Technical English
Unit 36
professional english
Heat and Temperature

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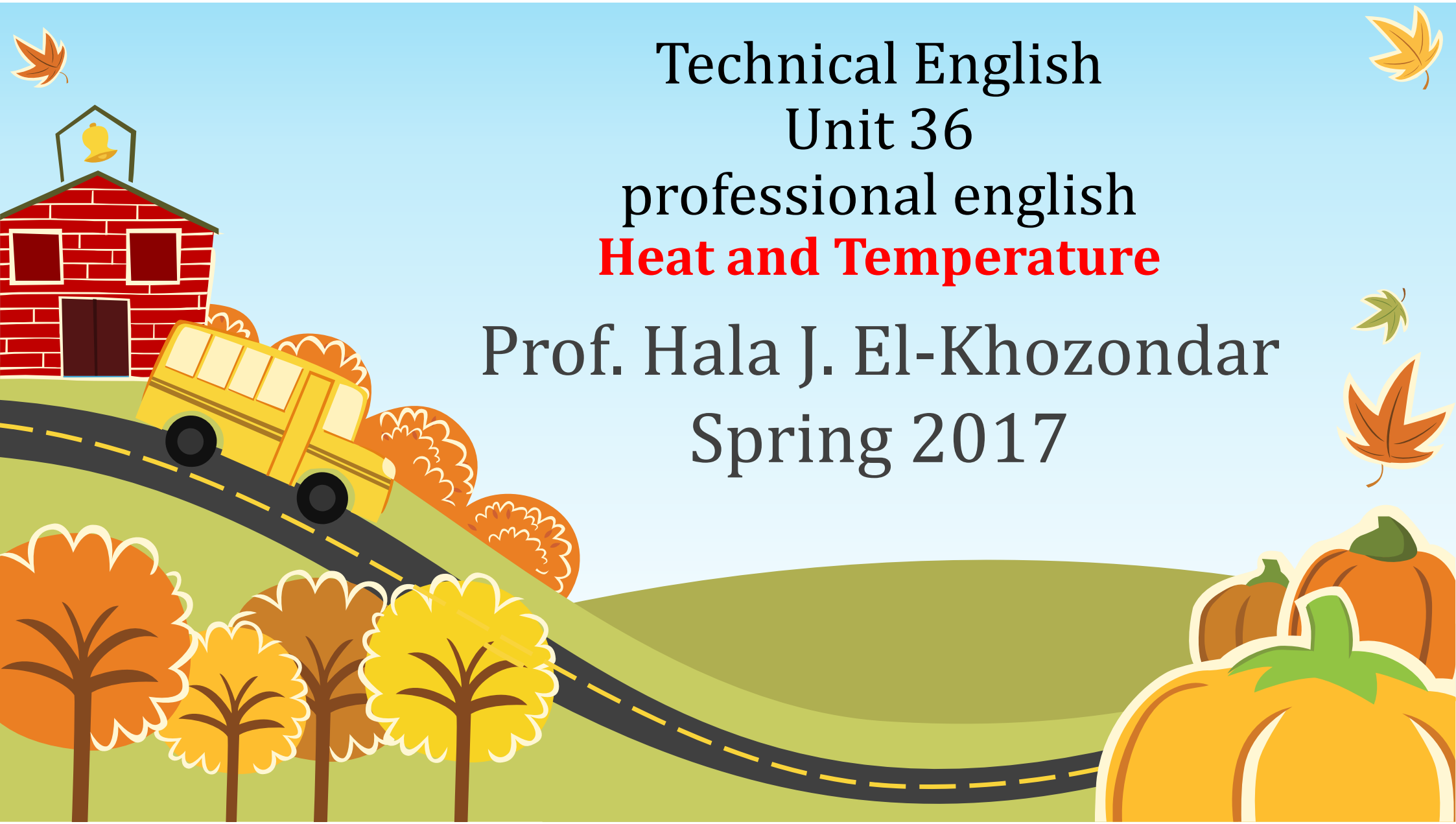


Content

A. Changes of temperature and state

B. Heat Transfer

A. Changes of temperature and state

The two extracts below are from a basic technical training course for the customer service staff of a manufacturer of heating boilers

As you know, temperature is measure in degree Celsius (°C). But heat is energy so it's measured in Joules. To calculate the amount of energy needed to raise the temperature of a substance, you need to know the mass of the substance being heated, and also the specific heat capacity – in other words, the amount of energy, in Joules, required to raise the temperature of one kilogram of the substance by one degree Celsius.

A. Changes of temperature and state

What happens when substances change state? Well, heat energy is needed to make a sold melt and become a liquid. It's also needed to turn liquid into vapour – it takes energy to make a liquid boil, so that it evaporates for vaporized and becomes a gas. That's because melting and evaporation are endothermic processes. That means they take in heat energy- they need to absorb heat from a heat source, such as a flame. And it's the opposite when a substance cools.

A. Changes of temperature and state

As a gas condense to become a liquid, or as a liquid solidifies to become a solid, the process is exothermic- heat is emitted. The amount of energy absorbed or emitted while a substance change state, in Joules per kilogram, is called latent heat. During melting it's called latent heat of fusion, and during vaporizing it's called latent heat of vaporization.

