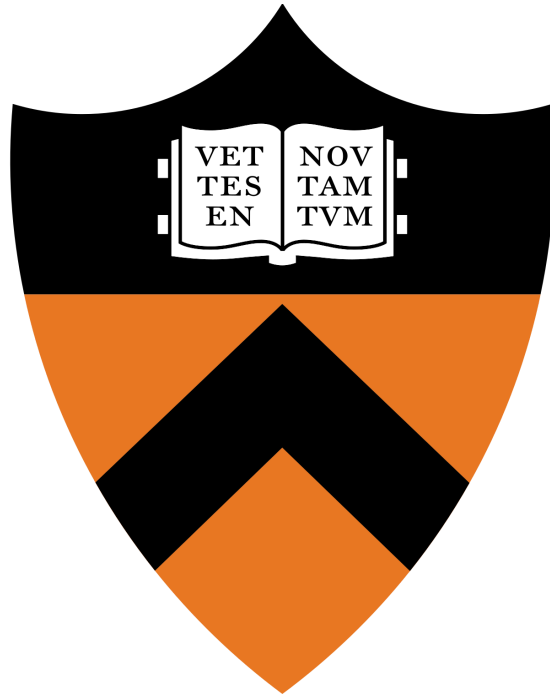


Princeton High School



Anatomy and Physiology Captains Tryouts 2018-2019

Score: ____ / 142

Excretory System

Which of the following substances is the standard to measure the glomerular filtration rate? (3 pts)

- A. NaCl
- B. Inulin
- C. Creatine
- D. Renin

Charlie has been more tired, hungry, and thirsty than usual. His doctor decides to test his urine for the renal clearance of glucose but forgets how to do basic math! Charlie's urine flow is 1 ml/min, the plasma concentration of glucose is 1.6 mg/ml, and the urine concentration of glucose is 240 mg/ml. Calculate the renal clearance of glucose and try to diagnose his condition. (4 pts)

Describe the sequence of the RAS hormone cascade and the mechanisms by which it regulates blood pressure. (8 pts)

Brian has a serious kidney condition: his proximal convoluted tubule has lost all function! Describe what would happen to Brian's blood pH and blood volume. (6 pts)

Match the following diseases with their symptoms: (1 pt each)

Incontinence

a) Sudden onset pain, severe and intermittent pain

Calculus

b) Swelling in limbs, decreased urine volume, drowsiness

Renal Failure

c) Loss of bladder control

Urinary Tract Infection

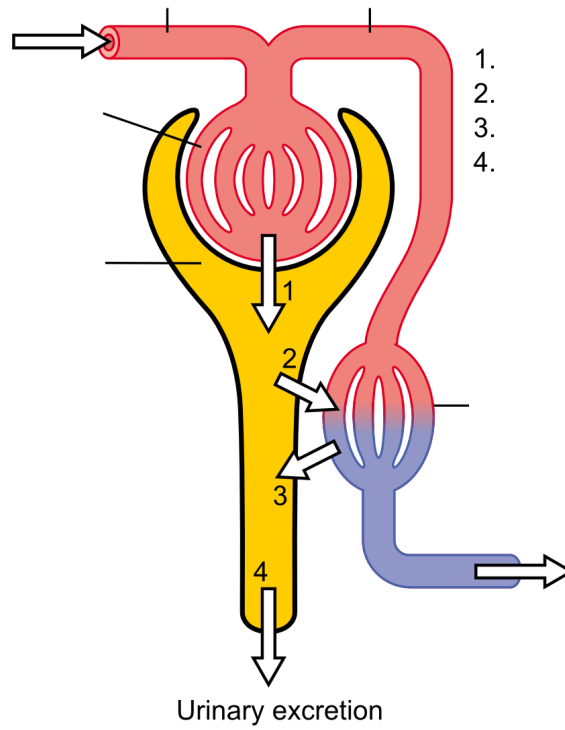
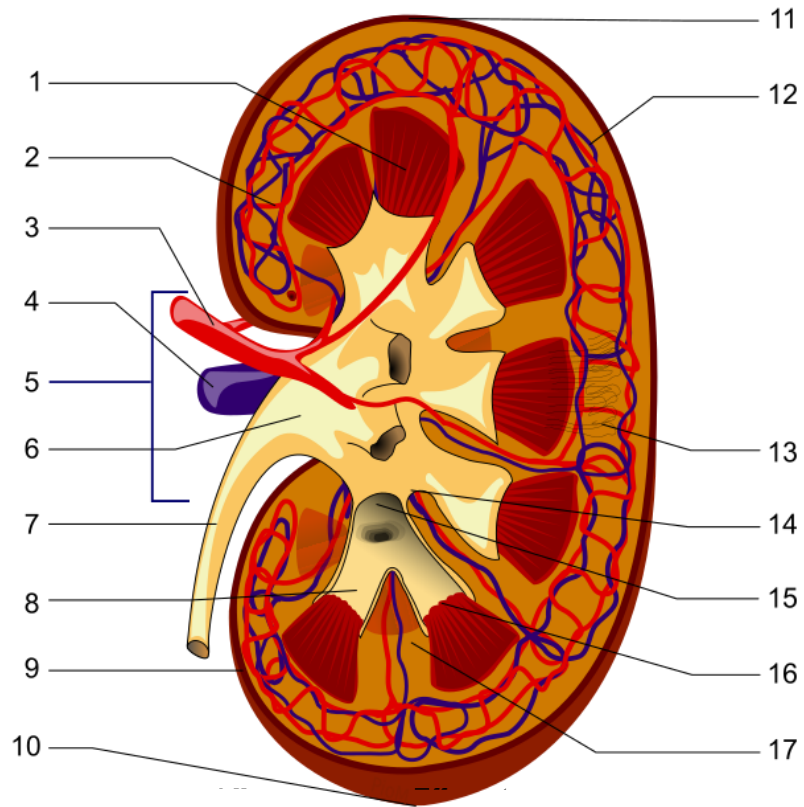
d) Hematuria, foamy urine, hypertension

