# GCSE Separate Sciences

# Practical Skills Supplement

## Student Extension Tasks Book

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## Biology

### Physiology

**Physiology, responses, respiration**

You have investigated and monitored changes in pulse, breathing rate and recovery after exercise.

**Quiz - test your knowledge and understanding**

|  |  |
| --- | --- |
| **1.** | Calculate the difference in the pulse and breathing rate after exercise. Add your results to the table. **[2 marks]** |
|  |  |
| **2.** | What effect did exercise have on the number of heartbeats in 1 minute (pulse rate) and on the number of breaths in 1 minute (breathing rate)? **[2 marks]** |
|  |  |  |
|  |  |
|  |  |
| **3.** | Compare and explain the measurements for pulse and breathing rate at the following time points: before exercise, immediately after exercise and 10 minutes after exercise. **[5 marks]** |
|  |  |  |
|  |  |
|  |  |
| **4.** | What are the differences between aerobic respiration and anaerobic respiration? Which process produces more energy in the form of adenosine triphosphate (ATP)? **[2 marks]** |
|  |  |  |
|  |  |

### Testing for Biological Molecules

**Banana nutrition**

You have been investigating and monitoring changes in biological molecules during the breakdown of starch using a range of food tests to test for starch and reducing sugar.

**Quiz - test your knowledge and understanding**

|  |  |
| --- | --- |
| **4.** | What colour would indicate a positive result in a test for starch? **[1 mark]** |
|  |  |
|  | **A** | Blue-black |
|  | **B** | Purple |
|  | **C** | Orange |
|  | **D** | Brick red |
|  | Your answer  |
|  |  |
|  |  |
| **5.** | What would be the most appropriate equipment for adding approximately 3cm3 of Benedict’s solution to a boiling tube? **[1 mark]** |
|  | **A** | Burette |
|  | **B** | Dropping pipette |
|  | **C** | 100cm3 measuring cylinder |
|  | **D** | Teaspoon |
|  | Your answer  |
|  |  |

1. A test for reducing sugar is done on three different foods. The results of the tests are as follows:
	1. Food A - orange colour
	2. Food B - green colour
	3. Food C - brick red colour

Write down the foods in order from most sugar to least sugar. Suggest what the foods might be and explain your answer. **[2 marks]**

|  |
| --- |
|  |

## Chemistry

### Identification of species

**Precipitation and flame tests**

You have used precipitation and flame test analysis to identify eight samples of unknown composition.

**Quiz - test your knowledge and understanding**

|  |  |  |
| --- | --- | --- |
| **1.** | Write word and ionic equations for each positive test that you carried out for the substances you tested. **[4 marks]** |  |
|  |  |

|  |  |  |
| --- | --- | --- |
| **2.** | An analytical chemist has received a small sample of a contaminant found in a batch of pain killers. They need to identify the chemical identity of the contaminant quickly. Discuss the advantages of using instrumental techniques. **[3 marks]** |  |
|  |  |

### Titration

**Titration of sodium hydroxide with hydrochloric acid**

You have carried out a titration of an acid against an alkali of known concentration, and then repeat the titration technique for an alkali of unknown concentration.

**Quiz - test your knowledge and understanding**

|  |  |  |
| --- | --- | --- |
| **1.** | Write word, symbol and ionic equations for the reaction between hydrochloric acid and sodium hydroxide. **[3 marks]** |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| **2.** | Describe how replacing hydrochloric acid with sulfuric acid (H2SO4) of the same concentration would affect your results. **[2 marks]** |  |
|  |  |  |
| **3.** | Explain why you carry out a rough titration. **[2 marks]** |  |
|  |  |  |
| **4.** | Explain the purpose of carrying out repeated titrations until you obtain concordant results. **[3 marks]** |  |
|  |  |  |

## Physics

### Series and parallel circuits

**The brightness of bulbs in series and parallel**

You have investigated how the brightness of bulbs change depending on whether they are connected in series or parallel.

**Quiz - test your knowledge and understanding**

|  |  |  |
| --- | --- | --- |
| **1.** | A student wants to measure the current and potential difference for a fixed resistor in a circuit. Draw the circuit diagram that they could use to measure these values.  **[3 marks]** |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| **2.** | In the experiment the current reading is 0.15 A and the potential difference is 2.0 V. What formula could the student use to find the resistance of the resistor? **[1 mark]** |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| **3** | Work out the resistance of the resistor to 3 significant figures and write down the units. **[4 marks]** |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
|  | Name the following circuit components. **[4 × 1 mark]** |  |
|  |  |  |
| **4.** | circuit component |  |

|  |  |  |
| --- | --- | --- |
| **5.** | circuit component |  |

|  |  |  |
| --- | --- | --- |
| **6.** | circuit component |  |

|  |  |  |
| --- | --- | --- |
| **7.** | circuit component |  |

### Measuring frequency of waves

**Barton’s pendulums**

You have investigated the frequency of a wave in a string, and the changes in frequency of pendulums suspended from the string. Using your observations you made a prediction and then modified the experiment to test your prediction.

**Quiz - test your knowledge and understanding**

|  |  |
| --- | --- |
| **1.** | What does the driver do in the Barton’s pendulum experiment? **[1 mark]** |
|  |  |
|  | **A** | Generates waves in the string |
|  | **B** | Makes potential energy |
|  | **C** | Synchronises all the pendulums |
|  | **D** | Transfers kinetic energy |
|  | Your answer  |
|  |  |
|  |  |
| **2.** | The velocity of the wave in the string is constant. Decide which statement about the wave in the string is true. [speed = frequency × wavelength] **[1 mark]** |
|  | **A** | Its wavelength increases when the driver gets shorter. |
|  | **B** | Its frequency increases when the driver gets longer. |
|  | **C** | Its wavelength increases when driver gets longer. |
|  | **D** | Its frequency decreases when the driver gets shorter |
|  | Your answer  |
|  |  |

1. Stringed instruments (like a guitar or violin work) in a similar way to the pendulum experiment. The strings of the instrument act as a *driver* and energy is transferred to the body of the instrument. Explain how the hollow wooden body of the musical instrument can amplify the sound of the vibrating string. **[3 marks]**

|  |
| --- |
|  |

1. LIMPET was an experimental wave power station on the Isle of Islay. The average period of the Atlantic waves at Islay is 12.3 seconds.

What is the frequency of these waves? **[2 marks]**

|  |
| --- |
|  |
| Hz |

1. It takes 90.3s for the waves to travel the final 1200m to the LIMPET power station. Calculate the wavelength of the waves using the information above and your answer to question 4. **[3 marks]**

|  |
| --- |
|  |
| m |

1. As each wave travels past the cliff they cause the level of the sea to move up and down by several meters. LIMPET is a large hollow concrete tube built into the cliff. As the seawater moves up and down inside LIMPET it forces air through a turbine which generates electricity.



LIMPET was designed so that the natural period of water oscillating up and down in the column was 12.3s. Explain the advantage of this design? **[2 marks]**

|  |
| --- |