

Trial Examination 2021

VCE Biology Units 1&2

Written Examination

Question and Answer Booklet

Reading time: 15 minutes

Writing time: 2 hours 30 minutes

Student's Name: _____

Teacher's Name: _____

Structure of booklet

<i>Section</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
A	40	40	40
B	10	10	80
			Total 120

Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.

Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

No calculator is allowed in this examination.

Materials supplied

Question and answer booklet of 32 pages

Answer sheet for multiple-choice questions

Instructions

Write your **name** and your **teacher's name** in the space provided above on this page, and on the answer sheet for multiple-choice questions.

Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

All written responses must be in English.

At the end of the examination

Place the answer sheet for multiple-choice questions inside the front cover of this booklet.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – MULTIPLE CHOICE QUESTIONS**Instructions for Section A**

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

Question 1

A tetanus bacterium is classified as a prokaryote, as it has

- A. a cell wall.
- B. many ribosomes.
- C. a plasma membrane.
- D. no distinct nucleus.

Question 2

Which row correctly compares the structure of a chloroplast with the structure of a mitochondrion?

	Chloroplast	Mitochondrion
A.	double outer membrane	single outer membrane
B.	pigment inside stacked membranes	pigment attached to folded inner membrane
C.	outer-membrane made of phospholipid and cholesterol	outer membrane made of phospholipid and protein
D.	absence of ribosomes	presence of small ribosomes

Use the following information to answer Questions 3 and 4.

Some cells contain membrane-bound compartments in the cell cytosol.

Question 3

The general term for a membrane-bound compartment is

- A. cytoplasm.
- B. vesicle.
- C. lysosome.
- D. nucleolus.

Question 4

The advantage of this compartmentalisation in cells is to

- A. keep the nucleus isolated from the cytosol.
- B. control the exchange of some substances.
- C. provide a structural network that helps to support the cell.
- D. provide a variety of intracellular environments in the cell.

Question 5

In order to carry out its function as a semi-permeable boundary, the plasma membrane has

- A. protein channels to allow large protein molecules to pass in and out of the cell.
- B. a phospholipid bilayer to allow lipid-soluble molecules such as alcohol to pass through.
- C. spaces in the phospholipid bilayer that allow small ions to pass through.
- D. cholesterol to maintain stability so the membrane does not move around.

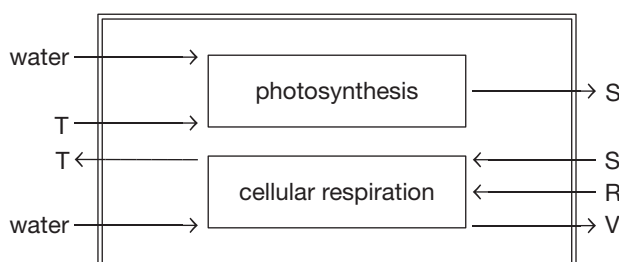
Question 6

In the process of photosynthesis,

- A. carbon is fixed into a carbohydrate using chemical energy.
- B. oxygen is produced as a waste product, as it is no longer needed by the cell.
- C. solar energy is converted into light energy to be used in carbohydrate synthesis.
- D. energy is absorbed by chlorophyll and is released as oxygen when the process is complete.

Use the following information to answer Questions 7 and 8.

The following diagram shows two of the important chemical reactions occurring in a plant cell.

**Question 7**

Which row gives correct chemical symbols or names for the chemicals in the diagram above?

	R	S	T	V
A.	ATP	CO ₂	O ₂	ADP
B.	ADP	O ₂	CO ₂	ATP
C.	ADP	CO ₂	O ₂	ATP
D.	ATP	O ₂	CO ₂	ADP

Question 8

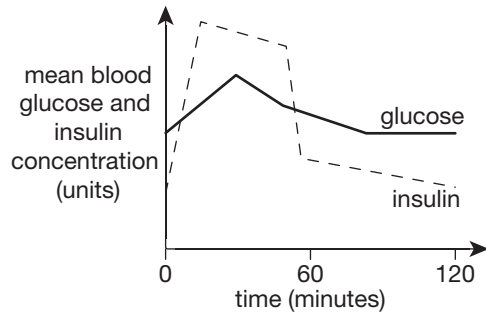
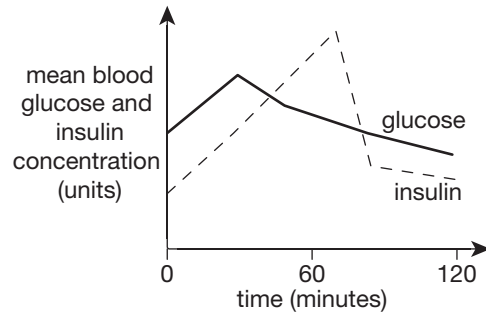
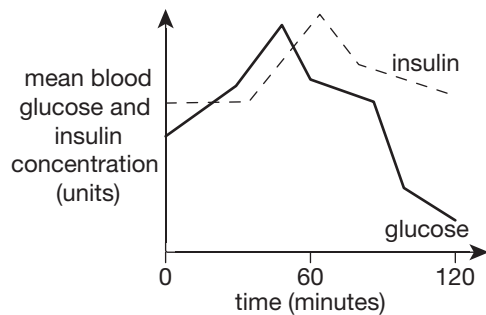
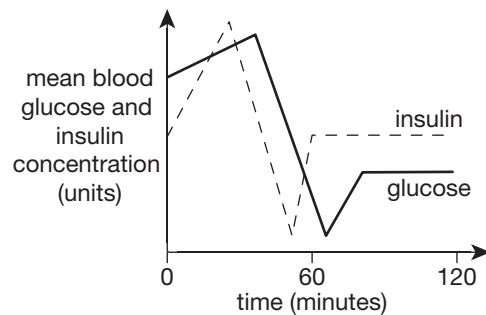
This plant cell could be

- A. a root hair cell.
- B. a xylem vessel cell.
- C. a mesophyll leaf cell.
- D. an inner stem storage cell.

Question 9

An experiment was carried out to investigate the relationship between the concentrations of glucose and insulin in the blood of healthy people. At the start of the experiment, 20 volunteers drank a syrup containing 50 g of glucose after fasting for 8 hours. The concentrations of glucose and insulin were measured in blood samples at intervals over the next 2 hours.

Which one of the following graphs shows the correct mean results for the volunteers?

