**13+ STEM Scholarship Exam**

**Name:**

**Mark: /30 %**

**Time Allowed: 30 Minutes**

**Instructions to students:**

1. **Write your answers on the test paper in blue or black ink**
2. **Use a pencil and ruler to draw your graph**

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| --- |
| 1. Pineapple juice contains a substance that speeds up the digestion of protein.   (i)      What is the name for substances that speed up digestion?  ............................................................ 1 mark |

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| --- |
| (ii)     What happens to a molecule of protein during digestion?  ...............................................................................................................  .............................................................................................................. 1 mark |

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| --- |
| (b)     Asim did an experiment to investigate the digestion of gelatin. Gelatin is the protein in jelly. In test tubes A and B he used one cube of jelly in each. In test tube C he used one cube of jelly that he had chopped up.    **A                            B                                 C**       5 g jelly cube          5 g jelly cube               5 g jelly cube                 +                            +                        chopped into            15 cm3               15 cm3 fresh                    pieces          cold water              pineapple                           +                                             juice                      15 cm3 fresh                                                                            pineapple                                                                                juice |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| He recorded how long it took for the jelly to be digested in each test tube. The table below shows his results.     |  |  | | --- | --- | | **test tube** | **result** | | A | **not** digested after 2 hours | | B | jelly digested in 2 hours | | C | jelly digested in 1 hour | |

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| --- |
| (i)      What was the purpose of test tube A?  ...............................................................................................................  ............................................................................................................... 1 mark |

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| --- |
| (ii)     It is helpful to chew your food. How do the results in test tube C show this?  ...............................................................................................................  ............................................................................................................... 1 mark |

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| (c)     The substances that speed up digestion stop working when they have been boiled.  (i)      What does Asim need to put in a fourth test tube to test this in his experiment? Label test tube D. Test tubes A, B and C contain the same as in the first experiment.  **A                               B                              C                               D**            5 g jelly                 5 g jelly cube            5 g jelly cube         ............................              cube                            +                      chopped into                 +                      15 cm3 fresh                  pieces              ............................            15 cm3                    pineapple                        +                               +         cold water                     juice                   15 cm3 fresh                                                                            pineapple            ............................                                                                                                        ............................                                                                                                        ............................  2 marks |

|  |
| --- |
| (ii)     Predict what Asim would observe in test tube D after 2 hours.  ............................................................................................................... 1 mark  maximum 7 marks |

1. Harry has a mixture of salt, and sand. He decides that he wants to separate the salt from the sand.

a. List 3 pieces of equipment Harry could use to do this.

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[3 marks]

b. Write out the method Harry could use to collect his sand and his salt.

[4 marks]

Maximum 7 marks

1. A test tube of crushed ice is taken out of a freezer and left in a warm room. The graph shows how the temperature in the test tube changes.



(a)What is happening to the ice at stage **B**?

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1 mark

(b) Why does the temperature of the water stop rising at 23°C (stage **D**)?

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1 mark

(c) Four descriptions of the ways molecules could move are given below.

They vibrate around fixed points.



They move past each other and are close together.



They move in straight lines, colliding occasionally.



They all move in the same direction at the same speed.



(i) How do the molecules move at stage **A**?   
Write **A** in the correct box above.

1 mark

(ii) How do the molecules move at stage **C**?   
Write **C** in the correct box above.

1 mark

(d) Ice from a freezer is put in a glass of water at room temperature. The ice floats in the water.

(i) What does this show about the density of the ice compared to that of water?

Tick the correct box.

Ice is more dense than water.



Ice and water have the same density.



Ice is less dense than water.



Ice has a density of zero.



1 mark

(ii) The fact that ice floats in water tells us something about the distances between the molecules.

Tick the box by the correct statement.

The molecules are further apart in ice than in water.



The molecules are the same distance apart in ice and in water.



The molecules are closer together in ice than in water.



1 mark

Maximum 6 marks

[6]

1. The drawing shows a hairdryer.



Ben drew the diagram below to show the circuit of the hairdryer.



(a) Which of the switches must be closed for the heater to work? Tick the correct box.

switch switch switches neither switch  
1 only 2 only 1 and 2 1 nor 2



1 mark

(b) With this circuit, is it possible to have the heater on when the motor is switched off?

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Explain your answer.

……………..……………………………….…………………..……………………

……………..……………………………….…………………..……………………

1 mark

(c) The motor and the heater are both on.  
The motor blows air through the hairdryer. If the motor breaks, what would happen to the temperature of the hairdryer?

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1 mark

(d) The motor and the heater are both on. Suddenly the wire in the heater breaks.  
What effect, if any, will this have on the motor?

……………..……………………………….…………………..……………………

1 mark

Maximum 4 marks

**5.** Russell investigated the relationship between mass and weight.  
He weighed five different masses using a force meter.

His results are shown in the table.

|  |  |
| --- | --- |
| **mass (g)** | **weight (N)** |
| 150 | 1.5 |
| 250 | 2.5 |
| 300 | 3.8 |
| 400 | 4.0 |
| 580 | 5.8 |

(a) He plotted four of his results on a grid as shown below,

(i) Plot the point for the 150 g mass on the graph.

1 mark

(ii) Draw a line of best fit.



1 mark

(b) One of the points Russell plotted does **not** fit the pattern.

Circle this point on the graph.

1 mark

(c) Use your graph to predict:

(i) the mass of an object weighing 6.5 N;

............. g

1 mark

(ii) the weight of an object of mass 50 g.

............. N

1 mark

(d) Give **one** reason why it is more useful to present the results as a line graph rather than a table.

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1 mark

maximum 6 marks

**End of Test**