This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

Stage Exam 05
27APR2026

Do NOT write in this box. Your MARK will be placed here.

Subject :	A Level : Biology 1	
Class :	11A and 12A	
Teacher :	Miss Rahmeh Hilal	
Duration :	2 hours	
Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

Q1.

Organisms can be grouped into domains.

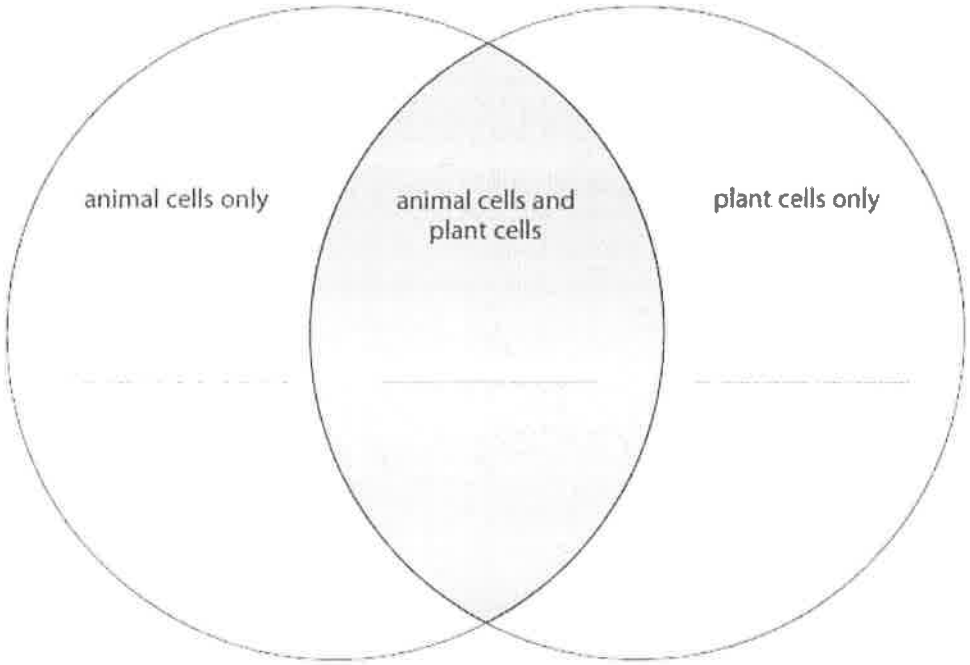
(a) Animals and plants belong to the domain Eukarya.

Some structures found in eukaryotic cells are found in both animals and plants.
Other structures are found in either animal cells only or plant cells only.

A Venn diagram can be drawn to represent this information. Structures found in both animal and plant cells are written in the part of the diagram where the circles overlap.

Complete the Venn diagram below by writing the name of **one** structure in each part of the diagram.

(3)



(b) The timeline below shows how taxonomic groupings have changed.



Explain why the taxonomic groupings of living organisms have changed over the years and may continue to change.

(3)

.....

.....

.....

.....

.....

.....

.....

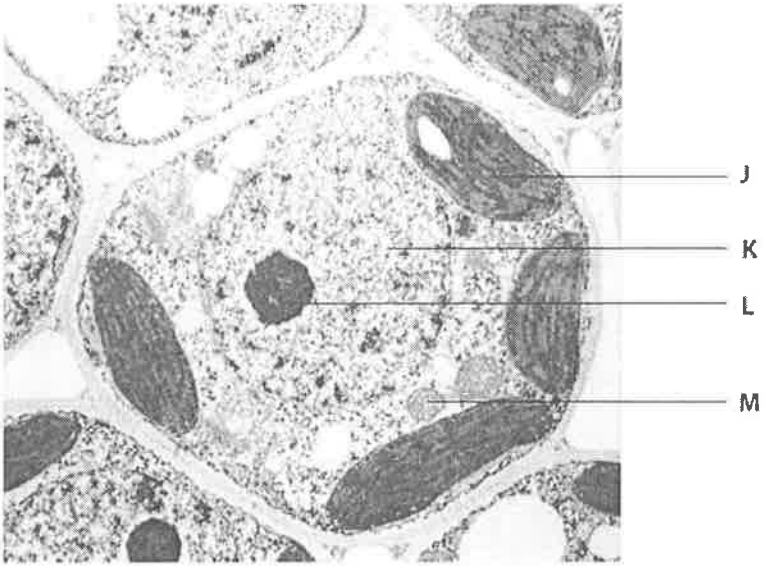
.....

.....

(Total for question 1 = 6 marks)

Q2.

The photograph below shows a plant cell as seen using an electron microscope.



Magnification × 20 000

(a) Place a cross ☒ in the box next to the number of structures labelled in the photograph that would also be present in an animal cell.

(1)

☐ **A** 1

☐ **B** 2

☐ **C** 3

☐ **D** 4

(b) The table below shows some features of plants cells and prokaryotic cells.

For each feature, place **one** cross ☒ in the appropriate box, in each row, to show whether it is found in plant cells only, prokaryotic cells only or in both plant cells and prokaryotic cells.

(3)

Feature	Plant cells	Prokaryotic cells	Plant cells and prokaryotic cells
cellulose cell wall	☐	☐	☐
nucleus	☐	☐	☐
ribosomes	☐	☐	☐

(c) Some plant cells contain plasmodesmata.

Describe the structure of plasmodesmata.

(2)

.....

.....

.....

.....

.....

.....

(Total for question 2 = 6 marks)

Q3.

Meiosis and mitosis are both types of nuclear division that take place in eukaryotic organisms.

(a) Put a cross ☒ in the box next to the correct word or words to complete each of the following statements.

