Assessment Schedule – 2022

Biology: Demonstrate understanding of biological ideas relating to the life cycle of flowering plants (90928)

Evidence Statement

Q	Achievement	Merit	Excellence
ONE	**Examples** of possible ideas include: **Describes the purpose of reproduction in plants.** Reproduction is for the continuation of the species / create offspring / pass on genetic information. **Describes the processes of pollination and fertilisation occurring in a flower.** • **Pollination** is the transfer of pollen from the anther of one flower to another flower / stigma (or within the same flower). • Pollination can occur via wind / insect / bird: - The animals / insects / birds pick up pollen from the male anthers and carry it to the female stigma. Flowers have different shapes, colours and smells, and often sugary nectar, to encourage animals to visit and pollinate them. - Wind-pollinated flowers are shaped to make it easy for the wind to pick up pollen and transport it in the air. • **Fertilisation** is the joining of male nuclei / sperm / male gamete / male sex cell with female sex cell / ovule / egg. • Before fertilisation can occur, a pollen tube grows down inside the style with the male sex cells / pollen nuclei / sperm inside. • Pollination is important because it brings the male sex cell closer to the female sex cell. • Fertilisation is important because it fuses egg and sperm / produces a zygote or seed or embryo plant. • Ovules become the seeds. • Ovary wall becomes the fruit. • Receptacle becomes the fruit. • The fruit helps with dispersal of the seed.	**Examples** of possible responses: **Explains how the processes of pollination AND fertilisation occur in a flower:** Pollen must land on the stigma of a suitable flower of the same species for pollination to occur. Pollination is **the transfer of pollen from the anther to the stigma** in a flower. This occurs so that the male sex cell / gamete / sperm is closer to / able to reach the female sex cell / gamete / egg / ovule so that a seed can form. The reason that the pollen tube grows towards the ovary is the ovary releases chemicals which guide the growth. Pollen can't get from the anthers to the ovules on its own, so plants rely on other things to move the pollen. Some flowers can be pollinated by their own pollen (self-pollination). However, this results in less genetic variation. Genetic variation is advantageous to the species. Many plants have ways to make sure they are pollinated only by pollen from a flower on a different plant, which is called cross-pollination. Some have the male and female parts in separate flowers on the same plant, while others have male and female flowers on different plants. Some have the stigmas and anthers ripening at different times to prevent self-pollination. Fertilisation **involves the joining / fusing of the male and female gamete.** After fertilisation has occurred, the ovules develop into the seeds. This is so that when the seed is in the right growing conditions, it will grow into a new plant. After fertilisation has occurred, the ovules develop into the seeds. This is so that when the seed is in the right growing conditions, it will grow into a new plant. After fertilisation, the ovule will swell and become the fruit, which carry the seeds ready to be dispersed. Dispersal of seed reduces competition with the parent plant.	**Examples** of possible responses: • Discusses an advantage and a disadvantage for one type of reproduction. • Compares the advantages or disadvantages for two different types of reproduction. eg One of the advantages to the plant of reproducing sexually is that it allows for increased genetic variation in the offspring. This is an advantage to the species because it increases the survival chances. For example, if members of a population are genetically different from each other, some are possibly able to survive a disease since some of them may be more resistant. On the other hand, plants that reproduce asexually produce offspring that are genetically identical to the parent plants. This means that if one of the population is adversely affected by disease, the probability of the other members being also affected is high. This can lead to many or all of the population dying. For example, taro plants can reproduce both sexually and asexually. The offspring that grow from the corm from the previous season are genetically identical to the parents. However, the offspring produced through seed formation would be genetically different and therefore the population will probably be more viable in the long run.

