Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

STEM | Exam Builder

Reproduction in plants

Time allowed: 1 hour 40 minutes

Subject code **0610**

Biology

Questions from Paper 3, Paper 4 and Paper 6

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.

Total marks

/ 94

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.

Information

- This paper has 10 questions worth 94 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

STEM | Exam Builder

Print at 100% (Actual size) so diagrams keep their real measurements.

1 A student carefully took a fuchsia flower apart.

Fig. 8.1 is a photograph of the parts of the flower.

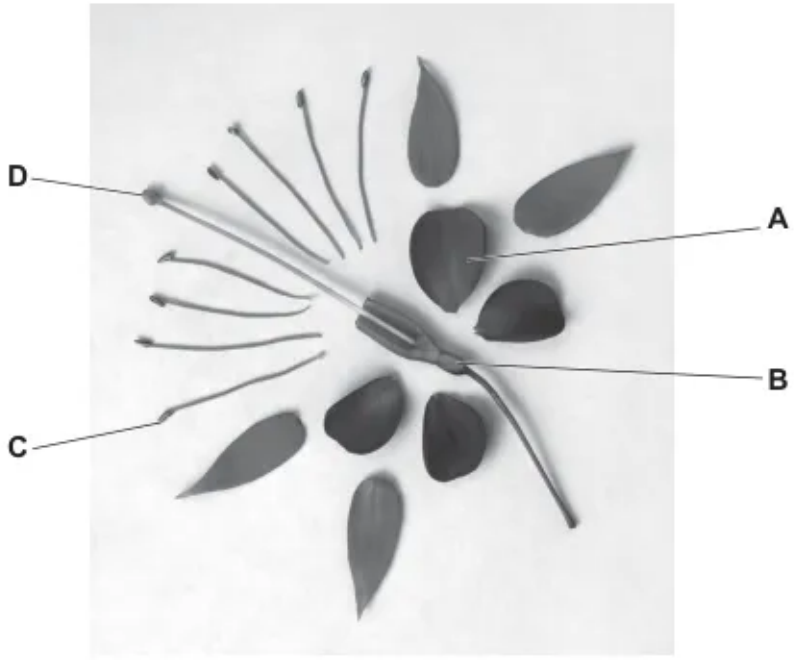


Fig. 8.1

State the function of each of the parts labelled **A** to **D** in Fig. 8.1.

A .....

.....

B .....

.....

C .....

.....

D .....

.....

[4]

Flowers, pollination and fertilisation Click for more variations

Reduced to 78% to fit the page (wider than A4).

1	**A** attracts, insects / (named) pollinator ; **B** produces / contains, female sex cells, female gametes / ovules ; **C** produces / contains / releases, male sex cells, male gametes / pollen ; **D** receives pollen (grains) / site of pollination or description ;	**4**	**A** site of fertilisation / where seeds develop

STEM | Exa

2 **(a)** Use words from the following list to complete the passage about plant reproduction.

You may use each word once, more than once or not at all.

asexual	**cotyledon**	**diploid**	**fertilisation**	**gamete**
haploid	**pollination**	**sexual**	**testa**	**zygote**

Living organisms must reproduce to replace organisms which die, and to supply more organisms to occupy new environments. Genetically identical offspring are produced from a single parent during the process of ..... reproduction. During ..... reproduction, a special cell called a ..... is made by one parent and fuses with a ..... from another parent. This process of fusion is called ..... and may eventually lead to the development of a seed.

[3]

(b) Describe how potatoes reproduce asexually.

.....

.....

.....

.....

.....

..... [3]

[Total: 6]

Asexual and sexual reproduction Click for more variations

Reduced to 76% to fit the page (wider than A4).

2 **(a)**	asexual + sexual; gamete + gamete; fertilisation;	[3]	both correct for 1 mark both correct for 1 mark
(b)	(potatoes have) tubers; idea of tubers growing into plant; photosynthesising; plant produces more tubers; mitosis;	max [3]	
		[Total: 6]	

STEM | Exam Builder

3 **(a)** A plant develops seeds and fruit after pollination has occurred.

Name **one** agent of pollination.

.....[1]

(b) State **one** reason why fruit and seed dispersal is important for plants.

.....

.....

.....[1]

(c) Fig. 6.1 shows the fruiting body of a dandelion plant and a single fruit. The fruiting body is made of many single fruits.

