



Sharing the best in Gardening

**R2101**  
**PLANT CLASSIFICATION, STRUCTURE AND FUNCTION**

**Level 2**

**Monday 25 June 2012**

**09:30 – 10:30**

**Written Examination**

**Candidate Name:** .....

**Candidate Number:** .....

**Centre Name/Number:** .....

**IMPORTANT – Please read carefully before commencing.**

- i) The duration of this paper is **60** minutes.
- ii) **ALL** questions should be attempted.
- iii) **EACH** question carries **10 marks**.
- iv) Write your answers legibly in the spaces provided.
- v) Use **METRIC** measurements only.
- vi) Where plant names are required, they should include genus, species and where appropriate, cultivar.
- vii) Please note, sufficient lined space is provided. It is **NOT** necessary that all lined space is used in answering the questions.

Ofqual Unit Code H/601/0307

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## ANSWER ALL QUESTIONS

**MARKS**

**Q1** a) State what is meant by a 'perennial' plant.

**1**

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b) State the differences between 'evergreen', 'semi-evergreen' and 'deciduous' perennials.

**3**

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c) Define **EACH** of the following terms and give **ONE NAMED** plant example for **EACH**:

- i) woody perennial;
- ii) herbaceous perennial;
- iii) tender perennial.

**2**

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**Q2** a) Name **ONE** stem tissue for **EACH** function listed below:

- i) transport;
- ii) packing;
- iii) protection.

**3**

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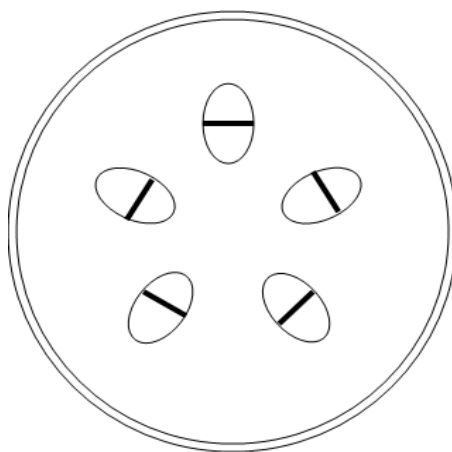
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b) Label the position of the tissues named in a), on the diagram provided below.

**3**



**Cross section of a young dicotyledonous stem**

c) State **FOUR** characteristics of **ONE** of the tissues named in a).

**4**

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Total Mark

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## MARKS

**Q4** a) Name the cell components where the following processes occur:

- i) photosynthesis;
- ii) aerobic respiration.

11

b) Name the products of aerobic respiration.

1

c) Describe how the levels of the following factors determine the efficiency of respiration:

- i) temperature;
- ii) oxygen.

34

Total Mark

**Please turn over/.....**

2

2

6

[illegible]

6

**MARKS**

**Q6** a) State the meaning of the following terms giving **ONE NAMED** plant example for **EACH**:

- i) monoecious;
- ii) dioecious.

**2**  
**2**

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b) Describe the characteristics of wind pollinated plants.

**6**

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**Q7** a) Define 'transpiration'.

**2**

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b) State the effect of any **TWO NAMED** environmental factors on the rate of transpiration.

**4**

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c) Describe how stomata limit water loss.

**4**

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**Q8** a) State **ONE** function of the fruit in plant reproduction.

**1**

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b) Complete the table below for the fruit types listed.

<b>Fruit type</b>	<b>Fruit type example</b>	<b>Plant example</b>	<b>Method of dispersal</b>
<b>Dry dehiscent</b>			
<b>Dry indehiscent</b>			
<b>False fruit</b>			

