

BrightRED Study Guide

Curriculum for Excellence

N4

BIOLOGY

ANSWERS

UNIT 1

CELL STRUCTURE & THE FUNCTIONS OF CELL PARTS

1.

Name of cell part	Function of cell part	Type of cells containing these parts (Animal only / Plant only / Both)
Cell membrane	Controls movement of substances into and out of the cell.	Both
Cell wall	Provides structure for plant tissue	Plant only
Chloroplast	Absorb light and carry out photosynthesis.	Plant only
Cytoplasm	Site of chemical reactions in cell.	Both
Nucleus	Contains chromosomes / genetic material.	Both
Vacuole	Keeps the cell firm.	Plant only

2. Chromosomes.
3. Controls the development and activities of the cell.

THE IMPORTANCE OF CELL DIVISION

1. (a) Reproduction.
(b) Growth and repair of damaged tissue.
2. (a) 2.
(b) They are the same.
3. The chromosomes are duplicated.
4. (a) Cancer.
(b) Chemotherapy and radiotherapy.

GENETIC INFORMATION

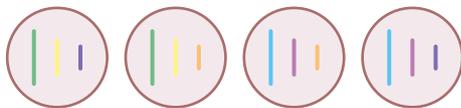
1. A A G A C G G G C
2. lysine – threonine – glycine

UNIT 1 ANSWERS

PASSING ON THE GENETIC INFORMATION

1. C

2. (a)



(b) 8388608

GENETIC ENGINEERING

1. Plasmids.

2. Insulin Factor VIII Human growth hormone.

3. Any two from:

It causes fewer side-effects / There are no ethical issues / Can be produced in larger quantities /

It can be produced more cheaply.

STEM CELLS

1. An unspecialised cell that is able to divide to produce more unspecialised cells and cells which can become specialised.

2. Any two from:

embryos fetuses umbilical cord blood bone marrow blood brains eyes liver
skin muscle

3. Treatment of cancer Testing of drugs

PROPERTIES OF ENZYMES

1. (a) They speed up chemical reactions in living organisms and that they are unchanged at the end of the reaction.

(b) Each enzyme can carry out only one type of reaction.

2. (a) Breakdown

(b) Build up

(c) Breakdown

3. Carry out the reaction in a tall narrow tube and measure the height of the foam produced by the bubbles of oxygen gas.

Use the same volume and concentration of hydrogen peroxide.

Use the same mass of the different tissues.

Use the same size of tube.

Keep the temperature the same.

THE USE OF ENZYMES IN INDUSTRY

1. They are catalysts and are not used up in the reaction.

2. It causes the separation of milk into solid curds and liquid whey.

The curds.

3. Any two from:

Breakdown of starch in flour to speed up the activity of yeast in causing the rise of bread dough.

Breakdown of starch in starch syrup to produce high value sugar syrup.

Breakdown of starch in barley grains to speed up the activity of yeast in producing alcohol.

Breakdown of starchy deposits on textiles and crockery by its addition to cleaning products.

Removal of hydrogen peroxide traces in foods. The hydrogen peroxide is used to kill bacteria.

Production of oxygen in foods along with another enzyme as a way of removing unwanted glucose.

Removal of hydrogen peroxide from textiles during production.

Contact lens cleaner.

Producing foam rubber from liquid rubber (latex).

Waste water treatment to remove toxic chemicals and organic matter.

Processing treatments for fabrics and leather.

PROPERTIES OF MICROORGANISMS AND THEIR USE IN INDUSTRIES

1. Brewing and baking.

2. Fermentation.

3. Alcohol and carbon dioxide.

UNIT 1 ANSWERS

USES OF BACTERIA

- (a) 8
(b) 32768
- Absence of oxygen.
- Bacteria and rennet enzymes.

THE PROCESS OF PHOTOSYNTHESIS

- Carbon dioxide and water.
- Sun / sunlight.
The light is absorbed by chlorophyll.
- They are boiled in water, then heated in alcohol and finally rinsed.

MEASURING THE RATE OF PHOTOSYNTHESIS

- The oxygen produced can be seen as bubbles which can be counted.
- Light intensity
Carbon dioxide concentration
Temperature.
- It is not possible to vary the availability of water for the aquatic plant.