A.**B.****C.****D.****Question 10**

The onset of type 1 diabetes occurs most frequently in people under 30 years of age, and about 10–15% of all cases of diabetes are type 1.

Type 1 diabetes results from a malfunction in the

- A. kidney, and is caused by excess sugar in the diet.
- B. pancreas, and is caused by blockage of the insulin duct.
- C. liver, and is caused by the body carrying too much weight.
- D. pancreas, and is caused by the breakdown of beta cells.

Question 11

A person with type 1 diabetes produces

- A. too little or no insulin.
- B. too much glucagon.
- C. spasmodic amounts of insulin.
- D. high levels of ADH.

Question 12

Symptoms of type 1 diabetes include excessive urination, thirst, hunger and fatigue, with an overly fast heart rate and weight loss also sometimes presenting. These symptoms show that a failure in one body system, such as the endocrine system, may affect the digestive, circulatory and excretory systems.

This is because

- A. each body system is a group of organs that work together to perform a certain job.
- B. each part of the body has a specific task to carry out.
- C. body systems are interdependent and need each other to function.
- D. some body systems share a common organ that performs more than one job.

Use the following information to answer Questions 13 and 14.

A group of explorers found a community of organisms in a pond in a completely dark cave.

Question 13

It is most likely that

- A. photosynthesis occurs somewhere in the cave.
- B. no animals move in and out of the cave.
- C. the plants in the pond are green and healthy.
- D. food is coming in from outside the cave by some means.

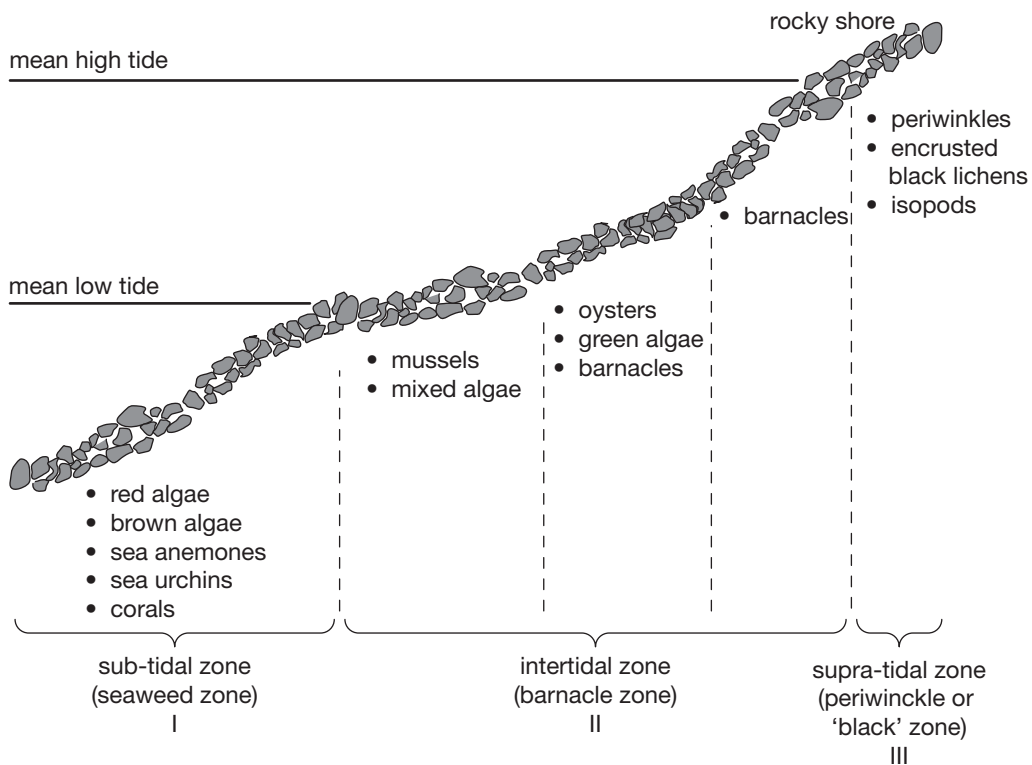
Question 14

The organisms in the pond in the cave are mostly

- A. chemosynthetic autotrophs.
- B. photosynthetic autotrophs.
- C. heterotrophs.
- D. decomposers.

Use the following information to answer Questions 15–17.

The following diagram shows the distribution of organisms on a rocky shore with the mean low tide and high tide marked.



Question 15

This diagram is an illustration of

- A. a community.
- B. an ecosystem.
- C. a population.
- D. a biosphere.

Question 16

Organisms in zone II are mainly

- A. mobile so that they stay covered with water during tide changes.
- B. able to resist dehydration because of hard outer-coverings.
- C. adapted to absorb oxygen directly from the air.
- D. producers, as they are exposed to sunlight during low tide.

Question 17

The red and brown algae in zone I would not provide food for the barnacles and oysters, as these algae

- A. cannot carry out photosynthesis.
- B. are fixed in position and so cannot be reached by the barnacles and oysters.
- C. are not located in the intertidal zone.
- D. are only available during low tide.

Use the following information to answer Questions 18–20.

Bushfires destroy many plants and, subsequently, food, shelter and breeding sites used by animals. This was seen in the devastation left from the 2019–20 bushfires in Victoria, South Australia and New South Wales. However, in communities subjected to repeated bushfires, many of the species have characteristics that assist them to survive and regenerate from bushfires.

Question 18

Characteristics in plants that assist the species to survive bushfires include

- A. smooth shiny bark to reflect the heat.
- B. long cylindrical leaves with a reduced surface area to volume ratio.
- C. horizontal stems running along the surface of the soil.
- D. buds beneath the surface of the bark.

Question 19

Before these bushfires, koalas were already classified as vulnerable, as the species faced major threats.

Which one of the following would **not** be considered one of these threats?

- A. habitat loss due to urbanisation
- B. competition with wombats
- C. motor vehicle accidents
- D. infection from bacterial diseases

Question 20

Many koalas have been found to be infected with contagious *Chlamydia* bacteria that can result in death. In early 2019, a large, isolated population of koalas was found on Kangaroo Island that, unlike other populations on the island, were not infected. Unfortunately, a significant proportion of the uninfected population was lost in the fires.

