

Name	Date started	Target end date
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GCE A LEVEL – BIOLOGY UNIT 4 QUESTION PACK

1075 (Legacy BY5) · New spec Unit 4 Topic 2 · A2 unit, first sat 2017, 90 marks, 2h paper

REVISE

.wales

BIOLOGY – UNIT 4 · PLANT REPRODUCTION – FLOWER, POLLINATION, SEED & FRUIT

4.2 Sexual reproduction in plants – flower structure, pollination, double fertilisation and the seed / fruit

Structure of an insect- and wind-pollinated flower, mechanisms preventing self-pollination, the adaptations of pollen grains for terrestrial life, double fertilisation in flowering plants, and the development of the seed and fruit (broad bean) from the fertilised ovule and ovary.

LEGACY 2008 SPECIFICATION

Estimated time for entire question pack: ~53 min

Derived from the legacy BY5 papers' pace of ~1.6 min/mark, padded for long-prose answers (33 marks over 3 questions).

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **comprehensive practice question pack**, not a single mock paper. It contains every question from the legacy WJEC BY5 papers (2008 modular spec, 2011–2017) that maps onto new-spec A2 Unit 4 Topic 2 (4.2).

Questions are ordered by source paper date.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working – quality of written communication will affect marks. A calculator is allowed. Diagrams included in answers must be fully annotated.

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Q	Source	Max	Mark
1	BY5 Jun 11 Q2	12	
2	BY5 Jun 15 Q1	12	
3	BY5 Jun 17 Q5	9	
Total		33	

Plant Reproduction – Flower, Pollination, Seed & Fruit – what the new spec asks

WJEC GCE A Level Biology (from 2015) · Unit 4: Variation, Inheritance & Options · Topic 4.2.

Flower structure

- Insect-pollinated: large coloured petals, scent, nectaries, sticky pollen.
- Wind-pollinated: small drab flowers, exposed anthers/stigmas, light pollen.
- Anther produces pollen; stigma receives pollen; ovary contains ovules.

Avoiding self-pollination

- Protandry / protogyny – anthers and stigmas mature at different times.
- Self-incompatibility – pollen rejected on stigma of same plant.
- Separate male and female flowers (monoecious) or plants (dioecious).

Pollen grain adaptations

- Thick, resistant wall (exine) of sporopollenin resists desiccation.
- Vegetative + generative nucleus; air sacs in wind-pollinated species.
- Adaptation to terrestrial life freed plants from water for reproduction.

Double fertilisation

- Pollen tube delivers two male gametes through micropyle.
- One fuses with egg → diploid zygote.
- Other fuses with two polar nuclei → triploid endosperm.

Seed development

- Zygote → embryo (radicle, plumule, cotyledons).
- Integuments harden → testa (seed coat).
- Endosperm provides food in many seeds (or is absorbed in non-endospermic seeds).

Fruit formation

- Ovary wall → pericarp (fleshy, leathery or dry).
- Fruit protects seed and aids dispersal (animal, wind, water).
- Broad-bean pod: dry dehiscent pericarp splitting along sutures.

Plant Reproduction – Flower, Pollination, Seed & Fruit in one page

Quick-reference notes – revisit before each question.

Insect-pollinated flower

Large bright petals, scent, nectaries.
Sticky / spiky pollen sticks to insect.
Stigma inside flower; visited intentionally.

Wind-pollinated flower

Small dull flowers, exposed anthers / feathery stigmas.
Light, smooth pollen released in large quantities.
No nectar; no scent.

Avoiding self-pollination

Protandry / protogyny (timing).
Self-incompatibility (chemical rejection).
Separate flowers / plants for male & female.

Pollen grain adaptation

Sporopollenin exine – tough, resists desiccation.
Generative + tube nuclei.
Frees plants from water for reproduction.

Double fertilisation

Pollen tube down style to micropyle.
One gamete + egg → zygote (2n).
Other + 2 polar nuclei → endosperm (3n).

