

Section B: Answer on this exam paper. (60 Marks)

Question 1.

(4 marks)

Complete the following paragraphs by matching the Blanks (A – H) with the appropriate terms in the table below: Answer the question by writing the letter in the table alongside the word you choose to fill the Blank.

“After the sperm pronucleus enters the egg and fuses with the egg’s pronucleus the new cell is called the A. After some time this cell divides by a process called B and the pattern of cell division for each species is influenced by the amount of C present in the original egg. In the early stages, after several divisions, the ball of cells is called a D, which consists of cells, which are almost completely E, and therefore have the ability to develop into separate individuals if removed.

Within a short time – maybe days – individual cells become more specialised and their future development into body tissues is partially determined. As this begins, we see the flowing movement of cells and the forming of a hollow inner chamber. At this stage the developing embryo is called a F. The specialising cells at one end called the G will eventually form the foetus. At this stage three primitive lines of cells, which are partially determined, appear. The H cells form the outer germ layer, which will eventually form (among other things) nervous tissue.”

If here is no match leave the box blank (not all words will be used)

Term	Location (A to H)
Animal pole	
Vegetable pole	
Polar body	
Oocyte	
Zygote	
Gastrula	
Blastula	
Placenta	
Ectoderm	
Endoderm	
Cleavage	
Differentiation	
Totipotent	
Yolk	

Question 2.

(4 marks)

Match these words to the statements below them (not all words will be used):

- | | | | |
|---|------------|---|----------------------|
| A | steroids | H | acetylcholine |
| B | acetyl CoA | I | pituitary hormones |
| C | glycerol | J | pheromones |
| D | oxytocin | K | antidiuretic hormone |
| E | glucagon | L | paracrine hormones |
| F | insulin | M | secretin |
| G | axon | N | dendrite |

Statement	Word (A to N)
Released into the external environment, providing chemical communication between organisms	
Produced by neurosecretory cells of the hypothalamus and associated with milk let down	
Produced in the pancreas and is responsible for raising of blood glucose levels	
Facilitates the reabsorption of water in the renal collecting ducts and reduces urine volume	
Group of hormones whose receptors in target cells are found in the cytoplasm	
Neurotransmitter released at the synapse between motor neurones and skeletal muscle	
Part which carries the depolarisation wave away from the body of the neuron	
Part which carries the depolarisation wave toward the body of the neuron	

Question 3.

(4 marks)

AED (anhydrotic ectodermal dysplasia), is an X-linked recessive disease which occurs primarily in Holstein cattle. Calves are born with no hair , deformities of the mouth and a lack of sweat glands (called naked calf).

Polledness is an autosomal dominant trait (horns being the homozygous recessive phenotype).

Males are the heterogametic sex in cattle.

When a polled normal (no AED) bull was mated to five normal polled cows (A, B, C, D and E) the following outcomes were achieved:

Cow	Calf		
	Sex	Poll/Horns	Normal/naked
A	M	Horned	Naked
B	M	Horned	Normal
C	F	Polled	Normal
D	M	Polled	Naked
E	F	Horned	Normal

Match the Statements below to the cows above (A-E). There is only one cow, which will match each statement, but a cow may match more than one statement or no statements at all.

Statement	Cow (A - E)
This is the only cow for which the genotype can be fully predicted	
This cow is heterozygous for AED but we are uncertain about her Poll/horn genotype	
This cow had a female calf which is definitely homozygous at the poll/horn locus	
This cow had a male calf and we are uncertain whether she is a carrier of AED	

Question 4.

(4 marks)

Complete the following paragraphs by matching the Blanks (A – H) with the appropriate terms below

“In the alimentary canal, food is subjected to a series of mechanical and chemical processes that break down the food into small molecules that can be absorbed by the body. In the rat, food is ground down by teeth and mixed with saliva containing the enzyme amylase that starts the digestion of carbohydrates. Boluses of food are carried down the A to the stomach, where the environment is B and the enzyme C starts to break down proteins. Aliquots of the chyme are passed through the D sphincter into the E where they are neutralized by secretions from the F. Bile from the G is added to emulsify fats so that they can be broken down into their building blocks - H and fatty acids - by the enzyme lipase .”