The best way to increase the population of these disease-free koalas would be to

- A. transfer some to the mainland and breed them in captivity.
- B. breed them with koalas from other populations on the island.
- C. leave them in their original burnt-out area so that they can breed naturally.
- D. breed a combination of island koala populations with mainland koala populations.

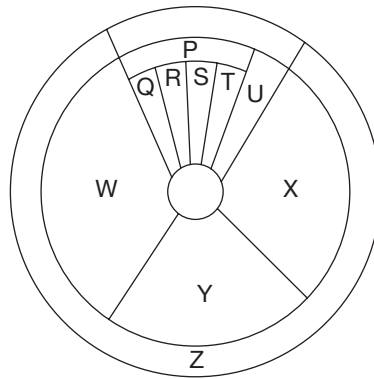
Question 21

The advantage of sexual reproduction from an evolutionary point of view is that

- A. it allows plant breeders to produce genetically uniform crops.
- B. all the offspring will be well-suited to the same environment as the parents.
- C. dispersal into new environments is more readily achieved.
- D. there is greater variation in the offspring, increasing the chances of the species' survival.

Use the following information to answer Questions 22–24.

The following diagram shows the cell cycle in eukaryotic cells.



Question 22

In the cell cycle above, two cells are produced at the end of stage

- A. P.
- B. U.
- C. Y.
- D. W.

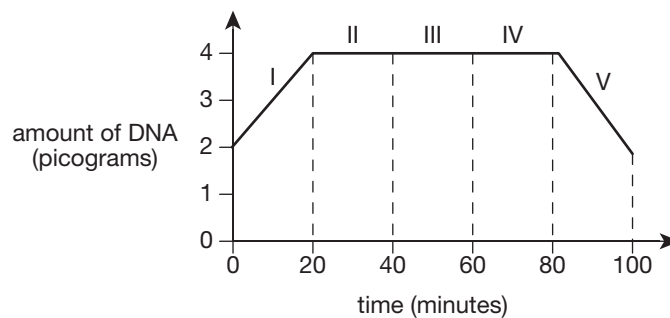
Question 23

Interphase includes stages

- A. Z and P.
- B. P and U.
- C. W, Y and X.
- D. Y, W and P.

Question 24

The following graph shows the changes in the amount of DNA in a cell during the cell cycle.

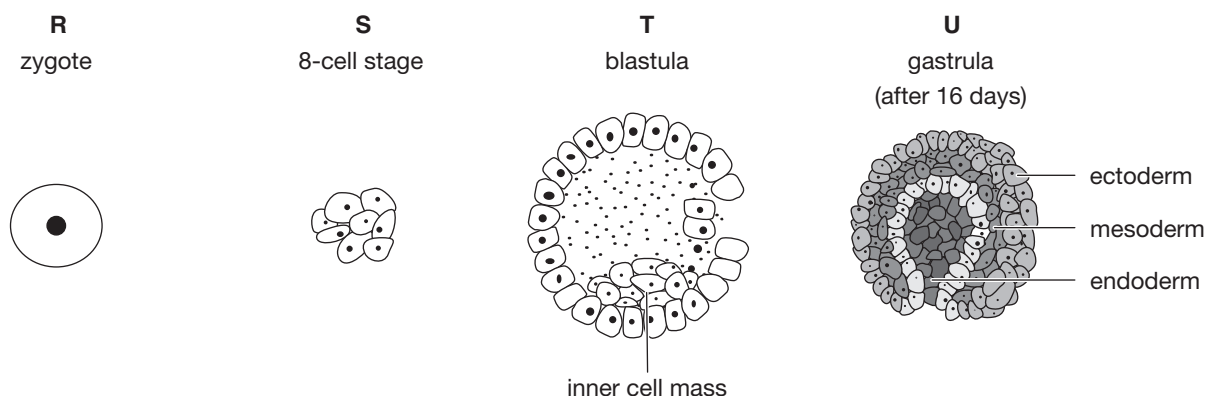


Which row correctly matches a stage of the cell cycle with the change in the amount of DNA during that stage?

	Stage of the cell cycle	Change in the amount of DNA
A.	R	II
B.	S	V
C.	X	I
D.	Y	III

Use the following information to answer Questions 25–27.

The following diagram shows the stages of development from a human zygote (fertilised egg) through its development (stages R–U). Five days after fertilisation, the zygote has divided into a ball of over 100 cells and formed a blastula. The outer layers of the blastula will form the placenta, while the inner mass will form the developing embryo, as shown in stage U below.



Question 25

The cells of the inner cell mass at stage T are

- A. totipotent.
- B. pluripotent.
- C. multipotent.
- D. unipotent.

Question 26

The cells at stage U

- A. are already predetermined for a particular cell type.
- B. can no longer divide by mitosis as they are specialised.
- C. are capable of differentiation into all cell types.
- D. are fully specialised.

Question 27

The cells at stage U make up three primary layers that form specialised cells, tissues and organs.

Which one of the following statements is correct?

- A. Ectoderm cells will form cardiac and skeletal muscle cells.
- B. Endoderm cells will produce heart and blood vessels.
- C. Mesoderm cells will form the inner layers of the digestive and respiratory system.
- D. Ectoderm cells will form the skin and pigment layers.

Use the following information to answer Questions 28–31.

The cell cycle is strictly controlled by checkpoints that ensure that a cell divides in an ordered manner. If the checkpoints fail, the result may be abnormal development of an embryo or cancer/tumour formation. Carcinogens are agents that can cause cancer; 90% of carcinogens are called mutagens, as they damage the DNA.

Most human cancers occur if mutations appear in:

- the proto-oncogenes, which initiate cell division and regulate normal cell development
- the tumour-suppressor genes, which switch off cell division.

Normally these genes work in balance in humans but, if mutations occur, especially in tumour-suppressor genes, cancers develop.

Question 28

In the cell cycle, there are checkpoints towards the end of the G1 phase, at the end of the G2 phase and during mitosis.

Which row correctly matches the checkpoint with its function?

	Checkpoint	Function
A.	G2	ensures that the amount of DNA has been halved
B.	mitosis	ensures that homologous chromosomes are attached to spindles
C.	G1	ensures that nutrients are sufficient and cell size and growth are normal
D.	G2	ensures that the DNA replication has produced identical chromosomes attached by the centromeres

Question 29

If a mutation appears in a tumour-suppressor gene, which one of the following would **not** occur?

