CNS Part 1

0:00:00.030,0:00:05.279
hello welcome to chapter 12 the central nervous system this is lecture 19 part 1

0:00:05.279,0:00:10.400
the central nervous system we're going to cover in five separate videos and

0:00:10.400,0:00:15.509
corresponding PowerPoint slides this one is just going to be an overview of the

0:00:15.509,0:00:20.369
central nervous system so let's get started when we talk about the central

0:00:20.369,0:00:25.590
nervous system as you see here we're talking about the brain and the spinal

0:00:25.590,0:00:30.390
cord these are the two components of the central nervous system and of course we

0:00:30.390,0:00:35.579
abbreviate that CNS and as we talked about in the introduction to the nervous

0:00:35.579,0:00:39.660
system we also have the peripheral nervous system which is here and we're

0:00:39.660,0:00:43.829
going to talk about that in a separate lecture that will be lecture 20 so we're

0:00:43.829,0:00:49.140
going to cover the brain first and this very first video and lecture is going to

0:00:49.140,0:00:54.809
be on the general characteristics of the nervous system and then the later videos

0:00:54.809,0:00:59.129
we'll go into the specifics of the brain and then later on we will get to the

0:00:59.129,0:01:05.250
spinal cord so let's begin with a brief overview about the embryology of the

0:01:05.250,0:01:10.170
brain this is important so you
understand where different structures in

0:01:10.170,0:01:14.189
the brain come from and as you can see
here this all starts with what's called

0:01:14.189,0:01:20.040
a neural tube this is a very important
structure in embryology this is the very

0:01:20.040,0:01:24.240
beginnings of the nervous system as you
see here and it really is just a tube

0:01:24.240,0:01:28.110
and you can see that throughout
development throughout the embryos

0:01:28.110,0:01:33.150
development what happens is there are
some swellings in this neural tube that

0:01:33.150,0:01:37.350
eventually develop into these embryonic
structure one called the Prosencephalon

0:01:37.350,0:01:41.729
the other is the mesencephalon mes-
meaning middle and the other is called

0:01:41.729,0:01:46.799
the rhombencephalon which is the
hindbrain and then as we progress on you

0:01:46.799,0:01:50.369
can see that these swellings get a
little bit more specific and they

0:01:50.369,0:01:54.659
further differentiate and develop into
specific structures that we are going to

0:01:54.659,0:01:59.640
deal with here in these lectures so
you'll notice the telencephalon which

0:01:59.640,0:02:03.899
comes from part of it anyway comes from
the prosencephalon will develop into

0:02:03.899,0:02:06.930
the cerebrum and the cerebral

hemispheres

0:02:06.930,0:02:12.090
and we're going to talk about those
first the diencephalon which is very

0:02:12.090,0:02:15.330
important this is
portion way down in the brain and you'll

0:02:15.330,0:02:19.380
see that the diencephalon consists of
these structures here would certainly

0:02:19.380,0:02:23.910
are very important and then the mid
portion of the brain we call the brain

0:02:23.910,0:02:28.800
stem when the brain stem actually
consists of three separate portions it

0:02:28.800,0:02:33.510
consists of the midbrain consists of the
pons and the medulla and we're going to

0:02:33.510,0:02:37.350
talk about each of these in turn a
little bit later and then finally once

0:02:37.350,0:02:42.270
we progress through the foramen magnum
of the skull the brainstem actually

0:02:42.270,0:02:47.280
becomes the spinal cord so the dividing
line for that is after the medulla

0:02:47.280,0:02:51.450
passes through the foramen magnum
you'll also notice this last column here

0:02:51.450,0:02:56.130
and these are things that are called
ventricles these are large spaces that

0:02:56.130,0:03:02.850
are in the brain also in the spinal cord
these aqueducts canals ventricles what

0:03:02.850,0:03:06.360
they contain is cerebrospinal fluid
we're gonna talk about cerebrospinal

0:03:06.360,0:03:11.250
fluid in the next lecture and discuss
its importance and why we need the

0:03:11.250,0:03:15.660
cerebrospinal fluid there so looking
down the bottom diagram here you can see

0:03:15.660,0:03:20.489
we have cerebral hemispheres and if you
remember hemisphere means half of a

0:03:20.489,0:03:24.690
sphere so there actually are two
different cerebral hemispheres there's a

0:03:24.690,0:03:28.590
left and the right and we'll talk about
how they're connected a little later on

0:03:28.590,0:03:35.220
as I mentioned up here the diencephalon
which we saw here is down here and this

0:03:35.220,0:03:39.060
is a very important region of the brain
we have some very important controlling

0:03:39.060,0:03:42.630
structures here one of which is called
the thalamus the other called the

0:03:42.630,0:03:47.040
hypothalamus these are very important in
control of body systems and in