If here is no match leave the box blank (not all words will be used);

Term	Location A to H
acidic	
amylase	
anal	
pyloric	
basic	
glycerol	
caecum	
duodenum	
Gall bladder	
lipase	
liver	
oesophagus	
pancreas	
pepsin	
glucose	

Question 5.

(4 marks)

Match these words to the statements below them (not all words will be used):

- | | | |
|-------------------------|---------------------|-----------------|
| A Bowman's capsule | H diastole | O urea |
| B alveoli | I convoluted tubule | P systole |
| C atrioventricular node | J pulmonary artery | Q haemoglobin |
| D Vena cava | K negative pressure | R baroreceptors |
| E sinus venosus | L right ventricle | S aorta |
| F carbonic anhydrase | M left ventricle | T vasodilators |
| G pulmonary vein | N uric acid | U nephron |

Statement	Word (A to U)
Major blood vessel carrying blood from the left ventricle	
Blood passes through the mitral valve into this chamber	
The point in time when the ventricles are in a relaxed state	
Has fenestrated epithelia and performs filtration under pressure	
Microscopic air sacs in the lungs	
An enzyme in erythrocytes which converts carbon dioxide to bicarbonate	
A slightly acidic protein which forms an unstable link with oxygen at high oxygen concentrations	
Stretch receptors in blood vessels which monitor blood flow and pressure	
A single excretory unit in the kidney	
The stage in the heart cycle when the chambers pump blood	

Question 6**(10 marks)**

Write a number (from alongside the word/s below) in the space to best complete the sentences A-U.

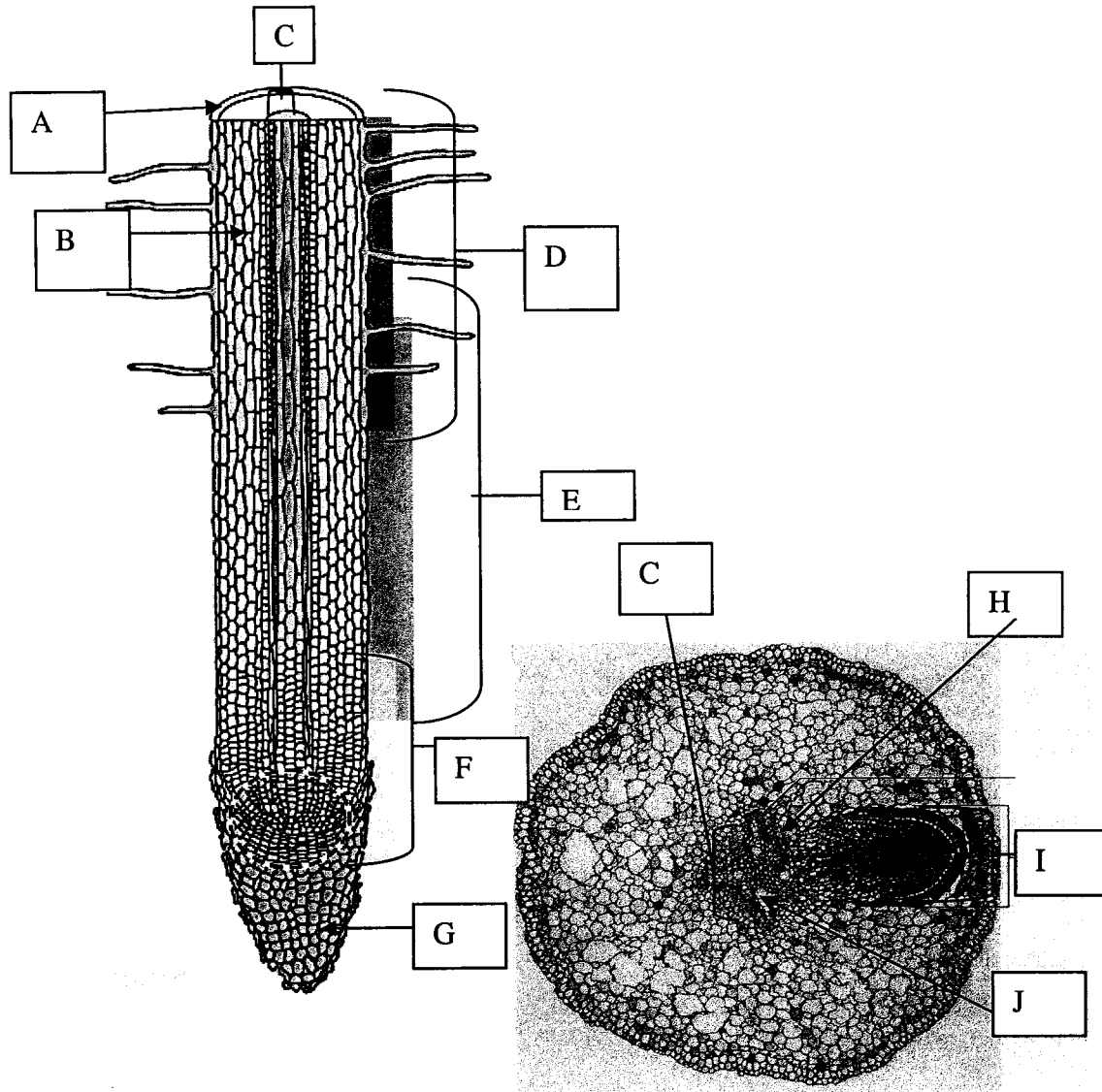
1 anther	9 cotyledons	17 guard cells	25 palea	33 spongy
2 auricle	10 cuticle	18 hypogeal	26 palisade	34 stele
3 bark	11 dicot	19 kranz anatomy	27 pericycle	35 stipule
4 blade	12 endodermis	20 lemna	28 periderm	36 stomata
5 collar	13 epidermis	21 ligule	29 petiole	37 style
6 cork	14 epigeal	22 mesophyll	30 phloem	38 vascular bundle
7 cork cambium	15 exodermis	23 monocot	31 sheath	39 Vascular cambium
8 cortex	16 glumes	24 ovary	32 spikelet	40 xylem

