NAME:
MYP 5 A B C

Asexual Reproduction Worksheet

1. **Explain what asexual reproduction is, using a spider plant as an example.**

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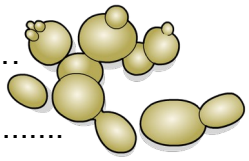
2. **Name two other organisms that reproduce asexually.**



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3. **Complete the following sentences using the words in the box below.**

a) In …… reproduction, the cells of the offspring are produced by

…… from the parent cells. This means the …….. in these cells are identical to the parent plant.

b) The new organism is a …….. of the original.

asexual	mitosis	alleles	parent	clone	osmosis

4. **Human clones are commonplace in our society.**
   a) **What are they more commonly called?**

……

b) Describe the natural process that creates a human clone.

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c) Give two reasons why many people believe that artificial human cloning is not ethically acceptable.

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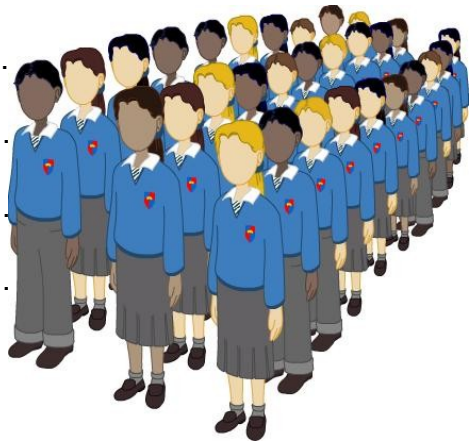


7. Dolly the sheep, born in 1996, was the first mammal to be cloned from an adult cell.

a) Give one disadvantage or risk of cloning an animal.

……

……

b) List two ways in which cloning an animal could be advantageous to humans.

……

……

……

8. Define the following types of sexual reproduction: Binary fission, budding, fragmentation

……..

……..……

…….

…….

MYP 5 B – Practice Task sheet
Date- 12.12.24

Heredity

NOTE: Alleles are alternative forms of a gene which occupies a particular position in a chromosome. Alleles affect the same characteristic (e.g. blood group) but not necessarily in the same way. $\mathbf{I^A}$, $\mathbf{I^B}$ and **i** are alleles of a gene which controls the ABO blood groups.

1 A plant with red flowers is crossed with a white-flowered plant of the same species. All the seeds, when grown, produce plants with red flowers. Assuming that the flower colour is controlled by a single pair of alleles, which allele is dominant and which is recessive?

2 If a dominant allele for tall plants is represented by the letter D, what letter should represent the corresponding recessive allele?

3 In cats, the allele (**S**) for short fur is dominant to the allele (**s**) for long fur.
(a) What is the genotype of a true-breeding, long-furred cat?
(b) What is the phenotype of a cat with the genotype **Ss**?
(c) In an **Ss** genotype, which allele is expressed in the phenotype?
(d) Which of the fo1lowing genotypes is (i) heterozygous (ii) homozygous dominant?
SS, **Ss**, **ss**

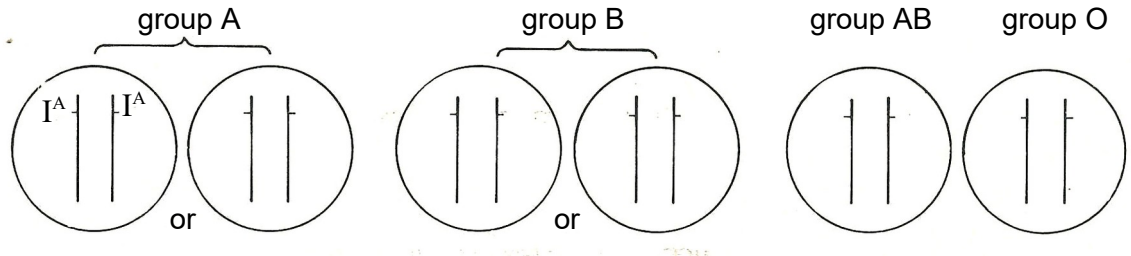
4 In rabbits, assume that the dominant allele (**B**) produces black fur. The allele (**b**) for white fur is recessive to **B**.
(a) What colour fur will each of the following rabbits have?

	Rabbit 1	*Rabbit 2*	*Rabbit 3*	*Rabbit 4*
genotype	**BB**	**Bb**	**bB**	**bb**

(b) Which of them will breed true?
(c) Which rabbits are homozygous for coat colour?
(d) If rabbits 1 and 4 were mated together and had 12 babies, how many of these would you expect to be black?
(e) If rabbits 2 and 3 are interbred and produce several litters, totalling 48 babies, how many white babies would be predicted by the laws of genetics?
(f) If rabbits 3 and 4 are mated together on several occasions and have 50 babies altogether, how many of their babies would you 'expect' to be black?

NOTE: In this context, 'expect' implies the perfect Mendelian ratio. In practice you would not expect to achieve this ratio with as few as 50 offspring.

5 The alleles controlling the ABO blood groups are given the letters $\mathbf{I^A}$ (group A), $\mathbf{I^B}$ (group B) and **i** (group O). On the drawings below, write in the alleles on the chromosomes for each of the blood groups. (The first one has been done for you)



Heredity (continued)

6 In shorthorn cattle, the coat colours red or white are controlled by a single pair of alleles. A calf which receives the allele for red coat from its mother and the allele for white coat from its father is called a 'roan'. It has an equal number of red and white hairs in its coat.

