cookie

Practice paper: mark scheme

GCSE Biology Higher, practice paper 1 (AQA style)

In the style of AQA GCSE Biology (8461) Paper 1 Higher

Practice paper written by cookie in the style of AQA GCSE Biology (8461) Paper 1 Higher. Not an AQA paper; not affiliated with or endorsed by AQA.

This mark scheme was written by cookie with its practice paper. Each row gives the answer, the marks and how they are given; where an answer is worded differently but means the same, give the mark.

Key

- Each line is one marking point, worth one mark unless it says otherwise.
- allow an answer that is also acceptable; do not accept an answer that gets no mark; ignore words that neither gain nor lose the mark
- Extended responses (6 marks) are marked by level: decide the level from the descriptors, then the mark within it.

Do it online, timed and marked:
cookie.education/past-papers/gcse/cookie/biology-aqa-style

Question	Answer and marking	Marks
01.1	**Answer: D** D (nucleus) *Do not accept more than one letter.*	**1**
01.2	**Answer: Place the thin layer flat on a slide, add a drop of stain, lower a coverslip at an angle, start on the lowest-power objective and focus with the coarse then fine focusing wheel.** place the strip flat on a (clean glass) slide / in a drop of water on the slide add a drop of stain, e.g. iodine solution lower a coverslip carefully at an angle to avoid trapping air bubbles use the lowest-power objective lens first focus using the coarse focusing wheel then the fine focusing wheel any three for 3 marks *Allow named stain such as methylene blue. Allow 'smallest magnification' for lowest-power objective. Ignore references to safety.*	**3**
01.3	**Answer: 180 µm** real size = image size ÷ magnification, e.g. 27 ÷ 150 (1) = 0.18 (mm) (1) = 180 (µm) (1) *An answer of 180 (µm) scores 3 marks. Allow 0.18 mm correctly converted for full marks. An answer of 0.18 with no conversion scores 2 marks.*	**3**
01.4	**Answer: 1.8×10^{-4} m** 1.8×10^{-4} (m) *Allow an error carried forward from 01.3 if correctly converted to metres in standard form. Do not accept 0.00018 (not in standard form).*	**1**
01.5	**Answer: An electron microscope has a much higher resolving power (and magnification), so the small ribosomes can be seen in detail.** (much) higher resolving power / resolution (so ribosomes can be seen) *Allow higher magnification. Allow 'ribosomes are too small to be seen with a light microscope'. Ignore 'clearer' on its own.*	**1**
02.1	**Answer: The cell grows and makes more sub-cellular structures; the DNA replicates; in mitosis one set of chromosomes is pulled to each end and the nucleus divides; the cytoplasm and cell membrane divide to form two identical cells.** the cell grows and increases the number of sub-cellular structures, e.g. ribosomes / mitochondria DNA replicates / two copies of each chromosome are formed (in mitosis) one set of chromosomes is pulled to each end of the cell and the nucleus divides the cytoplasm and cell membrane divide to form two (genetically) identical cells any three for 3 marks *Allow 'chromosomes copied'. Do not accept references to meiosis or gametes. Ignore names of the phases of mitosis.*	**3**

02.2 **Answer: 1.6 × 10^6** **3**

number of divisions = (5 × 60) ÷ 25 = 12 (1)

number of bacteria = 400 × 2^{12} = 1 638 400 (1)

= 1.6 × 10^6 (1)

An answer of 1.6 × 10^6 scores 3 marks. Allow 1 638 400 for 2 marks. Allow the third mark for an incorrect number correctly given in standard form to 2 significant figures (error carried forward).

02.3 **Answer: To reduce the chance of growing pathogens that are harmful to humans.** **1**

reduces the likelihood of growing pathogens / microorganisms that are harmful to humans

Allow 'bacteria that cause disease grow best at body temperature (37 °C)'. Ignore 'so the bacteria grow' or 'to kill bacteria'.

02.4 **Answer: 254 mm^2** **2**

radius = 18 ÷ 2 = 9 (mm) (1)

area = π × 9^2 = 254 (mm^2) (1)

Allow 254.5 or 254.3 (using π = 3.14). An answer of 1020 (using the diameter) scores 0 marks.

02.5 **Answer: A** **1**

A (meristem tissue)

Do not accept more than one letter.