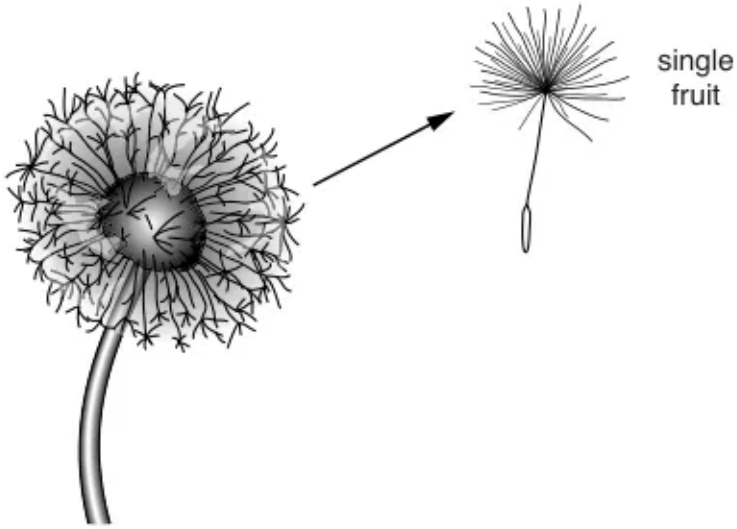


Fig. 6.1

Use Fig. 6.1 to suggest how the single dandelion fruits are dispersed from the parent plant.

Give a reason for your answer.

how fruits are dispersed .....

.....

reason .....

.....

.....

[2]

(d) Seeds will only germinate if they are provided with suitable conditions.

State the environmental conditions that are required for all seeds to germinate.

.....

.....

.....[3]

[Total: 7]

Seeds and germination Click for more variations

Reduced to 78% to fit the page (wider than A4).

3 (a)	wind ; animal ; water ;	[max 1]	**A** any named animal / type of animal
(b)	colonise new habitats ; prevent overcrowding / have more space ; reduce competition (with other plants of same species) ;	[max 1]	**A** grow in a new / different place **A** to move the seeds away from the plant
(c)	*how fruits are dispersed:* wind / idea of blown about ; *reason:* fruits / seeds easily detached ; large surface area to catch wind ; light weight idea ; hairs act as parachute ;	[max 2]	1 mark for method of dispersal and 1 mark for reason
(d)	water / moist / damp ; oxygen ; warmth / suitable temperature ;	[3] **[Total: 7]**	**R** light **R** minerals / food / nutrients **A** suitable pH

STEM | Exam Builder

4 Plan an investigation to find out how the volume of water added to germinating seeds affects the rate of germination.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

Seeds and germination Click for more variations

Reduced to 78% to fit the page (wider than A4).

4	*independent variable:* 1 at least two different volumes of water added **;** *dependent variable:* 2 number of seeds germinated / time taken for seeds to germinate **;** *3, 4, 5 method **;;;*** • method of maintaining temperature • watering at regular intervals • reference to placing seeds in trays / petri dish / test-tube / planting in soil • check seeds at regular intervals / at a set time period • AVP, e.g. calculation of rate described *6, 7 constant variables **;;*** • temperature • type of seeds • oxygen concentration • pH • type / amount of, soil / growing medium • light (intensity) 8 repeat at least two times (three trials) **;**	**6**	