(a) Is this an example of codominance or of incomplete dominance?
(b) Give a reason for your answer.
(c) Give one example in each case of (i) codominance, (ii) incomplete dominance, in humans.

7 Give three examples of human disorders which are caused by the action of a single pair of alleles. In each case say whether the harmful allele is dominant or recessive to the non-harmful allele.

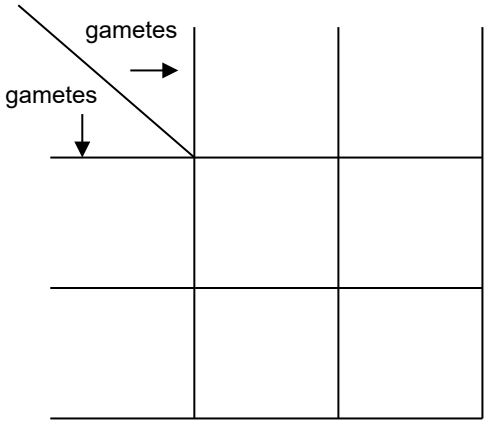
8 In humans, maleness or femaleness is determined by a pair of sex chromosomes called X and Y.

(a) What is the genotype for males?
(b) What is the genotype for females?

9 (a) In humans, is it the sperm or the ovum which determines the sex of the offspring?
(b) Give a reason for your answer.

10 In fruit flies, the allele (**n**) for ebony (black) body is recessive to the allele (**N**) for normal (grey) body.

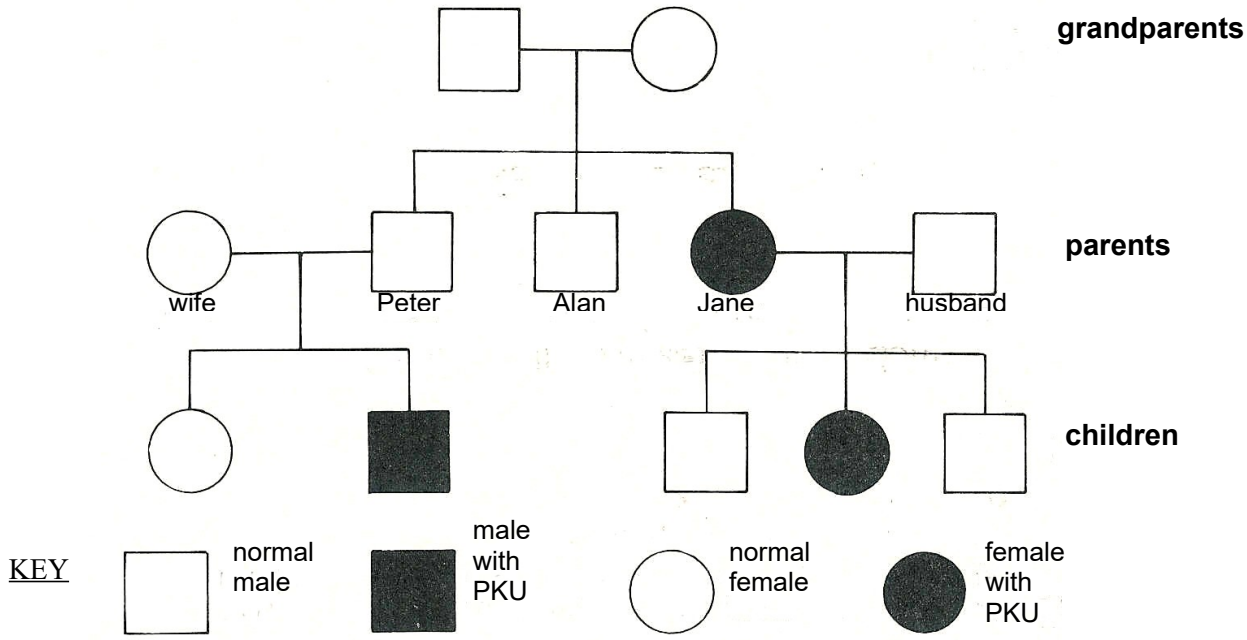
(a) Complete the Punnett square, for a cross between normal (grey-bodied) flies which are heterozygous for this allele (i.e. Nn genotypes).
(b) State the expected proportion of normal and ebony-bodied flies in a large sample of the offspring.
(c) State the proportion of the normal phenotypes which would be true breeding.



11 When a particular gene is said to be ‘sex-linked’, on which chromosome is that gene usually present?

Heredity (continued)

12 The genetic disorder phenylketonuria (PKU) is caused by a recessive allele (**n**). The family tree below shows the incidence of the disease over three generations.



(a) What can you deduce about the genotypes of the grandparents?
(b) Explain your reasoning.
(c) What is the genotype of Jane's husband?
(d) Explain your reasoning.
(e) What are the chances that Peter is the carrier of the PKU allele that resulted in his having an affected son?
(f) If Jane had been normal, what are the possible genotypes of the grandparents?
(g) Is it possible that the allele for PKU is sex-linked?

13 One form of colour-blindness is a sex-linked inherited condition controlled by a recessive allele. Use the symbols **X** and **Y** for the sex chromosomes and **N** and **n** for the alleles for normal or defective colour vision to show the genotypes of

(a) a normal male
(b) a colour-blind male
(c) a normal (non-carrier) female
(d) a colour-blind female
(e) a normal (carrier) female.

14 Use the genotypes you have written for your answer to question 13 to show the chances of (a) a son being colour blind, (b) a daughter being a carrier, resulting from a marriage between a normal man and a carrier woman.