Seed parts

Testa = hardened integument.
Embryo = radicle + plumule + cotyledons.
Endosperm (or used up cotyledons) = food store.

Fruit

Pericarp = ovary wall (fleshy / dry).
Aids dispersal: animal, wind, explosive, water.
Protects seed until conditions favour germination.

Broad bean

Pod = dry dehiscent fruit splitting along sutures.
Each seed = embryo + testa (no endosperm; food in cotyledons).

1. State the term which applies to the following ecological definitions.

(a) (i) The recolonisation by living organisms of a woodland following its destruction by fire. [1]

.....

(ii) The first organisms which colonise a bare rock surface. [1]

.....

(iii) The stable stage of a succession which undergoes no further change. [1]

.....

(iv) The different stages in a succession. [1]

.....

(b) (i) The rate at which products such as glucose are produced by a plant. [1]

.....

(ii) A diagram to represent the quantity of energy passing from one trophic level to the next. [1]

.....

(Total 6 marks)

2. (a) Complete the table to show **four** differences between insect and wind pollinated plants. [4]

<i>Insect pollinated</i>	<i>Wind pollinated</i>

(b) Some flowers can self pollinate. What is the main **disadvantage** of self pollination? [1]

.....

.....

.....

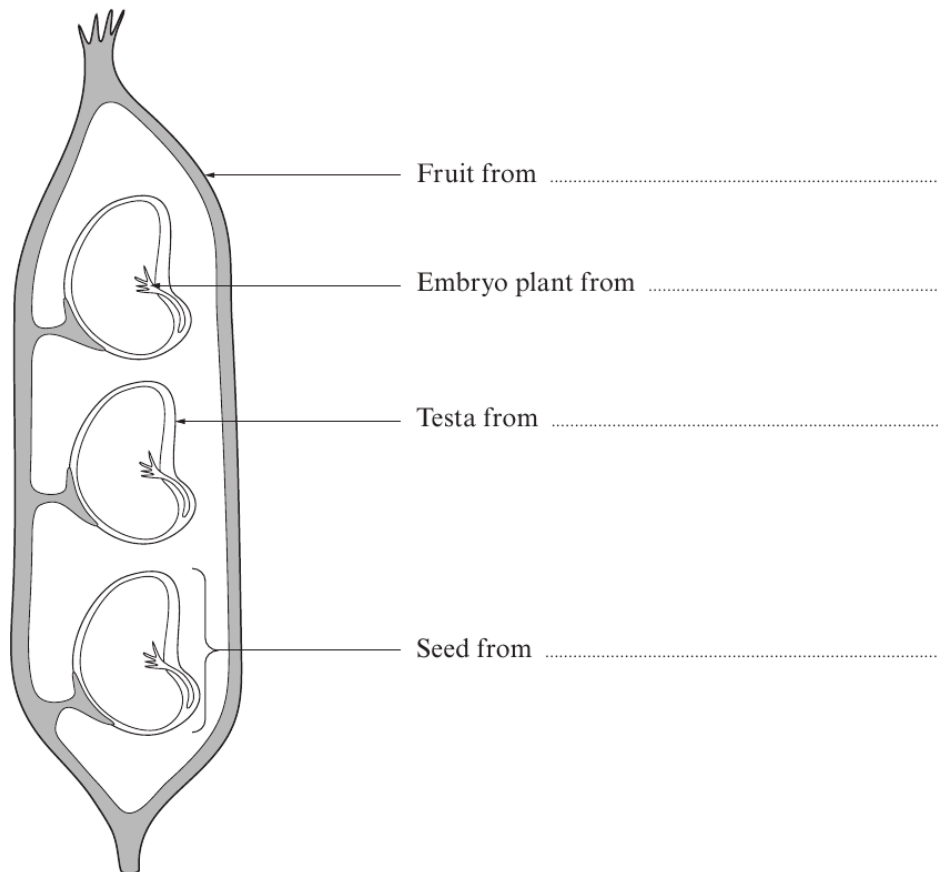
(c) State how the production of pollen grains has enabled flowering plants to adapt to terrestrial life. [3]

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.....