STEM | Exam Builder

5 Fig. 3.1 is a photograph of the flower of Amaryllis, *Hippeastrum aglaiae*.

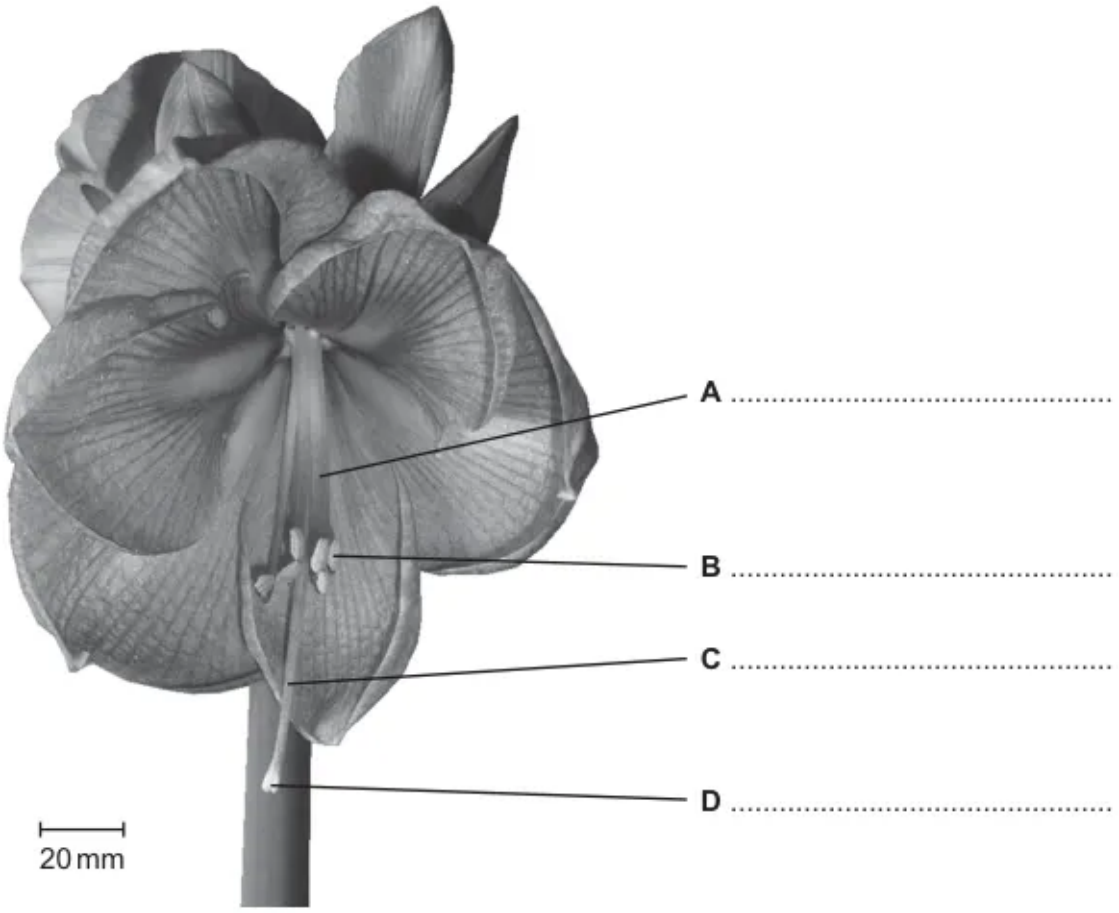


Fig. 3.1

(a) (i) On Fig.3.1, name the parts of the flower labelled **A**, **B**, **C** and **D**.

Write your answers on the lines in Fig.3.1 [4]

Plant breeders use small paint brushes to pollinate flowers of Amaryllis artificially.

(ii) State the letter of the part from which the pollen is taken.

..... [1]

(iii) State the letter of the part on which the pollen is put.

..... [1]

(iv) State one visible feature in Fig. 3.1 which shows that this flower is usually pollinated by insects.

.....

..... [1]

Fig 3.2 shows four pollen grains from an Amaryllis flower.

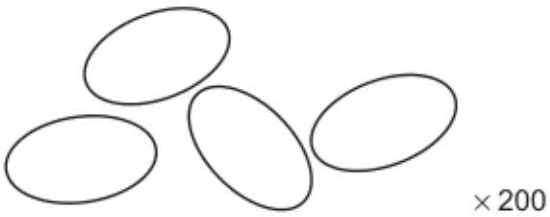


Fig. 3.2

(b) Measure the length of a pollen grain in mm.

Length of pollen grain ..... mm

Calculate the actual length of the pollen grain that you measured in mm.

Show your working.

actual length of pollen grain ..... mm [3]

[Total: 10]

Flowers, pollination and fertilisation Click for more variations

Reduced to 76% to fit the page (wider than A4).

5 **(a) (i)**	**A** filament ; **B** anther ; **C** style ; **D** stigma ;	[4]	
(ii)	**B** ;	[1]	
(iii)	**D** ;	[1]	
(iv)	large petals / honey or nectar guides ;	[1]	
(b)	**20** ; actual length = $\frac{\text{length of pollen grain in diagram}}{\text{magnification}}$; actual length = **0.1** ;	[3]	
		[Total: 10]	

STEM | Exam Builder

6 **(a)** The boxes on the left contain the names of flower parts.

The boxes on the right contain descriptions of the functions of the flower parts.

Draw **one** straight line from each box on the left to **one** box on the right to link the flower part to its function.

Draw **five** lines.

flower part	function
anther	attracts insects
ovary	place where pollen has to land
petal	produces ovules
sepal	produces pollen
stigma	protects the flower bud
	transports water

[5]

(b) Pollen grains from wind-pollinated flowers and insect-pollinated flowers are different.

State **two** ways in which a pollen grain from a wind-pollinated flower is different to a pollen grain from an insect-pollinated flower.

1 .....

2 .....

[2]

STEM | Exam Builder

(c) Complete the sentences about seeds.

Use words from the list.

