

2008 ANATOMY (B)

Training Handout

by Karen L. Lancour

This event encompasses the anatomy of the Nervous and **Circulatory** systems in health and disease.

- The competition will consist of timed stations.
- Each station will include questions relating to the following areas: the nervous system and the digestive system, nutrition, and diseases of the nervous and digestive systems.
- Topics include coping with disorders and how others can assist the people around them.
- Process skills may include observations, inferences, predictions, calculations, data analysis, and conclusions.

The following are suggested topics for state or regional levels. All topics will be used at the national level.

NERVOUS SYSTEM

All Levels:

- The Brain- major regions of the brain and their functions
- Sense Organs – regions of the sense organs and their functions
- Disorders: Epilepsy, seizures, Alzheimer's Disease, Multiple Sclerosis and Parkinson's Disease, shingles (herpes zoster), cerebral palsy, glaucoma, pink eye (conjunctivitis),
- Effects of alcohol, caffeine, nicotine, and marijuana on the nervous system

National Level Only:

- Central Nervous System- organization of the spinal cord
- Neural Impulses- Cellular anatomy and types of neurons
- Neural circuitry connecting the eye to the brain, tracing light detection from eye to brain
- Treatment and prevention of described diseases and drugs \

CIRCULATORY SYSTEM

All Levels:

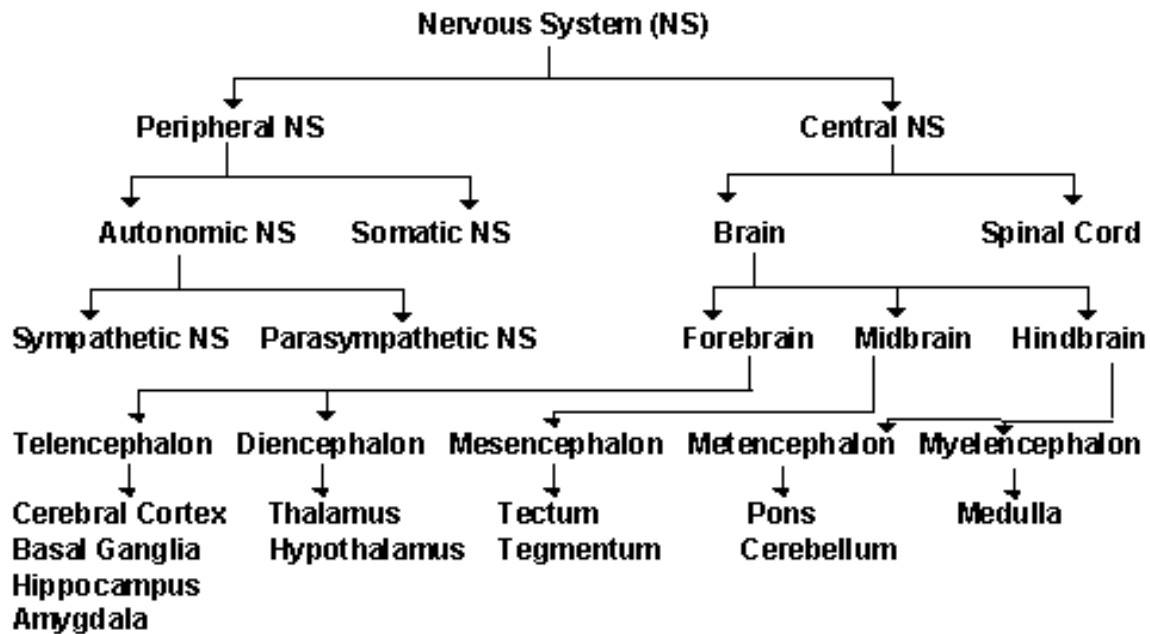
- The Heart- chambers and valves of the heart
- Blood Vessels – arteries, arterioles, veins, venules, capillaries
- Flow of blood through the heart and body
- Measurement of the pulse rate and blood pressure
- Relevant calculations include systolic and diastolic pressure, mean arterial pressure, stroke volume and cardiac output
- Disorders:, Arterial Sclerosis, high blood pressure, high cholesterol
- Effects of alcohol, caffeine, nicotine and marijuana on the circulatory system

National Level Only:

- The Heart – interpreting ECG(EKG) readings
- Blood components and their functions
- Disorders: Iron-Deficient Anemia, Sickle-Cell Anemia. Hemophilia, Erythroblastosis Fetalis
- Treatment and prevention of described diseases and drugs

