%)
<20	7.5
20-25	18.0
26-30	37.5
31-35	57.0
>35	74.5

[Adapted from American Association, March 2007]

- 2.3.1 Draw a histogram using the data in the table. (6)
- 2.3.2 Name the hormone that is deficient in these females, that is resulting in diabetes mellitus. (1)
- 2.3.3 Name the organ that secretes the hormone that you mentioned in QUESTION 2.3.2. (1)
- 2.3.4 State TWO ways of treating diabetes mellitus. (2)
- 2.4 Read the passage below and answer the questions that follow. (10)

THE DESTINY OF CHINA

In 1978, the Chinese government decided that it was necessary to use its influence to slow down the population growth rate in order for all people to have sufficient food and a reasonable quality of life. The population growth rate in 1971 was 2.3%. The government goals were to reduce it to 0% by the year 2000. By 1988 it was at 1%.

A one-child policy was introduced in which couples with one child would be rewarded with good jobs, good housing, a bonus of an extra month's salary, as well as free education and medical care for the child.

[Adapted from *Integrated Science, Systems and Diversity*, 1995]

Please turn over / 2.4.1 State a

- 2.4.1 State a direct method that is used to determine the human population size. (1)
- 2.4.2 From the passage, give TWO reasons why the Chinese government decided it was necessary to slow down the population growth rate. (2)
- 2.4.3 Explain how the one-child policy can influence the population size over many generations. (2)
- 2.4.4 In a country that values the birth of a son more than that of a daughter, explain how the one-child policy could influence the gender structure of the population. (2)

[40]

QUESTION THREE

- 3.1 Study the following diagram and table and answer the questions that follow.

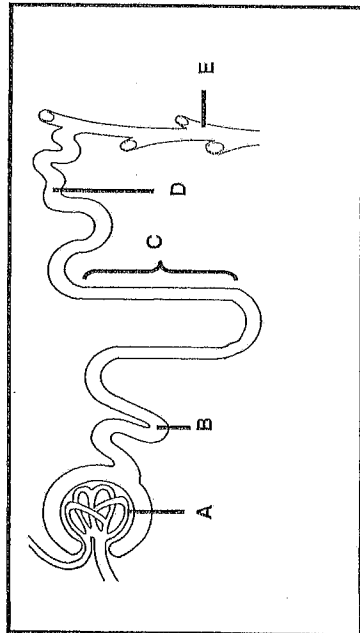


Table showing some substances moving through different parts of the structure represented by the above diagram

Substance	Amount moving through A daily	Amount moving through E daily	Amount absorbed daily
Water	180 litres	?	178.5 litres
Glucose	180 g	?	180 g
Urea	60 g	35 g	?

- 3.1.1 Identify the structure represented by the diagram. (1)
- 3.1.2 Identify parts C, D and E. (3)
- 3.1.3 Name the physical process that takes place at B. (1)

Please turn over / 3.1.4 Explain ...

- 3.1.4 Explain THREE ways in which the cells in part B are structurally suited for the process named in QUESTION 3.1.3. (6)
- 3.1.5 Refer to the table and state how much (2)
 (i) water is lost in the urine
 (ii) urea (in grams) will be re-absorbed in a normal healthy person. (1)
- 3.1.6 How would you explain the following? (2)
 (i) The presence of protein in D
 (ii) The absence of glucose in C (2)
- 3.1.7 Describe the relationship between this structure and the adrenal gland in maintaining the balance of salts in the body. (5)

(23)

- 3.2 Some of the substances in the blood flowing to and from the liver are listed in the table below:

HEPATIC PORTAL VEIN	Concentration in grams per 100 cm ³	HEPATIC VEIN	Concentration in Grams per 100 cm ³
Glucose	1,20	Glucose	0,10
Amino acids	0,08	Amino acids	0,04
Urea	0,001	Urea	0,03
Carbon dioxide	low	Carbon dioxide	high

- 3.2.1 Name the organ from which the hepatic portal vein transports blood. (1)
- 3.2.2 Calculate the difference in the amino acid concentration between the hepatic portal vein and the hepatic vein. Show working. (2)
- 3.2.3 Account for the glucose in the hepatic portal vein. (3)
- 3.2.4 Explain the difference in the concentration of glucose in the hepatic portal vein and the hepatic vein. (5)
- 3.2.5 Explain why the concentration of urea in the hepatic vein is higher than that in the hepatic portal vein. (4)
- 3.2.6 Suggest a reason why the hepatic vein has a higher concentration of carbon dioxide than the hepatic portal vein. (2)

(17)

[40]

Please turn over / SECTION C.....

SECTION C

QUESTION FOUR: ESSAY

4. Increased physical activity increases the need for more energy. Describe the phase of cellular respiration where energy is made available and discuss how the breathing rate is modified to meet the demands during physical activity.