THE PROCESS OF RESPIRATION

- (a) Use an equal mass of dead or inert material instead of the living organisms.
(b) To prevent the effects of photosynthesis masking the production of carbon dioxide by the green peas.
- Heat from the mouse causes the air in the apparatus to expand and push the marker drop away from the container.

FACTORS AFFECTING THE RATE OF RESPIRATION

- 37.5°C
- 25°C – 30°C
- As the temperature increases, the rate of respiration increases until the temperature reaches 37.5°C. As the temperature increases further, the rate of respiration decreases.
- (a) 60°C
(b) Enzymes become damaged at higher temperatures and stop working.

GENE THERAPY, PHARMING AND TRANSGENIC ORGANISMS

- The altered genetic information may become part of a new individual. This means it may be passed on to following generations.
- Some chemicals are too complex to be produced by bacteria.
- 'Farming' involves the growth of crop plants or livestock. 'Pharmaceutical' refers to the manufacture of medicines. 'Pharming' means the use of crops or livestock to produce medicines.
- Advantage Complex chemical could be produced.
 They could be produced relatively cheaply.
Disadvantage Could be a risk if they entered the human food chain
 Risk of transgenic plants cross pollinating unaltered crop plants
 Transgenic plants could affect biodiversity.

CLONING AND ANIMAL RESEARCH

- The nucleus of the egg cell which became Dolly was removed and replaced with the nucleus of a cell from a different sheep.
- Medical use Producing genetically altered animals which can produce useful medicines.
Non-medical use Producing genetically altered animals with good milk or meat yield.
- If the animals' suffering is kept to a minimum and if the benefits gained could not be obtained any other way.
- Animal suffering can never be justified and there is always another way.

UNIT 2

DIFFERENCES BETWEEN SEXUAL AND ASEQUAL REPRODUCTION

1. Sex cells.
2. It means 'without sex', in other words it does not involve the joining of two sex cells.
3. The production of sex cells with only one set of chromosomes.
The joining of two sex cells to form a single cell with two sets of chromosomes.
4. They all show the same advantageous characteristics of the parent and so are all equally capable of surviving.

PRODUCTION OF SEX CELLS IN FLOWERING PLANTS AND MAMMALS

1. Male mammals – Sperm cells produced in testes
Female mammals – Egg cells produced in ovaries
Male flowering plants – Pollen cells produced in anthers
Female flowering plants – Ovule cells produced in ovaries.
2. They produce large quantities of pollen which is light and easily carried by the wind.
They have anthers which are exposed to the wind so pollen is carried away.
They have feathery stigmas which are exposed to the wind so pollen is trapped.
3. They swim.
They have a tail.
4. A single set of chromosomes.

SUCCESS RATES OF DIFFERENT SEXUAL REPRODUCTION METHODS

1. External fertilisation requires surrounding water for sperm cells to swim to the eggs. This is not present for land-living organisms.
2. There is greater parental care taken of the eggs and the young offspring.
3. (a) 20
(b) 5%
4. (a) Binary fission
(b) Fragmentation

SEXUAL AND ASEQUAL REPRODUCTION

1. No.
Seeds are produced by sexual reproduction. Sexual reproduction results in variations in the offspring.
2. Male sex cells – relatively small
contain no food stores
move to female sex cell
Female sex cells – relatively large
contain food stores
stationary.
3. The pollen grain grows a tube which reaches an ovule in the ovary. The pollen nucleus passes down the tube and fertilises the ovule nucleus.
4. This reduces competition with other offspring and with the parent.

UNIT 2 ANSWERS

ASEXUAL PROPAGATION: NATURAL METHODS

- Two from: bulbs
corms
tubers (stem tubers or root tubers)
rhizomes
runners or stolons
- Tuber planted
Tuber sprouts and grows into a potato plant
Plant develops underground stems which swell into new potato tubers.
- Contain a food store. The structure can survive over winter and develop into a new plant the following year.
- Bulbs contain stored food in swollen leaf bases.
Corms contain stored food in swollen stem bases.

