**STAGE 2 NUTRITION**

**Investigations Folio: Core Topic 1: Energy Content of Macronutrients**

**Burning food practical**

**Introduction:**

By burning pieces of food, the chemical energy stored in molecular bonds is released as heat and light. The heat can be measured in units called kilojoules. The more kilojoules a food contains, the more heat is given off when burned. Foods high in kilojoules will release large amounts of energy. One gram of protein will release fewer kilojoules that one gram of fat.

**Aim:**

The aim of this practical is to work safely and collaboratively in a completion type practical in which you are provided with the method to investigate whether or not the energy released by burning food samples matches the energy data provided by nutritional panels.

**Hypothesis:**

The cheese and bacon balls will give off the most energy because of it’s high fat content, creating the biggest increase of heat.

**Safety:**

* Safety glasses
* Apron
* Be careful of flame
* Be careful of calorimeter it may be hot

**Independent variable:**

The independent variable is the food eg. Cheese and bacon balls, popcorn and multi-coloured popcorn.

**Dependent variable:**

The dependent variable is the energy released from the food.

**Controlled variable:**

The controlled variable is the water and distance need (food) away from calorimeter.

**Materials or equipment:**

See Appendix 1 attached to the end of the practical report.

**Method:**

See Appendix 1 attached to the end of the practical report.

**Results:**

See Appendix 2 this contains all the raw data obtained during the practical activity.
Table 1: Group Raw Data;

Tables 2, 3 and 4: Processed Group Data;

Table 5: Class Data

**Table 6: comparison table of class data and group data**

**Investigation**

Records and displays findings of investigations using generally appropriate conventions and formats with some errors but generally accurately and effectively.

|  |  |
| --- | --- |
| **Student / Class Group** | **Mean Energy released per 100g (kJ)** |
| **Popcorn** | **Multi-coloured Popcorn** | **Cheese and Bacon Balls** |
| Our Student Group Data  | 633.12 | 544.2 | 468.32 |
| Class Data  | 607.12 | 586.82 | 742.9 |



For the popcorn and multi-coloured popcorn, my group’s results were very close to the class results, therefore indicating that they were reliable. Although our cheese and bacon balls result was a fair bit lower that the class data, indicating that there may have been some errors.

**Analysis and Evaluation**

Describes basic connections between some data and concepts, and attempts to formulate a conclusion.

**Discussion:**

With the burning of the different food samples, we discovered that the more kilojoules that are in the food sample the faster the food would burn.

My hypothesis suggested that the cheese and bacon balls would release the most energy, because of its high fat content. However this was not the case it was actually the lowest energy release value, it released 468.32 on average. Although the results was the lowest for the cheese and bacon balls for my group it was actually the highest class value 742.89 on average, therefore my group must have had some errors. My prediction wasn’t supported by my results but was by the class’ results.

The food that burnt the longest ended up having a higher mass of food combusted, therefore suggesting the longer something burns the lighter it gets.

My group’s results for the amount of energy released were very close to the class average for the popcorn and multi-coloured popcorn , so I believe they were a success, however the cheese and bacon balls were a lot slower that the class average , we must have had some errors there.

The class results had a fairly large range, and some outliers occurred, this could be because of errors.

**Strengths and weaknesses:**

There were a number of strengths and weaknesses shown through this practical, some of the strengths include:

* The equipment was mostly collected already

**Analysis and Evaluation**

Evaluates some procedures in nutrition appropriately.

* We had a trial practical
* We measured everything as accurate as possible
* We measured water as soon as temperature stopped rising
* Working in groups, to share tasks

Weaknesses shown throughout the practical were:

* Not all the food samples were the same size, causing inconsistent results
* The water could warm a little when placed in the calorimeter that was just heated
* Sometimes we had to use more than one match, could cause it to be hotter than normal

All of the data was reasonably close therefore results are consistent and reliable.

**Random errors:**

* Sometimes we had to use more than one match to light the food, which could add more heat
* The distance between food and calorimeter was not exactly the same each time, energy may of escaped before getting to the calorimeter.

**Analysis and Evaluation**

Evaluates procedures but with some errors.