**3**

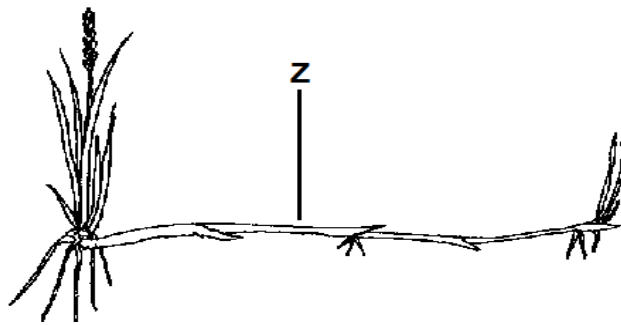
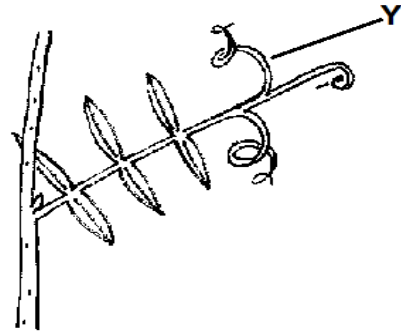
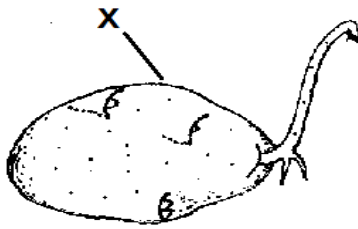
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**3**

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**Please turn over/.....**

- Q9** a) Identify the plant modifications (adaptations) X, Y and Z in the diagrams below and give a **NAMED** plant example for **EACH**.



X ..... Plant example .....

Y ..... Plant example .....

Z ..... Plant example .....

- b) Describe the functions of **TWO** of the modifications shown in the diagrams in a).

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Total Mark

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**Q10** a) Name **ONE** plant example for **EACH** of the plant groups listed below:

- i) gymnosperms;
- ii) angiosperms.

**2**

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b) State the differences between gymnosperms and angiosperms by completing the table below.

**8**

	<b>Gymnosperms</b>	<b>Angiosperms</b>
<b>Range of Habitats</b>		
<b>Life cycle</b>		
<b>Reproduction</b>		
<b>Leaves</b>		

Total Mark

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Charity Registration Number: 222879/SC038262**

## R2101 PLANT CLASSIFICATION, STRUCTURE AND FUNCTION

### Level 2

**Monday 25 June 2012**

<b>Candidates Registered</b>	541	<b>Pass with Commendation</b>	148 (33%)
<b>Candidates Entered</b>	436	<b>Pass</b>	171 (39%)
<b>Absent/Withdrawn/Deferred</b>	105	<b>Fail</b>	122 (28%)
<b>Total Candidates Passed</b>	319 (72%)		

### Senior Examiner's Comments:

1. Candidates should be able to demonstrate a good range of plant knowledge and be able to give accurately named plant examples where appropriate. Common names and generic names are often too vague and cannot be rewarded in the positive manner that genus, species and where appropriate, variety/cultivar can. This is particularly important when answering questions relating to particular (named) plant(s). Marks can only be awarded for these narratives where the example(s) are correctly and fully identified.
2. Candidates must be able to display accurate knowledge of the technical terms and concepts detailed in the syllabus, in the context of horticulture and be aware that wider interpretation will not be rewarded. The examination should be regarded as a possible introduction to higher level studies, which will only be open to those who are in possession of a clear understanding of the horticultural terms and concepts which are current.
3. The introductory rubric given on the first page of each question paper should be read carefully by candidates. At each examination there are a significant number of candidates who ignore or misread the instructions given and consequently may not perform as well as they could have done
4. Candidates should pace themselves during each paper. The most successful candidates allow sufficient time to read the question thoroughly before answering it and also take time to read through their answers. They should take care to write as legibly as possible, so that the examiner is in no doubt about what is intended.
5. Candidates need to interpret key words within questions, particularly those such as 'state', 'list' and 'describe'. Questions requiring descriptions or explanations obviously require a more detailed answer than those requiring a list.