Content: 17
Synthesis: 3
Total: 20



[Signature]
01/11/2019

QUESTION FOUR- ESSAY

Oxidative phosphorylation: ✓* compulsory

- This phase of cellular respiration occurs in the mitochondria✓
- The energized hydrogen atoms✓ (from Glycolysis✓ and Krebs' cycle✓ are transferred from one co-enzyme✓ carrier to the next✓
- At each transfer, a little energy from the energized hydrogen✓ is given off✓.
- Gradually all✓ the energy is drained✓ off from the hydrogen atoms.
- This energy is used to combine ADP + P✓ to form ATP✓.
- Finally the hydrogen combines with oxygen✓ to form water✓

(1 + 6 = 7)

Modification of breathing:

- As a result of increased physical activity, the rate of cellular respiration increases to release more energy✓
- Increased cellular respiration also releases more carbon dioxide✓ that gets into the blood.
- The increased carbon dioxide causes the medulla oblongata✓ of the brain to become stimulated✓.
- The medulla oblongata sends impulses to the heart✓ and to the breathing muscles✓.
- The heart beats faster✓ and blood carrying carbon dioxide is pumped faster to the lungs from the tissues✓
- The breathing muscles (the diaphragm and intercostals muscles) cause the breathing movements (inhalation and exhalation) to be speeded up✓.
- The abdominal muscles✓ also help to push up the diaphragm with greater force✓.
- Carbon dioxide is removed out of the body more quickly✓ and more oxygen✓ is taken in rapidly an supplied to the tissues✓.
- In this way, the levels of oxygen and carbon dioxide are brought back to their normal limits✓
- This ability of the body to maintain the composition of the blood more or less constant is called homeostasis✓.

Content (17)
Synthesis (3)
(2)

Description Marks

All information given is relevant to oxidative phosphorylation and modification of breathing. 1

The information for both aspects are presented in the correct sequence 1

Provided sufficient information on the both parts of essay 1

GRAND TOTAL:

150

NOV

MEMORANDUM: GRADE 11 – 2014 / LIFE SC PAPER 1

SECTION A: QUESTION ONE

- 1.1.1 D ✓✓
1.1.2 B ✓✓
1.1.3 C ✓✓
1.1.4 B ✓✓
1.1.5 C ✓✓
1.1.6 B ✓✓
1.1.7 D ✓✓
1.1.8 D ✓✓
1.1.9 B ✓✓
1.1.10 C ✓✓ (20)

1.4.1 To investigate the effect of temperature on the rate of anaerobic respiration/alcoholic fermentation. ✓

- 1.4.2 a) temperature ✓
b) Number of gas bubble produced ✓

- 1.4.3 a) anaerobic respiration ✓/alcoholic fermentation
b) CO₂ ✓

(5)

- 1.5.1 a) A – bronchioles ✓ B – alveolus ✓
b) gaseous exchange/diffusion ✓

- 1.5.2 a) CO₂ ✓
b) O₂ ✓

- 1.5.3 a) red blood cell ✓
b) squamous epithelium / endothelium ✓

- 1.5.4 *numerous alveoli ✓
*thin epithelium / single layer ✓
*richly supplied by blood capillary ✓
*moisture lines the inside of the alveoli (any 3) (10)

SECTION A = 50

- 1.2.1 Lactic acid fermentation ✓
1.2.2 biotechnology ✓
1.2.3 mitochondrion ✓
1.2.4 palisade ✓
1.2.5 alcohol/methylated spirit ✓ (5)

- 1.3.1 A only ✓✓
1.3.2 A only ✓✓
1.3.3 A only ✓✓
1.3.4 B only ✓✓
1.3.5 None ✓✓ (10)

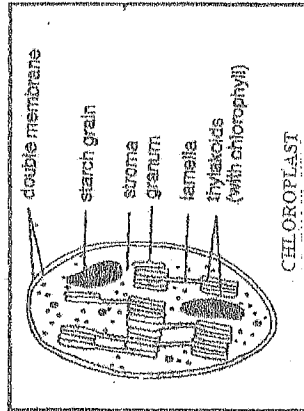
QUESTION TWO

2.1.1 Light phase ✓ (1)

2.1.2 - high energy hydrogen ✓

- combines with the carbon and oxygen ✓
- from CO₂ that enters through the stomata
- to form energy – rich carbohydrates ✓
- such as glucose ✓ and starch
- energy for the reaction comes from hydrogen atoms ✓ and ATP ✓ from the light phase ✓ (any 4)

2.1.3



(Any 4 labels)
Accuracy
Caption (max 6)

2.2.1 shows that the leaves were de-starched ✓, hence no starch present ✓ (6) (11)

2.2.2 - rubber tightly fitting – not to let air in or out ✓ (2)

- all leaf discs must be of the same size ✓
- level of water/ potassium or sodium hydroxide must be the same in all test tubes ✓ (any 2)
- metal gauze in exactly the same position in all ✓

