**HOW HOT IS HOT TRANSCRIPT**

Hello, I’m Zaid

I’m a chemistry teacher from Hulu Terengganu science school in Malaysia

Today we are going to learn about the concept of heat and temperature

but first, let’s watch

an amazing video taken at the

beautiful island of Langkawi Malaysia.

Let’s take a look

Welcome to MH Saujana

What’s this?

This is Gamat Oil

What is Gamat?

gamat is a species taken from the sea and being processed into oil.

It will be cooked with coconut oil and some herbs for a week.

this is the result after being cooked for a week

we finally produced the Gamat Oil

Gamat

commonly known as sea cucumber,

is a species of invertebrates which are

popular today for its nutritional

alues and unique healing properties.

It is said that the medicinal properties of gamat

were much sought-after by our

ancestor since 300 years ago

to heal various body ailments.

Gamat hails from the group of Ecchinodermates

that is a phylum rather than a family.

The are more than 2,000 species

of sea cucumber worldwide

and 49 of them are found in Malaysian waters.

The traditional ingredients that we used to produced Gamat provide the cooling effects

Are you brave enough to dip your finger in this boiling gamat oil?

Are you for real?

Why don’t you give it a try

Now,

please discuss with your friends and answer these questions:

What can you observe regarding the surface of the oil?

Why do you think the tourists are not willing

to dip their fingers in the boiling oil?

What do you think is the temperature of the boiling gamat oil?

Can you guess?

**Activity 1**

From the previous scene,

you can see vapor came out from the surface of the oil.

This has restricted the tourist

from dipping their fingers in the boiling gamat

because they may think that the oil is hot!

The tourist must have also thought

the temperature of the boiling oil

is terribly high.

Did you have the same assumption?

Some say that,

the temperature of oil is higher than water

even though same amount of heat is supplied.

Let’s see whether this is true.

Look!

Wow…

Don’t you feel hot?

Don’t you want to try?

I can’t believe it!

Don’t you think that was amazing?

But please do not simply try this at home.

This situation is ONLY experienced for gamat oil processed in Langkawi island, Malaysia.

To further understand the situation,

let us perform simple experiment

to compare the temperature of the water and oil.

You will have to follow your teacher’s instructions.

You will also need some materials for the experiment

such as, two test tubes,

the same amount (volume) of oil and water,

and a thermometer.

Have fun with the experiment!

**Activity 2**

Before we discuss the answer to our second activity,

I want you to first watch this next scene.

What do you think will happen

if hot oil from the fried banana pan

spilt on the hawker’s hand?

There is high possibility that it will injure the hawker’s hand

because boiling oil is hotter than boiling water.

Can you see the relation between the experiment

you did earlier and the scene you just watched?

It is proven that

the temperature of boiling oil is higher than boiling water.

That is why the hawker will feel more painful

after touching hot oil as compared to touching hot water.

To further understand the concept of heat and temperature,

let’s discuss this.

Do you know that water and oil have different heat capacities?

Heat capacity, or thermal capacity, is the measurable physical quantity of heat energy required to change the temperature of an object by a given amount.

For an example,

the specific heat capacity of water is

4.2 Jg -1oC-1

whereas oil is

2.0 Jg -1oC-1

This means that the same mass of water and oil

can transfer different quantities of heat

even if their temperatures change by the same amount.

Heat capacity for oil is lower than water

yet the temperature of boiling oil is higher than boiling water.

Why is this?

To answer this question,

let’s continue our next activity of measuring the temperature

of the boiling water and oil.

Again, please follow your teacher’s instructions.

In the activity,

you will have to compare the amount of energy supplied

by the boiling water and figure out

why is the temperature of oil higher than the temperature of water.

The heat capacity of oil is the ratio of the energy absorbed to the associated temperature rise.

For example, the specific heat of oil is 4.2 Jg/kgC so it takes 4.2 Jg to raise the temperature of 1 kg of oil by 1 degree C.

So the heat capacity of a kilogram of oil is 4.2 Jg/C

**Activity 3**

Did you manage to get the answer to the experiment?

let me repeat the question,

why is the temperature of oil higher than the temperature of water in the experiment

although the heat capacity for oil is lower than water?

how do we explain the situation?

