

## Eduqas style

# WJEC Eduqas GCSE (9-1) Combined Science (Double Award)

## Component 1: Concepts in Biology (Higher Tier) – Practice Paper

Component 1 (Higher Tier) · Higher Tier · Practice paper

**Time allowed: 1 hour 45 minutes**

|                         |  |
|-------------------------|--|
| <b>Candidate name</b>   |  |
| <b>Centre number</b>    |  |
| <b>Candidate number</b> |  |

### Materials

- a calculator
- a ruler
- Black ink or black ball-point pen
- You may use a calculator.

### Instructions

- Use black ink or black ball-point pen. Do not use gel pen. Do not use correction fluid.
- Write your name, centre number and candidate number in the spaces provided.
- Answer all questions.
- Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

### Information

- The number of marks is given in brackets at the end of each question or part-question.
- The assessment of the quality of extended response (QER) will take place in question 9(g).
- The total mark for this paper is 90.
- Original Teach io practice paper written in the style of WJEC Eduqas GCSE (9–1) Combined Science Component 1 (Higher Tier). Not an Eduqas paper.

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## Questions 1–9

Answer all questions. You are advised to spend about 1 minute per mark.

1

(a) Describe the structure of a DNA molecule.

[2]

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(b) In a sample of DNA, 22% of the bases are adenine (A).

Calculate the percentage of bases that are guanine (G).

[2]

(c) Catalase is an enzyme found in potato cells. It breaks down hydrogen peroxide.

Name the gas produced when catalase breaks down hydrogen peroxide.

[1]

(d) A student adds potato pieces to hydrogen peroxide solution and collects 42 cm<sup>3</sup> of gas in 3.5 minutes.

Calculate the mean rate of gas production in cm<sup>3</sup> per minute.

[2]

(e) Catalase does not break down starch.

Explain why.

[1]

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(f) Suggest one variable the student should keep the same when comparing the rate of gas production at different temperatures.

[1]

2 A student investigates how the plants growing on the ground change from an open field into a woodland. She places a 1 m<sup>2</sup> quadrat every 5 m along a line from the field into the wood. In each quadrat she measures the light intensity and estimates the percentage cover of grass.

The table shows her results.

| Distance from field edge (m) | Light intensity (lux) | Percentage cover of grass (%) |
|------------------------------|-----------------------|-------------------------------|
| 0                            | 18 500                | 85                            |
| 5                            | 15 200                | 70                            |
| 10                           | 9 800                 | 45                            |
| 15                           | 5 600                 | 20                            |
| 20                           | 3 400                 | 5                             |

(a) Name the sampling method in which quadrats are placed at regular intervals along a line.

[1]

(b) Calculate the percentage decrease in light intensity between 0 m and 20 m.

Give your answer to the nearest whole number.

[2]

(c) Describe the relationship between light intensity and the percentage cover of grass.

[1]

(d) Suggest one abiotic factor, other than light intensity, that the student could measure at each quadrat.

[1]

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**(e)** In the woodland, the caterpillars eating the oak leaves receive 24 000 kJ of energy per m<sup>2</sup> per year. The birds that eat the caterpillars receive 1680 kJ per m<sup>2</sup> per year.

Calculate the efficiency of energy transfer from the caterpillars to the birds.

**[2]**

**(f)** Explain why most of the energy in the caterpillars is not transferred to the birds.

**[2]**

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**3**

**(a)** Describe two ways in which red blood cells are adapted to carry oxygen.

**[2]**

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**(b)** A sample of blood contains 5 000 000 red blood cells and 7500 white blood cells per mm<sup>3</sup>.

Calculate the ratio of red blood cells to white blood cells.

Give your answer in the form n : 1, to the nearest whole number.

**[2]**

**(c)** Explain how capillaries are adapted for the exchange of substances with body cells.

**[2]**

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**(d)** A student's heart rate was 72 beats per minute at rest and 153 beats per minute at the end of a 3-minute run.

