

**Core 1**

A plant was allowed to disperse its seeds naturally. The seedlings were examined two weeks after they had started to grow. They were found to be of very different heights.

(i) Suggest **three** environmental factors which could have affected the height of the seedlings.

- 1. ....
- 2. ....
- 3. ....[3]

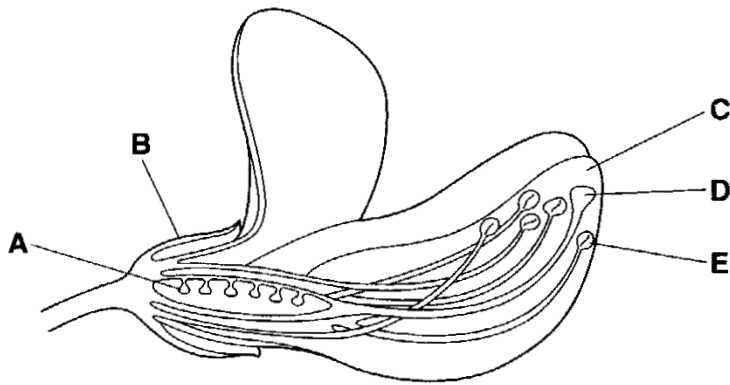
(ii) The seedlings all developed from the seeds of a single plant. The plants which later developed from these seedlings showed a number of inherited differences. Suggest **three** possible reasons for these inherited differences.

- 1. ....  
.....
- 2. ....  
.....
- 3. ....  
.....[3]

[Total : 11]

**Core 2**

Fig 1 | shows a section through a bean flower.



**Fig. 1**

(a) Name the parts labelled **A** and **B**.

**A** .....

**B** .....

[2]

(b) This flower is insect pollinated. Suggest how parts **C**, **D** and **E** help in pollination of this flower.

.....  
.....  
.....  
.....[3]

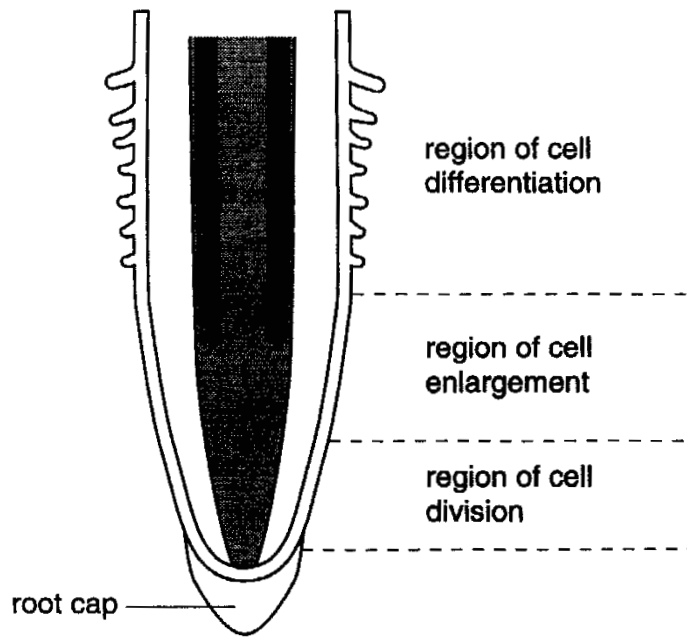
(c) After pollination the ovules develop into seeds. Describe the events which occur after pollination and which result in the formation of seeds.

.....  
.....  
.....  
.....  
.....[4]

[Total : 9]

**Extension 1**

Fig. 2 is a longitudinal section through a root tip showing the regions of growth and development.



**Fig. 2**

(a) Distinguish between the terms *growth* and *development*.

.....

.....

.....[3]

(b) Outline what happens in the region of cell division.

.....

.....

.....

.....[3]

**Extension 1**

The enlarging cells get bigger by absorbing water.

(c) (i) Name the process responsible for this absorption of water.

.....[1]

(ii) What condition must exist in a cell for water absorption to occur?

.....  
.....[1]

(iii) Which cell feature prevents the enlarging cells from bursting?

.....[1]

(iv) Suggest how the enlargement of these cells makes the root grow longer.

.....  
.....  
.....[2]

In the region of cell differentiation, a number of different tissues are formed.

(d) (i) Define the term *tissue*.

.....  
.....[2]

(ii) Table 1 contains some information about root tissues and their functions. Complete the table.