Each word may be used once, more than once, or not at all.

asexual	**carbon dioxide**	**gravity**	**hormones**
light	**mineral ions**	**oxygen**	**sexual**
vitamins	**water**		

Plants produce seeds as a result of ..... reproduction. Seeds germinate if they have the correct conditions. These conditions include a suitable temperature and also ..... and ..... .

The germinating seed produces a young root which grows downwards in response to ..... .

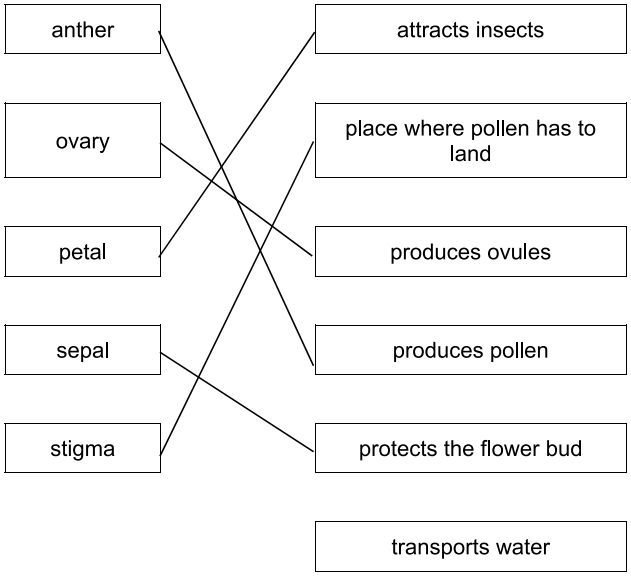
The young root absorbs ..... and ..... from the soil as well as keeping the young plant in a stable position.

[6]

[Total: 13]

Seeds and germination Click for more variations

STEM | Exam Builder

6(a)	 ;;;;;	**5**	one mark for each correct line
6(b)	small(er) ; light(er) / less mass ; smooth(er) / not rough / not spiky / AW ; not sticky ; have, wings / extensions / air bladders or sacs ;	**2**	
6(c)	sexual ; oxygen ; water ; gravity / light ; water / oxygen / mineral ions ;;	**6**	mp2 and mp3 in either order

STEM | Exam Builder

7 Fig. 1.1 shows a flowering shoot of tiger lily, *Lilium tigrinum*.



Fig. 1.1

(a) State the name of the genus of the tiger lily.

.....[1]

(b) Name the parts labelled **A** to **D**.

A .....

B .....

C .....

D .....[4]

(c) The tiger lily plant is a monocotyledon.

List two features, **visible in Fig. 1.1**, that show it is a monocotyledon.

1 .....

2 ..... [2]

(d) The tiger lily in Fig. 1.1 reproduces sexually.

Plants reproduce sexually and asexually.

Complete Table 1.1 to show the advantages and disadvantages of asexual and sexual reproduction to a flowering plant species.

Table 1.1

type of reproduction in flowering plants	advantages	disadvantages
asexual		
sexual		

[4]

[Total: 11]

Flowers, pollination and fertilisation Click for more variations

STEM

7	**(a)**	*Lilium* ;	1	
	(b)	**A** stigma ; **B** anther ; **C** petal ; **D** style ;	4	
	(c)	parallel veins / AW ; narrow / AW, leaves ; flower parts in, 3s / 6s ;	max 2	**A** non-branching veins / no mid-rib **A** long and thin **A** for any named part **R** one cotyledon

(d)

one mark per box – ignore any neutral comments

type of reproduction in flowering plants	advantages	disadvantages
asexual	only one, parent / plant ; fast ; (potential) rapid spread ; less energy required / no gametes needed ; if parent well adapted, offspring will be adapted to surroundings ; **max 1**	competition ; little / no, variation ; less evolution / less able to adapt to change ; may all be killed by same disease ; converse of MP5 for asexual ; **max 1**
sexual	variation ; evolution / formation of new species ; (seed) dispersal ; colonization / able to adapt to change ; **max 1**	may need two plants / pollinating agent; slow ; much pollen / many seeds wasted ; fertilization may not happen; loss of lots of energy ; **max 1**

[Total: 11]

STEM | Exam Builder

8 **(a)** Fig. 6.1 is a half-flower drawing of pride of Barbados, *Caesalpinia pulcherrima*.