- A. The tissues that lie within the endodermis are collectively called the _____
- B. Lateral roots arise from the _____
- C. The casparian strip is located in the _____
- D. The x or y shape seen in a young root cross sections is the _____
- E. Within the root abuscular fungi colonise the _____
- F. Root hairs arise from the _____
- G. The emergence of a seedling that has it cotyledons
above the ground is called _____
- H. At the base of a grass flower (spikelet) are the _____
- I. In a grass the junction of the leaf sheath and the leaf blade, there may be a
membranous tissue called the _____
- J. In C4 grasses carbon can be stored in the _____
- K. On the adaxial (upper surface) of the vascular bundles in a leaf, is the _____
- L. On the abaxial (lower surface) of the vascular bundles in a leaf is the _____
- M. The majority of photosynthesis in plants occurs in the _____
- N. Leaf orientation is controlled by the _____
- O. Lateral growth of a tree occurs from the _____
- P. The dead tissue on an the external surface of a
perennial plant is called the _____
- Q. The name for the collective tissues external to the vascular cambium is _____
- R. In a perennial plant immediately internal to the vascular cambium is the _____
- S. In a perennial plant immediately internal to the vascular cambium is the _____
- T. Protective waxes on a leaf surface are produced from the _____

Question 7

(5 marks)

Below are diagrams of a root. Identify the structures or processes labeled. Note that C is identified twice, once in each diagram. Write the number alongside the appropriate name of the part into the list A-J



- 1 abascular fungi
- 2 cork cambium
- 3 cortex
- 4 endodermis
- 5 epidermis
- 6 lateral root
- 7 meristem
- 8 pericycle
- 9 pith
- 10 primary phloem

- 11 primary xylem
- 12 procambium
- 13 root cap
- 14 root hair
- 15 secondary phloem
- 16 secondary xylem
- 17 stele
- 18 vascular cambium
- 19 zone of differentiation
- 20 zone of elongation

Answers for Question 7

- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____
- G. _____
- H. _____
- I. _____
- J. _____

Question 8

(4 marks)

Match these words to the statements below them (not all words will be used):