16 Human Reproduction

1 Fertilisation occurs when the …..(A)….. of the sperm cell fuses with the…..(B) ….. of the ….. (C) ….. .

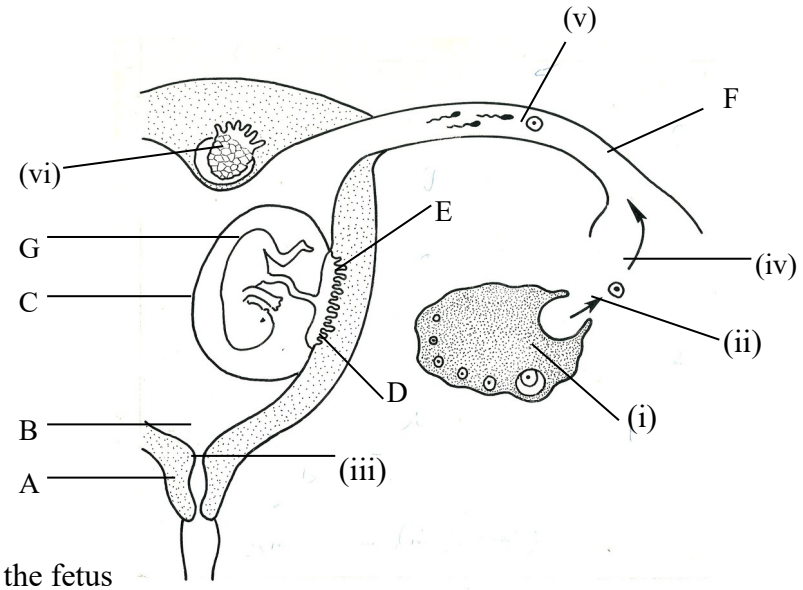
2 State the differences between the male gametes and the female gametes with regard to (a) their size; (b) their structure, (c) their relative numbers.

3 Before fertilisation can occur, the sperms have to travel from the testes to meet an ovum in the female organs. Using the list below, name the organs, in the correct order, through which the sperms will have to pass.
uterus, sperm duct, oviduct, urethra, cervix, vagina

4 (a) Explain what is meant by ovulation.
(b) How often does it occur in humans?

5 Explain why the chance of fertilisation in humans is restricted to only a few days each month.

6 The diagram below represents the events leading up to fertilisation (v), implantation (vi) and development. In each case name the structures involved and, at the numbers, state briefly what is happening or what has happened previously.



7 Blood from the fetus
(a) What substances pass (i) from the maternal to the fetal blood, (ii) from the fetal to the maternal blood?
(b) By what means is the fetal blood circulated through the placenta?

8 What is the function of the umbilical cord?

9 What are the possible effects on the fetus if, during pregnancy, the mother (a) smokes, (b) catches rubella?

10 Describe the events which lead to the formation of (a) identical twins, (b) fraternal twins.

11 At an ante-natal clinic what can (a) blood tests, (b) urine tests reveal?

Human reproduction (continued)

12 Place the following events in the correct order for natural childbirth.

amniotic fluid expelled, placenta expelled from uterus, baby's feet emerge from vagina, abdominal contractions begin, baby' head emerges from vagina, amnion breaks, cervix dilates, contractions of the uterus begin .

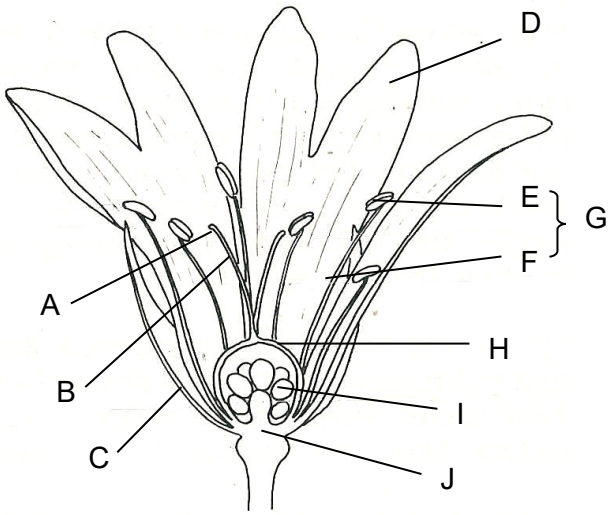
13 (a) What are the advantages of human milk over cows' milk for feeding babies?
(b) Apart from the composition of the milk, what are the other advantages of breast-feeding?

14 Name (a) the male sex hormone and (b) the female sex hormone which help bring about the changes at puberty .

15 After ovulation (a) what structure replaces the Graafian follicle, (b) what hormone does it produce?

8 Reproduction in flowering plants

1 Which is the most accurate statement?
The principal role of a flower in the life cycle of a plant is:
(a) attracting insects
(b) producing seeds
(c) producing pollen
(d) producing nectar



2 Name the parts A-J shown on this drawing of a half-flower of a Stitchwort.

3 What is (a) the male gamete, and (b) the female gamete in a flowering plant?

4 Complete the following paragraph selecting words from the list below. Pollination is the transfer of ……. from the …….. to the ……. in a flower. In cross-pollination, the ……. from a flower on one …….is transferred to the …….of another ……. of the same species.