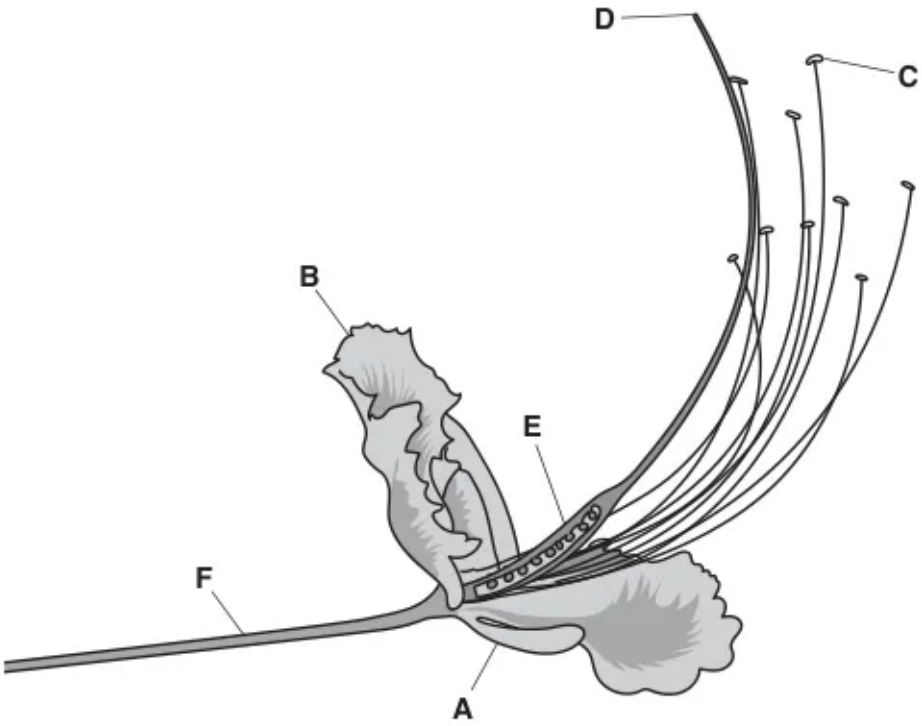


Fig. 6.1

Complete Table 6.1 by stating the letter from Fig. 6.1 that indicates the organ where each function occurs and the name of the organ.

Table 6.1

function	letter from Fig. 6.1	name of the organ
meiosis to produce pollen grains		
pollination		
development of seeds		
protection of flower in the bud		

[4]

STEM | Exam

(b) Fig. 6.2 is a scanning electron micrograph of some pollen grains from wind-pollinated flowers and insect-pollinated flowers.

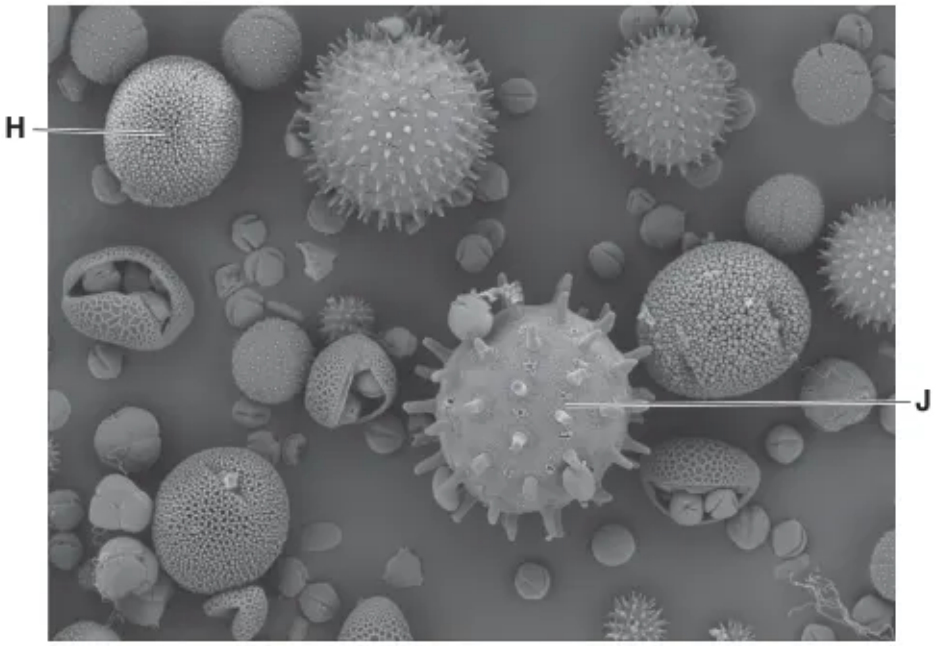


Fig. 6.2

(i) Write the formula that would be used to calculate the actual diameter of pollen grain **H**.

[1]

(ii) The actual diameter of pollen grain **H** is 0.082 mm.

Convert this value to micrometres (µm).

Space for working.

..... µm [1]

(iii) Explain how the pollen grain labelled **J** is adapted for insect pollination.

