## 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.

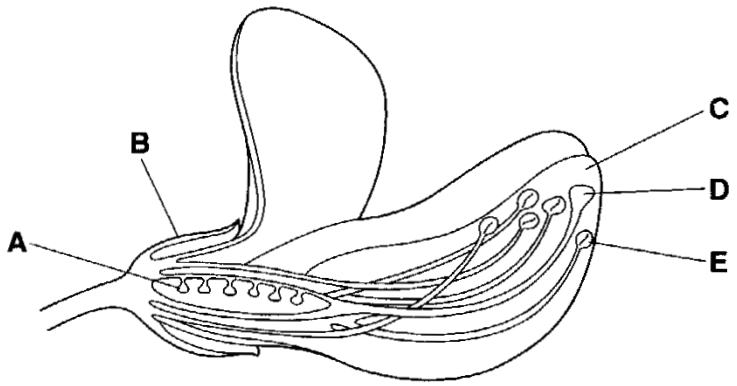


**Fig.** 1

**(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.

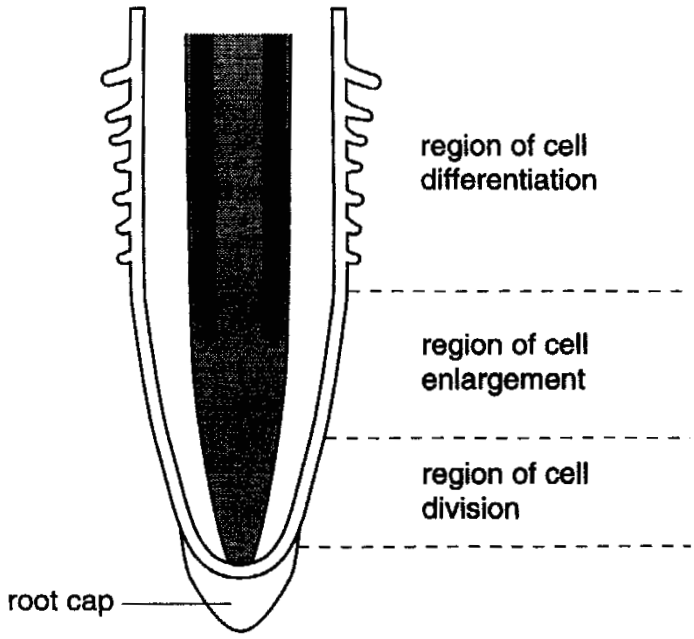


**Fig. 2**

**(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 <u>growth</u> at least one from
- increase in size or number of cells or dry mass / getting larger
- irreversible / permanent
- due to cell division

<u>development</u> 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