- | | | | |
|---|-----------------------|---|-----------|
| A | connective tissue | H | squamous |
| B | stratified epithelium | I | cardiac |
| C | skeletal muscle | J | ventral |
| D | striated | K | medial |
| E | smooth | L | dorsal |
| F | adipocytes | M | cartilage |
| G | tarsals | N | carpels |

Statement	Word (A to N)
This muscle surrounds "tubes" in the body when contraction for movement and strength is required.	
These cells contain a large amount of triglyceride enclosed in a vacuole	
This tissue consists of chondrocytes and one place that it is found is in the epiphysis of growing long bones like the femur.	
These bones are found in the distal hind limbs of animals like humans, cattle and sheep	
This term means "towards the front or belly"	
This tissue group contains cells of various types distributed in a non cellular matrix	
These cells line the inner surface of the urethra, esophagus, anus and vagina and the outer skin.	
This muscle cells are branched and interconnected via intercalated discs	

Question 9

(5 marks)

Write a number (from alongside the word/s below) in the space to best complete the sentences A-J.

- | | |
|--------------------|---------------|
| 1 crossing over | 11 chromosome |
| 2 chiasma | 12 uracil |
| 3 ribosome | 13 cytosine |
| 4 centromere | 14 adenine |
| 5 telomere | 15 guanine |
| 6 mRNA | 16 thymine |
| 7 tRNA | 17 mitosis |
| 8 DNA | 18 meiosis |
| 9 sister chromatid | 19 exon |
| 10 histone | 20 intron |

- A. With the base pairs in DNA, adenine joins with _____
- B. The base pair that is replaced by uracil in RNA is _____
- C. DNA is transcribed to _____
- D. During anaphase II there is a division of the _____
- E. This division occurring in D causes the separation of the _____
- F. Translation is the genetic code onto _____
- G. A condensed DNA strand is called a _____
- H. The portion of the DNA molecule that is not copied is called the _____
- I. Homologous chromosomes exchange DNA portions
the area of junction is called the _____
- J. These are involved in protein synthesis, and have two subunits _____

Question 10**(10 marks)**

Complete the following paragraphs by matching the Blanks (A – U) with the appropriate terms below

1	anther	11	microsporocyte
2	antipodal cells	12	microspores
3	diploid	13	mitosis
4	egg cell	14	polar nuclei
5	gamete	15	pollen tube
6	gametophyte	16	sperm cells
7	haploid	17	sporophyte
8	meiosis	18	synergid cells
9	megasporocyte	19	synergid degenerated
10	megaspores	20	vegetative cell

In the formation of pollen, the male A undergoes B to form four new cells that are C. Each of these new cells undergo D, to produce a E and a F. The later undergoes further G which then becomes a pollen grain. After release from the H, the pollen grain lands the stigma and the I germinates. The vegetative cell produces a J in which the K travel down through the style. Entry to the ovary is achieved through a L, and double fertilization occurs with the M fusing with the N to form the zygote and with the O to form the endosperm.

Within the ovary, the P undergoes Q. Only one of the cells produced survives and undergoes mitosis three times to produce three R, two S one T and one U.

A	_____	L	_____
B	_____	M	_____
C	_____	N	_____
D	_____	O	_____
E	_____	P	_____
G	_____	Q	_____
H	_____	R	_____
I	_____	S	_____
J	_____	T	_____
K	_____	U	_____

Question 11

(5 marks)

Complete the following paragraphs by matching the Blanks (A – J) with the appropriate terms below

- | | | | |
|----|------------------|----|-----------------|
| 1 | 2,4-D ethylene | 11 | IAA |
| 2 | ABA | 12 | Kinetin |
| 3 | abscisic acid | 13 | nastic movement |
| 4 | auxins | 14 | Nyctinasty |
| 5 | cytokinins | 15 | phototropism |
| 6 | dormancy | 16 | senescence |
| 7 | ethelene | 17 | Seismonasty |
| 8 | germination | 18 | thigmotropism |
| 9 | gibberellic acid | 19 | tropism |
| 10 | gravitropism | 20 | Zeatin |

Plants respond to their environments through the production of plants hormones. Where the plant has a directional response to an environmental stimulus is called A. Plants utilise plant hormones to govern processes throughout the life of a plant from the seed to production of seeds and death of the plant. The germination process is under control by at least two hormones, B regulates seed dormancy and C triggers the conversion of starch into α amylase. After germination, the young shoot or coleoptiles can determine which way to the surface is through a D response. The hormone responsible for this response is E. The growth of roots and shoots of a plant is governed by the presence of F and G. A plant reaction in a directional response to touch by is called H, where reaction to vibrations is called I, and the closing and opening of flower to daylight is called J.