.....

.....

.....

.....

.....[2]

(c) Pollen grains grow tubes, which contain haploid male gamete nuclei.

(i) One of these male gamete nuclei fuses with the female gamete.

State the part of the flower that contains the female gamete.

.....[1]

(ii) Define the term *haploid nucleus*.

.....

.....

.....[1]

(iii) Explain why it is important for gametes to be haploid.

.....

.....

.....[1]

[Total: 11]

Flowers, pollination and fertilisation Click for more variations

Reduced to 75% to fit the page (wider than A4).

8(a)	<table><tr><th>process / event</th><th>letter from Fig. 6.1</th><th>name of the organ</th></tr><tr><td>meiosis to produce pollen grains</td><td>**C**</td><td>anther</td></tr><tr><td>pollination</td><td>**D**</td><td>stigma</td></tr><tr><td>development of seeds</td><td>**E**</td><td>ovary</td></tr><tr><td>protection of flower in the bud</td><td>**A**</td><td>sepal</td></tr></table> ;;;;	**4**	*one mark per row*
8(b)(i)	image size ÷ magnification ;	**1**	
8(b)(ii)	82 (μm) ;	**1**	
8(b)(iii)	(covered in) spikes / sticky ; (pollen) sticks to, insect / animal (bodies / legs / AW) ; large(r) size (in comparison with wind) ; AVP ;	**2**	
8(c)(i)	ovule ;	**1**	
8(c)(ii)	(nucleus) containing one set of (unpaired) chromosomes ;	**1**	
8(c)(iii)	so that chromosome number does not double (at fertilisation) ; so that chromosome number remains constant from generation to generation ;	**1**	

STEM Exam Builder

9 Fig. 1.1 shows a vertical section through a flower of soybean, *Glycine max*, following self-pollination. Fig. 1.2 shows part of the section at a higher magnification.

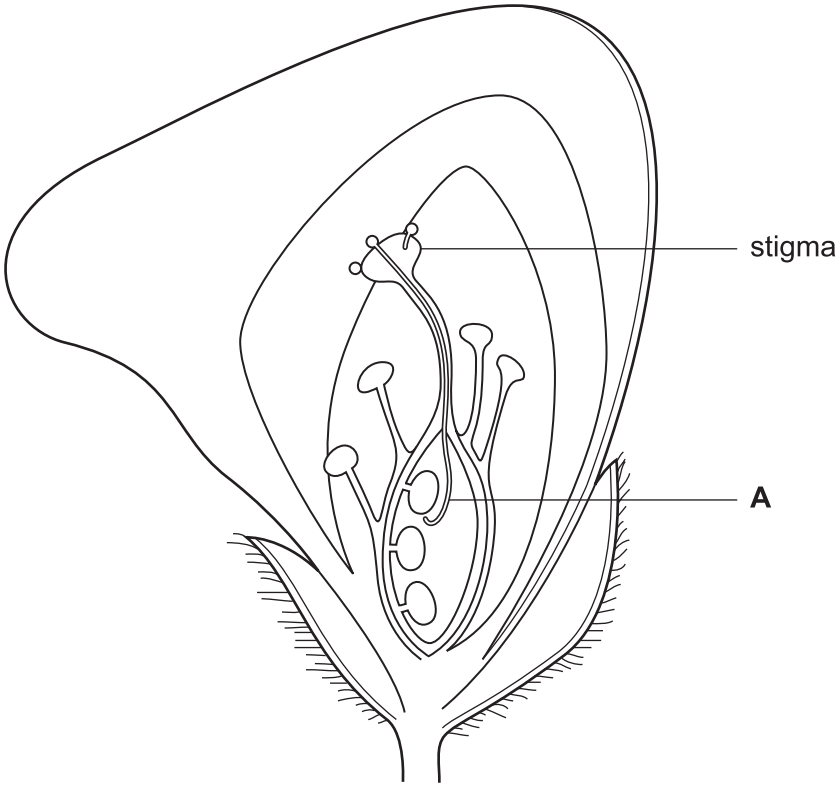


Fig. 1.1

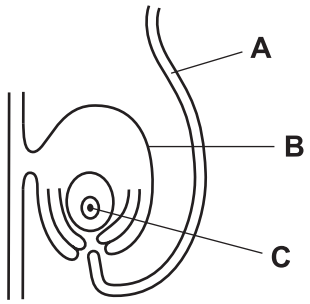


Fig. 1.2

(a) (i) Name the parts labelled **A** to **C** shown in Figs. 1.1 and 1.2.

A .....

B .....