	• The fruit can provide nutrients for the germinating seed. Etc. **Describes advantages to a plant of reproducing sexually / asexually / both:** • Asexual is quick. • Asexual does not require partner / can be done individually • Asexual does not require energy for making flowers / pollen / fruits. • Sexual results in genetic diversity. • Both means that the plant has options in terms of energy - can do low energy, low diversity asexual OR high energy high diversity sexual. **Describes disadvantages to a plant of reproducing sexually / asexually / both:** • Asexual: no increase in genetic diversity. • Asexual offspring are close to parent / competing with parent. • Sexual requires more energy for flowers etc. Etc.	Etc. **Explains the advantages AND disadvantages to a plant reproducing sexually:** • Sexual production produces more (genetic) variation so if the environment (disease) changes, the species (offspring) has less chance of dying out. • Sexual reproduction decreases competition for resources because the seed / offspring is dispersed away from the parent and is not in competition for the same resources, therefore increases survival. • Disadvantage of sexual is larger energy to produce few / less offspring / any valid reason / advantage of asexual is less energy to produce more offspring. • **Explains the advantages AND disadvantages to a plant reproducing asexually /** • Asexual plants reproduce quickly and require less energy (as they do not require a partner/second parent) thus they are able to colonise new areas quickly and outcompete other species. • Asexual plants produce identical offspring so if the environment (disease) changes, the species has an increased chance of dying. • Asexual reproduction increases competition because the offspring and parent plant are in close proximity and compete for the same resources, therefore decreases survival. Etc.	Reproducing sexually allows for increased genetic variation in the offspring / population. This is an advantage to the species because it increases the survival chances when environmental conditions / selection pressures change. Pollination and fertilisation rely on insects / environmental factors which may not always be available. Asexual reproduction allows for a rapid increase in the size of the population when conditions are favourable. However, as all offspring are genetically identical, the chance or probability of all individuals being affected by a particular environmental challenge / disease is high. Plants that carry out both sexual reproduction and asexual reproduction can benefit from the increased genetic diversity and resilience against environmental change while also having the ability to rapidly increase numbers when conditions are favourable.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response / no relevant evidence.	ONE idea given.	TWO ideas given.	THREE ideas given.	FOUR ideas given.	Explains TWO ideas.	Explains THREE ideas.	ONE discussion.	TWO discussions.

Q	Achievement	Merit	Excellence
TWO	**Examples** of possible ideas include: **Describes how an environmental factor affects the rate of photosynthesis.** • The availability of CO_2 will affect the rate of photosynthesis, as it is a reactant. • If temperature is very low, photosynthesis may slow down or stop. **Describes the chemical process of photosynthesis in words or symbols (does not need to be a balanced chemical equation).** • $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$. Carbon dioxide + water → glucose + oxygen The reactants, six carbon dioxide molecules and six water molecules, are converted by light energy into a sugar molecule and six oxygen molecules (the products). Accept sugar or glucose. **Describes the structures in the leaf (one Achievement point for each description).** Chloroplasts are the organelles involved in photosynthesis; they trap light to be converted to chemical energy. • Leaf is wide (broad) and flat. • The leaf has a spongy mesophyll cell layer with large intra-cellular spaces. • Waxy cuticle. • Dark green from lots of chloroplasts Etc.	**Examples** of possible responses: **Explains how environmental factors affect the rate of photosynthesis.** • The availability of CO_2 will affect the rate of photosynthesis, as it is a reactant. This means that as long as there is sufficient carbon dioxide available, photosynthesis will continue. If there is a lack of carbon dioxide, this will limit the rate at which the reaction can occur, as six carbon dioxide molecules are needed to be available for every one glucose molecule that is created. • If temperature is very low, photosynthesis may slow down or stop. This is because the reactions during photosynthesis require energy in the form of heat to drive them. Particles move more slowly in lower temperatures and decrease the rate of reaction. Different plants will have different optimum temperatures in which they thrive. Conversely, temperatures that are too high may also result in the photosynthesis reactions stopping. This is because a high temperature can result in the enzymes involved in photosynthesis denaturing, thus losing their shape and therefore their function. **Explains how leaf structures function in order to allow photosynthesis to occur.** • Chloroplasts contain chlorophyll, which is a pigment that attracts light energy and captures the energy. This energy drives the reaction of photosynthesis – without it, photosynthesis could not occur. • Clear epidermis allows light to pass through to the palisade layer / mesophyll / chloroplasts in order to maximise the rate of photosynthesis. • The stomata are located mainly on the underside of the leaf, so that gases can enter and exit, but they are not in direct sunlight – this prevents excess water loss. Water can still leave via the stomata (through the process of transpiration), but at a lower rate than if they were on the top side of the leaf. • The guard cells for the stomata are where the carbon dioxide gas diffuses through to get to the chloroplasts found in the palisade cells and in the mesophyll layer.	**Examples** of possible responses: • Palisade layer is near the top of the leaf and has more chloroplasts than other parts of the leaf. This allows maximum light capture in the organelle that carries out photosynthesis (chloroplast), which will maximise PS rate. • Xylem tubes bring water (a reactant in photosynthesis reaction) into the leaf, close to the palisade layer. This allows water to diffuse into the cells to maximise the rate of photosynthesis. • The more effectively a plant can carry out photosynthesis, the greater its chances are of survival. Thus all the adaptations a leaf has are to increase the efficiency of photosynthesis and maximise light absorption and hence starch production. For example, the more chloroplasts a leaf has in its palisade cells, the darker green it appears, and the way that the palisade cells are organised long ways with regular shapes closely packed together ensures the more sunlight it can trap, to then be converted to chemical energy by photosynthesis. Etc.