03.1 **Answer: For example, the length or diameter of each carrot cylinder.** **1**

any one from: length / diameter / surface area of cylinder; volume of solution; time in solution; temperature; type / source of carrot

Ignore 'size' on its own. Ignore 'mass' (it is measured, not controlled). Do not accept concentration.

03.2 **Answer: −1.9** **2**

(2.55 − 2.60) ÷ 2.60 × 100 (1)

= −1.9 (1)

Allow 1.9 for 1 mark only (sign missing). Allow −1.92 for 1 mark (wrong number of decimal places).

03.3 **Answer: The cylinders had different starting masses, so percentage change lets the results be compared.** **1**

the starting masses were different (so results can be compared)

Allow 'to compare results fairly' only if linked to different starting masses. Ignore 'more accurate'.

03.4 **Answer: About 0.34 mol/dm^3** **1**

any value from 0.31 to 0.37 (mol/dm^3)

The value must lie between 0.2 and 0.4; do not accept 0.2 or 0.4.

03.5 **3**

Answer: Water moved out of the carrot cells by osmosis, from the more dilute solution inside the cells to the more concentrated sucrose solution, through the partially permeable cell membranes.

water moved out of the cells by osmosis (1)

from a dilute solution (in the cells) to a more concentrated solution (outside) (1)

through a partially permeable (cell) membrane (1)

Allow 'from a higher water concentration to a lower water concentration'. Do not accept 'sucrose moved into / out of the cells'. Do not accept 'semi-permeable cell wall'.

03.6 **3**

Answer: Mineral ions in the soil are very dilute, so they are absorbed against the concentration gradient by active transport; this needs energy from respiration, which takes place in the mitochondria.

the concentration of mineral ions in the soil is lower than in the root hair cell / soil solution is very dilute (1)

so ions are absorbed by active transport / against the concentration gradient (1)

active transport requires energy from respiration (which happens in mitochondria) (1)

Do not accept 'energy is made / produced by respiration'. Do not accept 'mineral ions absorbed by osmosis'.

04.1 **1**

Answer: B

B (liver)

Do not accept more than one letter.

04.2 **3**

Answer: Bile emulsifies fat into small droplets, giving a larger surface area for lipase; bile is alkaline and neutralises the hydrochloric acid from the stomach, giving the alkaline conditions that increase the rate of lipase action.

(bile) emulsifies fat / lipids into small droplets (1)

increasing the surface area for lipase (to act on) (1)

(bile is alkaline so) it neutralises hydrochloric acid from the stomach (so the pH suits the enzymes in the small intestine) (1)

Do not accept 'bile digests / breaks down fat' or 'bile is an enzyme'. Ignore 'breaks fat into smaller molecules'.

04.3 **1**

Answer: Q

Q

04.4 **3**

Answer: 37.5 mg per minute

mass of starch = 10 × (5 ÷ 1000) = 0.05 g = 50 mg (1)

time = 80 ÷ 60 = 1.33 minutes or rate = 50 ÷ 80 = 0.625 mg per second (1)

rate = 37.5 (mg per minute) (1)

An answer of 37.5 scores 3 marks. Allow 38. Allow 0.0375 (g per minute) for 2 marks.

04.5 **6**

Answer: A method that mixes amylase and starch at a range of pH values (buffers) at a constant temperature, samples the mixture into iodine at regular intervals, records the time until iodine no longer turns blue-black, controls volumes, concentrations and temperature, and repeats to calculate a mean.

Level 3 (5–6 marks): A coherent, detailed method that covers the key steps in a logical order. It would allow another person to carry out the investigation and get valid results. Control variables and repeats are included.

Level 2 (3–4 marks): The main steps of a method are given, but some detail is missing or the order is not fully logical. The method could be followed but may not produce valid results.

Level 1 (1–2 marks): Some relevant steps are given, but the method lacks detail or logical structure and could not be followed to produce valid results.

0 marks: No relevant content.