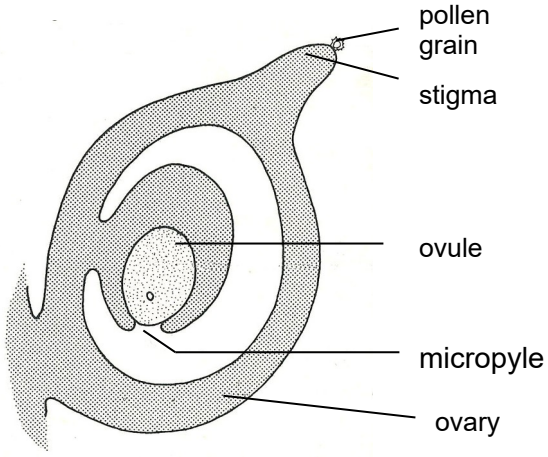
anthers, ovule, stigma, plant, flower, pollen, ovary, petal, style, receptacle, stamens

5 Complete the following sentences:
In a flowering plant fertilisation occurs when the ……..of the ……. fuses with the …….of the …… . After fertilisation , the ……. becomes the ……. and the ……. becomes the ……. .

6 Which of the following statements is correct? In flowering plants:
(a) pollination can take place without fertilisation
(b) fertilisation can take place without pollination
(c) pollination and fertilisation are the same
(d) pollination and fertilisation must occur at the same time

7 Some species of plant are strongly adapted to pollination by certain insects. Which of the following characteristics would you regard as adaptations to pollination by bees:
(a) white or coloured petals
(b) light, smooth pollen grains
(c) spiky or sticky pollen grains
(d) anthers and stigma inside the flower
(e) anthers and stigma protruding from the flower
(f) small green petals
(g) production of nectar
(h) production of pollen
(i) production of scent?

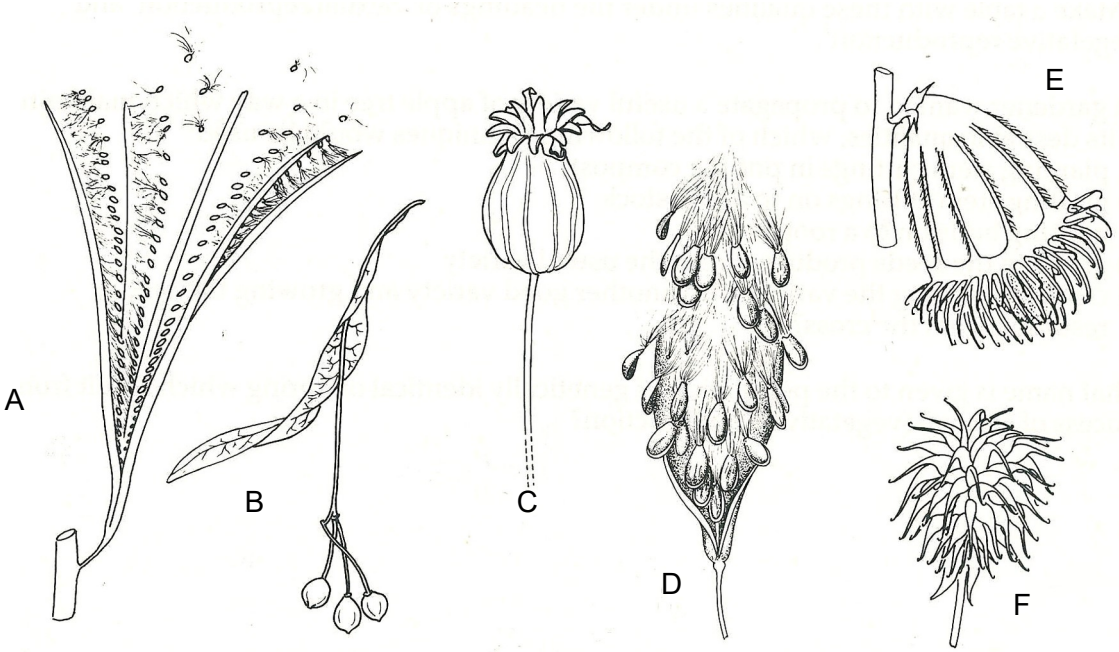
8 A bee visits several flowers in succession on a single willow herb plant. In doing so, the bee transfers pollen from the younger flowers, near the top of the inflorescence (group of flowers) to the older flowers near the base of the inflorescence. Is this an example of self-pollination or cross-pollination?



9 Complete the drawing to show what has to happen before fertilisation can occur

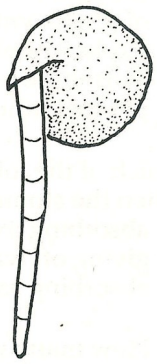
Reproduction in flowering plants (continued)

10 The drawings show seeds or fruits of different plants.
(a) From the appearance of the structures, make a guess at how each one is dispersed giving reasons for your answers.
(b) What are the advantages to a plant of an effective method of seed dispersal?



11 The root of the pea seedling is marked with equally spaced lines as shown here. Draw what you would expect to see in two days' time if the root

(a) grew only from the tip
(b) grew uniformly along its length
(c) grew only at the top
(d) did not grow.



12 (a) What conditions do most seeds need in order to begin germination?
(b) What other condition do the seedlings need to continue growth to mature plants?

13 How would you design, in principle, an experiment to test the hypothesis that a variety of lettuce seed needed daylight in order to germinate?

14 Figure 1 represents a pea seed split open to show its structure. Name the parts A-C and state the function of each.
Figure 2 represents a pea seedling-5 days after germination. Name the parts D-H.

15 The early stages of germination take place in the soil where there is little or no light for photosynthesis. How does the seedling obtain materials for its growth and energy during needs during this time?