- A. uncontrolled cell division
- B. apoptosis (cell death) of cells with DNA damage
- C. unchecked cell proliferation
- D. small amounts of repair to damaged DNA in cells

Question 30

Which one of the following is **not** a mutagen that can induce or increase the rate of mutations in DNA?

- A. X-rays and nuclear radiation
- B. some of the wavelengths of sunlight
- C. some viruses such as the human papillomavirus
- D. chlorine in filtered swimming pools

Question 31

Genetic predisposition means a person has an increased likelihood of developing a particular disease due to the presence of one or more gene mutations. For example, certain mutations in the BRCA1 and BRCA2 genes are involved with breast and ovarian cancer.

Which one of the following is a correct statement about these genes?

- A. If a person has a mutation in this kind of gene, they will definitely develop the disease.
- B. Lifestyle choices are important in cases of genetic predisposition, as they cause the disease.
- C. A genetic predisposition results from specific genetic variations that are often inherited from a parent.
- D. People with the genes for a genetic predisposition are less likely to develop cancers than people without the genes.

Use the following information to answer Questions 32 and 33.

In 1983, researchers observed that tumour tissue from patients with bowel cancer had less methylation than normal tissue from their other body parts.

Question 32

Genes that are methylated are usually switched off and do not express.

The decrease in methylation in the cells in the bowel would have resulted in

- A. an alteration of the structure of the DNA in the chromatin.
- B. changes in the nucleotide sequences in the DNA.
- C. an increased action of tumour-suppressor genes.
- D. less chance of cancer occurring.

Question 33

This research is an example of the effect of

- A. genotype on the organism's phenotype.
- B. epigenetics on the organism's genotype.
- C. phenotype on the organism's genotype.
- D. epigenetics on the organism's phenotype.

Question 34

Ichthyosis, a form of skin disease, is caused by the hereditary deficiency of a steroid hormone and is due to deletion mutations in the STS gene. It affects one in 2000–6000 males, whereas far fewer females have the condition.

This is because

- A. females would only have one copy of the ichthyosis gene in their genotype.
- B. females alter their genotype with the use of creams to moisturise their skin.
- C. the pattern of inheritance is Y-linked dominant.
- D. the ichthyosis gene is sex-linked on the X chromosome.

Use the following information to answer Questions 35 and 36.

In cattle, a single autosomal gene determines whether an animal is polled (meaning hornless) or horned. Polled is the dominant trait.

Question 35

A polled bull whose mother was horned was mated with a herd of heterozygous polled cows. What is the probability of polled offspring being heterozygous?

- A. $\frac{1}{2}$
- B. $\frac{2}{3}$
- C. $\frac{3}{4}$
- D. 1

Question 36

A farmer wanted to determine if a bull was homozygous polled or heterozygous polled. Which one of the following could be used to determine this information?

	Type of cross	Type of cow to mate the bull with
A.	test cross	horned cow
B.	reciprocal cross	horned cow
C.	test cross	polled cow
D.	back cross	polled cow

Use the following information to answer Questions 37–40.

The vinegar fly, *Drosophila melanogaster*, has four pairs of chromosomes. Genetic studies have mapped the genes of many of the traits of this species. The loci of some of the genes are shown in the following table.

Name of trait	Allele symbol	Description	Chromosome number	Dominant (D) or recessive (R) trait	Locus
arc wings	a	wings curved down	2	R	99.2
bar eyes	B	reduced eye shape	1	D	57.0
bent wings	bt	wings bent up	4	R	1.4
bobbed bristles	bb	short bristles	1	R	66.0
brown eyes	bw	brown eye colour	2	R	104.5
javelin bristles	jvl	cylindrical bristles	3	R	56.7
wrinkled wings	W	wrinkled wings	3	D	46.0
sparkling eyes	spa	rough, bulging eyes	4	R	3.0
vermillion eyes	v	vermillion eye colour	1	R	33.0
vestigial wings	vg	reduced wing size	2	R	67.0

Question 37

Using the information in the table above, what is the genotype of a male fly with wrinkled wings and short bristles?

- A. Wwbbbb
- B. WWbb
- C. wwbbbb
- D. WwBbBb

Question 38

Flies heterozygous for wrinkled wings and unaffected eye colour were crossed with flies with unaffected wings and vermillion eyes.

Which row gives the expected ratio of traits that would be seen in their offspring?

	Unaffected wings and unaffected eyes	Unaffected wings and vermillion eyes	Wrinkled wings and unaffected eyes	Wrinkled wings and vermillion eyes
A.	1	1	few	few
B.	1	1	1	1
C.	9	3	3	1
D.	2	1	2	1

Question 39

The two traits that would illustrate linkage with the highest percentage of crossing-over would be

- A. bent wings and sparkling eyes.
- B. bobbed bristles and vermilion eyes.
- C. wrinkled wings and javelin bristles.
- D. brown eyes and vestigial wings.

Question 40

Crossing-over is important as it

- A. reduces the likelihood that daughter cells that form gametes will contain different genetic material.
- B. mixes up the alleles between the two chromatids of one of the homologous chromosomes.
- C. increases genetic variation in the daughter cells and ultimately the offspring that are produced.
- D. changes the alleles of the genes, which increases genetic diversity.

END OF SECTION A

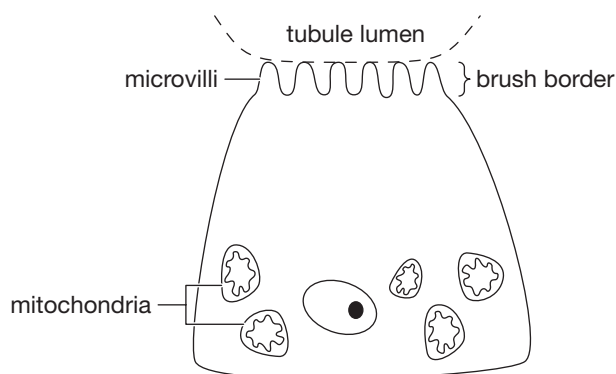
SECTION B**Instructions for Section B**

Answer **all** questions in the spaces provided.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (7 marks)

The proximal tubule is a segment of the kidney tubule found in the many tiny filtering units within the kidney called nephrons. The most distinctive feature of this proximal tubule is its 'brush border'. Like the small intestine, the surface facing into the centre of the tube, the lumen, is covered with densely packed microvilli as shown in the following diagram.



