

Journal of Physics Special Topics

An undergraduate physics journal

P4_1 Sunday Roast the 'Easy' Way.

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December 6, 2022

Abstract

This paper investigates the difference in time it would take to cook multiple common food items from a roast meal in an 'Easy Bake' oven, opposed to a standard kitchen oven. We found that when cooking a 1.00kg chicken and 1.00kg of roast potatoes it saved the chef 31.0mins and 5.60mins, respectively. However, due to the size of an Easy Bake Oven and the practicality of this, the standard kitchen oven continues to be the 'Easy' way to cook a Sunday roast.

Introduction

The Easy Bake Oven is a children's toy, widely known for baking cookies under a light bulb. On the outside it would appear as though nothing could be cooked in this way. However, due to the power of the light bulb used in the design and the heating dynamics, a convection oven effect is created inside this toy [1], allowing the cookies to be baked much easier than expected. This paper will investigate whether the original design (using a single 100W light bulb, as after the early 2000's the 100W bulb was banned in the US) of the toy would be capable of cooking some of the familiar components of a Sunday roast and comparing cooking times with a standard oven.

Method

To calculate the necessary times, the original design of the 'Easy Bake' oven is used. This is the design where one 100W incandescent light bulb is used [2].

The total time needed to cook an item can be found from:

$$P = \frac{Q}{t}. \quad (1)$$

The value of heat transferred to be used in

Eq.(1) can then be found using the below equation:

$$Q = mc\Delta T. \quad (2)$$

Firstly, one of the items most commonly cooked for a Sunday roast is a chicken. The mass of the chicken was assumed to be 1.00kg and the specific heat capacity of a chicken was researched and found to be 3220 J/kg [3]. Using the assumption that the chicken is being cooked from room temperature of 21.0°C and heated up to 75.0°C (the temperature chicken is considered cooked [4]). The change in internal temperature was calculated to be 54.0°C. These values were then used to find the heat transferred into the chicken, from Eq.(2).

To then calculate the time taken for this amount of heat to be transferred, an assumption was made that the light bulb is 100% efficient and that none of the heat from the light bulb is transferred into any of the surrounding material or air. The values of power and heat transferred were then inputted into Eq.(1).

Considering another well known food cooked for a Sunday roast, the same calculations done for a chicken were done for roast potatoes. The

mass of potatoes was considered to be 1.00kg, with a specific heat capacity of 3430 J/kg [3]. The change in temperature used was 77.6°C, where the potatoes are heated up to a temperature of 98.6°C (the temperature a potato is cooked [5]).

Results

The value from Eq.(2) for the amount of heat needed to be transferred into the chicken was calculated to be $Q = 174\text{kJ}$. The corresponding value for the time taken to cook the chicken was then found to be 29.0mins. For roast potatoes, the value for heat transferred was calculated as $Q = 266\text{kJ}$. Thus, the time taken for the roast potatoes to be cooked was calculated to be $t = 44.4\text{mins}$.

Discussion

The results of this paper show it would take a total of 73.3mins to cook a Sunday roast in an Easy Bake Oven. This total time was calculated by combining the time taken to cook both food items, as the items need to be cooked separately due to the small size of the Easy Bake Oven. Comparatively, the time it takes to cook a chicken in a standard oven is 60mins [6], so using the Easy Bake Oven saves 31mins. Moreover, the time it takes to cook roast potatoes in a standard oven is 50mins [7]. Thus, saving 5.6mins by using the Easy Bake Oven. Overall, when looking at the cooking times of individual items, the Easy Bake Oven cooks quicker than standard ovens. However, as standard ovens are larger in size, they can cook the chicken and roast potatoes simultaneously. So, it only takes the time for the item that takes the longest to cook (60mins), compared to the Easy Bake Oven's total time of 73.3mins.

Conclusion

The times for the standard oven used were based on how long it would take to cook the food so that it would taste the best, not on the quickest time to cook each item. To continue the research done in this paper, the quickest times could be found and used in the comparisons. In

conclusion, although the Easy Bake Oven provides quicker cooking times, the standard oven is in all likelihood the 'Easy' way to cook a Sunday roast.

References

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