* The food may have stopped before it turned to charcoal therefore having to use more matches
* Two of the class results for cheese and bacon balls were very different, one was really high and one was really low, this could be because of random error

**Application**

Uses generally appropriate nutrition terms and conventions with some general effectiveness.

**Systematic errors:**

* The calorimeter still was a bit warm therefore preheating the water a little bit
* The calorimeter after a few tests gets charcoal on it, added insulation and affecting temperature

**Knowledge and Understanding**

Uses different formats to communicate knowledge and understanding of nutrition in different contexts with some general effectiveness.

**Analysis and Evaluation**

Evaluates procedures and suggests some appropriate improvements that are generally appropriate.

**Improvements:**

Improvement could be made to improve errors.

* We could have marked 2 cm on a piece of paper, etc. to be more accurate
* We could have used the same amount of matches for each test
* We could have scratched the charcoal off the calorimeter
* We could have made sure the calorimeter was cooled before adding water so that the water is not preheated by calorimeter
* We could have done more than there trials of each, which would have made the results more reliable
* Maybe even using different types of food that burn for longer, might get different results
* Using a different calorimeter each test would insure it was cooled down and wouldn’t have charcoal on it
* We could place the food sample on evenly so every trial has the same surface area

**Conclusion:**

My hypothesis was not supported by the pac, the cheese and bacon balls were not the food sample that produces the most heat (energy). Not all of the energy burnt out from the food because charcoal was left, therefore leaving some energy behind. This means the results are not the same as the nutritional information. Most of our results were lower that the class average. This could mean we had a smaller mass index in our food samples. It is hard to compare the three food samples because the nutritional value, weight and energy release are just so different.

**Analysis and Evaluation**

Attempts to formulate a conclusion.

**Review:**

We had some safely considerations throughout this practical. All mainly to do with heat. We had to be careful with the burning food samples and the other apparatus still being hot after each trial. My group made sure we were very safe and no one got burnt, we wore safely equipment like safety goggles and apron.

**Application**

Evidence of constructive collaboration.

My group worked well together, we shared all the tasks evenly. We both collected materials and apparatus. My partner measured water, checked initial water temperature and lit the food samples. I weighed the initial weight, final weight and checked final temperature.

Appendix 1:

Materials or equipment:

* Thermometer
* Retort stand clamps (x1)
* Burette clamp (to hold needle)
* Electronic scales
* Measuring cylinder (100ml)
* Cardboard lid calorimeter (metal can)
* Popcorn (x6)
* Multi-coloured popcorn (x6)
* Cheese and bacon balls (x6)
* Alfoil
* Matches
* Mounted needle

Method:

Retort Stand

Thermometer

Cardboard lid

Calorimeter

Calorimeter

Mounted
needle

Food Sample

Clamp

Al Foil

Cardboard lid

1. Collect and wear safety glasses/apron.

2. Place ***2*** pieces of the same food on the needle.

3. Measure and record the initial mass of food,

 alfoil and mounted needle in grams using the scale.

4. Set up the apparatus as shown in diagram.

5. Make sure the food is approximately 2 cm below

 the bottom calorimeter.

6. Pour 50mL of tap water into the calorimeter.

7. Record the initial temperature of the water.

8. Light the food sample using a match (most cases

 it takes more than one match).

 9. Wait for the water to be heated until the food stops

 burning. Keep stirring the water with the thermometer

 until the temperature stops riding(don’t let the

 thermometer touch the calorimeter because it would

 measure the calorimeter instead of water). Record this

 temperature.

10. Measure the final mass of the food residue, alfoil

 and mounted needle in grams using a scale.

11. Wash and dry the calorimeter

12. Repeat steps 1 – 12 with each food sample 3 times

 (use new water each time).