		• The leaf is broad and flat / thin which increases surface area to volume ratio and increases the surface through which light can be absorbed. • The leaf is thin to allow the quick diffusion of gases to the site of photosynthesis (short diffusion distance). • The waxy cuticle is a clear waterproof layer which prevents the loss of water which is required for photosynthesis. This layer prevents the loss of water by evaporation, while allowing light to pass through. • The epidermal layer provides a thin layer of cells, which are transparent to allow the red and blue wavelengths of light through, and provide protection to the cells below. Etc.	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response / no relevant evidence.	ONE idea given.	TWO ideas given.	THREE ideas given.	FOUR ideas given.	Explains TWO ideas.	Explains THREE ideas.	Discusses how ONE of the environmental factors and TWO parts of the leaf work together to enable photosynthesis to occur.	Discusses how TWO of the environmental factors and TWO parts of the leaf work together to enable photosynthesis to occur.

Q	Achievement	Merit	Excellence
THREE	**Examples** of possible ideas include: **Describes the environmental factors required in order for seeds to germinate.** • germination begins with the seed taking in water – water availability is an environmental factor • oxygen availability • suitable temperature. **Describes germination / describes structures inside a seed involved in germination.** E.g. • Growth of an embryo plant within a seed is called germination. • The root of the embryo (the radicle) grows first, followed by the shoot (plumule). • The seed coat / testa protects the seed structures until germination begins. • As the radical grows, lateral roots form and root hairs develop. • The endosperm / food store of a seed provides the energy for germination to occur • Once the plumule reaches light, chlorophyll forms, the plumule turns green, and the seedling can carry out photosynthesis. • The first leaves of the seedling will start to photosynthesise. • Some seeds require scarification before they can germinate. • Some seeds require vernalisation before they can germinate. **Describes the role of enzymes in the process of seed germination.** Germination is a process controlled by enzymes. Etc.	**Examples** of possible responses: **Describes the environmental factors required in order for seeds to germinate.** • Germination begins with the seed taking in water. This is because the water is required to activate the enzymes required for energy for growth to be released from the food store. • The water increases the number and speed of chemical reactions occurring in the seed, and the embryo plant begins to grow. • The radicle breaks through the seed coat and into the surrounding environment. This is because the radicle or young root needs to absorb more water from the surrounding environment so that germination and growth of the seedling can continue. • As respiration increases, it uses the starch (energy) stored in the cotyledon, and it is used until the seedling can expose its first leaves to the sunlight for photosynthesis. **Explains the role of enzymes in the process of seed germination.** • The endosperm / food store of a seed which provides the energy for germination to occur are partly in insoluble form as starch grains, protein granules, lipid droplets etc. This means that they must be broken down into useable forms, which enzymes play a crucial part in. The embryo secretes enzymes onto these food stores and breaks them down. • Respiration is a series of enzyme-controlled chemical reactions. Etc.	**Examples** of possible responses: • In order for germination to occur, the seed must absorb water. This is because the water is required to activate the enzymes required for energy for growth to be released from the food store. The seed coat or testa has a micropyle or tiny hole in it so that water can be absorbed to start the process. • Oxygen is also absorbed through the micropyle. Oxygen is required by the seed so that aerobic respiration can occur in the seed and germinating seedling, allowing the release of sufficient stored energy in the cotyledon which allows growth to occur. A supply of oxygen is needed to allow respiration to continue aerobically once germination begins. Etc.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response / no relevant evidence.	ONE idea given.	TWO ideas given.	THREE ideas given.	FOUR ideas given.	Explains TWO ideas.	Explains THREE ideas.	Discuss how TWO structures inside a seed and ONE environmental factor work together to allow seed germination to occur.	Discuss how TWO structures inside a seed and TWO environmental factors work together to allow seed germination to occur.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 14	15 –19	20 – 24