Indicative content:

place one drop of iodine solution in each well of a spotting tile

add a buffer solution of known pH to the starch solution

place the starch, buffer and amylase in a water bath at a fixed temperature (e.g. 35 °C) so they reach that temperature before mixing

mix the amylase with the starch solution and start a stop clock

at regular intervals (e.g. every 10 or 30 seconds) transfer one drop of the mixture to a well of iodine

record the time when the iodine stays orange-brown (no longer turns blue-black) this shows all the starch has been broken down

repeat using buffer solutions of different pH, e.g. pH 4, 5, 6, 7, 8

keep the same: volume and concentration of amylase; volume and concentration of starch; temperature

repeat each pH (at least) three times and calculate a mean time

calculate the rate, e.g. 1 ÷ time or 1000 ÷ time, and compare rates at each pH

To reach Level 3 the method must include the iodine end point, a range of pH values and at least one control variable. Do not accept 'Benedict's test' as the method of measuring the end point. Ignore safety precautions unless linked to a step.

05.1 **1**

Answer: C

C (right atrium)

Do not accept more than one letter.

05.2 **1**

Answer: Pulmonary artery

pulmonary artery

Do not accept pulmonary vein. Ignore 'artery' on its own.

05.3 **2**

Answer: The left ventricle pumps blood around the rest of the body, while the right pumps blood only to the lungs, so the left must pump at a higher pressure.

the left ventricle pumps blood around the (rest of the) body whereas the right ventricle pumps blood (only) to the lungs (1)

so (more muscle is needed to) pump blood at a higher pressure / with more force (1)

Allow 'the body is further away than the lungs' for the first mark. Ignore 'pumps more blood'.

05.4 **3**

Answer: Layers of fatty material build up inside the coronary arteries, narrowing them; this reduces the flow of blood, so the heart muscle gets less oxygen for respiration and the cells may die.

layers of fatty material build up inside the coronary arteries, narrowing them (1)
reducing the flow of blood (through the coronary arteries) (1)
so there is a lack of oxygen for the heart muscle (1)
(so) less (aerobic) respiration / muscle cells may die
any three for 3 marks

The coronary arteries must be named for the first mark; do not accept 'arteries in the heart are blocked' on its own. Do not accept 'veins'.

05.5 **6**

Answer: A balanced evaluation of how each treatment works, with advantages and disadvantages of each from the table and own knowledge, ending with a justified conclusion.

Level 3 (5–6 marks): A detailed and coherent evaluation that gives advantages and disadvantages of both treatments, uses information from the table and own knowledge, and reaches a conclusion justified by the reasoning.
Level 2 (3–4 marks): An evaluation that gives at least one advantage or disadvantage of each treatment, with some explanation. A conclusion may be given but is not fully justified.
Level 1 (1–2 marks): Simple statements about one or both treatments. No conclusion, or a conclusion with no reasoning.
0 marks: No relevant content.
Indicative content:
a stent keeps the coronary artery open
so blood flow and oxygen supply to the heart muscle improve straight away
a stent is a one-off procedure; the patient does not need to remember daily tablets
a stent does not need major surgery / a general anaesthetic, so recovery is quick
but any procedure carries a risk, e.g. of infection, bleeding or a blood clot
the artery may narrow again, so the treatment may need repeating
a stent treats only the narrowed section; it does not stop fatty material building up elsewhere
statins reduce blood cholesterol levels
which slows down the rate at which fatty material is deposited in the arteries
statins need no procedure / are taken as a tablet
but statins take weeks to have an effect, so they do not help an artery that is already badly narrowed
statins must be taken every day for a long time / the patient may forget
statins can have side effects, e.g. muscle pain
conclusion, e.g. a stent for a badly narrowed artery needing immediate treatment, with statins as well to slow further build-up; or statins alone for mild disease

For Level 3 there must be a conclusion supported by the reasoning. Do not accept 'statins / stents remove the fatty material' or 'statins unblock the artery'. Do not accept 'stents are an operation on the heart under general anaesthetic'.

06.1 **1**

Answer: B

B (phloem)

Do not accept more than one letter.

06.2 **Answer: 4.56 mm^3 per minute** **3**

volume = $\pi \times 0.5^2 \times 58$ (1)

= 45.6 (mm^3) (1)

rate = 45.6 ÷ 10 = 4.56 (mm^3 per minute) (1)

An answer of 4.56 scores 3 marks. Allow 4.55 (using π = 3.14). Allow 2.83 (still air row used correctly) for 2 marks. An answer of 9.11 (radius not squared) scores 1 mark.

