Описание принципа функционирования механизмов

Task 1

Прочтите и переведите текст. Обратите внимание на перевод выделенных конструкций.

Microwave oven

A microwave oven **consists of:**

a high voltage power source, commonly a simple transformer or an electronic power converter, which passes energy to the magnetron

a high voltage capacitor connected to the magnetron, transformer and via a diode to the case.

a cavity magnetron, which converts high-voltage electric energy to microwave radiation

a magnetron control circuit (usually with a microcontroller)

a waveguide (to control the direction of the microwaves)

a cooking chamber

A microwave oven **works by** passing non-ionizing microwave radiation, usually at a frequency of 2.45 gigahertz (GHz)—a wavelength of 122 millimetres (4.80 in)—through the food. Microwave radiation is between common radio and infrared frequencies. Water, fat, and other substances in the food absorb energy from the microwaves in a process called dielectric heating. Many molecules (such as those of water) are electric dipoles, meaning that they have a partial positive charge at one end and a partial negative charge at the other, and therefore rotate as they try to align themselves with the alternating electric field of the microwaves. Rotating molecules hit other molecules and put them into motion, thus dispersing energy. This energy, when dispersed as molecular vibration in solids and liquids (i.e., as both potential energy and kinetic energy of atoms), is heat.

Microwave heating is more efficient on liquid water than on frozen water, where the movement of molecules is more restricted. It is also less efficient on fats and sugars (which have a smaller molecular dipole moment) than on liquid water. Microwave heating is sometimes explained as a resonance of water molecules, but this is incorrect: such resonance only occurs in water vapor at much higher frequencies, at about 20 GHz. Moreover, large industrial/commercial microwave ovens operating at the common large industrial-oven microwave heating frequency

of 915 MHz—wavelength 328 millimetres (12.9 in)—also heat water and food perfectly well.

Sugars and triglycerides (fats and oils) absorb microwaves due to the dipole moments of their hydroxyl groups or ester groups. However, due to the lower specific heat capacity of fats and oils and their higher vaporization temperature, they often attain much higher temperatures inside microwave ovens. This can induce temperatures in oil or very fatty foods like bacon far above the boiling point of water, and high enough to induce some browning reactions, much in the matter of conventional broiling (UK: grilling) or deep fat frying. Foods high in water content and with little oil rarely exceed temperatures greater than boiling (vaporizing) water.

Microwave heating can cause localized thermal runaways in some materials with low thermal conductivity which also have dielectric constants that increase with temperature. An example is glass, which can exhibit thermal runaway in a microwave to the point of melting. Additionally, microwaves can melt certain types of rocks, producing small quantities of synthetic lava. Some ceramics can also be melted, and may even become clear upon cooling. Thermal runaway is more typical of electrically conductive liquids such as salty water.

A common misconception is that microwave ovens cook food "from the inside out", meaning from the center of the entire mass of food outwards. This idea arises from heating behavior seen if an absorbent layer of water lies beneath a less absorbent dryer layer at the surface of a food; in this case, the deposition of heat inside a food can exceed that on its surface. In most cases, however, with uniformally-structured or reasonably homogenous food item, microwaves are absorbed in the outer layers of the item in a manner somewhat similar to heat from other methods. Depending on water content, the depth of initial heat deposition may be several centimetres or more with microwave ovens, in contrast to broiling/grilling (infrared) or convection heating—methods which deposit heat thinly at the food surface. Penetration depth of microwaves is dependent on food composition and the frequency, with lower microwave frequencies (longer wavelengths) penetrating further.

Task 2

Прочтите текст. Обратите внимание на перевод выделенных конструкций

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Heating efficiency

A microwave oven **converts** only part of its electrical input into microwave energy. A typical consumer microwave oven consumes 1100 W of electricity in producing 700 W of microwave power, an efficiency of 64%. The other 400 W are dissipated as heat, mostly in the magnetron tube. Additional power is used to operate the lamps, AC power transformer, magnetron cooling fan, food turntable motor and the control circuits. Such wasted heat, along with heat from the product being microwaved, **is exhausted as** warm air through cooling vents.