6. It is important to ensure that responses to questions are to the point. Candidates should bear in mind that small sketches might be used to convey information more succinctly than words.
7. Successful candidates ensure that their answers are focused and to the point. It is disappointing when they cannot be rewarded for their efforts because the answer is irrelevant to the particular question. Candidates should take note of the mark allocation for specific sections and allocate their time and efforts accordingly.
8. Diagrams can enhance an answer and where appropriate can replace detailed descriptions. They should be large, clear and well annotated, ensuring that labels are properly attached to the features they describe. Diagrams should preferably be in pencil. Colour may be used successfully but only where it is relevant to the answer.
9. In each examination it is clear that some candidates are ill prepared to answer papers of the type set. It is essential that candidates have the opportunity to practice questions. Ideally some papers should be answered in a time constrained situation. Appropriate feedback must, in any case be provided
10. Candidates should be aware of the reading list of suggested books for the RHS Level 2 Certificate in The Principles of Plant Growth, Propagation and Development which is available from the Qualifications Section and can also be found on the RHS website together with past papers.

### Examiners' Comments:

	MARKS
<b>Q1</b> a) State what is meant by a 'perennial' plant.	1
b) State the differences between 'evergreen', 'semi-evergreen' and 'deciduous' perennials.	3
c) Define <b>EACH</b> of the following terms and give <b>ONE NAMED</b> plant example for <b>EACH</b> :	
i) woody perennial;	2
ii) herbaceous perennial;	2
iii) tender perennial.	2
a) Full marks were awarded to candidates who stated that a perennial plant lives for more than two years rather than two years (a biennial) or more, or simply a plant that lives for many years.	
b) Most candidates correctly stated that evergreen plants retain their leaves throughout the year, semi evergreen usually retain their leaves but can lose them in harsh environmental conditions such as very cold winters or drought, and deciduous plants shed their leaves in autumn and winter. The best candidates understood that the term 'perennial' applies to both woody and herbaceous plants. Plant examples were not required for this part of the question.	

- c) Candidates who gained full marks were able to distinguish clearly between the three types of perennials. Marks were not awarded for redefining the term 'perennial' as these were given in part a) of the question. The best candidates described woody perennials as undergoing secondary thickening or having a permanent woody framework rather than simply being woody which was not awarded any marks. Herbaceous perennials do not undergo secondary thickening and so do not have a woody framework and generally die down in winter. Candidates who defined tender perennials as being killed by frost or temperatures less than 5°C achieved full marks. It was not sufficient to state that they may be damaged by or are vulnerable to these temperatures.

Suitable plant examples included; *Quercus robur* as a woody perennial, *Hosta fortunei* as an herbaceous perennial and many houseplants e.g. *Strelitzia regina* or perennial plants used for summer bedding e.g. *Canina indica* as tender perennials.

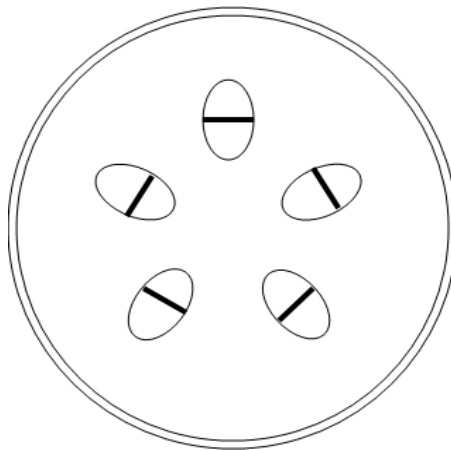
**Q2** a) Name **ONE** stem tissue for **EACH** function listed below:

- i) transport;
- ii) packing;
- iii) protection.

**3**

- b) Label the position of the tissues named in a), on the diagram provided below.

**3**



**Cross section of a young dicotyledonous stem**

- c) State **FOUR** characteristics of **ONE** of the tissues named in a).

**4**

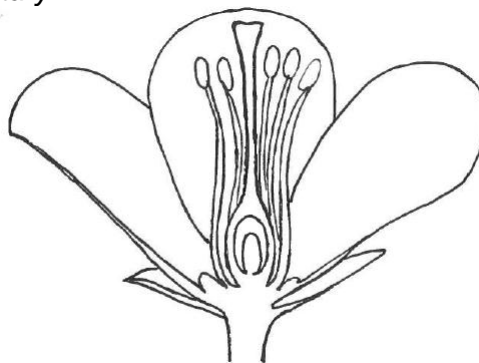
- a) Most candidates were able to name suitable examples of stem tissues involved in transport; e.g. xylem, phloem or vascular bundles, packing; e.g. pith, cortex or parenchyma and protection; e.g. epidermis or cork/bark. Some candidates provided examples of root tissues or cell components for which marks could not be awarded.