06.3 **Answer: Moving air carries water vapour away from the leaf, keeping a steep concentration gradient, so water vapour diffuses out of the stomata faster; more water is drawn up to replace it.** **2**

moving air removes water vapour from around the leaf (1)

so there is a steeper concentration gradient so water vapour diffuses out of the stomata faster / the rate of transpiration increases (1)

Allow 'evaporates faster' for the second mark only if linked to a concentration gradient or removal of water vapour. Do not accept 'the fan increases the temperature'.

06.4 **Answer: Magnesium ions are needed to make chlorophyll; with less chlorophyll (chlorosis) less light is absorbed so there is less photosynthesis, so less glucose is made for respiration and for making substances such as cellulose and proteins needed for growth.** **3**

magnesium ions are needed to make chlorophyll (1)

less chlorophyll so less light absorbed / less photosynthesis (1)

(so) less glucose made for respiration / to make cellulose / amino acids / proteins (for growth) (1)

Allow 'chlorosis' for the idea of less chlorophyll. Do not accept 'magnesium is needed to make proteins' (that is nitrate). Do not accept 'magnesium is needed for photosynthesis' without reference to chlorophyll for the first mark.

07.1 **Answer: (i) bacterium (ii) protist** **2**

(i) bacterium / bacteria (1)

(ii) protist (1)

Allow protozoan for (ii). Do not accept 'parasite' or 'mosquito' for (ii).

07.2 **Answer: Measles is caused by a virus, and antibiotics do not kill viruses.** **2**

measles is caused by a virus (1)

antibiotics do not kill viruses / antibiotics only kill bacteria (1)

Allow 'viruses live inside cells so antibiotics cannot reach them' for the second mark. Ignore references to antibiotic resistance.

07.3 **Answer: The vaccine contains small quantities of dead or inactive measles virus, which stimulates white blood cells to produce antibodies; if the virus enters the body later, white blood cells respond quickly to produce the correct antibodies, preventing infection.** **3**

vaccine contains small quantities of dead / inactive (forms of the) pathogen / virus (1)

stimulates white blood cells to produce antibodies (1)

if the same pathogen re-enters the body the white blood cells respond quickly to produce the correct antibodies (preventing infection) (1)

Do not accept 'the vaccine contains antibodies'. Do not accept 'white blood cells produce antibiotics'. Allow 'memory cells' for white blood cells in the third point.

07.4 **2**

Answer: As the percentage of children vaccinated increases, the number of measles cases decreases; cases still occur because some people are not vaccinated (or immune), or infected people arrive from other countries.
as the percentage of children vaccinated increases, the number of cases (of measles) decreases (1)
any one suggestion: not everyone is vaccinated (5% of children are not) / some people are too young to be vaccinated / the vaccine does not make every person immune / infected people travel from other countries (1)
Allow 'negative correlation' for the first mark. Do not accept 'vaccination causes fewer cases' for the first mark unless the direction of both variables is given. Ignore 'the vaccine wore off'.

08.1 **1**

Answer: B
B (digitalis)
Do not accept more than one letter.

08.2 **1**

Answer: To compare with the groups given the drug, to see whether the drug itself has an effect.
as a control / for comparison, to show the effect is caused by the drug (and not by the patient's belief that they are being treated)
Allow 'to rule out the placebo effect'. Ignore 'to make it a fair test' on its own.

08.3 **2**

Answer: Neither the patients nor the doctors know who is given the drug and who is given the placebo; this prevents bias in the results.
neither the patients nor the doctors / scientists know who receives the drug and who receives the placebo (1)
to prevent bias / so that expectations do not affect the results (1)
Both patients and doctors must be mentioned for the first mark. Ignore 'to make it fair'.

08.4 **2**

Answer: 20 mg: it worked for 61% of patients, almost as many as 40 mg (64%), but only 9% reported side effects compared with 27% at 40 mg.
20 mg (1)
justification using data comparing effectiveness and side effects, e.g. nearly as effective as 40 mg (61% compared with 64%) but far fewer side effects (9% compared with 27%) (1)
The dose mark can be awarded only with a reason. Allow 10 mg only if justified by the fewest side effects of the drug doses and data quoted, for 1 mark only. Do not accept 40 mg.