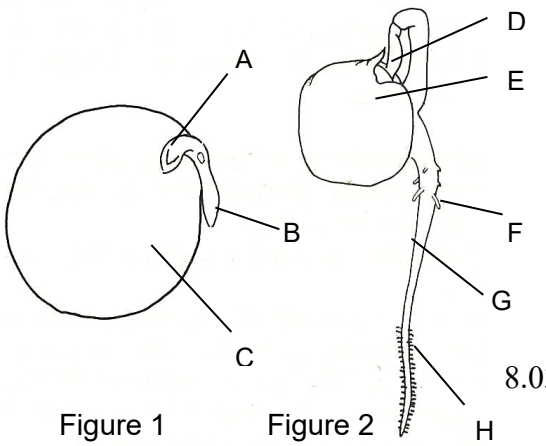


Figure 1 Figure 2

Reproduction in flowering plants (continued)

16 You are asked to set up an experiment to investigate the effect of temperature on the rate of germination. You place ten soaked peas in each of three flower pots containing moist sand. One pot is placed in a refrigerator at 4°C, one is placed in a cupboard at room temperature (about18°C) and the third is placed in an incubator at 25°C. You leave them for a week, checking each day that the sand is kept moist.

(a) How would you judge the results?

(b) Why was the pot, at room temperature, kept in a cupboard rather than on the laboratory bench?

17 Starch is one of the most common storage product in seeds. What happens to the starch before it can be used by the germinating seed?

18 The diagram represent an experiment to test the hypothesis that seeds need oxygen in order to germinate.

(a) What is the liquid in A and what does it do?

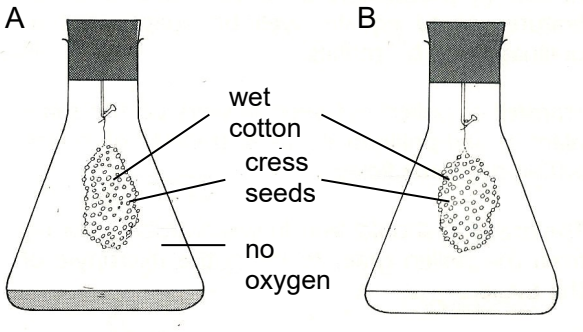
(b) What is the liquid in B and what does it do?

(c) Which of the two flasks represents the control and what is its purpose?

(d) What results would you expect

(i) if oxygen is necessary for germination

(ii) if oxygen is not necessary for germination?



19 What differences would you expect to see between pea seedlings grown for 10 days in total darkness and pea seedlings grown in the light for the same period of time?

9. In many flowers pollination occurs when pollen is transferred from the anther of one plant to the stigma of another plant of the same species. This is known as cross-pollination.

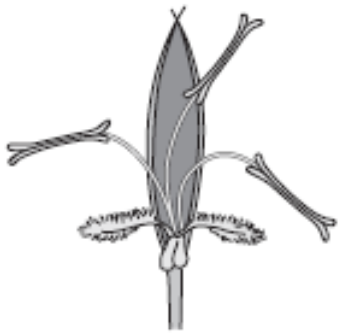
The table compares some features of insect-pollinated and wind-pollinated flowers.

(a) Complete the table to show how the two types of flowers differ.

Feature	Type of Flower	
	Insect-pollinated	Wind-pollinated
Petals	large and colourful	
Scent		
Nectar		
Pollen grains		
Stigma		feathery and hanging outside petals

(5)

7. (a) The diagram shows a wind-pollinated flower.



(i) Describe **two** features seen in the diagram that show this is a wind-pollinated flower.

1 .....

.....

2 .....

.....

(2)

(ii) Pollen grains produced by wind-pollinated flowers differ from pollen grains produced by insect-pollinated flowers.
Suggest **one** way in which the pollen from wind-pollinated flowers is different.

.....

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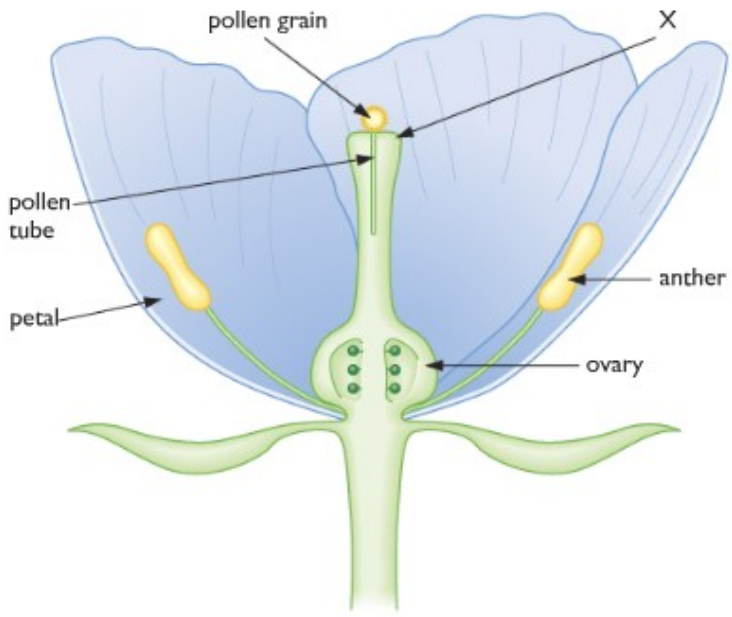
(1)

PPH Pollination



a) Name part X. _____ (1)

b) How are insects attracted to a flower like this? Give two ways.