ASEXUAL PROPAGATION: ARTIFICIAL METHODS

- Two from: cuttings
grafts
tissue culture
- Stimulates the development of new roots.
- The scion.
- A mass of unspecialised cells formed during tissue culture.

COMMERCIAL USES OF PLANTS - FOOD AND FUELS

- Two from: timber fabrics ornamental use
- Three from: mechanisation monoculture
pesticides fertilisers irrigation
plant breeding improving growth conditions (light, carbon dioxide, temperature) genetic modification
- The crop plants have removed an equivalent amount of carbon dioxide from the atmosphere during their growth.
- Digestion of waste vegetable matter to produce sugars.
Growth of microscopic algae.

COMMERCIAL USES OF PLANTS - MEDICINES

- In conventional medicine, plant products have been scientifically tested. This is not the case in herbalism.
- Two from:

Medicine	Use
Morphine	Pain relief
Digitalis	Treatment heart disease
Taxols	Treatment of breast cancer
Quinine	Treatment of malaria
Salicylic acid (aspirin)	Pain relief

- One from: The gene is added to the DNA of a virus.
The plant is then infected with the modified virus.
- Plants are able to manufacture more complex substances than microorganisms.

UNIT 2 AND 3 ANSWERS

HOMEOSTASIS

1. Keeping the internal conditions of the body at suitable stable levels.
2. It is a response to a change in conditions. It causes an opposite change to take place.
3. Reduces heat loss –
one from: decrease in sweat production
 narrowing of skin blood vessels
 body hairs stand up
Increases heat production –
one from: shivering
 increase in metabolic rate
4. Produced in the pancreas and affects the liver.

UNIT 3

BIOMES

1. An ecosystem, it consists of a habitat and a community of organisms. Biomes are much larger in scale.
2. Temperate boreal forests have coniferous trees with narrow leaves.
Temperate deciduous forests have broad-leaved trees.
3. Without the foxes, the rabbit population would grow out of control and would eventually starve from lack of food.
4. They are caused by living organisms.

SAMPLING TECHNIQUES & THE EFFECT OF ADDING OR REMOVING SPECIES ON OTHER SPECIES

1. Sampling randomly makes the samples more representative of the whole area being investigated.
Increasing the number of samples makes the results more reliable.
2. Area of lawn = $40\text{m} \times 10\text{m} = 400\text{m}^2$.
Total number of daisies counted = $4+0+7+3+6+5+1+1 = 27$
Average number of daisies per quadrat = $27 \div 8 = 3.375$
Estimated total number of daisies on lawn = $3.375 \times 4 \times 400 = 5400$
3. Removal of rabbits on owl population – Possible answers:
 - Decrease in owl populations due to loss of a food source
 - No effect because owls would eat more squirrels / mice / seed-eating birds / blackbirds
4. Removal of toads on blackbird population – Possible answers:
 - Decrease in blackbird population because snakes would eat more blackbirds to compensate for loss of toads
 - Increase in blackbird population because there would be more predaceous insects to eat
 - No effect because the increased predation and increased food supply would balance each other.

HUMAN POPULATION GROWTH

1. It has decreased.
2. As an agricultural chemical it is present in food and is absorbed into the body.
3. Obtaining food, energy, water, materials for manufacturing processes and the absorption of waste material.
4. (a) increase (b) decrease (c) decrease
(d) increase (e) decrease (f) decrease

UNIT 3 ANSWERS

IMPACT OF POPULATION GROWTH ON BIODIVERSITY

- Two from: Clearing land for crops
Clearing land for ranching
Clearing land for mining
Clearing land to get timber
- (a) A gas which reduces the amount of heat lost from the earth.
(b) Carbon dioxide and methane
- Death of aquatic organisms because of a rise in numbers of microorganisms which use up oxygen from the water.
Spread of diseases.
- Bacteria
- 8 times.