The cytoplasm of the cells is densely packed with mitochondria. This area of the tubule reabsorbs many of the essential sodium ions from the lower concentration in the filtrate back into the higher concentration in the blood. Water moves along the water concentration gradient caused by the reabsorption of sodium.

- a. i.** What type of adaptation are the microvilli of the 'brush border'? 1 mark

- ii.** In what way are the microvilli beneficial in this region of the kidney tubule? 1 mark

- b. i.** From the information given, identify how the sodium ions are moving from the lumen of the tubule into the surrounding blood capillaries. 1 mark

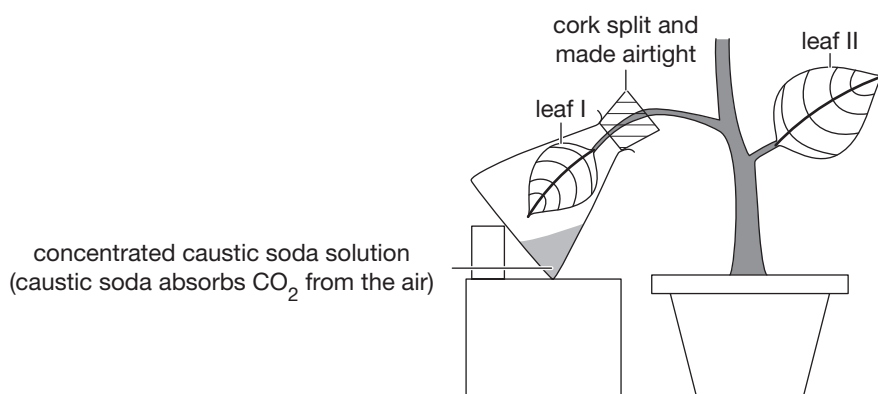
- ii.** Justify your answer to **part b.i.** using the information given. 2 marks

c. i. From the information given, identify the method by which water is reabsorbed. **1 mark**

ii. Is the water reabsorption passive or active? Justify your answer. **1 mark**

Question 2 (6 marks)

A group of students set up an experiment. The students first placed a plant in the dark for several days in order to de-starch the leaves. The plant was then placed in bright sunlight for 8 hours with the leaves exposed to the differing conditions shown in the following diagram.



Each of the leaves was then tested for starch using the iodine test. If starch was present, the yellow-brown iodine would turn blue-black; if starch was absent, the iodine would stay yellow-brown.

- a. i.** During the days when the plant was kept in the dark, what process involving energy transformation would have occurred in the leaf cells after the starch had broken down? 1 mark

- ii.** Suggest the hypothesis the students were testing by setting up this experiment. 1 mark

- b. i.** Kim suggested that, to save time, they only needed to test leaf I. Lee disagreed and said it was essential that they tested both leaf I and leaf II. Outline why Lee was correct. 1 mark

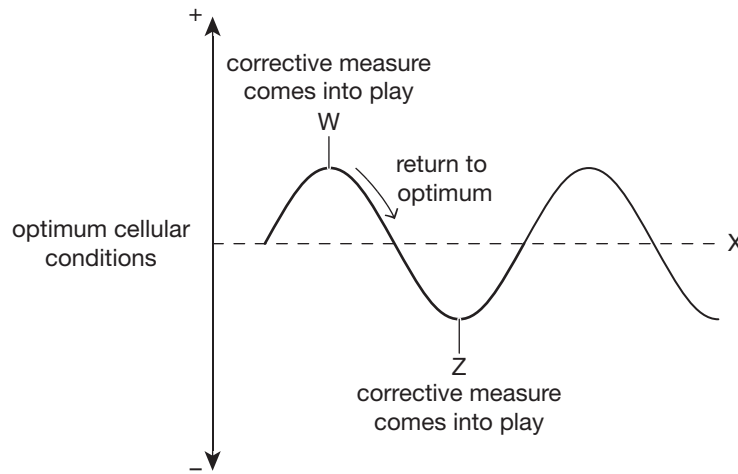
- ii.** Identify the dependent variable in this experiment. 1 mark

- c. i.** Write a balanced chemical equation for the main process of energy transformation occurring in the experiment. 1 mark

- ii.** Sujen commented that the process summarised by the equation in **part c.i.** would be the only energy transformation process happening in bright sunlight. Do you agree? Justify your choice. 1 mark

Question 3 (8 marks)

The following diagram shows the result of a change in an important factor in the human internal environment.



In a Biology class, Casey wrote that one important component of the human internal environment was the contents of the digestive tract, as it provides essential carbohydrates, proteins, lipids and vitamins needed by the cells of the body. Jess disagreed with part of this statement.

- a.** Identify which student was correct. Justify your response. 1 mark

Assume that the diagram shows thermoregulation in the human body.

- b.** Which specific part of the body would detect a change in the optimum internal temperature? 1 mark

- c. i.** State **and** explain **one** corrective mechanism that could occur at W. 2 marks

- ii.** State **and** explain **one** corrective mechanism that could occur at Z. 2 marks

- d.** The teacher in the Biology class said there was part of the diagram that was not correct and should be modified. The teacher commented that the graph line was too perfect and regular.

On the graph on the previous page, draw a modified graph line to correct the graph.

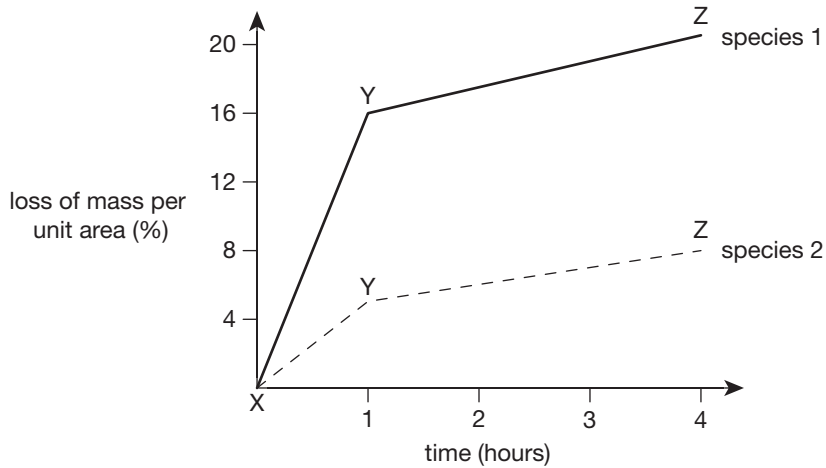
Give **one** reason to support how you have drawn the line.