(i) DNA synthesis takes place before

(1)

- ☐ **A** both meiosis and mitosis
- ☐ **B** meiosis only
- ☐ **C** mitosis only
- ☐ **D** neither meiosis nor mitosis

(ii) Crossing over takes place during prophase I in

(1)

- ☐ **A** both meiosis and mitosis
- ☐ **B** meiosis only
- ☐ **C** mitosis only
- ☐ **D** neither meiosis nor mitosis

(b) Put a cross ☒ in the box next to the row in the table that correctly describes the result of meiosis and the result of mitosis.

(1)

	Meiosis	Mitosis
☐ A	two daughter cells with one copy of each chromosome	four daughter cells with two copies of each chromosome
☐ B	two daughter cells with one copy of each chromosome	four daughter cells with one copy of each chromosome
☐ C	four daughter cells with one copy of each chromosome	two daughter cells with two copies of each chromosome
☐ D	four daughter cells with one copy of each chromosome	two daughter cells with one copy of each chromosome

(c) Suggest why neither meiosis nor mitosis take place in prokaryotic organisms.

(2)

.....

.....

.....

.....

.....

.....

(Total for question 3 = 5 marks)

Q4.

Some scientists believe that mitochondria evolved from prokaryotic organisms.

They think that a prokaryotic organism entered a single-celled eukaryotic organism and lived inside it. The two organisms evolved to become dependent on each other.

(a) In the space below, draw and label a diagram to show the structure of a mitochondrion.

(4)

(b) Give **two** similarities between the structure of a mitochondrion and the structure of a prokaryotic organism.

(2)

1 .....

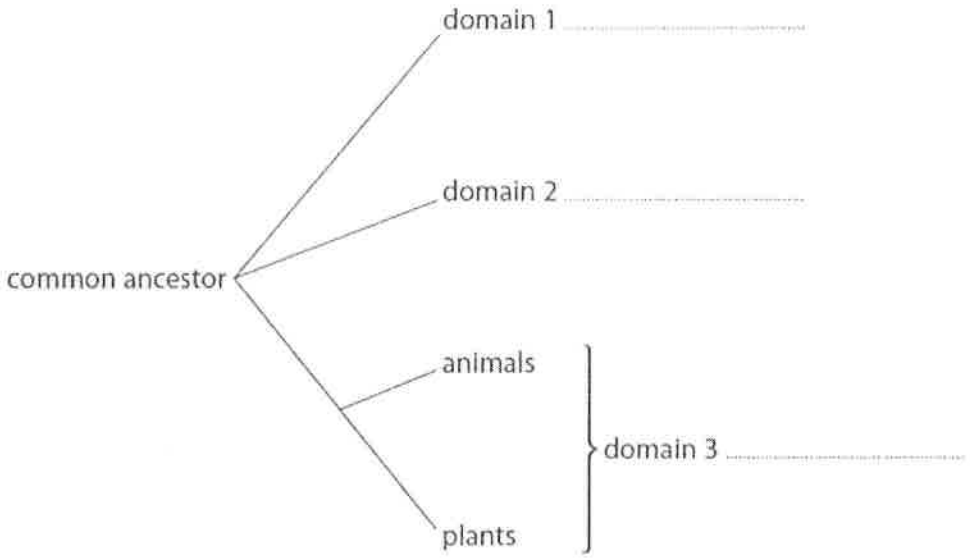
.....

2 .....

.....

(c) The diagram below shows the three domains and some of the organisms in them.
Complete the diagram by writing the name of each domain on the dotted lines.

(3)



(d) Name **one** organelle found in plants cells but not in animal cells.

(1)

.....

(Total for question 4 = 10 marks)

Q5.

Some organelles in plant and animal cells are surrounded by a membrane.

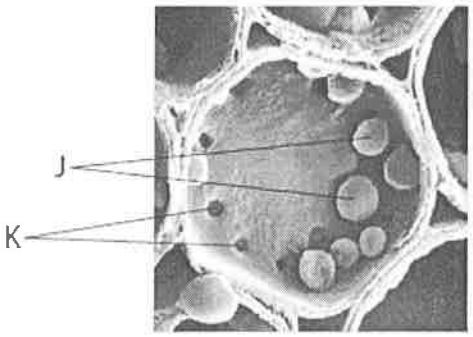
(a) Name **two** organelles that have a single membrane.

(2)

1.....

2.....

(b) The photograph below shows a section through a cell from the stem of a clematis plant.



Magnification ×1600

Put a cross ☒ in the box next to the correct word or words to complete each of the following statements.

(i) The structures labelled J contain starch and are

(1)

- ☐ **A** amyloplasts
- ☐ **B** mitochondria
- ☐ **C** nuclei
- ☐ **D** vesicles

(ii) The structures labelled K, in the cellulose cell wall, are

(1)

- ☐ **A** middle lamellae
- ☐ **B** mitochondria
- ☐ **C** pits
- ☐ **D** vesicles

(c) In plant cells, some of the organelles are plastids.

Most flowering plants gain their plastids from the female parent and not the male parent. This is due to the double fertilisation that occurs in flowering plants.

Describe the process of **doublefertilisation** in flowering plants.

(5)

.....

.....

.....

.....

.....

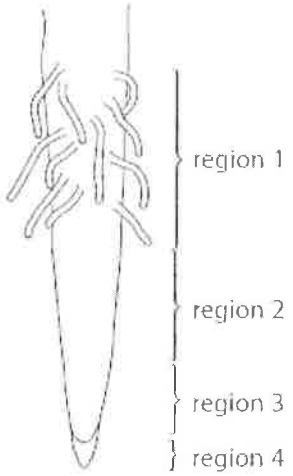
.....

.....

(Total for question 5 = 7 marks)

Q6.

The diagram below shows part of a plant root.



(a) Region 1 contains xylem tissue.

Explain why xylem is described as a tissue.

(2)

.....

.....

.....