13. Place equipment back where it belongs.

14. Place burnt food residue and used matches in bin.

Appendix 1: Raw Data

**Table 1: Group Raw Data:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Trial** | **Microwave Popcorn** | **Multi-coloured Popcorn** | **Cheese/Bacon Balls** |
| **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** |
| Mass of food, alfoil & mounted needle (initial) (g) | 10.17 | 10.18 | 10.21 | 10.62 | 10.61 | 10.46 | 10.93 | 10.95 | 10.93 |
| Mass of food, alfoil & mounted needle (final) (g) *(b)* | 9.97 | 9.98 | 9.95 | 10.11 | 10.19 | 10.12 | 10.43 | 10.48 | 10.47 |
| Mass of Food combusted (g) | 0.2 | 0.2 | 0.26 | 0.51 | 0.42 | 0.34 | 0.5 | 0.47 | 0.46 |
| Mass of water (g) [ml] | **50mL** | **50mL** | **50mL** | **50mL** | **50mL** | **50mL** | **50mL** | **50mL** | **50mL** |
| Initial water temperature (°C) | 21 |  | 21 | 22 | 22 | 22 | 22 | 23 | 23 |
| Final water temperature (°C) | 27 | 21 | 29 | 31 | 35 | 32 | 43 | 44 | 43 |
| Temperature Change (°C)  | 6 | 27 | 8 | 9 | 13 | 10 | 11 | 11 | 10 |

**Tables 2,3 and 4: Processed Data / Group**

**Food 1:Microwave popcorn Food 2: Multi-coloured popcorn Food 3: Cheese and**

 **Bacon Balls**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Student Group** | **Energy released per 100g (kj)** |  | **Student Group** | **Energy released per 100g (kj)** |  | **Student Group** | **Energy released per 100g (kj)** |  |
| Trial 1 | 627.75 | Trial 1 | 369.36 | Trial 1 | 460.35 |
| Trial 2 | 627.75 | Trial 2 | 647.78 | Trial 2 | 489.73 |
| Trial 3 | 643.84 | Trial 3 | 615.44 | Trial 3 | 454.9 |
| Trial 4 | 1899.35 | Trial 4 | 1632.61 | Trial 4 | 1404.971 |
| **Mean** | 633.12 | **Mean** | 544.2 | **Mean** | 468.32 |

**Table 5: Class data – Mean / Group**

|  |  |
| --- | --- |
| **Student Group** | **Mean Energy per 100g (kJ)** |
| **Microwave Popcorn** | **Multi-coloured Popcorn** | **Cheese/Bacon Balls** |
| **1** | 544.5 | 528.37 | 656.93 |
| **2** | 602.93 | 768.52 | 1217.86 |
| **3** | 652.79 | 458.61 | 831.07 |
| **4** | 651.45 | 641.22 | 775.97 |
| **5** | 523.01 | 569.66 | 709.49 |
| **6** | 633.12 | 544.2 | 468.32 |
| **7** | 623.61 | 679.05 | 614.08 |
| **8** | 625.85 | 504.9 | 669.4 |
| **Class Mean** | 607.1575 | 586.81625 | 742.89 |

**Additional comments**

* Teacher observation during the implementation of the investigation, together with the student’s own review, provides evidence of generally careful and mostly effective manipulation of apparatus, and safe and ethical procedures **(Investigation)** and mostly constructive and focused collaboration **(Application)**.
* On balance the response displays, ‘*Analysis of data and their connections with concepts, to formulate generally appropriate conclusions.’* **(Analysis and Evaluation)**.

Evidence from this investigation contributes to an overall assessment for the Investigations Folio of a student’s:

* use of appropriate nutrition terms and conventions **(Application)**
* communication of knowledge and understanding of nutrition in different contexts, using different formats **(Knowledge and Understanding)**.