Nervous System

Nervous System



Regions of the Brain

Cerebellum – muscle coordination, muscle tone & balance

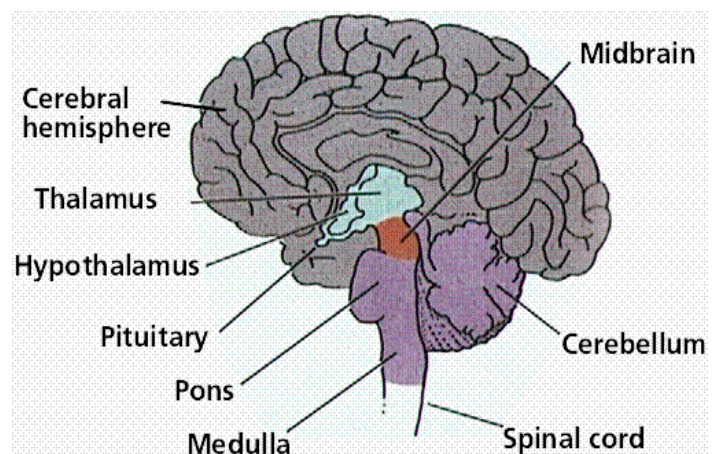
Cerebrum – conscious activity

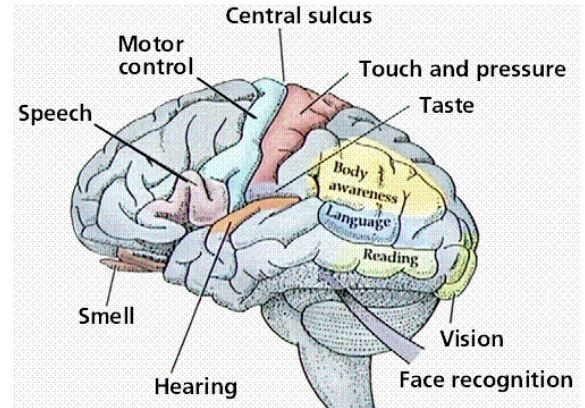
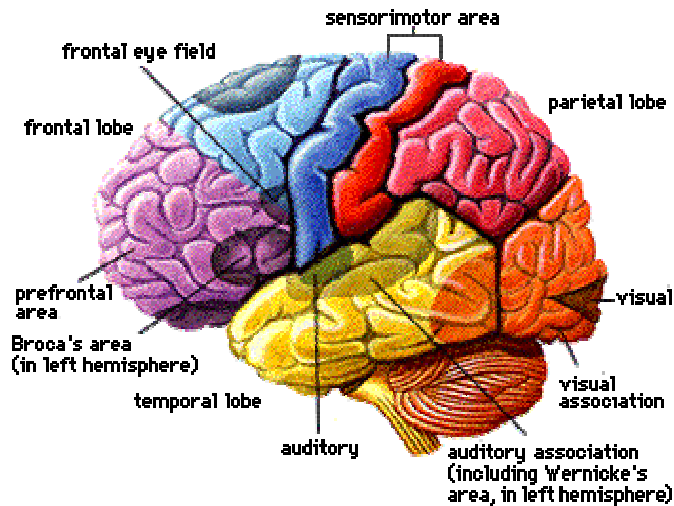
Thalamus – Brain's switchboard

Medulla – vital reflexes as heart beat and respiration

brainstem – medulla, pons, and midbrain (involuntary responses)

Hypothalamus – hormones





Lobes of the Cerebrum

Frontal – motor area, emotions

Parietal – sensory area

Temporal – hearing, taste, smell, some memory

Occipital – visual center

Sense Organs

Eye

Cornea - the clear, dome-shaped tissue covering the front of the eye.

Iris - the colored part of the eye - it controls the amount of light that enters the eye by changing the size of the pupil