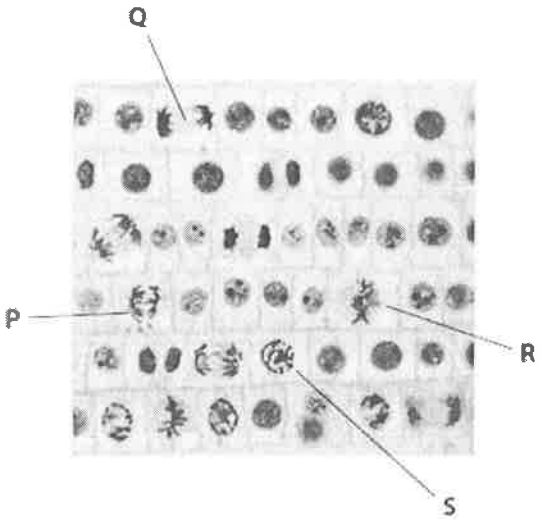
.....

.....

.....

(b) The photograph below shows a section through region 3 as seen using a light microscope.

Cells in four stages of mitosis are labelled.



Magnification ×200

(i) Name a stain that can be used to show the chromosomes in mitosis.

(1)

.....

(ii) Put a cross (☒) in the box next to the letters that give the order of the stages in the process of mitosis.

(1)

☐ **A** P Q R S
☐ **B** Q P R S
☐ **C** R Q P S
☐ **D** S R P Q

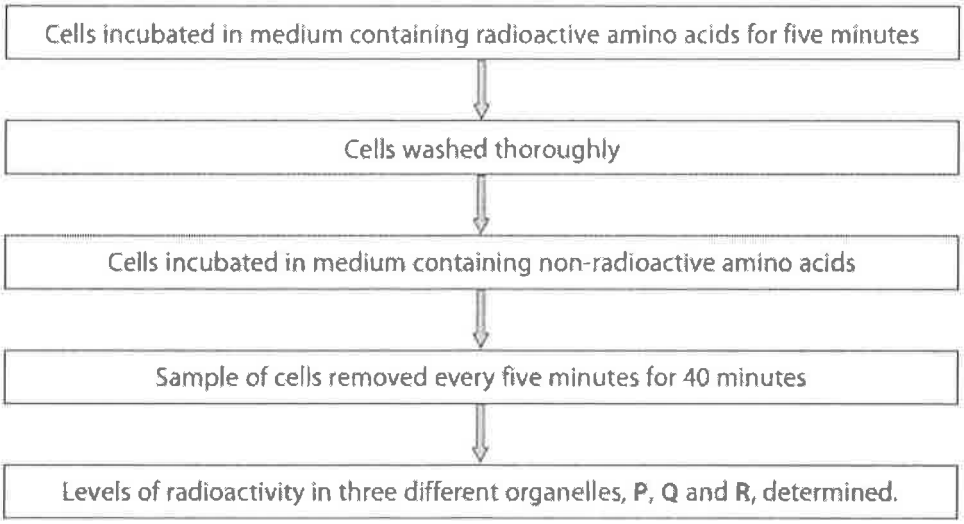
(iii) Draw and label a diagram of a chromosome as it would appear in cell **R**.

(3)

(Total for question 6 = 7 marks)

Q7.

An experiment was carried out to study the synthesis and movement of proteins through cells. The diagram below shows the method used.



The table below shows the results of this experiment.

Time / minutes	Level of radioactivity / arbitrary units		
	Organelle P	Organelle Q	Organelle R
5	60	0	0
10	80	40	0
15	20	70	0
20	15	80	10
25	10	30	30
30	5	20	60
35	5	10	40
40	5	5	20

(a) Place a cross ☒ in the box next to the row in the table that correctly identifies the three organelles **P**, **Q** and **R**.

(1)

	Organelle P	Organelle Q	Organelle R
☐ A	Golgi apparatus	ribosome	rough endoplasmic reticulum
☐ B	ribosome	rough endoplasmic reticulum	Golgi apparatus
☐ C	ribosome	Golgi apparatus	rough endoplasmic reticulum
☐ D	rough endoplasmic reticulum	ribosome	Golgi apparatus

(b) Suggest why the levels of radioactivity increased in organelle **P**.

(2)

.....

.....

.....

.....

.....

.....

.....

.....

(c) (i) Describe the changes in the level of radioactivity in organelle **Q**.

(2)

.....

.....

.....

.....

.....

.....

.....

(ii) Explain the changes in the level of radioactivity in organelle **Q**.

(2)

.....

.....

.....

.....

.....

.....

.....

(d) (i) Suggest why the maximum level of radioactivity in organelle **R** was lower than the maximum level of radioactivity in organelle **P**.

(2)

.....

.....

.....

.....

.....

.....

.....

(ii) Suggest what will happen to the level of radioactivity in organelle **R** after 40 minutes. Give a reason for your answer.

(2)

.....

.....

.....

.....

.....

.....

.....

(Total for question 7 = 11 marks)

Q8.

Carnivorous plants live in soil lacking mineral ions such as nitrates.

Carnivorous plants obtain nitrogen-containing compounds by digesting animal tissue.

(a) The pitcher plant is a type of carnivorous plant.

The photograph below shows a species of pitcher plant, *Nepenthes attenboroughii*.



Magnification ×0.1

Explain what is meant by the term **niche**, with reference to the pitcher plant.

(2)

.....

.....

.....

.....

.....

(b) Pitcher plants have leaves that trap insects or small mammals.
These leaves are shaped like deep cups filled with liquid. This liquid contains enzymes that digest protein.
Put a cross ☒ in the box next to the correct words to complete the following statement.
The adaptations shown by the pitcher plants are

(1)

- ☐ **A** anatomical and behavioural
- ☐ **B** anatomical and physiological
- ☐ **C** anatomical, behavioural and physiological
- ☐ **D** behavioural and physiological

(c) Suggest how natural selection has given rise to carnivorous plants.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question 8 = 7 marks)

Q9.

The photograph below shows two giant pandas, an adult and a cub. Giant pandas are endangered in the wild. Zoos play a role in the conservation of endangered species.