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(d) On the following diagram of a broad bean pod (drawn in section), show which parts of the flower have developed into the labelled structures. [4]

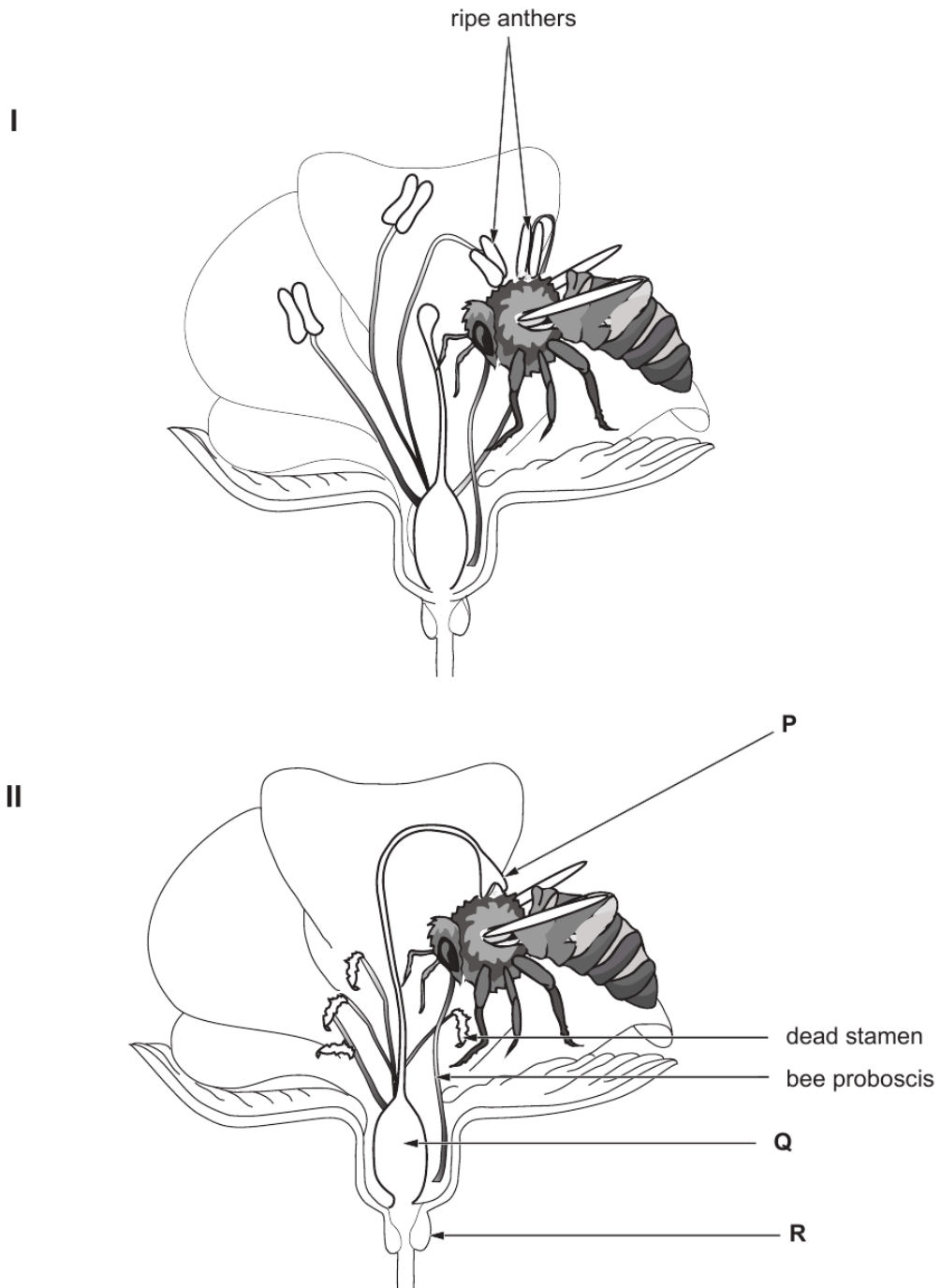


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(Total 12 marks)

Answer **all** questions.