0:03:47.040,0:03:51.660
maintaining homeostasis going a little
further down you can see the cerebellum

0:03:51.660,0:03:56.970
which in the table here is marked here
and you can see the cerebellum here it's

0:03:56.970,0:04:01.950
a piece of tissue under the cerebral
hemispheres as you could see here and it

0:04:01.950,0:04:06.810
really is responsible for a lot of
automatic movement of muscles we're

0:04:06.810,0:04:10.500
gonna come back that a little later and

then finally the brainstem that we

0:04:10.500,0:04:15.540
mentioned up here this consists of these
three sections the midbrain the pons and

0:04:15.540,0:04:20.310
the medulla and of course once we pass
through once again the foramen magnum of

0:04:20.310,0:04:25.560
the skull this then becomes the spinal
cord down here so we're going to talk

0:04:25.560,0:04:29.500
about each of these structures in turn
in the next lecture we're actually going

0:04:29.500,0:04:33.280
to start with the cerebral hemispheres
talk about their functions what they do

0:04:33.280,0:04:38.470
how they do it and we're going to talk
in general terms about how the neural

0:04:38.470,0:04:42.310
impulses that come into the brain are
coordinated and have the neural impulses

0:04:42.310,0:04:46.660
we want to send out of the brain or
coordinate it as well so that will be in

0:04:46.660,0:04:51.220
the next video what I want to discuss
here though is a little bit more about

0:04:51.220,0:04:56.260
the anatomy of the brain now many of you
have already seen this in lab talking

0:04:56.260,0:04:59.620
about what we said just a second ago
remember we talked about cerebral

0:04:59.620,0:05:04.780
hemispheres and you notice that we have
a left cerebral hemisphere and a right

0:05:04.780,0:05:10.750
cerebral hemisphere this is the anterior
that we have over here and of course the

0:05:10.750,0:05:14.590
posterior is back here in the back and
you'll notice that we have several

0:05:14.590,0:05:19.660
different lobes or frontal lobe we have
a parietal lobe occipital lobe and we

0:05:19.660,0:05:23.110
have a couple of others that you can't
see except from the side one of these is

0:05:23.110,0:05:27.850
called the temporal lobe we also have
one that's beneath the temporal lobe

0:05:27.850,0:05:30.729
that's called the insula which we're
really not going to spend much time

0:05:30.729,0:05:34.690
on we're gonna focus mainly on the
frontal lobe parietal lobe occipital

0:05:34.690,0:05:40.000
lobe and the temporal lobes you notice
that we have a division that separates

0:05:40.000,0:05:43.710
the two cerebral hemispheres this
division is something that's known as a

0:05:43.710,0:05:48.820
longitudinal fissure and if we were to
pry apart the two cerebral hemispheres

0:05:48.820,0:05:52.990
here and take a look down under we would
actually see a strip a wide band of

0:05:52.990,0:05:56.530
nervous tissue that connects both
cerebral hemispheres and that's called

0:05:56.530,0:06:01.599
the corpus callosum we're going to talk
about that a little later on you'll also

0:06:01.599,0:06:04.990
notice a couple of other terms that are
important for you to understand first of

0:06:04.990,0:06:10.330
all the term gyri that you see here is a

plural term the singular for this is

0:06:10.330,0:06:16.419
gyrus with a -us and the gyrus is simply
one of these bumps that you see here on

0:06:16.419,0:06:21.550
the cerebrum so you'll see of these
individual little bumps so these are

0:06:21.550,0:06:27.250
projections outward and the space
between the gyri is known as the sulcus

0:06:27.250,0:06:34.930
and so here we have one of the sulci so
the plural of sulcus is sulci and you'll

0:06:34.930,0:06:39.190
notice that we have a lateral sulcus we
have a central sulcus here

0:06:39.190,0:06:41.230
which is going to become very important
later

0:06:41.230,0:06:46.750
but in general a sulcus is the space
between the gyri and then as we

0:06:46.750,0:06:51.160
mentioned a little while ago you see the
cerebellum which is this very highly

0:06:51.160,0:06:56.140
folded tissue that's beneath the
cerebrum so that's right here and as I

0:06:56.140,0:07:00.880
mentioned this is going to be important
in automatic control of muscle movements

0:07:00.880,0:07:05.380
and coordination we're gonna talk about
that a little later in here you see the

0:07:05.380,0:07:09.730
portion of the brain that includes the
thalamus and hypothalamus and then down

0:07:09.730,0:07:13.930
here of course you see that this is the
brainstem until we get through the

0:07:13.930,0:07:19.390
foramen magnum and then it becomes the
spinal cord as we said before now at the

0:07:19.390,0:07:23.290
bottom of this slide you'll notice that
an average male brain weighs about 1,600

0:07:23.290,0:07:28.270
grams or one point six kilograms average
female brain about fourteen hundred and