- A _____
- B _____
- C _____
- D _____
- E _____
- F _____
- G _____
- H _____
- I _____
- J _____

(5 marks)

Section C : Answer in answer book provided (20 Marks)

Question 1

(4 + 2 = 6 marks)

- a) Some organisms are capable of both sexual and asexual reproduction depending on the prevailing environment. There are advantages and disadvantages for both asexual and sexual reproduction. Describe the particular situations where sexual reproduction might be an advantage and those where asexual reproduction might be an advantage and explain why.
- b) From fertilisation to the time that the progeny are capable of surviving on their own, there are various strategies used among animals to ensure the survival of their species. These strategies range from large numbers of progeny to lots of nurture of small numbers of progeny. Give an example of an animal species for each of “numbers” and “nurture” and describe the strategies used in each case.

Question 2

(2 + 6= 8marks)

Two key concepts discussed in animal biology have been surface area and diffusion. These two features limit the size of cells and multicellular organisms have developed organ systems, which increase surface area and facilitate delivery or removal of substances to areas where diffusion occurs. The respiratory, circulatory and digestive systems provide examples of how this is achieved.

- a) explain why surface area and diffusion are limiting factors to cell size
- b) using examples from all three systems listed, describe structures and processes which facilitate delivery or removal of substances to areas where diffusion occurs.

Question 3

(6 marks)

- a) Outline the three processes that contribute to an increase in size of a multicellular organism and
- b) explain how the relative importance of each process changes as the animal develops from fertilisation to mature size.
- c) Explain the concept of allometric growth

Section D : Answer in answer book provided (20 Marks)

Question 1

(10 marks)

Plants need to continuously replace the water lost from their leaves into the atmosphere. This water is absorbed from the soil and transported to the leaves.

Describe the pathways, tissues, and processes involved in the above process.

Your answer should include the appropriate usage of the following terms:

Root hair, epidermis, stomata, xylem, mesophyll cells, osmosis, active transport, endodermis, Apoplastic, cytoplasm, casparian strip, stele, symplastic, cortex, cohesion, cavitation, passive transport, guard cells, water potential and cuticle.

Question 2

(10 marks)

Chloroplasts are able to use atmospheric CO₂ and sunlight energy in the process called photosynthesis to synthesise organic molecules that plant cells use for growth.

Describe the steps in this process including the inputs and products of each step.

Your answer should include the appropriate usage of the following terms:

Matrix, Calvin cycle, ATP, NADPH, water, oxygen, Chemiosmosis, ATPase, RuBP, Rubisco, 3PGA, light, CO₂, thylakoid, grana, Light reactions, Dark reactions, carbon fixation.

THE UNIVERSITY OF MELBOURNE

202-109 BIOLOGY FOR LAND AND FOOD RESOURCES

ANSWER SHEET

Semester 1, 2005

Student ID Number _____

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D

20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D
26	A	B	C	D
27	A	B	C	D
28	A	B	C	D
29	A	B	C	D
30	A	B	C	D
31	A	B	C	D
32	A	B	C	D
33	A	B	C	D
34	A	B	C	D
35	A	B	C	D
36	A	B	C	D
37	A	B	C	D
38	A	B	C	D

39	A	B	C	D
40	A	B	C	D
41	A	B	C	D
42	A	B	C	D
43	A	B	C	D
44	A	B	C	D
45	A	B	C	D
46	A	B	C	D
47	A	B	C	D
48	A	B	C	D
49	A	B	C	D
50	A	B	C	D
51	A	B	C	D
52	A	B	C	D
53	A	B	C	D
54	A	B	C	D
55	A	B	C	D