1. _____
2. _____ (2)

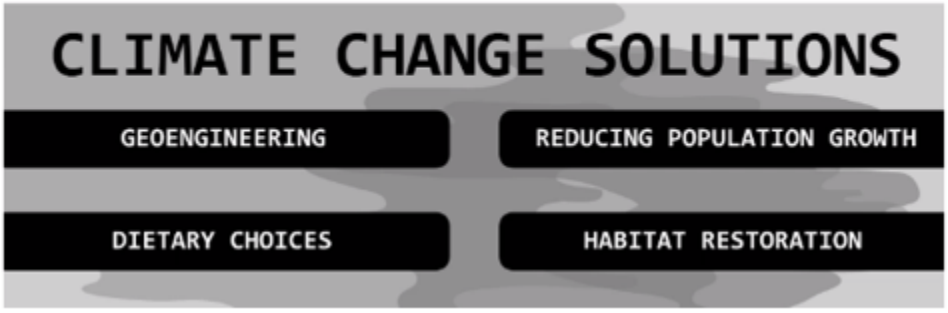
MYP 4 Biology

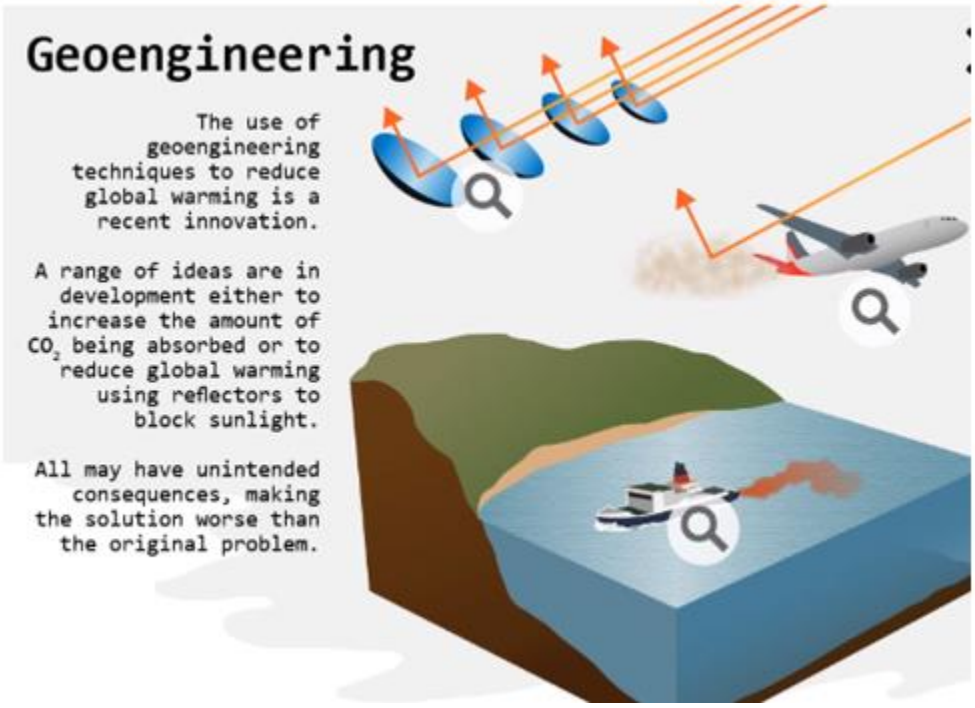
Criteria D

Sample Questions with Answers

Q. 1

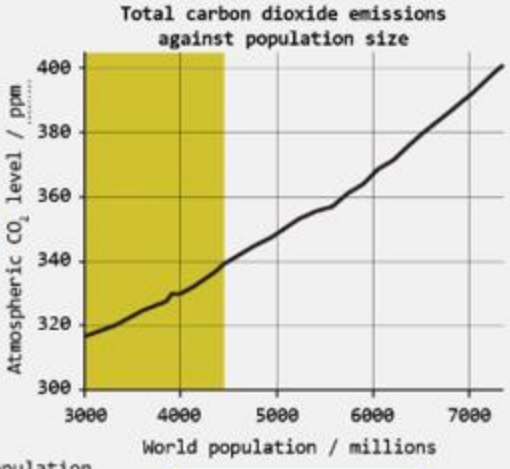
There have been many solutions suggested o reduce the cause of climate change. Four of the solutions are described in the infographics below.





Reducing population growth to reduce carbon dioxide emissions

Small population



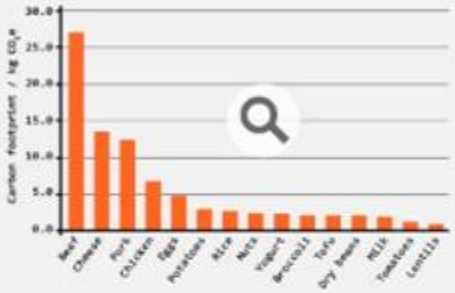
Small population
Medium population
Large population