© Shutterstock/Gang Liu

Magnification ×0.05

(a) Explain how breeding programmes can help conserve the genetic diversity of the giant panda.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Giant pandas are difficult to breed in captivity. The males tend to be aggressive towards the females and there is only a short period of time when the females are fertile.

Artificial insemination can be used to fertilise female pandas. The sperm for this has been stored by freezing.

Freezing for long periods of time can damage the mitochondria in the sperm.

(i) Explain how damage to the mitochondria could affect the ability of sperm to fertilise an egg.

(3)

.....

.....

.....

.....

.....

.....

.....

(ii) Freezing sperm can also damage the acrosome membrane.
Suggest how damage to the acrosome membrane could affect the fertilisation of an egg.

(4)

.....

.....

.....

.....

.....

.....

.....

(Total for question 9 = 11 marks)

Q10.

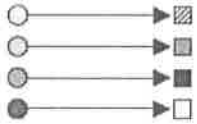
Wheat is a crop plant.

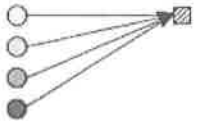
The phenotype of wheat is determined by its genotype and the environment.

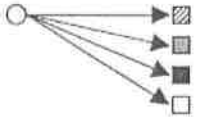
(a) The colour of wheat grains is an example of polygenic inheritance. It is also an example of a character that shows continuous variation.

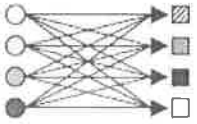
(i) Put a cross ☒ in the box next to the diagram that illustrates polygenic inheritance for the colour of wheat grains.
Each circle represents one gene and each square represents one character.

(1)

☐ A 

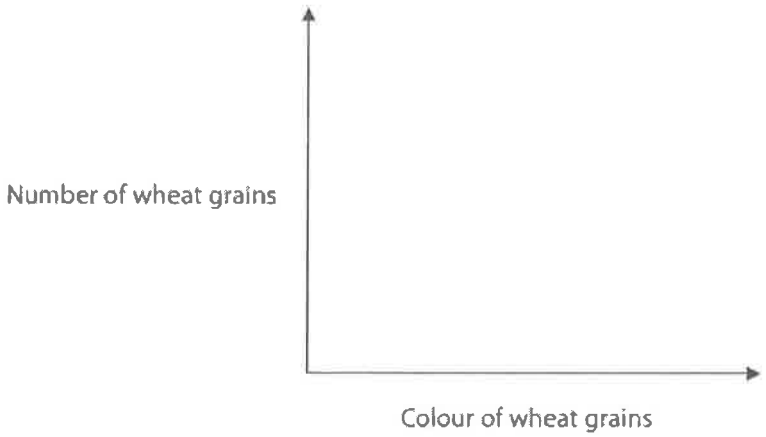
☐ B 

☐ C 

☐ D 

(ii) Complete the graph below to show continuous variation for this character.

(1)



(b) The phenotype of wheat plants is affected by the availability of magnesium ions.

Explain how a lack of magnesium ions could affect the phenotype of wheat plants.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question 10 = 5 marks)

Q11.

In Japan, scientists have used stem cells from the skin of mice to produce gametes.

The stem cells were stimulated to give rise to cells that can produce gametes. These cells were implanted into sterile female mice that had been unable to produce egg cells. These female mice were then able to produce egg cells.

The photograph below shows one of these female mice with her offspring.



© SSP

Magnification ×1

(a) The allele for white fur is recessive. The scientists took a skin cell from a brown mouse and used it to grow egg cells in a sterile white mouse. These egg cells were fertilised with sperm from another white mouse.

All the offspring had brown fur.
Suggest what conclusion can be made from this observation.

(2)

.....

.....

.....

.....

.....

(b) When the undifferentiated cells were implanted into the sterile female mice they gave rise to egg cells. These egg cells were genetically varied.

Suggest how these undifferentiated cells gave rise to genetically varied egg cells.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

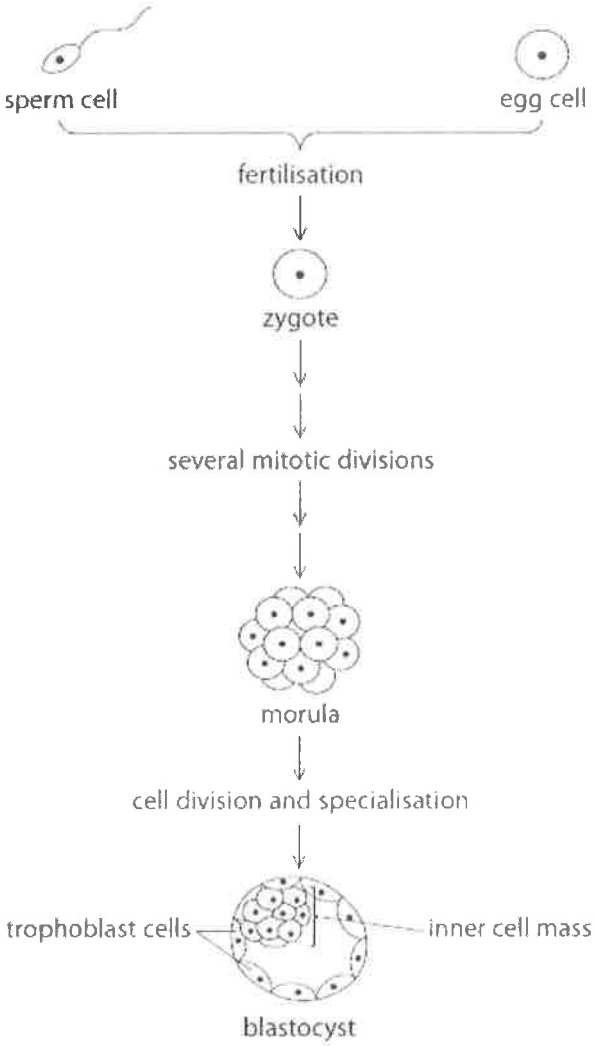
.....

.....