1. The diagrams below show pollination in an insect-pollinated flower.





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(a) (i) Name parts: [1]

P

Q

(ii) Name the substance produced by structure **R**. [1]

.....

(iii) What is the function of this substance? [1]

.....
.....

(b) Describe what happens to the pollen in diagrams I and II. [2]

I.

.....
.....

II.

.....
.....

(c) Using the diagrams opposite, explain how these flowers are adapted to ensure that;

(i) there is effective pollen transfer between two flowers of the same species, [1]

.....
.....

.....

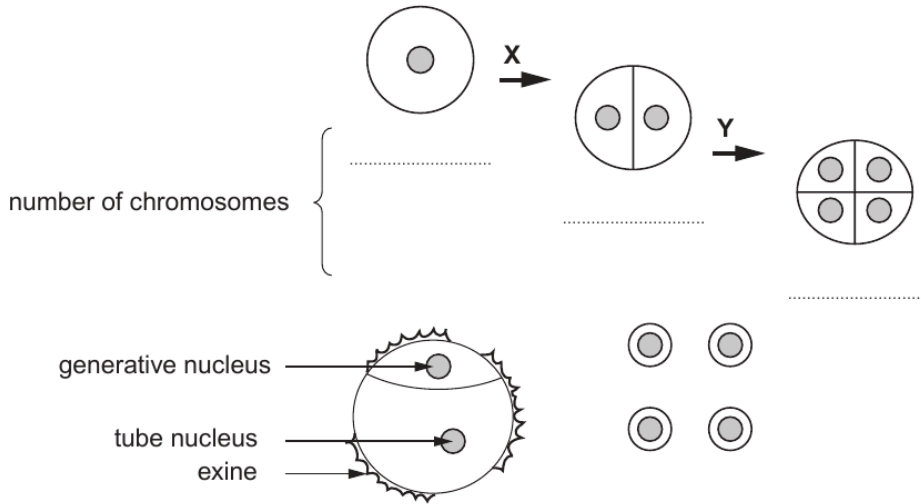
(ii) self-pollination is avoided. [1]

.....
.....

.....

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(d) The diagrams below show the formation of pollen grains.



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(i) In which floral part does this take place? [1]

(ii) Name the cell process represented by arrows X and Y. [1]

(iii) The diploid number of this species is 10, underneath **each** structure indicated above, write the number of chromosomes in **each** nucleus. [1]

(iv) Give the functions of:
 I. the generative (male) nucleus; [1]