2 marks

Question 4 (8 marks)

Both plants and animals lose water by different means, and so it is essential that both have mechanisms to regulate and control water loss and gain.

Two different species of plants were used in an investigation into water loss from leaves detached from the plants: *Phaseolus*, which has hairless leaves with a thin cuticle, and *Pelargonium*, which has hairy leaves with a thicker cuticle. The leaves were placed in identical conditions. The change in mass of the detached leaves was measured over several hours and plotted on the following graph.

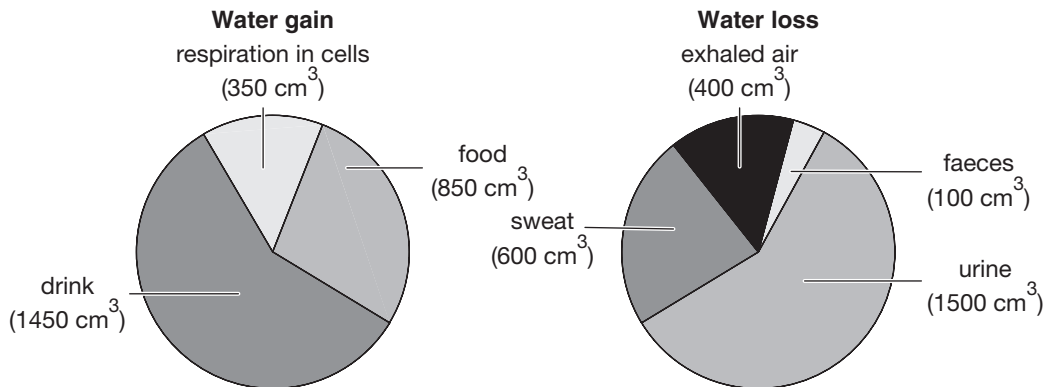


a. i. Outline the pathway for the main method of water loss from the leaves. 1 mark

ii. Suggest a reason for the decrease in the rate of mass loss in both plants between points Y and Z. 1 mark

iii. From the graph, determine which species was the *Pelargonium*. Explain your choice. 2 marks

Osmoregulation is the homeostatic control of body water. Humans and many other mammals have mechanisms to balance water intake with water loss. Examine the following pie charts of suggested values for water gain and water loss in a human.



- b.** A person was playing tennis on a hot dry day and did not stop to have a drink of water during the match.
- i.** Suggest **one** change that may happen in the water loss pie chart of this person. 1 mark
-
-
- ii.** How would the kidneys of this person be involved in the changes suggested in **part b.i.**? 1 mark
-
-

The following data tables show water gain and loss in a kangaroo rat, a desert animal that is nocturnal and stays in a burrow during the day. Little or no water is available for drinking, so the kangaroo rat gains most of its water from the metabolism of dry food, which produces water as a by-product. The data shows that the total water gain is equal to the total water loss.

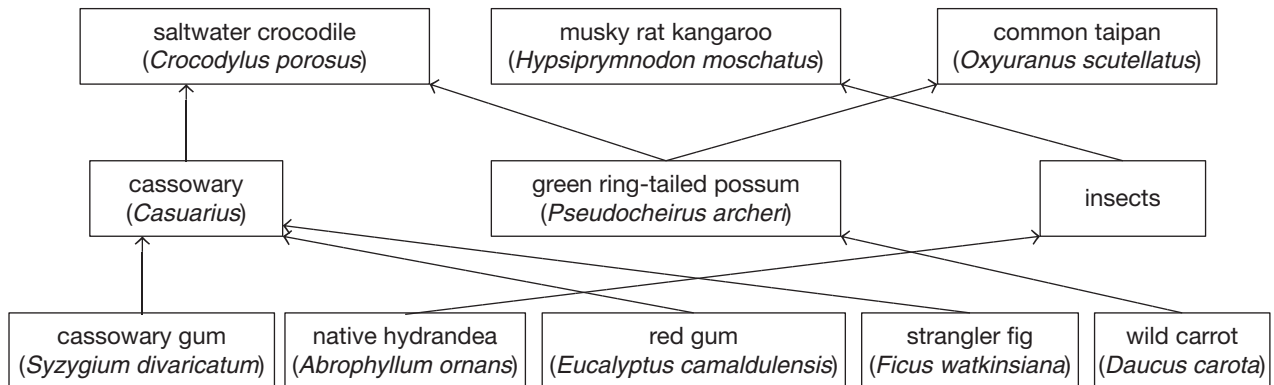
Water gain (cm ³)	
metabolic water	54.0
water in dried food	6.0
total water gain	60.0

Water loss (cm ³)	
urine	13.5
faeces	2.6
evaporation (mainly breath)	43.9
total water loss	60.0

- c.** Using data from the tables above, explain why water loss for the kangaroo rat is different to a human. 2 marks

Question 5 (11 marks)

The following diagram shows a food web for the Daintree Rainforest in Northern Queensland, giving the common name for the organisms alongside their scientific name under the binomial system of nomenclature.



During the discussion about this food web in a Biology class, some students said the arrows should always point upwards, and others said they should always point towards the organism doing the eating. However, there is a more meaningful way of presenting this information, as light energy is the original source of energy for the food web.

a. i. In terms of energy, what do the arrows show in a food web? 1 mark

ii. Suggest a link in the food web above that would place the taipan at the fourth trophic level. 1 mark

Cassowary birds eat parts of the cassowary gum, red gum and strangler fig, and the fruits of many tropical plants. The seeds pass out in the birds' faeces, and are deposited in a pile of dung perfect for germination and distribution over a large area.

b. i. What is the relationship between the cassowary and the fruit trees? 1 mark

ii. Outline the impact of relationship on the fruit trees. 1 mark

Although the cassowary is not the top-order consumer, it is considered a keystone species in this food web.

- c. i. What is the meaning of the term 'keystone species'? 1 mark

- ii. Why would cassowaries be considered a keystone species in the Daintree Rainforest? 1 mark

The territories of adult cassowaries can be more than 100 hectares. However, the loss of their habitats due to farming and subdivision of the land into smaller areas for homes is having a major impact on the species.