Calculate the percentage increase in heart rate.

Give your answer to 3 significant figures.

**[2]**

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**(e)** Explain why heart rate increases during exercise.

**[2]**

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**4** A student cuts five cylinders from a carrot. He weighs each cylinder, places it in a different concentration of salt solution for 30 minutes, then blots it dry and reweighs it.

The table shows his results.

| Salt concentration (mol/dm <sup>3</sup> ) | Starting mass (g) | Final mass (g) | Percentage change in mass (%) |
|-------------------------------------------|-------------------|----------------|-------------------------------|
| 0.0                                       | 2.40              | 2.70           | +12.5                         |
| 0.2                                       | 2.50              | 2.60           | +4.0                          |
| 0.4                                       | 2.45              | 2.33           |                               |
| 0.6                                       | 2.40              | 2.16           | -10.0                         |
| 0.8                                       | 2.50              | 2.10           | -16.0                         |

**(a)** Define the term osmosis.

**[2]**

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**(b)** Calculate the percentage change in mass for the carrot cylinder in 0.4 mol/dm<sup>3</sup> salt solution.

Give your answer to 1 decimal place.

**[2]**

**(c)** Use the data to estimate the concentration of salt solution that is equal in water concentration to the carrot cells.

**[2]**

**(d)** Explain why the carrot cylinder in 0.0 mol/dm<sup>3</sup> solution increased in mass.

**[2]**

**(e)** Carrot root cells absorb nitrate ions from the soil by active transport.

Explain why carrot plants grown in waterlogged soil, which contains very little oxygen, absorb fewer nitrate ions.

**[2]**

**5** A student spreads bacteria on a nutrient agar plate. She places three paper discs, A, B and C, on the agar. Each disc is soaked in a different antibiotic. After 48 hours at 25 °C she measures the diameter of the clear zone around each disc.

The table shows her results.

| Disc | Diameter of clear zone (mm) |
|------|-----------------------------|
| A    | 9                           |
| B    | 22                          |
| C    | 14                          |

**(a)** Name one disease of humans caused by a virus. [1]

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**(b)** Describe two aseptic techniques the student should use when preparing the agar plate. [2]

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**(c)** Calculate the area of the clear zone around disc B.

$$\text{Area} = \pi r^2$$

Give your answer to the nearest whole number. [2]

**(d)** Calculate how many times larger the area of the clear zone around disc B is than the area around disc C.

Give your answer to 2 significant figures. [2]

**(e)** The student concludes that antibiotic B should be used to treat infections caused by this bacterium.

Evaluate this conclusion. [2]

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**(f)** Explain why the plates were incubated at 25 °C and not at 37 °C. [1]

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**6** A student investigates how sensitive different areas of skin are. A partner gently touches the skin of a blindfolded person with either one or two points of a pair of compasses. The student records the smallest distance at which the person can feel two separate points.

The table shows her results.

| Area of skin | Test 1 (mm) | Test 2 (mm) | Test 3 (mm) | Test 4 (mm) | Mean (mm) |
|--------------|-------------|-------------|-------------|-------------|-----------|
| Fingertip    | 2           | 3           | 2           | 3           | 2.5       |
| Palm         | 11          | 12          | 10          | 11          | 11        |
| Forearm      | 36          | 41          | 58          | 39          |           |

**(a)** State the function of a receptor.

[1]

**(b)** Calculate the mean result for the forearm. Do not include the anomalous result.

Give your answer to the nearest whole number.

[2]

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**(c)** Explain the difference between the results for the fingertip and the forearm.

**[2]**

**(d)** Suggest why the person being tested was blindfolded.

[1]

**(e)** Suggest one variable that should be controlled in this investigation.

[1]

**(f)** Impulses can only pass in one direction across a synapse.

Explain why.

**[2]**

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**(g)** Explain why a reflex action is important to the body.