**Table 1**

name of tissue	function
xylem	
	transport of sugars
	absorption of water from the soil

[3]

[Total: 16]

## Extension 2

- (a) Define the term *pollination*. [2]
- (b) Describe the structure of a **named** insect-pollinated flower and state the functions of its parts. [10]
- (c) Describe how cross-pollination leads to variation in a species. [3]

[Total:15]

## Extension 3

- (a) Discuss, giving examples, how the use of modern technology has resulted in increased food production. [9]
- (b) How is plant growth affected by a deficiency of magnesium ions? [3]
- (c) How can minerals, trapped in the bodies of dead animals, become available for plant use? [3]

[Total:14]

## Core 1

- (i) any three of these
- amount / brightness of sunlight / light
  - water availability
  - mineral supply
  - rooting space
  - other soil factors e.g. pH
  - disease infections / damage by herbivores / animals
  - affected by competitor species
- (ii) any three of these
- meiosis leading to variations in ovules / female gametes / nuclei
  - meiosis leading to variation on pollen grains / male gametes / nuclei
  - second / male parent may be different for different seeds / fertilisation of ovules from different pollen grains
  - possibility of mutations / specific mutagen action
  - correct reference to different genotypes of parents / heterozygous state for some genes

## Core 2

- a A ovule / ovary  
B sepal / calyx
- b C (petals are) coloured / bright / shaped / produce nectar / have nectar guides to attract insects  
D (stigma / style) receives pollen from pollinator / insect  
E (anther / stamen) produces pollen / place pollen on insect
- c fusion of gametes / nuclei / fertilisation  
plus any three of these

pollen tube grows / develops / forms  
through / down style / to ovary  
to micropyle / ovule / embryo sac  
male gamete passes through pollen tube / moves to female  
gamete/nucleus  
zygote develops into embryo  
reference to female gamete as egg cell, ovum

## Extension 1

- a     growth at least one from  
          increase in size or number of cells or dry mass / getting larger  
          irreversible / permanent  
          due to cell division
- development at least one from  
          increase in complexity  
          formation of different cells / tissues / organs / additions of new features
- b     three references from  
          mitosis  
          chromosomes  
          division of nucleus  
          formation of new cells / daughter cells  
          being identical / of same genetic composition
- c(i)   osmosis / diffusion
- (ii)   higher concentration of solutes than outside the cell / lower water potential in cell
- (iii)   cell wall
- (iv)   two points from  
          cell swells up / becomes turgid / gets longer / elongates  
          press against each other  
          results in increase in overall length of root / whole root gets longer  
          downward growth as a result of upper part of root being anchored  
          cells elongate vertically
- d(i)   group of cells of the same type  
          carrying out the same function
- (ii)   

<u>name of tissue</u>	<u>function</u>
(xylem)	transport of water or minerals / support
phloem / sieve tubes	(transport of sugars)
root hair (cells)	(absorption of water from soil)



## Extension 2

- a transfer of pollen  
from anther / stamen to stigma
- b ten marks from the following  
named insect-pollinated flower  
sepals, description of position or shape or appearance  
reference to protection of flower while in bud  
petals, description of position or shape or appearance  
attracting insects / acting as landing stage / guides present to direct  
insects to nectar  
stamen = anther + filament  
anther, description of position or shape or appearance  
pollen  
filament, description of position or shape or appearance  
supports anther  
carpel = stigma + style + ovary  
stigma, description of position or shape or appearance  
receives pollen  
style, description of position or shape or appearance  
supports stigma for pollination / acts as a pathway for pollen tube  
ovary, descriptions of position or shape or appearance  
contains ovules / reference to site of fertilisation / becomes the fruit  
nectary position / reference to scent  
produces nectar  
flower stem supports flower  
for greater visibility to insects  
receptacle acts as base for other flower parts  
ovule and position  
forms seeds
- c reference to mixing of genetic material  
can result in different genotypes  
so phenotypes / offspring appearance can be different

### Extension 3

- a any nine from these
- chemical or artificial fertilisers provide more of named mineral or element
  - results in greater crop yield (linked to above)
  - pesticides / fungicides reduces crop damage by insects or fungi / farm animal infestation
  - herbicides reduce competition between crop and weeds for named requirements (e.g.light / minerals / water)
  - reference to use of machinery
  - larger areas of land to be cultivated / saves time
  - reference to artificial selection of crop types
  - results in greater yield / ability to grow crops on harsh climates
  - reference to genetic engineering / cloning
  - one example of use
  - reference to use of bacteria to make yoghurt
  - reference to use of yeast in bread-making
  - reference to use of single cell protein to make meat substitutes
  - reference to controlled conditions in greenhouse
  - reference to improved weather forecasting and application
  - use of satellites to observe crop disease / need for fertiliser
  - use of computerisation and application
  - reference to intensive animal farming / fish farming
  - use of animal food concentrates / balanced feeding
  - use of antibiotics / hormones / other drugs for animal rearing / plant growing or fruit production
  - reference to biological control of pests
- b any three of these
- needed for production of chlorophyll
  - needed to trap sunlight
  - reference to photosynthesis
  - no sugars produced
  - so protein synthesis not possible
  - reference to chlorosis / yellowing of leaves / pale leaves
- c
- reference to decomposition / rotting
  - by fungi / bacteria / saprophytes / named decomposers
  - releases minerals into the soil