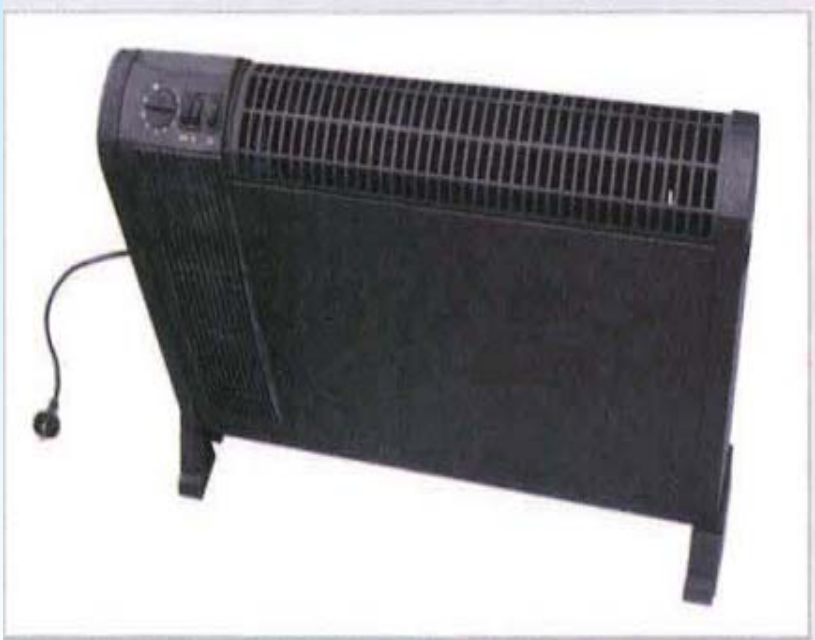
Latent: الكامنة

Note: See Appendix III on page 100 for other units of temperature, and Appendix VII on page 109 for notes on vapour and steam.

B. Heat Transfer

The textbook extract below looks at heat transfer – how heat travels

To help understand heat transfer, homes provide everyday examples. The heating systems in homes often have electric convector heaters. These heat the air and make it circulate, so that it moves in a circle-first rising, then cooling and sinking before rising again. This is called convection, where warm gas or liquid moves around and dissipates heat, transferring it to the rest of the gas or liquid.



An electric convector heater

B. Heat Transfer

Alternatively, the heating system in a home may circulate hot water through radiators. The radiators act as heat exchangers- devices that transfer heat- in this case, from the hot water inside to the cooler air outside. This happens by conduction- heat transfer through solid material. After the heat has been conducted through the metal of the radiator, the heat is dissipated by convection.

The third way that heat is transferred by radiation. This is heat that travels as electromagnetic waves. An example is the heat from the sun. So the radiators that circulate water have a misleading name, as they don’t really function by radiation.

36.1 Complete the sentences about water using words from A opposite. Sometimes there is more that one possible answer.

1 When the temperature of ice reaches 0 °C , it changes ------ . it --------- to become water.

1 state, melts

2 At 100 °C, water 2 boils/evaporates/vaporizes

3 cooled, solidifies

3 When water is -------- to 0 °C or below and ------ to become ice, it is said to freeze.

4 In gas form, water is called ------ or ----- 4 steam, water vapour

5 vapour

5 Between 100 °C and 374 °C water is a ------ because it is below its critical temperature.

6 Extremely hot water vapour is called --- 6 superheated steam

36.2 Match the two parts to make correct sentences. Look at A and B opposite, and Appendix VII on page 109 to help you.

1 A liquid pumped onto a workpiece that is being machined, to stop it overheating, is called a

2 The form of heat transfer that occurs with infrared heat – a form of electromagnetic wave is called

3 The metal fins (plates) around air-cooled engines, intended to maximize the surface area of the hot engine that is in contact with the cooler air, are designed to act as a

4 Thick, dense, internal walls inside an energy –efficient house, which are intended to absorb heat energy during the day and store some of it to be emitted at night, function as a

5 The soil and rocks on the surface of the earth remain warm at night in summer, due to the principle of

a radiation.	**c heat sink.**	**e heat exchanger.**
b coolant.	d thermal inertia.	

36.2 1b, 2a, 3e, 4c, 5d

36.3 Circle the correct words to complete the article about conducting boilers. Look at A and B opposite to help you. The first one has been done for you.

Condensing boilers are becoming increasingly popular in homes, as they use up to 40% less gas than traditional boilers. How do they work? By exploiting the fact that when a liquid condenses, due to the principle of latent heat of [1] fusion/vaporization, the process is [2]endothermic/exothermic. This means heat is [3] absorbed/emitted, and can thus be [4] circulated/conducted via the water inside the radiators in the home.

A condensing boiler burns natural gas {hydrocarbon fuel}to [5] heat/cool water, just like a conventional boiler. However, it achieves greater efficiency by recovering energy from water vapour.

36.3

2 exothermic
3 emitted
4 circulated
5 heat
6 heat
7 temperature
8 dissipated
9 convection
10 heat
11 absorbed
12 heating
13 conduction
14 condenses
15 latent

This is present in the hot, waste gas that's produced when natural gas is burned. In a traditional boiler the [6] heat/temperature energy from the gas, which is at a [7] heat/temperature of 180 °C or more, would be [8] dissipated/radiated into the atmosphere by[9] conduction/convection, and the water vapour within it would condense in the outsider air. But in a condensing boiler the hot gas passes through a [10] heat/temperature exchanger.

This allows the heat from the gas to be [11] absorbed/emitted by the cool water that's returning to the boiler after passing through the radiators in the home's [12] cooling/heating system – heat transfer takes place from hot gas to cool water by[13] conduction/radiation through the metal of the heat exchanger. In addition, when the tempreture of the gas has fallen to a certain point, the water vapour within it[14] condenses/solidifies. And it is this process that enables significant amounts of heat to be transferred, due to the principle of [15]latent/specific heat.

36.3

2 exothermic
3 emitted
4 circulated
5 heat
6 heat
7 temperature
8 dissipated
9 convection
10 heat
11 absorbed
12 heating
13 conduction
14 condenses
15 latent

I see you
got right

Any Questions