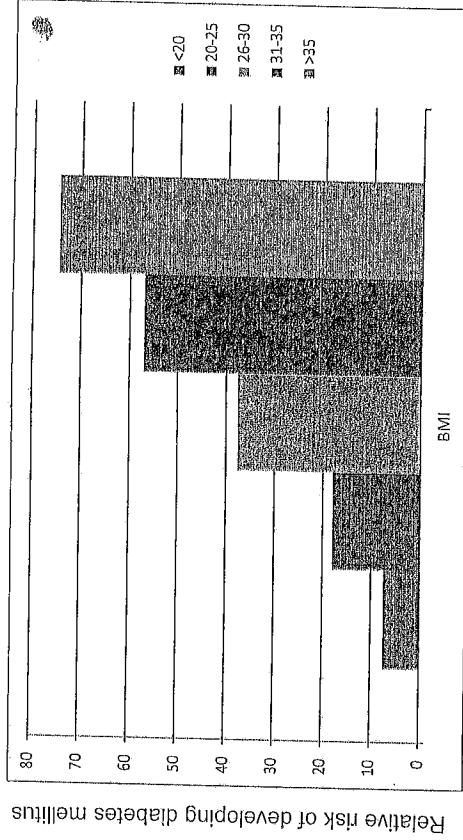
2.2.3 1 ✓ ✓ (2)

2.2.4 tracing / transparent paper ✓ allows the sunlight to enter
Photosynthesis takes place ✓ (2)

2.2.5 potassium or sodium hydroxide solution absorbs CO₂ ✓
No photosynthesis takes place ✓ (2)

2.2.6 test tube 5 – disc was from plant B
Disc is probably from a part of the leaf that lacks chlorophyll ✓ / leaf is probably
A variegated leaf (2) (12)

2.3.1 Histogram showing the relationship between BMI and the relative risk of developing diabetes mellitus in females ✓



2.3.2 insulin ✓ (1)

2.3.3 pancreas ✓ (1)

2.3.4 exercise ✓
Eat a diet suitable for diabetes ✓
Using prescribe medication/ drug to manage it ✓ (any 2) (10)

2.4.1 census ✓ (1)

2.4.2 all people to have sufficient food ✓
All people to have reasonably good quality food ✓ (2)

2.4.3 The population size would decrease ✓
As one child would be replacing two adults ✓ (2)

2.4.4 It could result in a greater proportion of males to females ✓
As many abortions would take place when couples know that a girl baby is being
expected ✓ / girl children may be abandoned (2) (7)

[40]

QUESTION THREE

- 3.1.1 Nephron✓ (1)
- 3.1.2 C – loop of Henle ✓ / ascending limb of loop of Henle
D – distal convoluted tubule✓
E – collecting duct✓ (1)
- 3.1.3 re-absorption ✓ / active diffusion (1)
- 3.1.4 - single layer ✓ – provides a thin barrier✓
- more mitochondria✓ – provide more energy ✓ for the active process
- micro villi✓ – increase the surface area✓ (6)
- 3.1.5 i) $180\text{ l} - 178.7\text{ l} = 1.5\text{ l}✓$ (2)
ii) $60\text{ g} - 35\text{ g} = 25\text{ g}✓$ (1)
- 3.1.6 i) damaged glomerulus✓✓ / inflamed glomerulus and therefore, the filter mechanism
Doesn't function properly
Damage to any other part of the urinary pathway /
Diseased kidney (any 1 x 2=2)
- ii) 100% / all glucose gets re-absorbed✓ at proximal convoluted tubule✓ (2)
- 3.1.7 adrenal cortex secretes aldosterone hormone✓
When there is a shortage of sodium✓ / salts in the blood
More✓ aldosterone is secreted
More sodium is re-absorbed ✓ by the blood capillaries at the distal convoluted tubule✓
And less sodium ions is excreted✓
Therefore, the amount of sodium is raised until it comes back to normal ✓ (any 5) (23)

- 3.2.1 small intestine ✓ / stomach / large intestine (any 1)
- 3.2.2 $0.08 - 0.04\text{g per } 100\text{ cm}^3$
 $= 0.04\text{g per } 100\text{ cm}^3✓$ (2)
- 3.2.3 glucose is actively absorbed✓ from the lumen of the small intestine✓
Into the blood capillaries✓ of the villi
Venules from the villi join to form hepatic portal vein✓ (3)
- 3.2.4 Hepatic portal vein takes blood into liver✓ – where excess glucose ✓ as stored✓
As glycogen✓ in the liver, by hormone insulin ✓, secreted by the islets of Langerhans ✓ in the pancreas✓ – therefore it has a higher conc. ✓
(1.2 g per 100 cm³)
Remainder glucose ✓ enter the hepatic veins ✓ which leave the liver✓, therefore it is Less✓ glucose (0.1 g per 100 cm³) (any 5)
- 3.3.5 excess amino acids✓ (0.04 per 100 cm³) are deaminated✓ in the liver
Amino group of the amino acid is converted to urea ✓
To be excreted by the kidney✓ (4)
- 3.2.6 CO₂ is produced by cellular respiration✓ in the liver cells✓ which enter the hepatic veins (2)
(17)
- [40]