- d. i. What impact would the loss of habitat have on the cassowary species? 1 mark

- ii. How will the loss of habitat for the cassowary affect the rainforest? 1 mark

Cassowary gums and red gums are both commonly called gum trees. However, their scientific names are completely different from one another. Both gum trees have two words in their scientific name, with the first word being the genus.

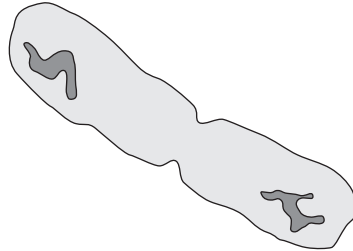
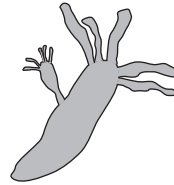
- e. i. What is the second word in a scientific name called? Use the red gum as an example in your answer. 1 mark

- ii. If the two types of trees are both called 'gum trees', why do they **not** have the same genus name? 1 mark

- iii. Outline **one** of the main benefits of having a scientific naming system such as the binomial system of nomenclature. 1 mark

Question 6 (6 marks)

As part of their study of asexual reproduction, Biology students were shown the following two diagrams and asked to complete a table with information about the diagrams.

Diagram 1**Diagram 2**

- a. One student wrote their responses in the table as shown below. They did not complete every cell of the table and some of the information that they included was incorrect.

Complete the table below by filling in the **two** empty cells with the correct information. 2 marks

	Diagram 1	Diagram 2
Type of reproduction	asexual reproduction	sexual reproduction
Name of reproduction	binary fission	
Type of organism	eukaryote, such as bacteria	eukaryote, such as Hydra
Genetics of parent organism compared to offspring and each other	genetically identical to each other and parent	genetically different to the parent and each other
One advantage of this type of reproduction		The species can adapt to new environments due to variation, which gives them a survival advantage.

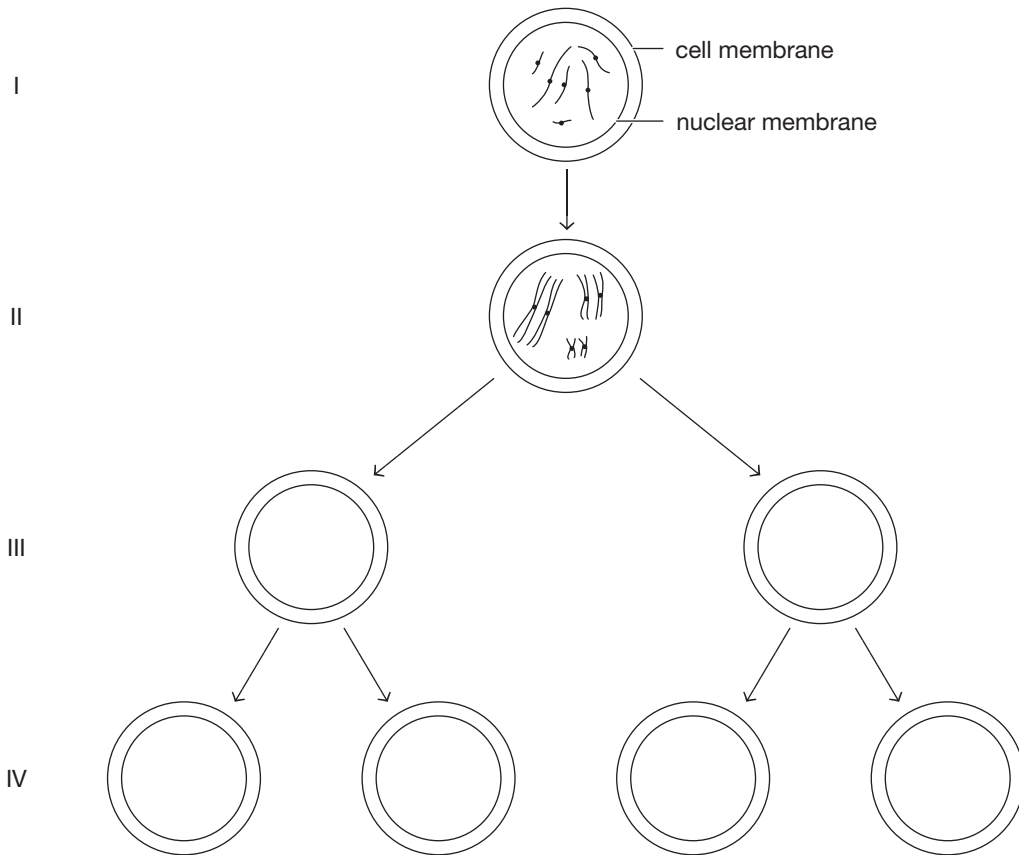
b. The teacher told the student that they had made five errors in the cells that they had completed.

Identify **four** of the errors that the student made in the table. Justify your answers.

4 marks

Question 7 (11 marks)

Aedes aegypti is a type of mosquito that carries yellow fever. The following diagram shows the various stages of one cycle of meiosis in a female *Aedes aegypti*. Some of the cells have been left empty.



a. i. Identify **two** pieces of evidence in the diagram above that suggest the type of cell division is meiosis. 2 marks

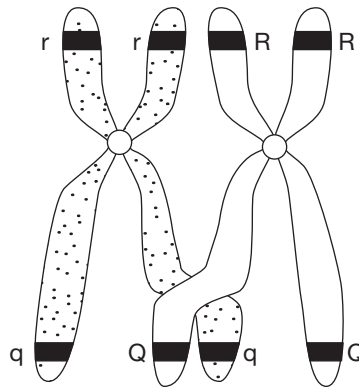
ii. Complete the diagram above with the chromosomes that would be found in the cells at stages III and IV. 2 marks

b. i. What is the diploid number of the cells of the *Aedes aegypti*? 1 mark

ii. Two Biology students were discussing this example. Susie said the initial ovary cell of the female mosquito in which meiosis was occurring would be called a somatic cell. Ted said it would be called a sex cell as it resulted in the production of gametes.

Which student is correct? Explain your answer using the terms ‘haploid’ and ‘diploid’. 2 marks

c. During meiosis, the process illustrated in the diagram below could be observed.



i. What is the name of this process and in which stage(s) of meiosis would it be observed? 2 marks

Name _____

Stage(s) _____

ii. A cell containing the pair of chromosomes in the diagram above underwent meiosis to produce new cells.