**[1]**

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**7** The table shows the percentage of adults in a survey who have type 2 diabetes, grouped by body mass index (BMI).

| <b>BMI (kg/m<sup>2</sup>)</b>   | <b>18.5–24.9</b> | <b>25.0–29.9</b> | <b>30.0–34.9</b> | <b>35.0 and over</b> |
|---------------------------------|------------------|------------------|------------------|----------------------|
| Adults with type 2 diabetes (%) | 2.1              | 5.3              | 11.4             | 19.6                 |

**(a)** Name the hormone released by the pancreas when blood glucose concentration rises.

**[1]**

**(b)** Explain how the body returns blood glucose concentration to normal after a meal.

**[3]**

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**(c)** A man has a mass of 92 kg and a height of 1.75 m.

Calculate his BMI.

$$\text{BMI} = \text{mass (kg)} \div \text{height}^2 \text{ (m}^2\text{)}$$

Give your answer to 3 significant figures.

**[2]**

**(d)** Describe the trend shown in the table.

**[1]**

**(e)** A newspaper headline says: 'Being obese causes type 2 diabetes.'

Use the data to evaluate this headline.

**[2]**

**(f)** Describe how type 1 diabetes is treated.

**[1]**

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**8** Cystic fibrosis is an inherited disorder caused by a recessive allele (f). The dominant allele (F) does not cause the disorder.

**(a)** State what is meant by the term allele.

**[1]**

**(b)** State the genotype of a person who is a carrier of cystic fibrosis.

**[1]**

**(c)** A man who is a carrier has children with a woman who has cystic fibrosis.

Complete the Punnett square to show the possible genotypes of their children.

**[2]**

|             | Gamete ____ | Gamete ____ |
|-------------|-------------|-------------|
| Gamete ____ |             |             |
| Gamete ____ |             |             |

**(d)** What is the probability that a child of this couple will have cystic fibrosis?

Give your answer as a percentage.

**[1]**

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**(e)** Embryos produced by IVF can be screened for cystic fibrosis before being placed in the uterus.

Give one argument for and one argument against embryo screening.

**[2]**

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**(f)** State what is meant by the term phenotype.

**[1]**

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**9**

**(a)** Name the green pigment in chloroplasts that absorbs light.

**[1]**

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**(b)** Plants convert some of the glucose made in photosynthesis into other substances.

Give two uses of glucose in plants.

**[2]**

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**(c)** A student places tubes of algae in hydrogencarbonate indicator at 15 cm and at 45 cm from a lamp.

Light intensity is proportional to  $1/d^2$ .

How many times greater is the light intensity at 15 cm than at 45 cm?

**[1]**

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**(d)** The student tests a variegated leaf (with green and white areas) for starch using iodine solution after the plant has been in light for 6 hours. Only the green areas turn blue-black.

Explain this result.

**[2]**

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**(e)** Before the starch test the plant was kept in the dark for 48 hours.

Suggest why.

**[1]**

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**(f)** The student also set up a tube of hydrogencarbonate indicator with no algae at each distance.

Suggest why.

**[1]**

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**(g)** Leaves from the top of a beech tree grow in bright light (sun leaves). Leaves near the ground grow in shade (shade leaves).

Explain how leaves are adapted for photosynthesis, and use the data in the table to explain how sun leaves and shade leaves are each suited to the conditions in which they grow. [6 QER]

**[6]**

| Feature                                                  | Sun leaf | Shade leaf |
|----------------------------------------------------------|----------|------------|
| Leaf thickness (mm)                                      | 0.24     | 0.11       |
| Layers of palisade cells                                 | 2        | 1          |
| Leaf area (cm <sup>2</sup> )                             | 28       | 46         |
| Chlorophyll per gram of leaf (mg)                        | 1.9      | 3.1        |
| Rate of photosynthesis in dim light (arbitrary units)    | 2        | 5          |
| Rate of photosynthesis in bright light (arbitrary units) | 24       | 9          |

**END OF QUESTIONS**