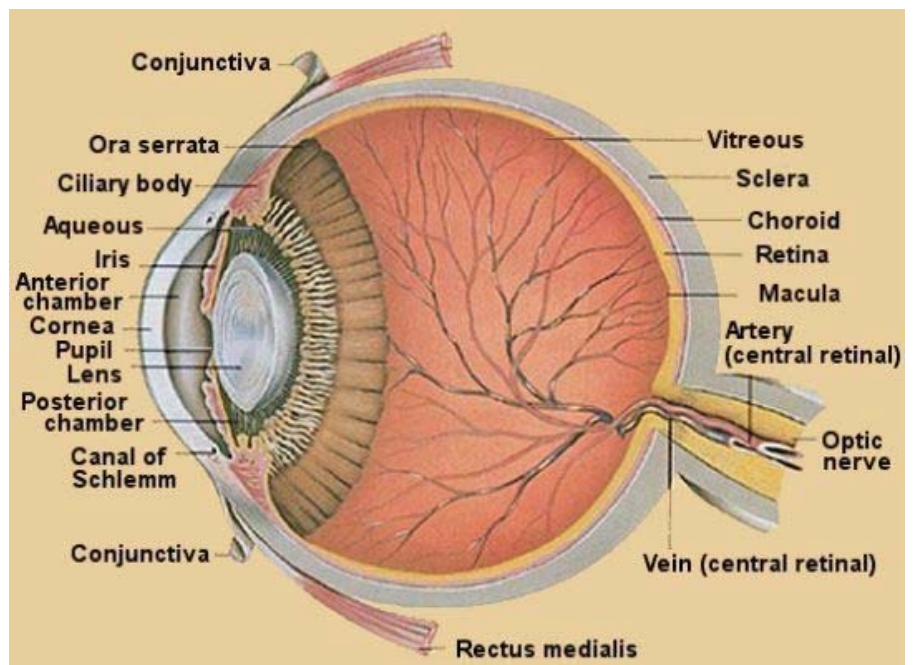
Lens - a crystalline structure located just behind the iris - it focuses light onto the retina

Optic nerve - the nerve that transmits electrical impulses from the retina to the brain

Pupil - the opening in the center of the iris- it changes size as the amount of light changes (the more light, the smaller the hole)

Retina - sensory tissue that lines the back of the eye. It contains millions of photoreceptors (rods and cones) that convert light rays into electrical impulses that are relayed to the brain via the optic nerve

Vitreous - a thick, transparent liquid that fills the center of the eye - it is mostly water and gives the eye its form and shape (also called the vitreous humor)



EAR

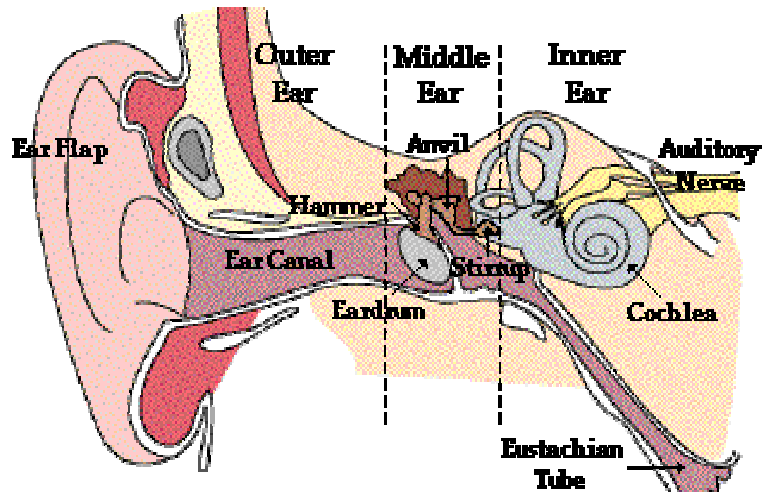
Outer Ear & ear canal – brings sound into eardrum

Eardrum – vibrates to amplify sound & separates inner and middle ear

Ossicles = anvil, stirrup, stapes – amplify sound (small bones)

Eustachian tube – connects middle ear to throat and equalizes pressure on eardrum

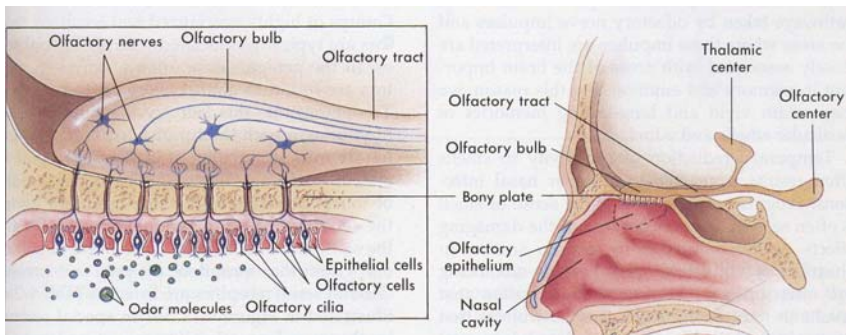
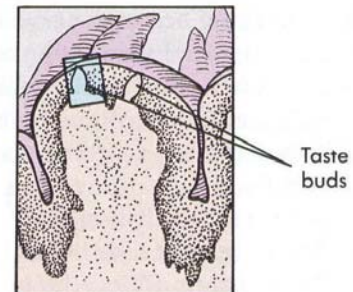
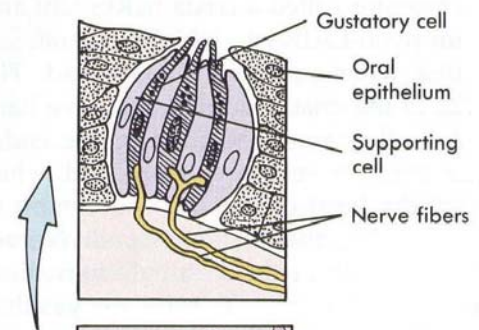
Cochlea – in inner ear – has receptors for sound & sends signals to brain via Auditory Nerve.