Let’s watch this animation.

The same amount of heat given

will raise different temperature.

because of different heat capacity.

Heat capacity is the amount of heat

required to raise

the temperature of an object

or substance one degree.

Meaning,

different objects would warm up

at different rates because

each object has its own

specific heat capacity

Object with lower heat capacity

will cause the temperature

to raise quickly.

The increase of internal energy

will often be associated

with a corresponding increase

in the speed of the particles

which would imply

an increased kinetic energy,

thus the temperature of the body increases.

Temperature is the measurement

of the average kinetic energy

in the substance when heat

energy is absorbed or released.

The absorption of heat also depends

on types of substance

and the mass of substance.

The heat absorbed

or released by a substance that is

Q=mcθ

Q=m\*c\* (θ)

Q=heat energy

m=mass

c=specific heat

θ = change in temperature

(=final – initial temp)

Heat is different from temperature.

They are not identical ideas but they are related.

Heat is the total amount of energy

possessed by the molecules in a piece of matter.

Heat is measured in Joules.

Temperature is not energy.

It relates to the average (kinetic) energy

of every particle in the system.

It is measured in Kelvin (K)

or Celsius (C)

of Fahrenheit (F)

When heat is transferred to a substance,

the substance can sometimes experience a rise in the temperature or phase change

as a result of an increase in the averange

kinetic energy of the particles in the substance.

When we apply this concept

to everyday life such as pots and pans,

we need to understand the term

Thermal Diffusivity

A high thermal diffusivity means that a

materials conducts more heat rather than stores it.

When I say conducts heat, I mean that it transfers from the source of energy through the material

to the other side and the substance in contact with it,

say water in a pot that you want to boil.

A low thermal diffusivity means high heat capacity so that more of the energy is stored internal to the material.

For example, a metal cooking pan would have a

high thermal diffusivity when compared to the wooden handle on it.

Now, the interesting part of processed Gamat oil

as compared to normal oil is that,

it has a high specific heat capacity.

So, when it is heated, the increase in temperature is low.

if the same amount of 1kg of sunflower oil

and Gamat oil are heated

at the exact same heat

and in the same type of cooking pan

the result may indicate this

This is why you don’t feel hot dipping

your finger in boiling gamat oil.

Nevertheless, there are other ingredients

used during the boiling process

to lower the temperature such as

coconut oil and some traditional herbs.

From this lesson,

you have learned about the difference

between heat and temperature.

Substances having a small specific heat capacity

can be quickly heated up,

it also experience a big

change in temperature

even though only small amount of heat is supplied.

The same concept also applies in everyday life,

for examples:

Substances having a small specific heat capacity

are very useful as material in cooking instruments

such as frying pans, pots and kettles.

This is because,

they can be quickly heated up

even when small amount of heat is supplied.

Sensitive thermometers

also must be made from materials

with small specific heat capacity

so then it can detect

and show a change of

temperature rapidly and accurately.

Substances that have a high specific heat capacity

is suitables as a materials

for constructing kettle handles,

insulators and oven covers,

because a high amount of heat will cause

only a small change in temperature

otherwise the materials will not get hot faster.

Water as a cooling agent

acts excellent as a cooling agent in engines.

Water is also used in houses

in cold climate countries

because as it is heated up (boiled)

it tends to retain heat and warm the house

due to its high specific heat capacity

I hope you enjoy watching this video

and getting to know more about the concept

of heat and temperature.

Thank you

and have a nice day.

**Teacher’s Guide**

this lesson will take about 50 minutes.

The earlier shot of this video was taken in Langkawi, Malaysia where gamat oil is produced.

the video will be followed by an experiment

to clarify about the concept of heat and temperature.

It also shows the concept of specific heat capacity,

the affect and the amount of heat absorbed by different materials.

Student should watch the animation

showing the vibration and movement of particles

in different liquids

when the same amount of heat is applied.

Other than carrying out experiment,

teacher can also use demontration method

if the apparatus and materials are not suffucient.

I would also suggest for you to watch

blossoms video entitled

“how cold is cold”

These are the links to the video: