# MJSO 2023 - Marking Scheme

| Item number | | | Description | Remarks | Mark |
|---|---|---|---|---|---|
| Section A: Biology | | | | |
| 1 | a | | A test tubes was filled with 5 ml of Hydrogen peroxide. | 1 | 6 |
| | | | 5mls of a fruit or vegetable slurry was poured into the test tube. | 1 | |
| | | | The contents of the test tube were mixed, and the stopwatch started. | 1 | |
| | | | After (1/2/3/4/5) minutes (a determined time given) the height of the froth was measured by means of a ruler. | 1 | |
| | | | The previous steps were repeated using different fruits and vegetables provided. | 1 | |
| | | | All steps were repeated twice to strengthen accuracy. | 1 | |
| | b | i | It is how the experimenter knows that testing involves the concentration of catalase and hydrogen peroxide only. | | 2 |
| | | ii | Either: using water instead of hydrogen peroxide so the reagent is absent<br>Or: Boiling the fruit/vegetable to denature the enzyme | | 1, 2 |
| | c | | Table of results with independent variable: type of fruit/vegetable and dependent variable: height of froth | | 3 |
| | | | Table drawn in correct format | | 1 |
| | d | | Correct calculation of rate of reaction | ½ mark per fruit/vegetable | 3 |
| | e | i | Title of bar chart | 1 | 6 |
| | | | Correct axes labelled including units (where necessary) | 1 | |
| | | | Correct plotting of bars | 2 | |
| | | | Bars separated from each other. | 1 | |
| | | | Correct scale ( 2/3 of paper) | 1 | |
| | | ii | A bar chart  is used because data is discrete and not continuous. | | 2 |
| | f | | Same volumes of fruit/vegetable/peroxide  for each test -to keep variables constant; same time for each test – to keep variable constant;  homogenous  mixture- so all catalase mixes with peroxide | 1 | 2 |
| | | | Any other equivalent answer | 1 | |
| | g | | The rate would the lower | 1 | 3 |
| | | | As the proportion of the enzyme would have been used, denatured or inhibited by other factors. | 2 | |
| | h | | On a higher temperature (below denaturation) the molecules are moving around faster and will therefore "bump" into each other more often. More collisions afford more opportunities for reaction. | | 2 |
| | Total | | | | 33 |

| Item number | | | Description | Remarks | Mark |
|---|---|---|---|---|---|
| **Section B: Chemistry** | | | | | |
| 1 | a | | Colour: white<br>Appearance: crystals | | 1<br>1 |
| | b | i | Dip the moist nichrome wire into the sample of the substance being investigated. Some crystals should stick to the wire.<br>Gently, place the wire close to the blue Bunsen flame. | | 1<br><br>1 |
| | | ii | No flame colour is observed. | | 1 |
| | c | i | To the solution add NaOH(aq) drop wise<br>until in excess. | | 1<br>1 |
| | | ii | A white precipitate forms<br>which is insoluble in excess NaOH | | 1<br>1 |
| | | iii | $Mg^{2+}(aq) + 2OH^-(aq) \rightarrow Mg(OH)_2(s)$ | 1 mark for formulae, 1 mark for balancing. | 2 |
| | d | i | To a solution of substance A,<br>add acidified barium chloride solution. | | 1<br>1 |
| | | ii | A white precipitate indicates the presence of the sulfate ion. | | 1 |
| | | iii | $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$ | 1 mark for formulae, 1 mark for balancing. | 2 |
| | e | | Substance A is $MgSO_4$ | 1 mark for each ion. | 2 |
| 2 | a | | Colour: transparent<br>Appearance: crystals | | 1<br>1 |
| | b | | No flame colour observed. | | 1 |
| | c | i | A smell of ammonia is observed<br>which indicates the presence of the ammonium ion. | | 1<br>1 |
| | | ii | $NH_4^+ + OH^-(aq) \rightleftharpoons H_2O(l) + NH_3(g)$ | 1 mark for formulae, 1 mark for balancing, and 1 mark for reversible reaction sign. | 3 |
| | d | i | To a solution of the halide,<br>add a few drops of acidified silver nitrate solution. | | 1<br>1 |
| | | ii | A white precipitate is formed. | | 1 |
| | | iii | $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$ | 1 mark for formulae, 1 mark for balancing. | 2 |
| | e | | Substance B is $NH_4Cl$ | 1 mark for each ion. | 2 |
| **Total** | | | | | **33** |

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| | | | **Section C: Physics** | | |
| 1 | a | i | The extension of a spring is directly proportional to the force applied, provided that the elastic limit (limit of proportionality) is not exceeded. | | 2 |
| | | ii | the time interval between two successive repetitions. | | 1 |
| | b | | Data entered in table | 1 mark for heading, 3 marks for data | 4 |
| | c | | Filling of table according to data in b | | 6 |
| | d | | Straight line graph passing through most points | 1 mark for labelling of axis, 1 mark for heading, 3 marks for plotting points, 1 mark for best line of fit | 6 |
| | e | | k= 22.2   Kg/s$^2$ | (+/-  0.2) | 3 |
| | f | | 0.03kg or 30g (found from extension of graph to find the intercept) | | 3 |
| | g | | Mention or circling an anomalous point | | 1 |
| | h | | As more masses are added it takes less time to complete a cycle | | 2 |
| | i | | Stiffer springs have a shorter period | | 2 |
| | j | | A child in a swing, a person bouncing on the end of a diving board, oscillation of a simple pendulum, vibrations in car suspensions | (any other valid examples) | 4 |
| | | | | **Total** | 34 |