Welcome students I'm Placida Pereira,

assistant professor in physics

from Government, College of Arts,

science, commerce, quepem.

The title of today's unit is

radioactivity and the name of

the today's module is radioactive

carbon dating some applications of

radioactive carbon dating Anna problem

based on radioactive carbon dating.

Said the outline of the module,

we have the radioactive carbon

dating and a few of its applications.

At the end of today's module,

a student will be able to solve problem

based on radioactive carbon dating.

So let's begin by starting

with radioactive carbon dating.

What is carbon dating?

Carbon dating is a method used to

find the origin or age of any object.

In addition to the naturally

occurring radioactive elements,

there is a trace of carbon

14 in the atmosphere.

Carbon 14 is a radioactive

isotope of carbon 12.

So next we go to how is this

carbon 14 formed in the atmosphere?

Carbon 14 is formed by the

continuous bombardment of nitrogen

14 by cosmic ray neutrons.

The reaction is given as follows.

We have neutrons bombarding the nitrogen 14,

giving us carbon 14.

That is the radioactive isotope of carbon 12.

This radioactive carbon is converted

into carbon dioxide and is taken up

by plants during photosynthesis.

This animals are then consumed.

These plans are then consumed by animals.

Animals return a part of it to the

atmosphere during respiration.

All carbon present in living matter contains

a constant equilibrium concentration

of the carbon 14 isotope that is,

or the radioactive carbon.

This amount is determined by the

rate of formation from decay of

carbon 14 back to nitrogen 14.

On the death of organic matter,

this intake of carbon dioxide stops

and the equilibrium quantity of carbon

14 decays gradually by beta emission.

By measuring the proportion

of carbon 14 in dead matter,

its life can be calculated.

That is, the life from which

the carbon 14 sample was taken,

whether it's a tree or an animal.

For any other living being

that no longer ceases to exist.

The half life of carbon 14

is about 5760 years.

So this is the time that which half of

the carbon 14 sample reduces to half

of its initial number that was present.

Next we go to the applications

of radioactive carbon detail.

The carbon dating method is used for

age measurements of archaeological

and geological specimens.

This includes objects such as seeds,

textiles,

wood and charcoal from ancient Egyptian

tools, from cave dwellings and wood.

Anne also merged from the Glacial

Age and many other examples.

When an animal or plant dies,

its intake of carbon 14 stops and

from that moment the key of carbon 14

is the only process that continues.

Coal and petroleum are organic in nature,

but they are so old that no trace

of carbon 14 is found in them.

This has been established by experiments.

In animal or tree, the activity of carbon

14 is the same as atmospheric carbon,

which is about 15 disintegrations

per gram per minute.

By measuring the carbon 14 activity

of a fossil or a dead tree,

it is possible to estimate its age.

Next, let's solve a problem based on

radioactive carbon dating a piece

of wood from the ruins of an ancient

dwelling was found to have a carbon

14 activity of 13 disintegrations per

minute per gram off its carbon content.

The carbon 14 activity of living bull is

about 16 disintegrations per minute per gram,

so we need to know how long ago did

the tree die from which the sample.

Of Carbon 14 was taken.

Now here we try to solve this by.

Let's denote the activity of a

certain mass of carbon from a tree

that was recently arrived alive,

as are not activity of the same mass of

carbon from the sample to be dated as art.

Therefore,

we can write the equation that is our,

that is the activity at some instant

of time is equal to are not are

not as the activity at the initial

or the beginning of time times

exponential minus Lambda T.

Thus we get an equation.

R is equal to are not exponential

minus Lambda T.

Let's call this equation.

Now we rearrange the equation a.

We get exponential Lambda T

is equal to R, not by our.

We are not as the activity at

some initial time and R is the

activity at some instant of time T.

Now taking the natural log on both

the sides of the above equation,

we can write the equation is Lambda,

T is equal to natural log Ro n by R.

Therefore, rearranging the

whole equation we get T.

That is, the time is equal to 1 by Lambda,

Natural log Ro by

R

Lambda is the decay constant or

disintegration constant . Ro

Is the activity at the initial time and R

is the activity at some instant of time T.

Let's call this equation 1.

Now, in order to calculate the time we

need the values of Lambda

That is from equation one.

We already have the values of Ro by R,

but we do not have the value

of Lambda or the decay,

constant or the disintegration constant

Now we know that are not as given is 16

disintegrations per minute per gram NR,

that is the activity at some

instant of time T is given to be

13 disintegrations per minute per.

So in order to calculate the time,

we need the value of Lambda.

Lambda is in the disintegration

constant or the decay constant.

Now we've already established a relation

for the half-life, the half-life,

which is denoted by T half,

is equal to 0.693 divided by Lambda.

That is the decay constant,

other desintegration constant.

Now we rearrange this equation therefore.

The half for carbon 14 is equal

to 5760 years.

Thus,

the disintegration constant for carbon 14 is.

That is,

rearranging the equation for half life

we get Lambda is equal to 0.693 / T half,

which is equal to 0.693.

We have already stated that the half

life of carbon 14 is equal to 5760 years.

So we substitute the value of half

life in the equation for Lambda.

So we get 0.693. Divided by 5760 years.

Now substituting the value of

Lambda which is equal to 0.693

/ 5760 years in the equation,

one that was the equation for time.

We knew that the ac for

time was one by Lambda natural log

Ro by R which is can be

substituted is for Lambda and natural log of 16 by 13.

After calculating.

The time,

the value for time was obtained to be

1.7 * 10 to the power three years.

These are the references.

Thank you.