08.5 **4**

Answer: Mouse lymphocytes are stimulated to make a particular antibody; they are combined with a tumour cell to make a hybridoma cell, which can both divide and make the antibody; a single hybridoma cell is cloned and the antibodies are collected and purified.
mouse lymphocytes are stimulated to make a particular antibody (e.g. by injecting the mouse with an antigen) (1)
the lymphocytes are combined / fused with a (particular kind of) tumour cell (1)
to make a hybridoma cell (which can both divide and make the antibody) (1)
a single hybridoma cell is cloned to produce many identical cells (that all make the same antibody) (1)
the antibodies are collected and purified (1)
max 4

Allow 'white blood cell' for lymphocyte. Allow 'cancer cell' for tumour cell. Do not accept 'the antibody is combined with a tumour cell'.

08.6 **Answer: For example, in pregnancy tests.** **1**

any one from: pregnancy tests; measuring levels of hormones / chemicals in blood; detecting pathogens; locating or identifying specific molecules in a cell or tissue (with a fluorescent dye); treating some diseases, e.g. cancer (carrying a drug, toxin or radioactive substance to cancer cells)

Ignore 'to treat disease' on its own; a named disease or use is needed.

09.1 **Answer: B** **1**

B (energy is transferred from the environment)

Do not accept more than one letter.

09.2 **Answer: 31** **2**

19 identified as anomalous / (30 + 32) ÷ 2 (1)

= 31 (1)

An answer of 27 (all three results used) scores 0 marks.

09.3 **Answer: An LED gives out very little heat, so the temperature of the water stays the same.** **1**

LED lamp releases little heat so the temperature (of the water / pondweed) does not change / temperature is kept constant

Ignore 'it is brighter'. The idea of controlling temperature is needed.

09.4 **Answer: 16 times** **2**

$(40 \div 10)^2$ or $1/10^2 \div 1/40^2$ (1)

= 16 (1)

An answer of 4 scores 0 marks. Allow 0.0625 or 1/16 for 1 mark (inverted ratio).

09.5 **Answer: Light intensity is no longer the limiting factor; another factor, such as carbon dioxide concentration or temperature, is limiting the rate.** **2**

light intensity is no longer the limiting factor (1)

another factor is limiting, e.g. carbon dioxide concentration / temperature / amount of chlorophyll (1)

Do not accept 'oxygen' or 'water' as the limiting factor. Ignore 'the pondweed is photosynthesising as fast as it can' on its own.

09.6 **Answer: Heart rate and breathing rate rise to supply more oxygen and glucose to the muscles for respiration and remove carbon dioxide; demand outstrips supply so muscles also respire anaerobically, making lactic acid and an oxygen debt; after the race the rates stay raised to repay the oxygen debt as lactic acid is carried to the liver and converted back to glucose, so its concentration falls.** **6**

Level 3 (5–6 marks): A detailed and coherent explanation of the changes both during and after the race, linking the rise in heart rate and breathing rate to respiration, explaining the build-up of lactic acid, and explaining the oxygen debt and how lactic acid is removed.

Level 2 (3–4 marks): An explanation of the changes during the race or after the race, with some links between the measurements and respiration. Some steps in the reasoning may be missing.

Level 1 (1–2 marks): Simple statements describing some of the changes, with little

or no explanation.
0 marks: No relevant content.
Indicative content:
during the race the muscles need more energy (for contraction)
heart rate increases to supply the muscles with more oxygenated blood / glucose
breathing rate (and breath volume) increase to take in more oxygen / remove more carbon dioxide
more aerobic respiration in the muscle cells
not enough oxygen reaches the muscles, so they also respire anaerobically
anaerobic respiration is the incomplete oxidation of glucose, producing lactic acid
so the concentration of lactic acid in the blood rises (from 1.1 to 12.4 mmol/dm^3)
anaerobic respiration releases much less energy than aerobic respiration
lactic acid build-up causes muscle fatigue / muscles stop contracting efficiently
an oxygen debt builds up
oxygen debt is the amount of extra oxygen the body needs after exercise to react with the accumulated lactic acid and remove it from the cells
after the race heart rate and breathing rate stay above resting levels (98 and 22) to supply this oxygen
blood transports lactic acid to the liver, where it is converted back into glucose
so the concentration of lactic acid falls (to 6.0 mmol/dm^3), but has not yet returned to the resting level
For Level 3 the answer must explain changes after the race in terms of the oxygen debt. Do not accept 'energy is produced / made by respiration'. Do not accept 'lactic acid is broken down by oxygen in the lungs'. Do not accept 'anaerobic respiration produces carbon dioxide' in muscles.

Total: 100 marks