0:07:28.270,0:07:32.680
fifty grams or one point four five
kilograms this has absolutely nothing to

0:07:32.680,0:07:36.910
do with intelligence rather it has to do
with average body size the bigger the

0:07:36.910,0:07:40.690
body usually the bigger the brain
although that's not always true there's

0:07:40.690,0:07:45.160
always exceptions but this is the
average size that we have in the human

0:07:45.160,0:07:51.070
brain we're going to talk just about the
general functions of the brain and how

0:07:51.070,0:07:55.630
we divide them up so you'll notice that
all of these that we have on the left

0:07:55.630,0:08:01.690
are all functions that work in the brain
so it regulates visceral activity that

0:08:01.690,0:08:06.370
is it regulates oragon activities
coordinates muscle movements interpret

0:08:06.370,0:08:10.960
sensations which is basically the
arrival of a nerve impulse in the brain

0:08:10.960,0:08:15.490
and it determines perception now the
difference between these two is that a

0:08:15.490,0:08:20.770
perception is basically our

interpretation of a sensation in other

0:08:20.770,0:08:24.580
words it's how we make sense of the
nerve impulses that are arising in the

0:08:24.580,0:08:28.810
brain and of course store memory which
we hope is one of the most advanced

0:08:28.810,0:08:32.919
functions in our anatomy and physiology
student brains right carries out

0:08:32.919,0:08:38.470
reasoning makes decisions determines
personality all of these things

0:08:38.470,0:08:43.780
basically many of these are advanced
functions evolutionarily anyway of the

0:08:43.780,0:08:50.260
brain many of these functions that we
see down here are lower level from

0:08:50.260,0:08:55.030
evolutionary standpoint functions of the
brain so let's divide up these activities

0:08:55.030,0:08:59.350
just a little bit you can see that
once again the major parts of the brain

0:08:59.350,0:09:03.300
that will review the diencephalon which
includes the thalamus and hypothalamus

0:09:03.300,0:09:06.670
once again these are regions that are
very important in maintaining

0:09:06.670,0:09:11.560
homeostasis control of body functions
the brainstem as we said before which is

0:09:11.560,0:09:15.400
the midbrain it's important that you
note that this is also referred to as

0:09:15.400,0:09:20.980
the mesencephalon mess means middle
and -cephalon refers to the brain so the

0:09:20.980,0:09:25.060
midbrain the pons we're gonna look at
this later and the medulla oblongata

0:09:25.060,0:09:30.070
that terminates at the foramen magnum
and then becomes the spinal cord the

0:09:30.070,0:09:33.520
cerebellum which is the highly folded
piece of tissue beneath the cerebral

0:09:33.520,0:09:37.240
hemispheres we're gonna come back and
talk about this as well and then of

0:09:37.240,0:09:41.110
course we have the cerebrum which as we
said is divided into two hemispheres the

0:09:41.110,0:09:46.120
left hemisphere and the right divided by
the longitudinal fissure and down below

0:09:46.120,0:09:50.890
they're connected by the corpus callosum
as I mentioned before now the way we can

0:09:50.890,0:09:55.480
divide these things up if you notice
here all of these are older functions

0:09:55.480,0:10:01.410
evolutionarily so these are kind of
sometimes called the reptilian brain and

0:10:01.410,0:10:07.810
this just means basically that this is
common to all higher vertebrates and

0:10:07.810,0:10:14.020
animals and these are things that we
don't have to consciously control on the

0:10:14.020,0:10:17.950
other hand you'll notice that all of
these functions here are really

0:10:17.950,0:10:23.020
functions of what we call the neocortex
and this is the new cortex

0:10:23.020,0:10:28.590
evolutionarily and basically what this

is is the newer portion of the brain

0:10:28.590,0:10:32.530
typically we're referring to the higher
portions of the brain that are located

0:10:32.530,0:10:36.940
in the cerebrum okay and if you notice
the way we divide these up you'll see

0:10:36.940,0:10:40.840
that all of these functions here that a
part of the reptilian brain are carried

0:10:40.840,0:10:45.820
out by all of these things here so these
don't require any conscious control on

0:10:45.820,0:10:50.050
our part however all of these functions
would be carried out by the more

0:10:50.050,0:10:54.460
advanced cerebrum the two cerebral
hemispheres so this once again is called

0:10:54.460,0:10:59.230
the neocortex for that reason okay so
that finishes up our very brief

0:10:59.230,0:11:03.430
introduction and overview of the brain
we're going to come back in the next

0:11:03.430,0:11:07.000
lecture and we're going to explore how
the different regions of the brain work

0:11:07.000,0:11:09.410
together and then we'll go on and
examine the

0:11:09.410,0:11:15.310
functions of some individual parts of
the brain I'll see you then