II. the tube nucleus. [1]

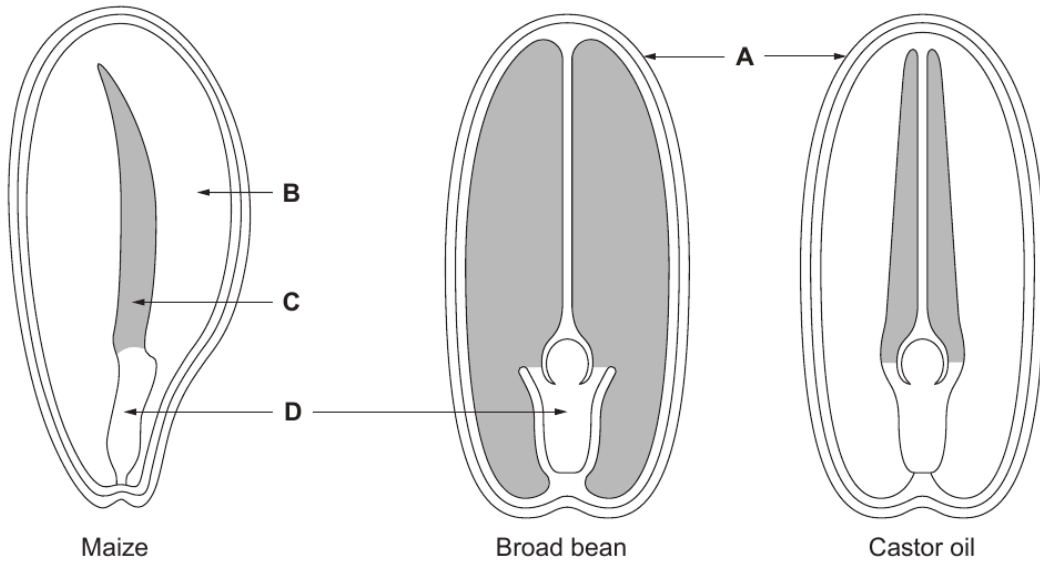


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5. The diagrams show sections through a maize fruit and the seeds of two other plants.

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(a) (i) Name the parts labelled A–D. [2]

- A
- B
- C
- D

(ii) Give **one** similarity with and **one** difference between the structures in which the food is stored in castor oil seeds and maize and broad bean. [2]

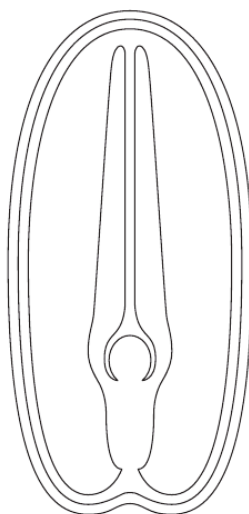
	Similarity with castor oil seed	Difference from castor oil seed
Broad bean seed
Maize fruit

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- (b) Tetrazolium salts act as hydrogen acceptors and change colour from colourless to bright red on accepting hydrogen atoms. They are therefore used to detect dehydrogenase activity.

If a castor oil seed was cut in half along the plane shown in the diagram and laid, cut side down, in a Petri dish containing a solution of tetrazolium salts for 10 minutes the areas of highest dehydrogenase activity would stain red.

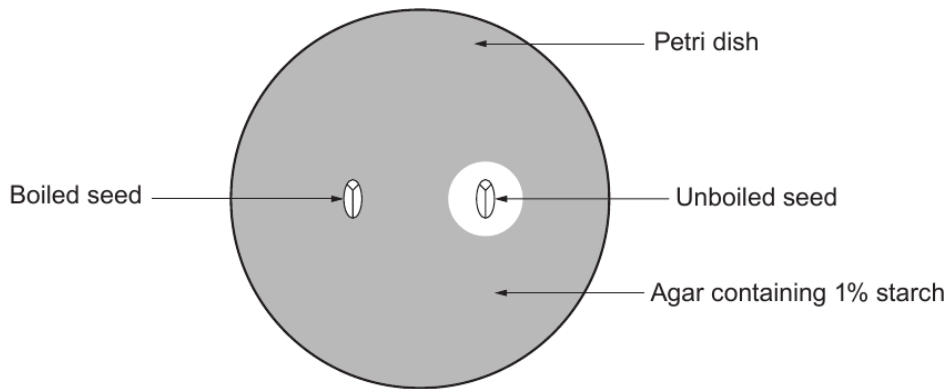
Shade, on the diagram below, the area of the castor oil seed which would be stained red. [1]

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An experiment was carried out to demonstrate the activity of another enzyme which is important during the germination of seeds.

Two seeds, one of which had been boiled, were cut in half and placed, cut side down, on the surface of agar containing 1% starch. After two days the plate was flooded with iodine solution which was then washed off, the area of plate containing starch was stained blue-black.



(c) (i) Name the enzyme responsible for the clear zone around the unboiled seed. [1]

.....

(ii) What was the purpose of the boiled seed? [1]

.....

(d) Explain how the two enzyme systems referred to in parts (b) and (c) depend upon each other during the process of seed germination. [2]

.....

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END OF QUESTION PACK

3 questions · 33 marks · ~53 min

Source: WJEC BY5 (2008 modular spec, 2011–2017)

Curated for WJEC Biology 2015 spec A2 Unit 4 – Topic 2 (4.2)

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