State the combinations of alleles that would be present in these cells using the allele symbols in the diagram above. 1 mark

iii. Outline the significance of the process shown in the diagram above to the *Aedes aegypti*. 1 mark

Question 8 (6 marks)

Plant cloning has been used to create hybrid strains of fruit, vegetables and grains that are high-yielding, drought- and frost-tolerant and disease-resistant. The strains can be reproduced exactly over and over. The benefits of plant cloning in commercial farming are assumed to outweigh any potential negatives, but a major problem in nature could result due to its overuse.

- a. i.** What is meant by ‘reproduced exactly over and over’? 1 mark

- ii.** Give an example of a crop that has been successfully cloned commercially. 1 mark

- iii.** Outline the ‘major problem in nature’ that could result from plant cloning. 1 mark

Many people are far more comfortable with plant cloning than animal cloning. Because identical twins are naturally occurring clones, some people believe cloning is a technological version of a natural process. This argument is often used to justify the ethics of human cloning.

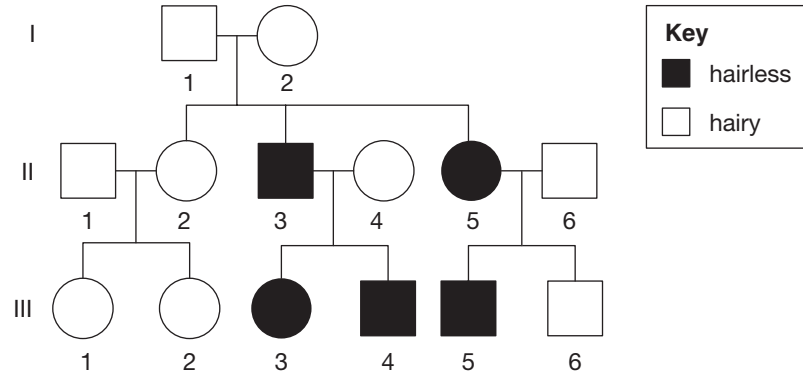
- b. i.** What is meant by ‘a technological version of a natural process’? 1 mark

- ii.** What term would be used to describe the potency of the source of the initial cells used in animal cloning? 1 mark

- c.** With reference to your answer to **part b.ii.**, what is an ethical issue that has prevented research on human cloning? 1 mark

Question 9 (8 marks)

Several breeds of dogs are hairless, including Mexican hairless dogs (MHD), Chinese crested dogs (CCD) and American hairless terriers (AHT). Only two types of hairless gene have been reported. The gene in the MHD and the CCD is different to the gene in the AHT, though both types are inherited in autosomal patterns. The following pedigree shows the pattern of inheritance of the hairless trait in the AHT.



- a. Is the pattern of inheritance of the hairless phenotype in the AHT autosomal dominant or recessive? Justify your choice.

2 marks

Diana decided to use the allele symbols H for hairless and h for hairy when she was doing a genetics problem on the CCD. She had read about a breeding program using the CCD that reported that matings between hairless CCD resulted in both hairless and hairy male and female offspring.

- b. i.** From the symbols Diana allocated, what had she deduced? Explain your answer. 2 marks

- ii.** Using the allele symbols Diana allocated, determine the ratio of hairless to hairy offspring of the offspring produced by two heterozygous CCD dogs. Show your working. 2 marks

- c.** When carrying out breeding with heterozygous hairy CCD, the birth ratio noted in litters was 1 : 2. There were no pure-bred hairless CCD.

- i.** What is meant by the term 'pure breeding'? 1 mark

- ii.** Suggest a reason why there were no pure-bred hairless CCD in the breeding results obtained. 1 mark

Question 10 (9 marks)

Budgerigars have many genes that control feather colour. These genes combine to produce different feather colours. Light green is referred to as 'wild type', as it is the most common, but over 30 colour variations have arisen from mutations of the genes.

- a. What term is used to describe this pattern of inheritance? 1 mark

The following table shows the genotypes that correspond to four different phenotypes that commonly appear in budgerigar populations.

Green	Blue	Yellow	White
BBYY, BBYy, BbYY, BbYy	BByy, Bbyy	bbYy, bbYY	bbyy

- b. How many gene loci are involved in the pattern of inheritance of these four phenotypes? 1 mark

- c. Two blue budgerigars with the genotype Bbyy were mated and produced offspring.

- i. What is the chance that the offspring has the same genotype as its parents? Show your working. 3 marks

- ii. What is the chance that the offspring has the same phenotype as its parents? 1 mark

d. Jimmy was given three green budgerigars by his parents. He wanted to know if their genotype was BBYY and not one of the other three possible genotypes. Jimmy decided to use the quickest breeding cross to find their genotypes. However, this breeding cross required another budgerigar of a different colour.

i. What were the phenotype and genotype of the budgerigar he needed for this cross? 1 mark

ii. Explain how the results of the breeding cross would indicate the genotypes of the three green budgerigars. 2 marks

END OF QUESTION AND ANSWER BOOKLET

VCE Biology Units 1&2

Written Examination

Multiple-choice Answer Sheet

Student's Name: _____

Teacher's Name: _____

Instructions

Use a **pencil** for **all** entries. If you make a mistake, **erase** the incorrect answer – **do not** cross it out. Marks will **not** be deducted for incorrect answers.

No mark will be given if more than **one** answer is completed for any question.

All answers must be completed like this example:

A	B	C	D
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Use pencil only

1	A	B	C	D	15	A	B	C	D	29	A	B	C	D
2	A	B	C	D	16	A	B	C	D	30	A	B	C	D
3	A	B	C	D	17	A	B	C	D	31	A	B	C	D
4	A	B	C	D	18	A	B	C	D	32	A	B	C	D
5	A	B	C	D	19	A	B	C	D	33	A	B	C	D
6	A	B	C	D	20	A	B	C	D	34	A	B	C	D
7	A	B	C	D	21	A	B	C	D	35	A	B	C	D
8	A	B	C	D	22	A	B	C	D	36	A	B	C	D
9	A	B	C	D	23	A	B	C	D	37	A	B	C	D
10	A	B	C	D	24	A	B	C	D	38	A	B	C	D
11	A	B	C	D	25	A	B	C	D	39	A	B	C	D
12	A	B	C	D	26	A	B	C	D	40	A	B	C	D
13	A	B	C	D	27	A	B	C	D					
14	A	B	C	D	28	A	B	C	D					