C ..... [3]

STEM | Exam Builder

(ii) Describe what happens to the structures shown in Figs. 1.1 and 1.2 to bring about fertilisation. You may refer to the structures labelled **A** to **C** by their letters if you wish.

.....

.....

.....

.....

.....

..... [3]

(iii) Explain the advantages **and** disadvantages of self-pollination for flowering plants, such as soybean.

advantages .....

.....

.....

.....

disadvantages .....

.....

.....

.....

..... [4]

(b) Soybean is a dicotyledonous plant.

(i) Name the genus to which the soybean belongs.

..... [1]

(ii) State two features which are **only** found in dicotyledonous plants.

1. .....

2. ..... [2]

[Total: 13]

STEM | Exam Builder

Flowers, pollination and fertilisation Click for more variations

9 (a) (i)		**A** – pollen tube ; **B** – ovule ; **C** – egg cell / female gamete / female nucleus ;	[3]	**R** egg / ovum
(ii)	**1** **2** **3** **4** **5** **6** **7** **8**	(stigma) place where pollen grain, germinates / develops (to form a tube) ; growth of pollen <u>tube</u> (down the style) ; pollen tube / **A**, enters, ovule / **B** ; ref to micropyle ; tip of, pollen tube / **A**, opens ; (male) nucleus / gamete fuses with, female gamete / nucleus / egg cell (nucleus) / **C** ; forms zygote ; diploid ;	[max 3]	**I** lands MP2 **A** male gamete travels down **R** pollen grain moves linked to pollen tube **A** ovum as an *ecf*
(iii)		**max 3 for advantages OR disadvantages** *advantages* *idea that* self-pollination perpetuates variety that is well adapted to habitat ; greater chance of pollination / ensures pollination occurs ; **A** reproduction / fertilisation less wastage of pollen / gametes / energy (in pollen production) ; *idea that* useful if no other plants (of same species) nearby ; no need for pollinating agent ; *disadvantages* less, variation ; ref. to genotype becoming homozygous ; ref. to harmful alleles (**A** genes) ; less chance of adapting to changing conditions / AW ; more susceptible to diseases ; may become extinct ;	[max 4]	 **I** faster **R** ref. to clones / genetically identical

(b) (i)	*Glycine* ;	[1]	**R** *Glycine max*
(ii)	network / AW, of veins / one (large) central vein ; broad leaves ; two, cotyledons / seed leaves ; flower parts in multiples of, 4 / 5 ; central / main, root ; vascular bundles regularly arranged ; has (true) secondary growth ;	[max 2]	 **A** reverse arguments **I** large leaves **R** parts **A** 'not in 3s' **A** vascular bundles **not** irregularly arranged
		[Total: 13]	