Glomerulonephritis

e) Strong persistent urge to urinate, strong smelling urine

Choose two diseases from above and describe how to treat each of them. (6 pts)

Label the diagram: (0.5 pts each)



Lymphatic System

What is the difference between primary, secondary, and tertiary lymphatic tissues? Give examples for each. (6 pts)

What two structural modifications allow lymph vessels to be so permeable? (4 pts)

Describe the role of the spleen as a lymphatic organ in immune function. (5 pts)

Describe the function of the thymus. (4 pts)

What are the two main lymph ducts? What area does each drain? (4 pts)

Describe the role of the lymphatic system in fat absorption. (3 pts)

Which of the following lymphoid tissues are found in the walls of the intestines? (2 pts)

- A. Palatine tonsils
- B. Adenoid tonsils
- C. Peyer's patches
- D. Vermiform appendix

What term collectively describes all of those tissues above? (2 pts)

Match the following diseases with their symptoms. (1 pt each)

Lymphedema

a) Painless swelling of lymph nodes in neck, armpits and groin, persistent fatigue, Reed-Steinberg cells detected in biopsy

Hodgkin's lymphoma

b) Enlarged spleen, swelling of lymph nodes in neck

Lymphadenopathy

c) Painless swelling of lymph nodes in neck, armpits and groin, persistent fatigue, no Reed-Steinberg cells detected in biopsy

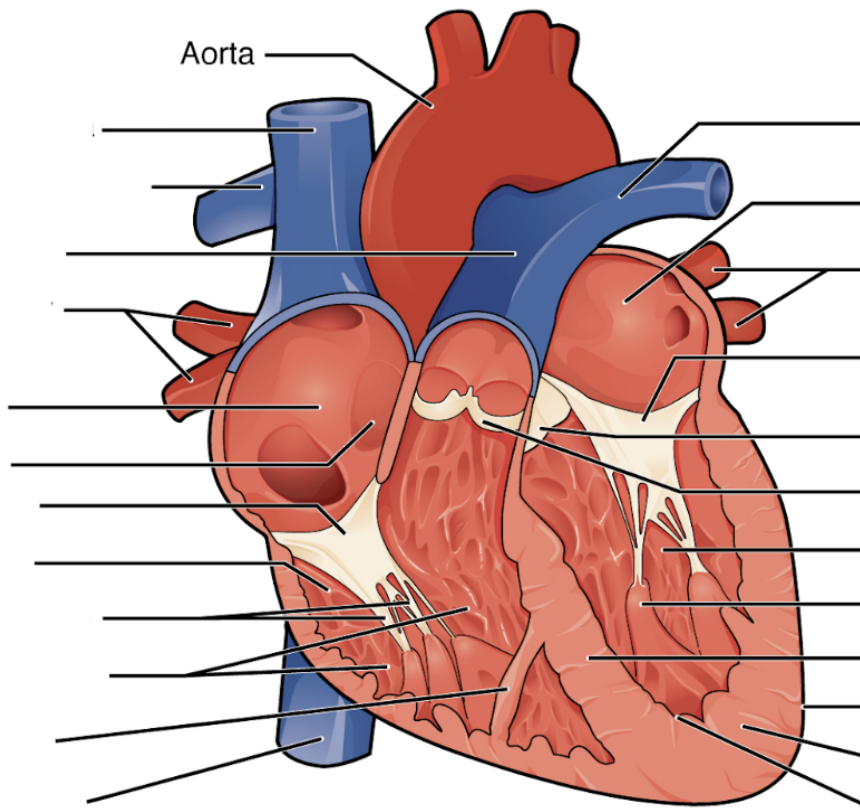
non-Hodgkin lymphoma

d) Swelling in arms and legs, restricted range of motion, fibrosis

Choose two diseases from above and describe how to treat each of them. (6 pts)