- b) The best candidates accurately positioned the labels on the diagram for the tissues named in a). Marks were lost by some candidates who chose cork/bark as a protective tissue in a) as the diagram in b) was of a stem which had not undergone secondary thickening.
- c) Candidates who stated four characteristics of one of the tissues named in a) (rather than their function or location) gained full marks. The best candidates provided the information clearly in the form of four bullet points. For example the characteristics of epidermal tissue include;
- Single layer of living, transparent, flattened cells without air spaces between them.
  - May form epidermal hairs.
  - Has a waxy cuticle.
  - Waterproof and airtight.

**Q3** a) Identify **EACH** of the features listed below by labelling the diagram provided:

- i) sepal;
- ii) style;
- iii) ovule;
- iv) anther;
- v) nectary.

**5**



**A typical dicotyledonous flower**

b) State the function of **EACH** of the features listed in a).

**5**

- a) Most candidates had a good knowledge of the flower parts listed and were able to label them accurately on the diagram provided. The position of the nectary was not generally well known and some candidates labelled the style close to the stigma instead of lower down which would provide a more clear differentiation between these two flower parts.
- b) The majority of candidates were able to state the correct functions for each of the features listed in part a) of the question; e.g. the sepal protects the flower bud from insect or weather damage; the



style supports the stigma in the correct position for pollen collection or provides a route for the pollen tube to reach the ovule; the ovule contains the embryo, becomes the seed, contains the ovum/female gamete or is the site of fertilisation; the anthers contain pollen within which the male gamete is held and the nectary contains a sugary solution that attracts pollinators.

The best candidates understood that it is the male gamete which travels through the style and not the pollen and that the style is not a hollow tube. A number of candidates confused the terms ovum, ovule and ovary.

**Q4** a) *Name the cell components where the following processes occur:*

- |                                 |          |
|---------------------------------|----------|
| i) <i>photosynthesis;</i>       | <b>1</b> |
| ii) <i>aerobic respiration.</i> | <b>1</b> |

b) *Name the products of aerobic respiration.* **1**

c) *Describe how the levels of the following factors determine the efficiency of respiration:*

- |                        |          |
|------------------------|----------|
| i) <i>temperature;</i> | <b>3</b> |
| ii) <i>oxygen.</i>     | <b>4</b> |

a) Candidates who named chloroplast as the cell component where photosynthesis occurs and mitochondria as the cell component where aerobic respiration occurs received full marks. Long descriptions were not required for this section of the question.

b) The best candidates named all the products of aerobic respiration i.e. water, carbon dioxide and energy/ATP/heat.

c) Full marks were awarded to candidates who described the effects of increasing and decreasing temperature or oxygen levels on the rate of respiration rather than describing their effects on transpiration or photosynthesis.

i) The best candidates described how increasing temperature increases the rate of respiration up to an optimum above which the rate decreases as the temperature increases. Marks were awarded for giving suitable temperature optima or ranges or for mentioning the significance of respiratory enzymes.

ii) Candidates who correctly described the effects of anaerobic respiration in the absence of oxygen gained high marks. They also included that in these conditions respiration is inefficient since energy production is not sufficient to maintain plant health, reproduction and growth. In addition toxic ethanol is produced as a by-product.