STEM | Exam Builder

10 Fig. 5.1 is a diagram showing the events from pollination to fertilisation in a species of flowering plant.

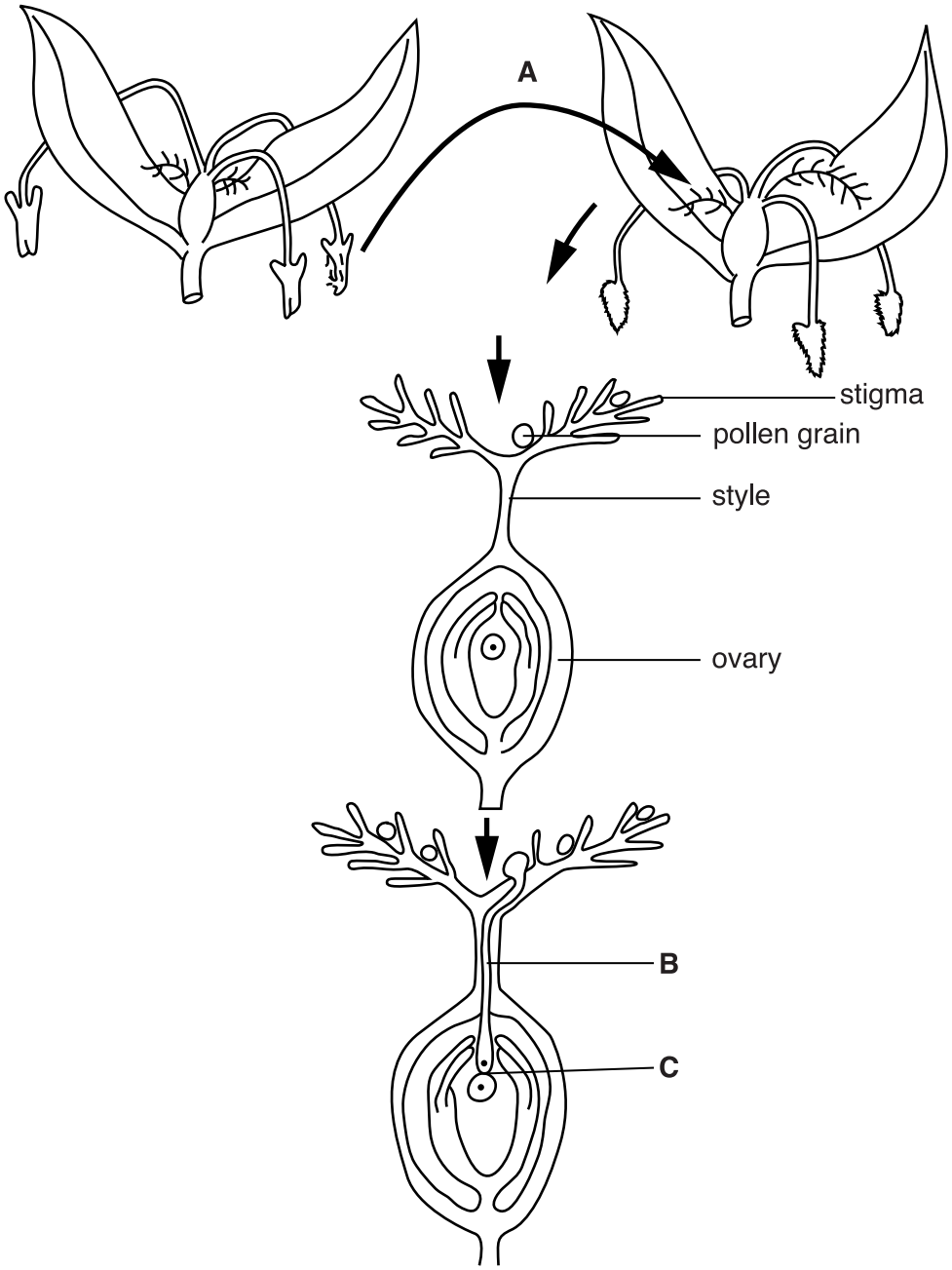


Fig. 5.1

(a) Name the likely method of pollination for the flowers shown at **A** in Fig. 5.1. Give an explanation for your choice.

method of pollination .....

explanation .....

.....

.....

.....

[3]

STEM | Exam Builder

(b) In Fig. 5.1 pollen is transferred from one plant to another.

State the name for this type of pollination.

.....[1]

(c) Name structure **B** shown in Fig. 5.1 and state its function.

.....

.....

.....[2]

(d) Fertilisation occurs at **C** as shown in Fig. 5.1.

Describe what happens at fertilisation in flowering plants.

.....

.....

.....

.....

.....[2]

(e) Seed formation occurs after fertilisation. Seeds are formed inside the fruits and then dispersed.

(i) Name the part of the flower that develops into the seed.

.....[1]

(ii) Name the part of the flower that develops into the fruit.

.....[1]

(iii) State an advantage of seed dispersal.

.....

.....[1]

STEM | Exam Builder

(f) Seed germination occurs when conditions are suitable.

Explain the role of enzymes in seed germination.

.....

.....

.....

.....

.....[2]

[Total: 13]

Flowers, pollination and fertilisation Click for more variations

Reduced to 77% to fit the page (wider than A4).

10 (a)	*method of pollination*: wind ; *explanation to max 2:* Feathery / AW, stigma ; long, filament ; large, anthers / stamens ; anthers / stamens, hang outside flower ; anthers loosely attached (to filament) ; light pollen ; no petals ;	[1] + [2] max [3]	**A** 'only bracts'
(b)	cross (pollination) ;	[1]	
(c)	pollen tube ; delivers male gamete / pollen nucleus / male nucleus to ovule ; AW	[2]	**A** female gamete / egg / female nucleus / ovum.
(d)	*idea that* tip of pollen tube opens / AW ; gametes / sex cells / ova and pollen nuclei, fuse / join / combine ; formation of zygote ; diploid ;	max [2]	**A** male nucleus for pollen nucleus **ignore** pollen unqualified **ignore** meet / mix
(e) (i)	ovule ;	[1]	
(ii)	ovary (wall) ;	[1]	
(iii)	colonise new areas ; reduce (intraspecific) competition ; reduce inbreeding ; **ora**	max [1]	
(f)	stored food / food reserves (in seed) broken down ; named enzyme plus substrate ; product plus use ; enzymes required in process of respiration ;	max [2]	
		[Total:13]	

STEM | Exam Builder