IMPACT OF NATURAL HAZARDS ON BIODIVERSITY

- Climate change has meant that many forests are now much drier than they were.
Large scale fires leave behind dead wood and allow colonisation by plants such as grasses which are more likely to catch fire.
- Over 23% of its habitat was destroyed.
The remaining habitat was broken up into separate areas.
- Land is flooded by seawater. The salt makes the soil infertile.
- Two from: Deforestation Over grazing
Cultivation of unsuitable land

THE ROLE OF MICROBES IN THE RECYCLING OF NUTRIENTS

- Fungi and bacteria
- To make proteins
- The nodules contain nitrogen-fixing bacteria, which convert nitrogen from the air into nitrates, giving the plant its own supply of nitrates for making protein.
- Denitrifying bacteria use nitrates in the soil and release nitrogen gas into the atmosphere.

COMPOST HEAPS

- It is warmer. This makes the decomposers more active.
- They create air pockets which help the activity of the decomposers.
- Slow growth Yellow leaves (chlorosis) Red leaf bases
- To ensure high yields of crop plants.

MINERAL DEFICIENCIES

1.

Mineral	Chemical symbol	Role in Plant
Nitrogen	N	for healthy leaves and stems
Phosphorus	P	for strong roots
Potassium	K	for formation of fruits and flowers

- Plant material is removed. It does not decompose and return minerals to the soil.
- Green manure and Animal manure
- Bacteria in the root nodules of the plants produce nitrates from atmospheric nitrogen. If these plants are ploughed into the soil, the nitrates are released and become available for later crops.

UNIT 3 ANSWERS

ADVANTAGES AND DISADVANTAGES OF DIFFERENT FERTILISER TYPES

1. Example: Green manure or Animal manure or Compost
Advantage – one from:
Less expensive
Adds organic material improving soil texture
Increases the ability of the soil to hold water
Reduces the chance of erosion by water and wind
Increases soil pH
Less likely to damage young plants
Disadvantage – one from:
Slow to break down
Smelly and unpleasant to apply
Less consistent.
2. The ratio of nitrogen (N) to phosphorus (P) to potassium (K) is 30 : 10 : 10 or 3 : 1 : 1
The leaves and stems will benefit the most.
3. (a) Excess fertilisers washed from farmland
(b) Aquatic algae
(c) They feed on dead plants and algae
(d) The bacteria use up oxygen from the water.

THE NEED FOR ADAPTATION

1. To allow them survive and thrive in changing environments.
2. Structural Adaptations – Examples include:
the shape of bird beaks, shape of leaves on trees, spines instead of leaves on cactus plants, the size of fish fins.
Physiological Adaptations – Examples include:
the ability of snakes to produce venom,
the ability of camels to produce concentrated urine to reduce water loss.
Behavioural Adaptations – Examples include:
migration of birds, hibernation of animals,
animals being nocturnal.
3. Predators – Eyes allow judgement of distance of prey.
Prey – Eyes allow good all round vision to spot predators.
4. (a) (b) Three from:

Feature	Insect Pollination		Wind Pollination	
Pollen	sticky pollen	attaches to insect	small, lightweight pollen	easily blown by wind
Petals	colourful petals	attracts insects	dull petals	no need to attract insects
Nectar	sweet, sugary nectar	attracts insects	no nectar	no need to attract insects
Stigma	sticky stigma	pulls pollen from insects	feathery stigma	catches wind-blown pollen
Scent	sweet scent	attracts insects	no scent	no need to attract insects

EXAMPLES OF ADAPTATION

1. Structural – one from: white fur fat layer under the skin fur on the soles of the feet large wide paws
Behavioural – swimming when hot
2. Tissues which tolerate water loss tissues which tolerate high temperatures
- 3 & 4 Answers will be found in the research material

INNATE BEHAVIOUR

1. Innate
2. Swarming
3. (a) It provides him with enough resources for himself and his mate to raise offspring.
(b) He puffs out his red breast and sings a high-pitched song to warn off others. He becomes most aggressive to intruders if they are at the centre of his territory and may attack them.
4. It allows more time to collect food for the young.

UNIT 3 ANSWERS

LEARNED BEHAVIOUR

1. It makes the results more reliable.
2. The stimulus may actually represent a threat and so the animal needs to react.
3. Fewer mistakes are made.
4. It reduces wasted effort and energy.

COURSE ASSESSMENT

An overview of the assessment

Sample question 1. (a) 300 – 349

(b) 30%

Sample question 2. (a) 6.2mmol/l

(b) Any value in the range 6.3 to 6.7mmol/l