Taste and Smell – Chemical Receptors

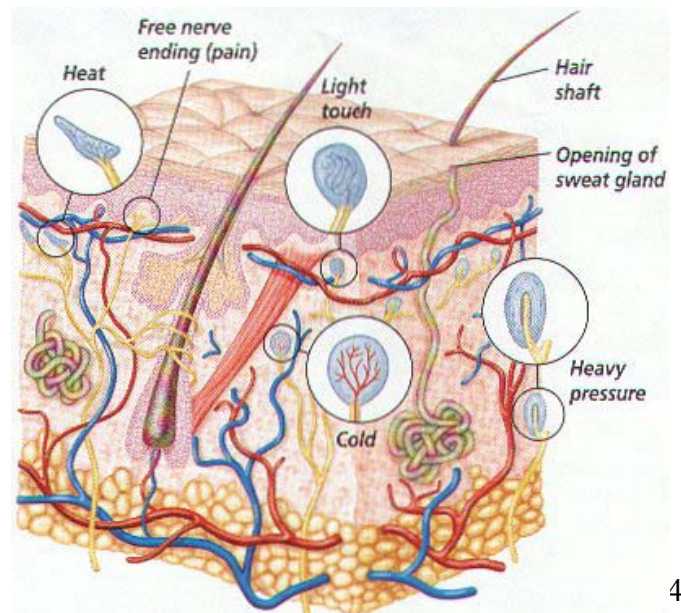
Taste – Sweet, Sour, Bitter, Salty, MSG

Smell Receptors - top of nasal cavity, very sensitive, and easily fatigued so you do not notice smells



Skin receptors:

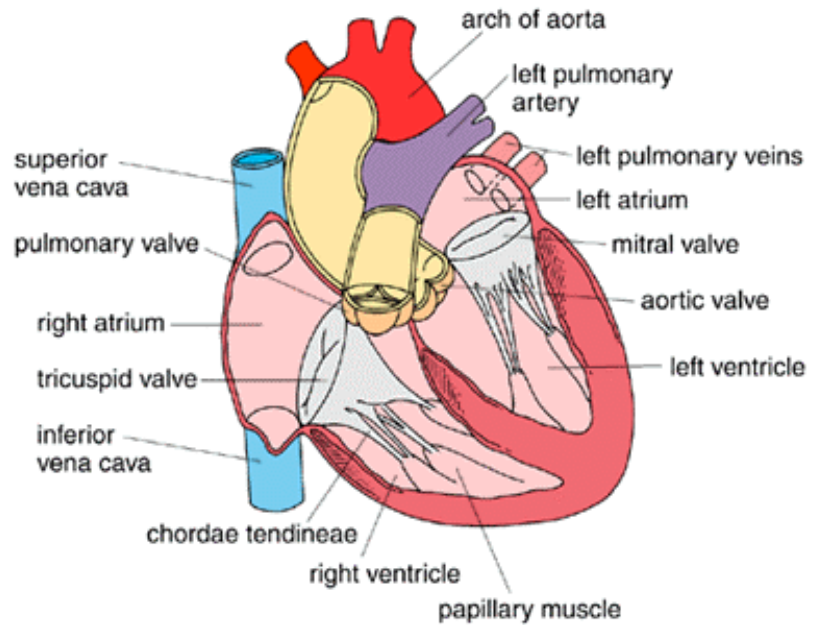
- Heat
- Cold
- Light Touch
- Heavy Pressure



