cookie

Practice paper

GCSE Double Award Science Higher, practice paper: Biology Unit B1 (CCEA style)

In the style of CCEA GCSE Science Double Award (2017) Unit B1: Biology, Higher Tier

Practice paper written by cookie in the style of CCEA GCSE Science Double Award (2017) Unit B1: Biology, Higher Tier. Not a CCEA paper; not affiliated with or endorsed by CCEA.

Time allowed: 1 hour

Total marks: 70

Name _____

Instructions

- Answer all nine questions in the spaces provided.
- You may use a scientific calculator.
- Show your working in calculations: you may get marks for a correct method even if your final answer is wrong.
- Quality of written communication will be assessed in Question 4.
- This paper covers Unit B1: cells; photosynthesis and plants; nutrition and food tests; enzymes and digestion; breathing and respiration; the nervous system and hormones; ecological relationships and energy flow.

Information

- The marks for each question are shown in brackets at the end of each part.
- The maximum mark for this paper is 70.

Do it online, timed and marked:
cookie.education/past-papers/gcse/cookie/science-double-award-ccea-style

Answer ALL questions. Write your answers in the spaces provided.

1 A student made a temporary slide of the thin layer of cells from the inside of an onion bulb and looked at it with a light microscope.

(a)

(i) The student added a drop of iodine solution to the onion cells on the slide. Give one reason why.

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(1)

(ii) The student lowered the coverslip onto the slide slowly and at an angle. Explain why.

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(1)

(b) Give two ways in which the structure of a bacterial cell is different from the structure of a plant cell.

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(2)

(c) A leaf is an organ. Explain what is meant by an organ.

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(2)

(Total for Question 1 is 6 marks)

2 A student investigated a breakfast cereal.

(a) Describe how the student could test a crushed sample of the cereal for fat. Give the result if fat is present.

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(2)

(b)

(i) The student burned a 0.80 g piece of the cereal under a boiling tube containing 20 cm^3 of water. The temperature of the water rose from 19.0 °C to 41.0 °C. Calculate the energy released per gram of cereal. Use the equation: energy released (J) = mass of water (g) × 4.2 × temperature rise (°C). 1 cm^3 of water has a mass of 1 g.

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(ii) The packet states that the cereal contains 15 500 J per gram. Suggest two reasons why the student's value is much lower than this.

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(Total for Question 2 is 7 marks)

3 A student investigated the effect of temperature on the activity of a protease enzyme. She mixed protease solution with a cloudy suspension of cooked egg white. As the protease digests the egg-white protein, the mixture becomes clear. She timed how long the mixture took to become clear at six temperatures. The table shows her results.

Temperature in °C	**10**	**20**	**30**	**40**	**50**	**60**
Time to become clear in s	620	300	150	85	140	did not clear in 900 s

(a) Use the table to estimate the optimum temperature of this protease.

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(1)

(b) Explain why the mixture took longer to become clear at 20 °C than at 40 °C.

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(2)

(c) At 60 °C the mixture did not become clear. The student then cooled this mixture to 40 °C and left it for a further 900 s. It still did not become clear. Explain both of these observations.

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(3)

(d) Substance X is an inhibitor of this protease. When the student added substance X to the mixture at 40 °C, the mixture took much longer to become clear. Use the lock and key model to explain why.

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(2)

(Total for Question 3 is 8 marks)

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4 A variegated plant has leaves with green areas and white areas. The white areas contain no chlorophyll. Describe how a student could use this plant to show that chlorophyll is needed for photosynthesis. Your answer should include how the student would test a leaf for starch, and the results the student would expect. Your written communication is marked in this question, including how well you use scientific terms.

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(6)

(Total for Question 4 is 6 marks)

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5 This question is about breathing and respiration.

(a) Write the balanced chemical equation for aerobic respiration.

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(2)

(b)

(i) The table shows the breathing of a student at rest and during exercise. Calculate how many times greater the volume of air breathed in per minute was during exercise than at rest.

	Breathing rate in breaths per minute	**Volume of each breath in dm^3**
At rest	12	0.50
During exercise	30	2.2

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(2)

(ii) Explain how the change in breathing shown in the table helps the student's leg muscles during exercise.

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(2)

(c) Give two differences between the products of anaerobic respiration in yeast and the products of anaerobic respiration in mammalian muscle.