(Total for question 11 = 6 marks)

Q12.

The diagram below shows some of the stages in the formation of an embryo.



(a) The morula consists of totipotent stem cells.

Explain the meaning of the term **totipotent stem cells**.

(2)

.....

.....

.....

.....

(b) The blastocyst consists of two types of cell, trophoblast cells and the inner cell mass.

Cells in the inner cell mass are pluripotent.
Explain how the cells formed from the inner cell mass become specialised.

(3)

.....

.....

.....

.....

.....

.....

(Total for question 12 = 5 marks)

Q13.

In the development of new drugs, three-phased testing will only take place on those drugs that pass the pre-clinical testing stage. Pre-clinical testing involves the use of animals.

*Describe three-phased testing.

(5)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question 13 = 5 marks)

Q14.

Plants, such as rice, can be genetically modified to reduce the thickness of the secondary cell wall.

(a) The secondary cell wall is composed of cellulose and lignin.

Describe the arrangement of cellulose molecules in cell walls.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Explain the importance of lignin in the transport of materials in xylem vessels.

(3)

.....

.....

.....

.....

.....

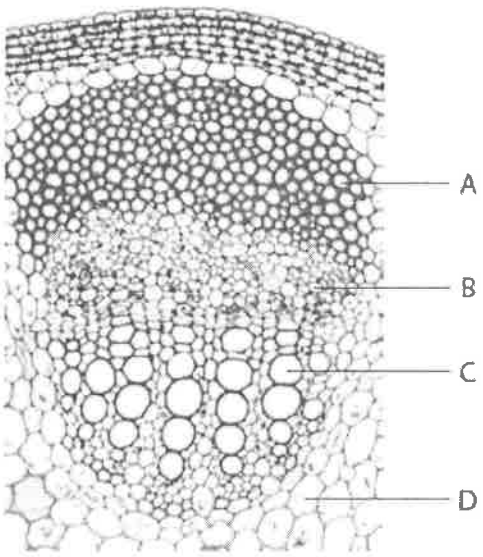
.....

.....

.....

.....

(c) The photograph below shows a section through part of the stem of a plant, as seen using a light microscope.



Magnification ×80

Put a cross ☒ in the box that identifies a xylem vessel.

(1)

☐ A
☐ B
☐ C
☐ D

(Total for question 14 = 7 marks)

Q15.

Packaging materials can be made from plastics produced from oil or bioplastics.
Bioplastics are made from either starch or cellulose.

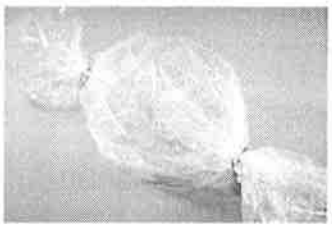
(a) Starch and cellulose are both polysaccharides found in plants.

The table below lists features of polysaccharides.
Complete the table by placing a cross in the appropriate box (☒) to indicate if each feature is present in cellulose, starch or both.

(4)

Feature	Cellulose only	Starch only	Both starch and cellulose
Polymer of α-glucose	☐	☐	☐
Polymer of β-glucose	☐	☐	☐
Contains 1,4-glycosidic bonds	☐	☐	☐
Contains 1,6-glycosidic bonds	☐	☐	☐

(b) The photograph below shows a bioplastic wrapper made from starch.



Suggest the advantages of using bioplastic wrappers instead of plastic wrappers made from oil.

(3)

.....

.....

.....

.....

.....

(Total for question 15 = 7 marks)

Total for paper = 105 marks

Q1.

Question Number	Answer	Additional guidance	Mark
(a)	Animal cells only: centriole ; Animal and plant cells: (cell) membrane / cytoplasm / Golgi (apparatus) / mitochondrion / endoplasmic reticulum / lysosome /nucleus / nucleolus / ribosome ; Plant cells only: chloroplast / cell wall / amyloplast / tonoplast / plasmodesma / {large / permanent / sap/ eq} vacuole ;	**ACCEPT** plural names **ACCEPT** phonetic spellings **DO NOT ACCEPT** when more than one answer is given in one part of the diagram if one of these answers is incorrect for the cell type **ACCEPT** centrosome/cortical granules **ACCEPT** correctly qualified answers e.g plasma membrane / rough ER /smooth ER / 80S ribosome IGNORE vacuole **ACCEPT** pits / middle lamella	(3)

Question Number	Answer	Additional guidance	Mark
(c)	1. idea that classification was based on {anatomy / morphology /physical structure / eq};	**IGNORE** references to natural selection	
	2. idea of use or availability of {improved / electron} microscopes ;	2. and 3. **named** equipment or methods must be given	
	3. use of molecular phylogeny;	3.**ACCEPT** a name or description of chemical analysis e.g. proteomics / DNA profiling / DNA analysis	
	4. idea that {more / new} **species** {have been / will be} discovered ;	4. **DO NOT ACCEPT** new organisms 4. **IGNORE** references to speciation, this has to be in context of **discovery** or **identification** of species	
	5. idea that in the future, technology will continue to develop ;	5. e.g. improved technology / chemical analysis / DNA analysis **(in the future)**	
			(3)

Q2.

Question Number	Answer	Mark
(a)	**The only correct answer is C as the nucleus, nucleolus and mitochondrion are found in animal cells** ***A*** *is not correct because the nucleus, nucleolus and mitochondrion are found in animal cells* ***B*** *is not correct because the nucleus, nucleolus and mitochondrion are found in animal cells* ***D*** *is not correct because chloroplasts are not found in*	(1)

Question Number	Answer	Mark
(b)		(3)

Feature	Plant cells	Prokaryotic cells	Plant cells and prokaryotic cells
cellulose cell wall	☒		
nucleus	☒		
ribosomes			☒

Only plant cells have cellulose cell walls. Prokaryotic cell walls are made of peptidoglycan. Plant cells are eukaryotic cells so have a nucleus. Prokaryotic cells do not have a nucleus. Ribosomes are found in both eukaryotic cells and prokaryotic cells, although their sizes are different.