High heating power delivered directly to the meal, bypassing the kitchenware, makes microwave oven the most efficient appliance for cooking or reheating small meals.

Task 3

Прочтите и переведите текст. Обратите внимание на перевод выделенных конструкций.

Control panels

Modern microwave ovens use either an analog dial-type timer or a digital control panel for operation. Control panels feature an LED, liquid crystal or vacuum fluorescent display, numeric buttons for entering the cook time, a power level selection feature and other possible functions such as a defrost setting and pre-programmed settings for different food types, such as meat, fish, poultry, vegetables, frozen vegetables, frozen entrées, and popcorn. In most ovens, the magnetron is driven by a linear transformer which can only feasibly **be switched** completely on or off. As such, the choice of power level does not affect the intensity of the microwave radiation; instead, the magnetron is turned on and off in duty cycles of several seconds at a time. Newer models have inverter power supplies which use pulse width modulation to provide effectively-continuous heating at reduced power so that foods **are heated** more evenly at a given power level and can be heated more quickly without being damaged by uneven heating.

The microwave frequencies used in microwave ovens are chosen based on regulatory and cost constraints. The first is that they should be in one of the industrial, scientific, and medical (ISM) frequency bands set aside for non-communication purposes. Three additional ISM bands exist in the microwave frequencies, but are not used for microwave cooking. Two of them **are centered** on 5.8 GHz and 24.125 GHz, but are not used for microwave cooking because of the very high cost of power generation at these frequencies. The third, centered on

433.92 MHz, is a narrow band that would require expensive equipment to generate sufficient power without creating interference outside the band, and is only available in some countries. For household purposes, 2.45 GHz has the advantage over 915 MHz in that 915 MHz is only an ISM band in the ITU Region 2 while 2.45 GHz is available worldwide.

The cooking chamber is in fact a Faraday cage, and it **prevents** the waves from coming out of the oven. The oven door usually has a window for easy viewing, but the window has a layer of conductive mesh some distance from the outer panel to maintain the shielding. Because the size of the perforations in the mesh is much less than the microwaves' wavelength, most of the microwave radiation cannot pass through the door, while visible light (with a much shorter wavelength) can.

Использование конструкций сослагательного наклонения

Языковые конструкции с *if/unless*

Условия, о которых сигнализирует сенсорное устройство, определяют команды панели управления. Мы можем связать каждое условие и последующую команду следующим образом: If the water level is low, the inlet valves are opened.

Изучите следующий пример:

Сенсор	*Условие*	*Команда панели управления*
Door	***Door open***	***Washing machine cannot start***
	Door closed	***Washing machine can start***

Мы можем связать эти условия и команды следующими способами:
If the door is open, the washing machine cannot start.
If the door is closed, the washing machine can start.
Unless the door is closed, the washing machine cannot start.

Мы можем использовать **unless,** *когда команда не может быть осуществлена или не будет реализована, если первое условие не выполнено. В последнем примере* **Unless***, означает* **If… not***. Мы можем переписать последнее предложение следующим образом:*
If the door is *not* closed, the machine cannot start.

Task 4

Дополните данные предложения, используя Unless и ваши знания в области техники.

1. Unless the ignition is switched on, a car cannot_____.
2. Unless the pilot light is on, gas central heating will not_____.
3. Unless the diverter valve is switched to central heating, the radiators will not_____.
4. Unless there is current flowing in the primary coil of a transformer, there will be no current in the _____ coil.
5. Unless there is _____in the cylinders, a petrol engine will not start.
6. He doors are _____, a lift will not operate.
7. Unless mild steel is painted, it will_____.
8. Unless electrical equipment is earthed, it may be_____.