Performance Standards for Stage 2 Nutrition

|  | Investigation | Analysis and Evaluation | Application | Knowledge and Understanding |
| --- | --- | --- | --- | --- |
| A | Designs logical, coherent, and detailed nutrition investigations.Critically and logically selects and consistently and appropriately acknowledges information about nutrition and issues in nutrition from a range of sources.Manipulates apparatus, equipment, and technological tools carefully and highly effectively to implement well-organised safe and ethical investigation procedures.Obtains, records, and displays findings of investigations using appropriate conventions and formats accurately and highly effectively. | Critically and systematically analyses data and their connections with concepts, to formulate logical and perceptive conclusions and make relevant predictions.Logically evaluates procedures and suggests a range of appropriate improvements. | Applies nutrition concepts and evidence from investigations to suggest solutions to complex problems and to promote good health in new and familiar contexts.Uses appropriate nutrition terms and conventions highly effectively.Demonstrates initiative in applying constructive and focused individual and collaborative work skills. | Consistently demonstrates a deep and broad knowledge and understanding of a range of nutrition concepts.Uses knowledge of nutrition perceptively and logically to understand and explain issues related to diet, lifestyle, culture, and health.Uses a variety of formats to communicate knowledge and understanding of nutrition in different contexts coherently and highly effectively. |
| B | Designs well-considered and clear nutrition investigations.Logically selects and appropriately acknowledges information about nutrition and issues in nutrition from different sources.Manipulates apparatus, equipment, and technological tools carefully and mostly effectively to implement organised safe and ethical investigation procedures.Obtains, records, and displays findings of investigations using appropriate conventions and formats mostly accurately and effectively. | Analyses data and their connections with concepts, to formulate generally appropriate conclusions and make simple predictions, with some relevance.Evaluates procedures and suggests some appropriate improvements.  | Applies nutrition concepts and evidence from investigations to suggest solutions to problems and to promote good health in new and familiar contexts.Uses appropriate nutrition terms and conventions effectively.Applies mostly constructive and focused individual and collaborative work skills. | Demonstrates some depth and breadth of knowledge and understanding of a range of nutrition concepts. Uses knowledge of nutrition logically to understand and explain issues related to diet, lifestyle, culture, and health.Uses a variety of formats to communicate knowledge and understanding of nutrition in different contexts coherently and effectively. |
| C | Designs considered and generally clear nutrition investigations.Selects with some focus, and mostly appropriately acknowledges, information about nutrition and issues in nutrition.Manipulates apparatus, equipment, and technological tools generally carefully and effectively to implement safe and ethical investigation procedures.Obtains, records, and displays findings of investigations using generally appropriate conventions and formats with some errors but generally accurately and effectively. | Analyses data and their connections with concepts, to formulate generally appropriate conclusions and make simple predictions, with some relevance.Evaluates some procedures in nutrition and suggests some improvements that are generally appropriate.  | Applies nutrition concepts and evidence from investigations to suggest some solutions to basic problems and to promote good health in new or familiar contexts.Uses generally appropriate nutrition terms and conventions with some general effectiveness. Applies generally constructive individual and collaborative work skills. | Demonstrates knowledge and understanding of a general range of nutrition concepts. Uses knowledge of nutrition with some logic to understand and explain one or more issues related to diet, lifestyle, culture, and health.Uses different formats to communicate knowledge and understanding of nutrition in different contexts with some general effectiveness. |
| D | Prepares the outline of a nutrition investigation.Selects and may partly acknowledge one or more sources of information about nutrition or an issue in nutrition.Uses apparatus, equipment, and technological tools with inconsistent care and effectiveness and attempts to implement safe and ethical investigation procedures.Obtains, records, and displays findings of investigations using conventions and formats inconsistently, with occasional accuracy and effectiveness. | Describes basic connections between some data and concepts, and attempts to formulate a conclusion and make a simple prediction that may be relevantFor some procedures, identifies improvements that may be made. | Applies some evidence to describe some basic problems and identify one or more simple solutions, or to promote good health, in familiar contexts.Attempts to use some nutrition terms and conventions that may be appropriate. Attempts individual work inconsistently, and contributes superficially to aspects of collaborative work. | Demonstrates some basic knowledge and partial understanding of nutrition concepts. Identifies and explains some nutrition information that is relevant to one or more issues related to diet, lifestyle, culture, and health.Communicates basic information about nutrition to others, using one or more formats. |
| E | Identifies a simple procedure for a nutrition investigation.Identifies a source of information about nutrition or an issue in nutrition.Attempts to use apparatus, equipment, and technological tools with limited effectiveness or attention to safe or ethical investigation procedures.Attempts to record and display some descriptive information about an investigation, with limited accuracy or effectiveness. | Attempts to connect data with concepts, formulate a conclusion, and make a prediction.Acknowledges the need for improvements in one or more procedures. | Identifies a basic problem and attempts to identify a solution or promote good health in a familiar context.Uses some nutrition terms or conventions.Shows emerging skills in individual and collaborative work. | Demonstrates some limited recognition and awareness of nutrition concepts. Shows an emerging understanding of an issue related to diet, lifestyle, culture, and health.Attempts to communicate information about nutrition. |