Question Number	Answer	Additional guidance	Mark
(c)		**PIECE TOGETHER** e.g. "Areas where there is no cell wall and cytoplasm links two adjacent cells," gains mp1 and 2.	(2)
	1. pores in the cell **wall** between (adjacent) cells / eq ;	**1. ACCEPT** gaps /channels / canals / holes as eq to pores **1. ACCEPT** references to bridges only if in the context of cell wall **1. ACCEPT** descriptions of no cell wall present **1. NOT** pits	
	2. idea that there is **cytoplasm** running through the plasmodesmata ;	**2.IGNORE** ref to symplast **2.ACCEPT** cytoplasm-filled channel / cytoplasmic bridge **ACCEPT** labelled diagram with the above points for 2 marks	

Q3.

Question Number	Answer	Additional Guidance	Mark
(a)(i)	**A** both meiosis and mitosis	***B*** *is incorrect because the DNA has to replicate before both mitosis and meiosis* ***C*** *is incorrect because the DNA has to replicate before both mitosis and meiosis* ***D*** *is incorrect because the DNA has to replicate before both mitosis and meiosis*	(1)
(a)(ii)	**B** meiosis only	***A*** *is incorrect because there is no prophase I in mitosis* ***C*** *is incorrect because crossing over there is no prophase I in mitosis* ***D*** *is incorrect because crossing over occurs in meiosis, prophase I*	(1)

Question Number	Answer	Additional Guidance	Mark
(b)	**C** four daughter cells with one copy of each chromosome / two daughter cells with two copies of each chromosome	***A*** *is incorrect because mitosis results in two daughter cells with two copies of each chromosome and meiosis results in four daughter cells with one copy* ***B*** *is incorrect because mitosis results in two daughter cells with two copies of each chromosome and meiosis results in four daughter cells with one copy* ***D*** *is incorrect because mitosis results in two daughter cells with two copies of each chromosome and meiosis results in four daughter cells with one copy*	(1)

Question Number	Answer	Additional Guidance	Mark
(c)	1. because they do not have a nucleus ; 2. because they do not have (linear) chromosomes ; 3. **meiosis** does not take place because they do not {reproduce sexually / produce gametes} ;	2. ACCEPT because they have circular DNA 3.ACCEPT **meiosis** does not take place as they reproduce by binary fission	(2)

Q4.

Question Number	Answer	Additional Guidance	Mark
(a)	**Drawing mark** 1. two membranes drawn with inner membrane folded ; **Labelling marks** 2. outer membrane and {inner membrane / cristae} ; **Any two from:** 3. inter-membrane space; 4. matrix ; 5. stalked particles 6. (circular)DNA ; 7. (70S)ribosomes ;	1.IGNORE labels when assessing drawing mark 1.IGNORE shape of mitochondrion 1.IGNORE number of folds IGNORE labels of phosphate granules/lipid droplets DO NOT ACCEPT other structures including granum/stroma/thylakoid/starch grain/nucleus/cytoplasm/mesosome 2.NOT cell membrane/cell wall 2. NOT cisternae instead of cristae 2.ACCEPT double membrane/envelope 3. and 4. Need to be labelled in the correct position but no additional drawing needed 5.6. and 7. A drawing (not detailed) to represent them is needed as well as label being in correct position. (Quality of drawing is not being assessed in these marking points). 5. Drawn attached to cristae 6. and 7. Drawn in matrix and not attached to membrane	(4) EXP

Question Number	Answer	Additional Guidance	Mark
(b)	1. (loop of) DNA ; 2. (70S / small) ribosomes ;	IGNORE answers about features that they don't have 1. IGNORE plasmid /genetic material	(2) GRAD

Question Number	Answer	Additional Guidance	Mark
(c)	1. top line = archaea ; 2. middle line = bacteria ; 3. bottom line = eukaryota ;	ACCEPT either way around 1. ACCEPT archaebacteria 2. ACCEPT eubacteria 3 ACCEPT eukaryote / eukarya/ eukaryotic	(3) GRAD

Question Number	Answer	Additional Guidance	Mark
(d)	chloroplast / large vacuole / amyloplast ;	DO NOT ACCEPT any other structure IGNORE plastid ACCEPT sap vacuole/permanent vacuole	(1) GRAD

Q5.

Question Number	Answer	Additional Guidance	Mark
(a)	Any two of: 1. Golgi (apparatus / body / complex) ; 2. lysosome ; 3. vesicle ; 4. rough endoplasmic reticulum / rER ; 5. smooth endoplasmic reticulum / sER ; 6. vacuole ;	DO NOT ACCEPT any other structure 1 ACCEPT dictyosome ACCEPT endoplasmic reticulum / ER for one mark only	(2)

Question Number	Answer	Mark
(b)(i)	A amyloplasts	(1)

Question Number	Answer	Mark
(b)(ii)	C pits	(1)

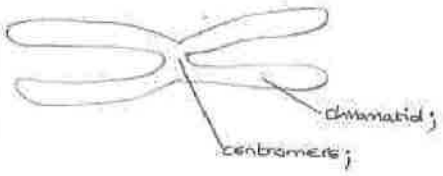
Question Number	Answer	Additional Guidance	Mark
(c)(i)	1. idea that one (haploid) male {gamete / nucleus } fuses with (haploid) {egg cell / egg nucleus / female gamete / female nucleus} ; 2. to produce a {diploid / 2n} {zygote / embryo} ; 3. idea that one (haploid) male {gamete / nucleus} fuses with {two polar nuclei / diploid endosperm nucleus / fusion nucleus} ; 4. to produce a {triploid / 3n} endosperm (nucleus) ;	1 **ACCEPT** sperm nucleus **DO NOT ACCEPT** generative nucleus **IGNORE** ovum / egg unqualified 3 **ACCEPT** sperm nucleus **DO NOT ACCEPT** generative nucleus / polar bodies	(3)

Q6.