- Q5**
- a) *Distinguish between the 'juvenile' and 'adult' stages in the life cycle of a plant.* **2**
  - b) *Distinguish between 'senescence' and 'death' in the life cycle of a plant.* **2**
  - c) *Describe the phototropic response of a plant in a **NAMED** situation.* **6**
- a) Candidates who were able to succinctly define juvenile growth as the vegetative/non-flowering stage and adult growth as the reproductive/flowering stage of the life cycle were awarded full marks. Marks were also awarded for other differences e.g. juvenile leaf form, leaf retention or growth patterns or ability to root as cuttings.
- b) The best candidates described senescence and death in relation to whole plants and the plant life cycle rather than annual changes in plant organs such as leaves and fruits although some marks were awarded for the latter. Those candidates who stated that senescence precedes death and is the stage where plant processes are still taking place but growth and reproduction have ceased i.e. the plant is dying whereas death involves the cessation of plant and cellular function were awarded full marks.
- c) Candidates who were awarded high marks named a suitable situation where plants show a phototropic response, most commonly positive phototropism in plant shoots on a windowsill. The best candidates described that phototropic movements are due to growth in response to light. Descriptions included the role of auxin, the effect of light on its distribution behind the shoot tip and its stimulation of cell expansion.
- Q6**
- a) *State the meaning of the following terms giving **ONE NAMED** plant example for **EACH**:*
    - i) *monoecious;* **2**
    - ii) *dioecious.* **2**
  - b) *Describe the characteristics of wind pollinated plants.* **6**
- a) Full marks were awarded to candidates who provided correct meanings and plant examples for;
- i) monoecious as having separate male and female organs/flowers on one plant e.g. *Corylus avellana*
  - ii) dioecious as having male organs/flowers on one plant and female organs/flowers on a separate plant e.g. *Ilex aquifolium*

- b) The best candidates described the physical characteristics of wind pollinated plants in detail including; reduced petals with dull colouring, no scent or nectar, externally presented stigmas and stamens, small, smooth pollen produced in large amounts, sometimes with air sacs or wings, early flowering, flowers often in catkins or pollen produced in cones.

- Q7** a) Define 'transpiration'. **2**
- b) State the effect of any **TWO NAMED** environmental factors on the rate of transpiration. **4**
- c) Describe how stomata limit water loss. **4**

- a) Candidates who defined transpiration as the loss of water vapour from the leaves and other plant surfaces primarily through the stomata gained full marks. Details of the pathway of water through the plant were not required and could not be awarded any marks.
- b) Environmental factors affecting the transpiration rate include humidity, temperature, light, air movement/wind and soil moisture. The best candidates linked an increase or decrease in the transpiration rate with an increase or decrease in the corresponding environmental factor e.g. an increase in wind speed or temperature increases transpiration.
- c) Marks were awarded to candidates who described the conditions when stomata may open or close and how the guard cells enable the stomatal opening/closure due to turgor changes which regulate water loss. The best candidates were able to describe the physical structure of guard cells which enable this to occur, osmosis and changes in the concentration of potassium, the role of abscisic acid and the differential distribution and modifications of stomata which help reduce water loss.

- Q8** a) State **ONE** function of the fruit in plant reproduction. **1**
- b) Complete the table below for the fruit types listed.

<b>Fruit type</b>	<b>Fruit type example</b>	<b>Plant example</b>	<b>Method of dispersal</b>
<b>Dry dehiscent</b>			
<b>Dry indehiscent</b>			
<b>False fruit</b>			

**3**

**3**

**3**

- a) The majority of candidates were able to state one function of the fruit in plant reproduction e.g. to protect the seed from damage or to aid seed dispersal with very few candidates stating the role of fruit in controlling seed germination/maintaining seed dormancy.
- b) Candidates who were awarded high marks for this section of the question were able to complete the table with correct examples in the appropriate columns and provided a suitable method of dispersal.

Fruit type examples of dry dehiscent, dry indehiscent and false fruits were generally not well known. Suitable examples include;

**Dry dehiscent fruit type:** Fruit type example – capsule, plant example – *Papaver orientale*, method of dispersal – capsule opens when dry and is shaken by the wind.