Cardiovascular System

Label the diagram: (0.5 pts each)



Daniel is a member of Princeton High School's Live Action Role Playing Club. As a putrid orc, he regularly gets into physical combat with other members. John, a blade shaman, has just stabbed Daniel in the back of his thigh. List and describe the 3 general steps which Daniel's body will take to stem the flow of blood. (7 pts)

Match the disease to the symptom: (1 pt each)

Congestive Heart Failure

a) Blood clots, angina, can lead to stroke or heart attack

Atrial Fibrillation

b) Pressure or tightness in chest, pain in the jaw or back that lasts for a few minutes and goes away

Myocardial Infarction

c) Long QT interval, palpitations, can lead to sudden cardiac death

Atherosclerosis

d) Fluttering in chest, skipped beats, extra beats

Premature Ventricular Contractions

e) Very rapid weight gain, dyspnea, persistent cough

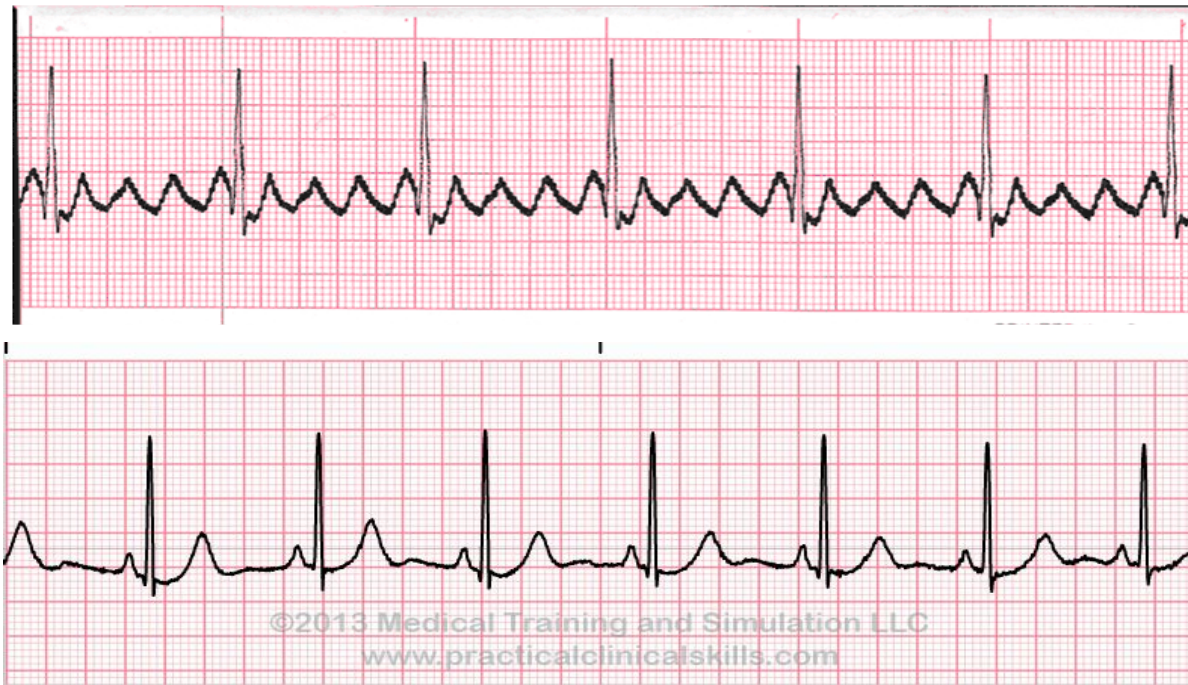
Torsades

f) Irregular and rapid heart rate, heart palpitations, weakness

Choose three diseases from above and describe how to treat each of them. (9 pts)

Saumya is at her physical check-up. The doctor uses an instrument to calculate her blood pressure. The reading is 110/72. Answer the following questions:

- What is the name of the method and instrument used to measure Saumya's blood pressure? (2 pts)
- What is her systolic blood pressure? What is her diastolic blood pressure? (1 pt)
- Calculate her mean arterial pressure. (2 pts)



Label either EKG as normal or abnormal. What disease does the abnormal EKG suggest? Label the different waves of the normal sinus rhythm. (6 pts)

Describe how, physiologically, pacemaker cells generate automatic action potentials. (6 pts)

Calculate the net filtration pressure given the capillary hydrostatic pressure is 20 mmHg, the capillary osmotic pressure is 1 mmHg, the interstitial hydrostatic pressure is 5 mmHg, and the interstitial osmotic pressure is 10 mmHg. (6 pts)