Question Number	Answer	Additional guidance	Mark
(a)	1. group of cells ; 2. with similar {structure / function / origin} ;	1.ACCEPT similar cells 2. ACCEPT description of a function e.g. (all) involved in support / transport (of water / mineral ions / eq)	(2)

Question Number	Answer	Additional guidance	Mark
(b)(i)	(acetic / ethanoic / propionic) orcein / toluidine (blue) ;	ACCEPT phonetic spellings ACCEPT Schiff's (reagent) / Feulgen's (stain) / (aceto)carmine / methylene blue NOT iodine	(1)

Question Number	Answer	Mark
(b)(ii)	The only correct answer is **D** ***A** is incorrect because **R** is metaphase which comes before **P** which is anaphase* ***B** is incorrect because **Q** is telophase which comes after **P** which is anaphase* ***C** is incorrect because **R** is metaphase which comes before **P** which is anaphase*	**(1)**

Question Number	Answer	Additional guidance	Mark
(b)(iii)	1. chromosome drawn showing two chromatids ; 2. one/both of the chromatids labelled correctly ; 3. centromere labelled correctly	e.g.  **1.** ACCEPT simple line drawings and ignore any drawings of nuclear spindle. **1.**IGNORE labels when assessing mp1 **2. and 3.** ACCEPT phonetic spellings **2. and 3.** IGNORE any other labels	**(3)**

Q7.

Question Number	Answer	Additional guidance	Mark
(a)	**B** ribosome | rough endoplasmic reticulum | Golgi apparatus *Polypeptide chains are synthesised on the ribosome and then move through the cytoplasm in the RER to the Golgi apparatus where they are modified.*		**(1)**

Question Number	Answer	Additional guidance	Mark
(b)	1. idea that this is where { protein / polypeptide } synthesis occurs ; 2. using radioactive amino acids ;	**1. ACCEPT** translation **2. ACCEPT** idea of radioactive amino acids being transported to { P /	**(2)**

Question Number	Answer	Additional guidance	Mark
(c)(i)	1. it increases between 10 and 20 minutes ; 2. it decreases after 20 minutes ;	**1. ACCEPT** between 5 and 20 minutes **2. ACCEPT** between 20 and 40 minutes	**(2)**

Question Number	Answer	Additional guidance	Mark
(c)(ii)	1. idea that { proteins / polypeptides } { enter / are in / move through } Q 2. idea that { proteins / polypeptides } are { packaged in vesicles / transported to R / transported to Golgi apparatus } ;	**ACCEPT** { RER / eq } as alternative to Q throughout **2. ACCEPT** enter as eq to transported	**(2)**

Question Number	Answer	Additional guidance	Mark
(d)(i)	1. idea that some of the proteins are { for intracellular use / synthesised on free ribosomes } ; 2. idea that some of the proteins { are still in vesicles / remain in the RER / Q } ; 3. idea that some { amino acids / proteins } were in the cytoplasm ; 4. idea of radioactive decay ;	**ACCEPT** polypeptides as eq to proteins throughout answer **1. ACCEPT** idea that not all proteins need modification **1. ACCEPT** some proteins are made { in mitochondria / on mitochondrial ribosomes } **2. ACCEPT** some vesicles have not reached the Golgi / R	(2)

Question Number	Answer	Additional guidance	Mark
(d)(ii)	1. levels will decrease / eq ; 2. as proteins { move into vesicles / move into lysosome / are secreted from cell / are removed by exocytosis } ;	**1. ACCEPT** stated values below 20 e.g. zero / 5 **2. ACCEPT** due to radioactive decay /eq **2. ACCEPT** non-radioactive amino acids now being used	(2)

Q8.

Question Number	Answer	Additional Guidance	Mark
(b)(i)	1. idea of role of {organism / species} in its { habitat / community / ecosystem / environment } ; 2. idea of providing {food / shelter} for {animals / herbivores} **OR** recycling nitrogen **OR** soil improvement;	**1 ACCEPT** relationship between organisms in a {habitat / eq} **IGNORE** exploits **2 ACCEPT** it is a producer	**(2)**

Question Number	Answer	Mark
(b)(ii)	**B** – anatomical and physiological	**(1)**

Question Number	Answer	Additional Guidance	Mark
(b)(iii)	1. idea that low nitrates act as a selection pressure ; 2. genetic variation in population / (variation due to) mutation / eq ; 3. description of relevant feature for feeding on insects ; 4. less competition from other plants ; 5. idea of passing on carnivorous alleles; 6. change in allele frequency (over generations) / eq ;	**IGNORE** comments about drought and storing water **3** e.g. cup-shaped leaves, produce enzymes **IGNORE** carnivorous **6 DO NOT ACCEPT** genes	**(4)**

Q9.

Question Number	Answer	Additional Guidance	Mark
(a)	1. use of { stud books / DNA profiles / eq } (to select mates) ; 2. exchange of animals between zoos / eq ; 3. idea of { reducing inbreeding / encouraging outbreeding } ; 4. prevention of genetic drift / eq ; 5. introduction of alleles from other populations / eq ;	1. ACCEPT 'breeding records' 2. ACCEPT reference to exchange of eggs or sperm between zoos	(4)

Question Number	Answer	Additional Guidance	Mark
(b)(i)	1. idea that mitochondria provide { energy / ATP } ; 2. reference to (aerobic) respiration ; 3. (therefore) flagellum unable to move / sperm unable to swim / chances of fertilisation reduced / eq ;	ACCEPT converse points for mp1 and mp2 e.g. damaged mitochondria do not provide ATP 3. ACCEPT tail for flagellum	(3)

Question Number	Answer	Additional Guidance	Mark
(b)(ii)	**(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. *acrosome* contains { *acrosin* / *digestive enzyme* / eq } ; 2. *acrosome* cannot fuse with cell surface *membrane* of sperm ; 3. (*acrosin* / *enzyme*) cannot be released ; 4. by *exocytosis* ; 5. idea that the sperm cell cannot penetrate the *zona pellucida* / *zona pellucida* not { digested / broken down } ;	**QWC emphasis on spelling** 1. ACCEPT *hydrolytic enzyme* or *hydrolase* 2. ACCEPT plasma membrane 5. ACCEPT "jelly layer"	**(4)**

Q10.