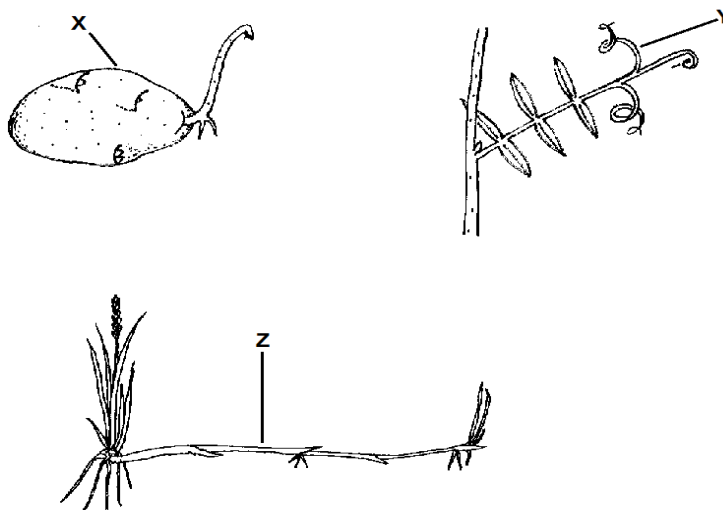
**Dry indehiscent fruit type:** Fruit type example – nut, plant example – *Quercus robur*, method of dispersal – squirrels/jays bury acorns.

**False Fruit:** Fruit type example – pome, plant example – *Malus sylvestris*, method of dispersal – animals eat succulent fruit and excrete the seed.

Marks were awarded for legume, capsule, pod, nut, samara, pome and pseudocarp etc. and strawberry/apple/acorn were accepted where appropriate. As fruits are the products of angiosperms cones were not accepted.

- Q9** a) Identify the plant modifications (adaptations) X, Y and Z in the diagrams below and give a **NAMED** plant example for **EACH**.

6



X ..... Plant example .....

Y ..... Plant example .....

Z ..... Plant example .....

- b) Describe the functions of **TWO** of the modifications shown in the diagrams in a).

4

- a) Full marks were awarded to candidates who correctly and fully identified and named an example of the modifications illustrated as;

- X) Stem tuber e.g. *Solanum tuberosum*  
 Y) Leaf tendril e.g. *Clematis armandii*  
 Z) Rhizome (stolon/runner also accepted)  
 e.g. *Agropyron repens*

- b) The best candidates gave detailed descriptions of the functions of each plant modification; e.g. stem tubers store starch which is needed for new growth in the spring i.e. perennation and can also give rise to vegetative reproduction or spread. Leaf tendrils enable plants to climb up supports towards the light for increased photosynthesis. Rhizomes enable vegetative spread/asexual reproduction to reduce competition from the mother plant.

- Q10** a) Name **ONE** plant example for **EACH** of the plant groups listed below:

- i) gymnosperms;  
 ii) angiosperms.

2

- b) State the differences between gymnosperms and angiosperms by completing the table below.

8

	<b>Gymnosperms</b>	<b>Angiosperms</b>
<b>Range of Habitats</b>		
<b>Life cycle</b>		
<b>Reproduction</b>		
<b>Leaves</b>		

- a) Candidates who gave full botanical names of appropriate plants were awarded full marks. Suitable examples included; *Pinus sylvestris* as a gymnosperm and *Quercus robur* as an angiosperm.
- b) Candidates who completed the table accurately and provided some detail in their answers gained full marks for this section of the question, e.g.

Habitat - refers to a plants' natural home. Gymnosperms have a limited range, often xerophytic habitats, forests, alpine etc. whereas angiosperm habitats are very diverse e.g. including

water and tropics.

Life cycle – gymnosperms are mostly woody perennials whereas angiosperms have a range of life cycles e.g. annual, biennial and perennial and may be woody or herbaceous.

Reproduction – gymnosperms have cones/naked seeds and are generally wind pollinated whereas angiosperms have flowers/ovaries/seeds enclosed in fruit and a range of pollination mechanisms including insect and wind.

Leaves – gymnosperm leaves are generally reduced to needles and are evergreen whereas angiosperm leaves are broad, have a range of shapes, sizes and colours and are evergreen and deciduous.

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