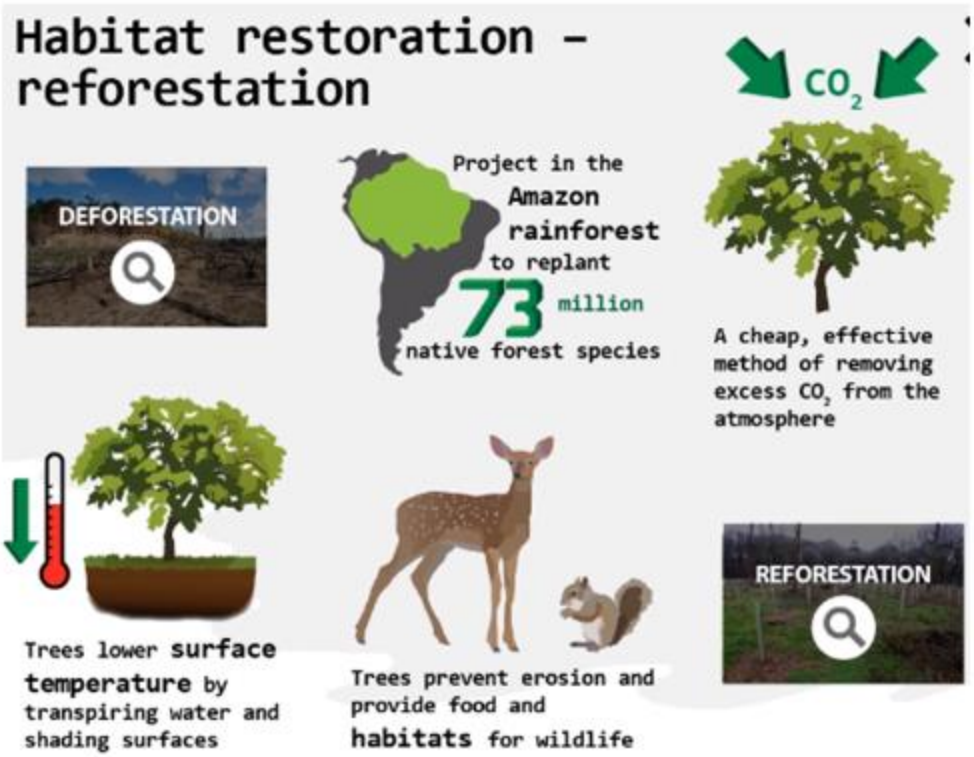
AVERAGE CARBON FOOTPRINT

Dietary choices

Less land is needed to grow vegetables for human consumption compared to the land needed for meat production.

A meat-based diet releases more than 1.8 tonnes $CO_2e\ y^{-1}$ than a vegan diet. This unit measures the effect of greenhouse gases.





Using information from the infographics and your wider MYP studies, discuss and evaluate two possible solutions to reduce the impact of climate change. In your answer, you should include:

- a description of two actions humans can take to reduce the impact of global climate change
- an explanation of the science behind each human action
- advantages of your two chosen climate change solutions
- disadvantages of your two chosen climate change solutions
- a concluding appraisal giving your opinion of the single best climate change solution with justification

Sample Answer

What Humans Can Do to Reduce the Impact of Climate Change and Scientific Explanation:

Climate change has had various effects on the environment, not only with global warming, but also changes in vegetation and precipitation patterns. All of these can be extremely detrimental to ecosystems. One of the main causes of climate change is a growing population. Over time, human population has grown exponentially, and data has suggested a resultant increase in CO_2 emissions. An increasing population means that more resources and land are required to support them. This leads to increased resource consumption (burning of fossil fuels) and deforestation for land. Both of these can increase CO_2 concentrations. Furthermore, an increased population leads to an increase in the CO_2 emitted during respiration. Respiration is essential for human life because it acts as an energy source, and because it converts oxygen and glucose into carbon dioxide and water, more respiration leads to more more carbon dioxide production. Therefore, through effective population control policies and resource management, we can reduce the effect that a growing population has on climate change.

Another method is through habitat restoration through deforestation. Trees and other plants photosynthesise. Photosynthesis involves converting carbon dioxide and water into glucose (food) and oxygen. Photosynthesis takes out carbon dioxide from the atmosphere. This reduces climate change because it redces the concentration of carbon dioxide in the atmosphere. Carbon doxide has a heating effect on the Earth's surface. This leads to global warming and can have a significant impact on reforestation. Through reforestation, we can get rid of the excess carbon dioxide because there will be an increase in photosynthesis

Advantages of These Activities:

To evaluate the advantages, it is important to evaluate why climate change is a problem. Climate change is the slow and continuous change in global climatic conditions. This includes temperature and precipitation patterns. With ecosystems being a key part of life on earth, it is important to protect them. Humans are also impacted by changes in ecosystems and as the climate changes, ecosystems are in danger. This is because many plants and animals are not adapted to changes in the climate and are forced to evacuate. One way in which humans are impacted by climate change is the increase in droughts and flood which can cause damage to health and infrastructure.

By controlling population, we can reduce the CO_2 emissions which lead to climate change. This includes the carbon dioxide from both respiration and the burning of fossil fuels. A higher population also leads to higher vehicle use. This can lead to the release of nitrogen dioxide which reacts with rainwater to create nitric acid. Additionally, acid rain is also caused by the release of sulfur from the burning of fossil fuels, and this also increases with population. Acid rain is one of the effects of climate change. Various plant and animal species are unable to thrive in acidic environents because the ions present in acids can replace the ions in the soil that are necssary for plant growth. For example, nitrate and magnesium ions, which are essential for growth and photosynthesis. Plants are an essential part of ecosystems because they act as a producer in all food chains.

Reforestation can also help the problem by removing excess CO_2 and in turn reducing climate change. It also provides food and habitats to various forms of wildlife. This is beause many species are native to rainforests and are adapted to having trees as a source of food and shelter. Planting trees can help provide this to those species. Additionally, plants give out oxygen which is essential for animal species. This can have a positive impact on wildlife. Because of deforestation, animal species have been in danger of endangerment and extinction, stressing the need for reforestation and the advantages it could bring.