Question Number	Answer	Mark
(a)(i)	The only correct answer is **B** *A is incorrect because each gene is determining one character* *C is incorrect because one gene is determining several characters* *D is incorrect because it is impossible*	**(1)**

Question Number	Answer	Additional Guidance	Mark
(a)(ii)	{line / bar} graph to show a bell-shaped curve ;	**ACCEPT** a skewed distribution	**(1)**

Question Number	Answer	*Additional Guidance*	Mark
(b)(i)	1. idea that the leaves will look { yellow / white }; 2. because chlorophyll will not be made ; 3. idea that the plant will {be small / not be healthy / eq} ; 4. as photosynthesis will be slow / eq ;	1. **ACCEPT** correct reference to chlorosis 1. **IGNORE** "leaves change colour" / "leaves will not be green" 2. **ACCEPT** magnesium needed to produce chlorophyll 3. e.g. stunted growth / reduced growth	(3)

Q11.

Question Number	Answer	Additional Guidance	Mark
(b)	1. the { egg cell / female gamete } contains the { nucleus / genes } of the brown mouse ; 2. alleles for brown fur are in the { egg cell / female gamete } ; 3. the alleles for brown fur are dominant / (stem cell) homozygous dominant for brown fur ; 4. idea of genetic material from { female parent / sterile mouse } not passed on to offspring ;		(2)

Question Number	Answer	Additional Guidance	Mark
(d)	1. meiosis produced { haploid nuclei / genetic variation } ; 2. independent assortment of chromosomes / { crossing over of chromatids / chiasmata } ; 3. resulting in recombination of alleles ; 4. { transcription / mRNA produced } at active genes / eq ; 5. translation of mRNA produced { protein /polypeptide } ; 6. production of { protein / enzyme } which determine { cell structure / function } ;	3. ACCEPT production of recombinants. IGNORE reference to mutations 5. ACCEPT enzyme 6. ACCEPT 'proteins modify the cells'	(4)

Q12.

Question Number	Answer	Additional guidance	Mark
(a)	1. they are { undifferentiated/unspecialised } (cells) 2. that { divide continuously/ have unlimited cell division } ; 3. idea that they can become any cell type ;	**2 ACCEPT** no Hayflick limit **3. ACCEPT** all cell types **3. ACCEPT** embryonic AND extra- embryonic tissues **3. ACCEPT** so that a whole organism can be made	**(2)**

Question Number	Answer	Additional guidance	Mark
(c)	1. reference to differential gene expression ; 2. idea that some genes are { active / switched on / eq } ; 3. idea of { transcription / mRNA produced } at active genes ; 4. { proteins / polypeptides } produced (from this mRNA) / eq ; 5. idea that this protein (permanently) modifies cell **OR** idea that this protein determines { cell structure / function } ;	3. e.g. only active genes are transcribed	(3)

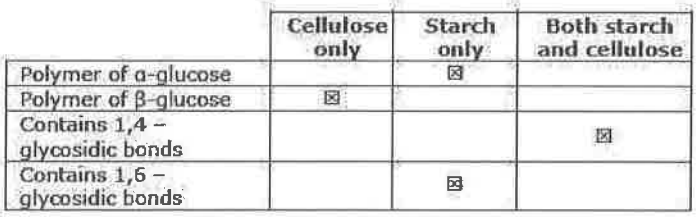
Q13.

Question Number	Answer	Additional Guidance	Mark
*(a)	(*QWC - Spelling of technical terms must be correct and the answer must be organised in a logical sequence.) 1. (phase I) involves (small) number of healthy {people / volunteers} ; 2. (phase II) involves small number of patients / eq ; 3. (phase III) involves {large/larger number} of patients / eq ; 4. reference to a double blind trial ; 5. reference to use of placebo ; 6. idea that neither the patient nor the doctor knows who is receiving the placebo ;	QWC emphasis is on clarity of expression 2.ACCEPT idea that there are more people than in phase I 2.ACCEPT100-300 3.ACCEPT > 1000 4.5.6. ACCEPT in context of phase II or phase III	(5) EXP

Q14.

Question Number	Answer	Additional Guidance	Mark
(a)(i)	1. cellulose molecules linked by hydrogen bonds ; 2. reference to **microfibrils** ; 3. idea of sheets / layers (of microfibrils) ; 4. (microfibrils) arranged in {net / mesh / criss-cross /eq };	4.ACCEPT at different angles (to each other)	(3)
(a)(ii)	1. vessels are hollow tubes ; 2. lignin needed to add {strength / support} to the vessels ; 3. xylem involved in transport of water ; 4. lignin needed to waterproof the vessels ;	ALLOW xylem as eq to vessels throughout ACCEPT cell walls as being in context of vessels 2.ACCEPT provides rigidity to the vessels / prevents vessels collapsing 4. e.g.to make vessels impermeable to water / to prevent water loss from vessels	(3)
(a)(iii)	C	***A** is incorrect because it is the sclerenchyma* ***B** is incorrect because it is the phloem* ***D** is incorrect because it is the parenchyma*	(1)

Q15.

Question Number	Answer	Additional Guidance	Mark
(a)(i)			(4)

Question Number	Answer	Additional Guidance	Mark
(b)	1. idea that starch is a { sustainable / renewable } resource / bioplastic comes from a { sustainable / renewable } resource ; 2. more plants can be grown ; 3. plastic comes from a non-renewable resource / oil { is non-renewable / will run out / eq } ; 4. bioplastics are biodegradable / eq ;	1. **NOT** bioplastics are renewable 4. **ACCEPT** converse statement	(3)