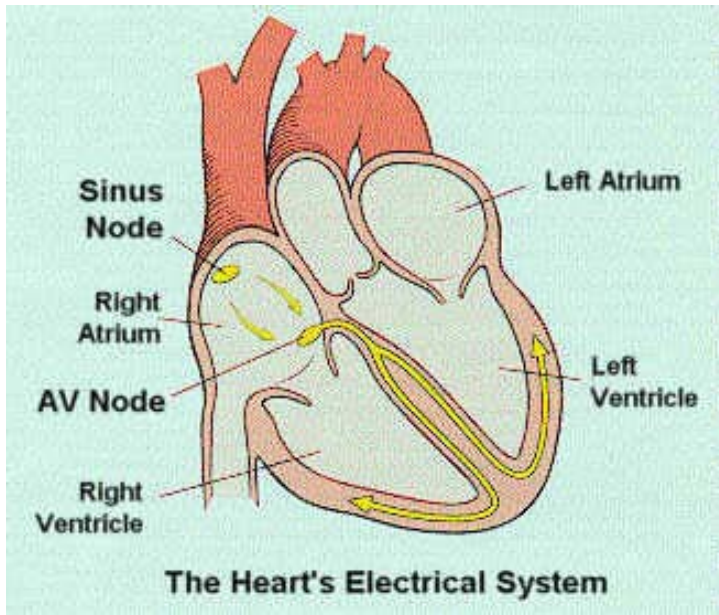
Circulatory System

Know:

Flow of blood through system
Electrical system of the heart
Control of heart and activities
Blood flow, blood pressure
Blood vessels and their differences



Electrical System of the Heart



[Electrocardiogram \(ECG or EKG\)](#) = record of spread of electrical activity through the heart

P wave = caused by atrial depolarization (contraction)

QRS complex = caused by ventricular depolarization (contraction) and atrial relaxation

T wave = caused by ventricular repolarization (relaxation)

ECG = useful in diagnosing abnormal heart rates, arrhythmias, & damage of heart muscle

Relevant Formulas

Stroke volume (SV) = milliliters of blood pumped per beat

Heart rate (HR) = number of beats per minute

Cardiac output (CO) = heart rate times stroke volume

$$CO = HR \times SV$$

Pulse pressure (PP) = the difference between systolic pressure (SP) and diastolic pressure (DP)

$$PP = SP - DP$$

Mean Arterial Pressure (MAP) (2 equations):

Formula 1: $MAP = \text{diastolic pressure} + 1/3 \text{ pulse pressure}$

Formula 2: $MAP = 2/3 \text{ diastolic pressure} + 1/3 \text{ systolic pressure}$

Blood Vessels

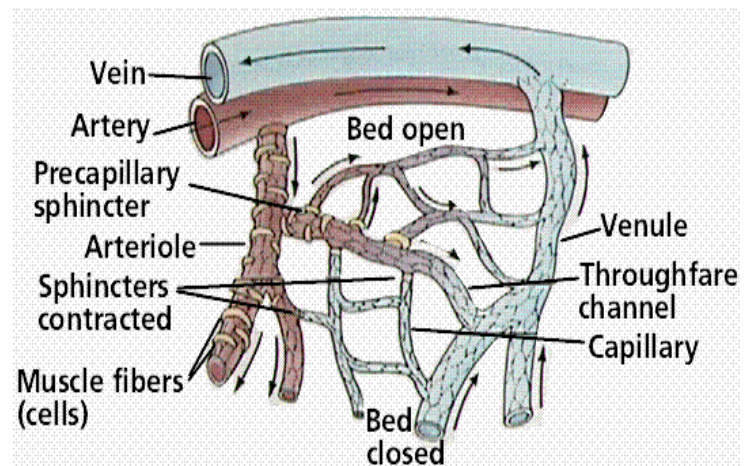
Arteries – largest vessels – carry blood from the heart.

Arterioles- smaller version of arteries, carry blood to the capillaries

Capillaries – smallest vessels, one cell thick, transfer materials to and from blood

Venules – small version of veins, carry blood from capillaries to veins

Veins – carry blood back to heart, have valves to stop backflow



Blood – Functions

- Transportation:
 - oxygen & carbon dioxide
 - nutrients
 - waste products (metabolic wastes, excessive water, & ions)
- Regulation - hormones & heat (to regulate body temperature)
- Protection - clotting mechanism protects against blood loss & leucocytes provide immunity against

Diseases, their symptoms, treatment and prevention

Epilepsy, seizures, Alzheimer's Disease, Multiple Sclerosis and Parkinson's Disease, shingles (herpes zoster), cerebral palsy, glaucoma, pink eye (conjunctivitis), Arterial Sclerosis, high blood pressure, high cholesterol

Effects, symptoms, and treatment of
alcohol, caffeine, nicotine, and marijuana