Disadvantages of These Activities:

Along with the many advantages, there are drawbacks to these solutions. Firstly, both of these solutions are difficult to implement. One of the main methods of population control is through governmental policies. These are oftentimes controversial or difficult to enforce. It also limits the freedom of citizens. Reforestation is also incredibly difficult to implement. When trees are manually planted, it could take a long time for effects to be seen and these effects would be minimal. Trees can also take a long time to grow, making it less ideal while looking at short-term solutions. Furthermore, reforestation would limit the area of land for humans to live in. This can lead to congestion which leads to a higher chance of diseases spreading and several other problems.

Appraisal:

In the end, population control is the most effective because an increasing population has a wider range of impacts, therefore reducing it would also have a greater positive impact on climate change. Although it can be difficult to implement, there are still ways to do so with the use of contraceptives. Additionally, population control is long lasting because as population decreases, there are less people who can facilitate a further increase. Effectively managing resources with a currently growing population is also at the forefront while looking at the effect of population growth on increased CO_2 emissions and other environmental concerns. Reducing resource consumtion can be both a short-term and long-term solution while looking at global warming and climate change caused by increased CO_2 emissions, making it more effective than other methods. However, it is still important to acknowledge all possible methods of reducing the impact of global climate change.

Q. 2 Getting the right nutrition is essential for our health and well being.

Food scarcity and poor nutrition are global problems that affect societies worldwide.

Changes in the environment are causing more extreme weather which leads to severe floods and severe droughts. These environmental changes can make it impossible to grow food in some parts of the world.

Biofortified crops are crops which are genetically modified to contain additional nutritional value. Food from these crops can be used to give nutrients to people suffering from specific nutritional deficiencies.

The most common consequence of vitamin A deficiency is blindness. Other conditions include night blindness, weakened immune function, cancer and birth defects when the mother had vitamin A deficiency during pregnancy.

Golden rice is a genetically modified form of rice which contains beta carotene in its grains. Beta carotene is needed by the human body to produce vitamin A. Non modified rice grains do not contain beta carotene. In 2009, results of a clinical trial of golden rice carried out with adult volunteers found that beta carotene is effectively converted to vitamin A in humans. Despite these results, as of March 2016, golden rice has not yet been grown commercially.

Some groups are against the introduction of golden rice as they claim that people will eat this genetically modified rice without being aware of it or without having the choice not to.

Another concern is the possibility of this genetically modified type of rice cross pollinating with non modified rice grown in near by fields. This could lead to new varieties of rice being unintentionally created, eventually leading to the loss of the non modified form of rice. Research continues in the biotechnology field of fortified foods and in 2016, the World Food Prize went to biofortified sweet potatoes.

A. Using the information provided in this question and your wider MYP knowledge discuss and evaluate the possible implications of introducing biofortified food crops.

In your answer, you should include

- Health impacts of introducing a new biofortified food on an individual.
- Environmental impacts of introducing biofortified food crops in areas where the species has never been cultivated before.
- Ethical impacts
- Economic impacts for the local community
- A conducting recommendation based on the arguments you have discussed.

Sample Answer

Biofortified crops
Health impact
+ve

- can save lives of many by increased intake of nutrients that individuals have deficiency in
- most nutrients in biofortifies foods can be digested and absorbed by the human body and are effective in curing deficiency diseases
- can improve the health of individuals especially in LEDCs where incomes are low
- does not require new method of cooking or consumption, it is just the same food but with enhanced nutritional qualities
- can lead to a more healthy society as thing such as childbirth and disease in children is make more successful.

-ve

- might have adverse side effects that have not been fully discovered
- nutrients in too large concentrations can be detrimental and can cause excess tarin on kidney and liver
- some claim that the biofortified crops may contain carcinogens that can cause mutations in the body

Environmental impact
+ve

- biofortified crops have similar insect ecosystems around them, so it might not impact biodiversity
- such crops can decrease deficiency disease not only in humans but other organism that consume them

-ve

- biofortified crops may be less genetically distinct, and so more crops will be impacted by diseases, which may cause more frequent crop failure
- biofortified crops may require more fertilizers as the plant itself needs to have more nutrients. Farmers might overuse these fertilizers and it may cause dead zones and eutrophication in basins
- such crops may cross pollinate with non-GMO variants of crops and cause new breeds to arise: the effect of such breed may be unknown
- fortified crops may alos cause the extrapolation or even extinction of non fortified crops
- research and development of such crops may result in large carbon footprint

Economic impact
Positive:

- famers might be able to make more profits

- poor households that cannot afford such supplements might be able to gain access to biofortified food for lesser cost.
- better eating habits may prevent expensive treatments and surgeries for the local community
- the increased used of biofortified crops will support the scientists who developed such organism

-ve

- the crops may be more expensive to cultivate for farmers
- biofortified crops might compete with non-GMO crops and cause some farmers not make profits
- as crop failure is mor likely with less genetically diverse organisms the change of economic devastation is much greater
- such crops may be more expensive and only consumed by the richer people in society

Ethical impact

+ve

- these crops have usually been studied very well and all adverse effects have been minimized
- the crops can prevent diseases to a great extent and lead to increased welfare of society

-ve

- consumers might not have the choice between fortifies an unfortified crops: this may be unfair to those who di not want such crops
- there might be unknown implication of such crops that only show in the long term
- those who do not have deficiency diseases might be forced to eat such crops as other variants become extinct: consuming excess of nutrients may have adverse effects on the excretory system

Concluding appraisal

All in all, while biofortified crops can be extremely beneficial to populations that they prevent deficiency disease and lead to increase physical welfare, it is important that the cultivation of such crops is closely monitories, cross pollination is prevented and these crops ar only consumed by those with deficiency disease. Government regulation of such crops can remove the adverse effects of this life-saving innovation.