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(2)

(Total for Question 5 is 8 marks)

6 This question is about photosynthesis.

(a)

(i) A scientist measured the carbon dioxide exchange of a leaf at different light intensities. The temperature was kept at 20 °C. The table shows the results: a positive value means the leaf took in carbon dioxide; a negative value means the leaf gave out carbon dioxide. Give the light intensity at which the leaf was at its compensation point. Explain your answer.

Light intensity in arbitrary units	**0**	**1**	**2**	**3**	**4**
Carbon dioxide taken in (+) or given out (−) by the leaf in arbitrary units per hour	−4	−2	0	+3	+5

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(2)

(ii) Another leaf from the same plant was sealed in a boiling tube containing red hydrogencarbonate indicator. The tube was kept at 20 °C and a light intensity of 1 arbitrary unit for three hours. Predict the colour of the indicator after three hours. Explain your prediction.

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(2)

(b)

(i) A grower measured the rate of photosynthesis of tomato plants in a glasshouse under four sets of conditions, A to D. The table shows the results. Use the table to identify the factor that was limiting the rate of photosynthesis in condition B. Explain your answer.

Condition	Light intensity	Carbon dioxide concentration in %	Temperature in °C	Rate of photosynthesis in arbitrary units
A	low	0.04	20	12
B	high	0.04	20	20
C	high	0.10	20	34
D	high	0.10	28	36

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(2)

(ii) Heating the glasshouse from 20 °C to 28 °C changed condition C into condition D. Calculate the percentage increase in the rate of photosynthesis from condition C to condition D. Give your answer to 2 significant figures.

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(2)

(Total for Question 6 is 8 marks)

7 This question is about co-ordination and control in the human body.

(a)

(i) A person walking barefoot stepped on a drawing pin and immediately lifted their foot. Describe the pathway of the nerve impulses in this reflex action, from the receptor to the effector.

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(ii) Give one way in which a reflex action is different from a voluntary action.

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(1)

(b)

(i) Two people each drank a glucose drink at 0 minutes. Person P does not have diabetes. Person Q has Type 1 diabetes and had not taken any medication. The table shows the concentration of glucose in their blood over the next 120 minutes. Explain the changes in the blood glucose concentration of person P.

Time in minutes	**0**	**30**	**60**	**90**	**120**
Blood glucose of person P in mmol/dm^3	5.0	8.0	6.5	5.5	5.0
Blood glucose of person Q in mmol/dm^3	7.0	13.5	16.0	15.5	15.0

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(ii) Explain why the blood glucose concentration of person Q does not fall back to its starting value.

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(Total for Question 7 is 9 marks)

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8 This question is about the kidneys and about a plant hormone.

(a) Name the tube that carries urine from each kidney to the bladder.

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(1)

(b) On a hot day, a person who sweats a lot produces a smaller volume of urine than usual. Explain how antidiuretic hormone (ADH) brings about this change.

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(3)

(c) A scientist cut the tip off a young shoot and stood the tip on a small block of agar jelly for several hours, so that the plant hormone auxin passed from the tip into the agar. She then cut the tip off a second shoot and placed the agar block on the left-hand half of the cut end only. The second shoot was kept in complete darkness. After a day, the shoot had bent to the right. Explain this result.

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(Total for Question 8 is 7 marks)

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9 Students studied plants in a rectangular field next to a river. The field measured 50 m by 40 m.

(a) The students used random sampling with quadrats to estimate the number of dandelion plants in the field. Describe how they should decide where to place each quadrat so that the samples are random.

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(2)

(b) The students used ten quadrats, each measuring 0.5 m by 0.5 m. The table shows the number of dandelion plants in each quadrat. Estimate the total number of dandelion plants in the field.

Quadrat	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Number of dandelion plants	3	0	5	2	4	1	6	2	3	4

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(3)

(c) The farmer spread nitrate fertiliser on the field. Heavy rain washed some of the fertiliser into the river. Several weeks later, many fish in the river died. Explain how the fertiliser led to the death of the fish.

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(4)

(d) The next spring, before sowing a crop, the farmer ploughed the field. Ploughing breaks up the soil and turns it over. Suggest how ploughing could increase the nitrate content of the soil. Refer to the nitrogen cycle in your answer.

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(2)

(Total for Question 9 is 11 marks)

END OF QUESTIONS