INSTRUCTIONS

This examination is composed of one calculation question, multiple choice and short answer questions. The allotted time is 180 minutes. Write your name on both the question booklet and the answer sheet. The answers are to be written on the answer sheet preferably in pencil, since it is easier to change your answer. For each multiple choice question there is only one correct response, so write only one letter as an answer. At the end of the test, the answer sheet should be stapled to the question booklet and they both must be handed in.
### NORMAL LABORATORY VALUES

<table>
<thead>
<tr>
<th>Test</th>
<th>Normal Range</th>
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</thead>
<tbody>
<tr>
<td>Blood, Serum or Plasma</td>
<td></td>
</tr>
<tr>
<td>blood glucose</td>
<td>67-109 mg/dl</td>
</tr>
<tr>
<td>Scr</td>
<td>&lt;1.5 mg/dl</td>
</tr>
<tr>
<td>BUN</td>
<td>&lt;20 mg/dl</td>
</tr>
<tr>
<td>BUN/Scr ratio</td>
<td>10-15</td>
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<tr>
<td>Osmolality</td>
<td>280-290 mOsm/kg</td>
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<tr>
<td>Na⁺</td>
<td>135-145 mEq/L</td>
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<tr>
<td>K⁺</td>
<td>3.5-5 mEq/L</td>
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<tr>
<td>H⁺</td>
<td>38-43 nEq/L</td>
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<tr>
<td>pH (arterial)</td>
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<tr>
<td>Cl⁻</td>
<td>95-105 mEq/L</td>
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<tr>
<td>HCO₃⁻</td>
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<tr>
<td>pCO₂ (arterial)</td>
<td>37-43 mHg</td>
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<tr>
<td>Albumin</td>
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<tr>
<td>Anion gap</td>
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<tr>
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<td>Daily Urinary Excretion</td>
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<tr>
<td>Creatinine</td>
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<tr>
<td>GFR or Ccr</td>
<td>80-150 ml/min (115-216 L/day)</td>
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<tr>
<td>Protein</td>
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<tr>
<td>Water (average)</td>
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<tr>
<td>(1.5L)</td>
<td></td>
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<tr>
<td>Na⁺ (average)</td>
<td>150 mEq/day</td>
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<td>K⁺ (average)</td>
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<td>H⁺ (average)</td>
<td>60-120 nEq/day</td>
</tr>
<tr>
<td>Osmoles (average)</td>
<td>600 mOsm/day</td>
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An 85-year-old woman weighing 98 lbs. has a Scr of 4 mg/dl and a 24-hour urine with 288 mg/dl creatinine and a volume of 2 L. (Answer on separate answer key)

1. The GFR in ml/min is \( \frac{288}{4} = \frac{24 \times 10^3}{48} = 120 \text{ml/min} \)

2. The patient probably has:
   A. Normal renal function
   B. Increased renal function
   C. Muscular overproduction of creatinine
   D. An overcollection of urine
   E. An accurately collected 24-hour urine

3. A 45-year old male patient with essential hypertension is placed on a low sodium diet by his physician. The most likely mechanism by which the diet reduces the patient's blood pressure is:
   A. Direct effect on baroreceptors
   B. Effects Na⁺-K⁺ membrane transport
   C. Changes ADH release threshold by the hypothalamus
   D. Increases insulin sensitivity

4. A 56-year old female patient with obesity, hypertension and diabetes mellitus is advised by her physician to lose weight. The most plausible mechanism by which this dietary change reduces the patient's risk of a stroke and lowers blood pressure is:
   A. Decreases nitrous oxide induced endothelial relaxation
   B. Effects kallikreins and eicosanoid production
   C. Increases insulin sensitivity
   D. Improves glycemic control leading to increased renal blood flow

5. A 24-year old female patient with hypertension is recommended to start a DASH-sodium diet by her physician. The most plausible mechanism by which the dietary change will lower this patient's blood pressure is:
   A. Suppresses the renin angiotensin system and the sympathetic nervous system
   B. Promotes nitrous oxide induced endothelial relaxation via a direct effect of phytochemicals
   C. Acts as a direct vasodilator via isoflavones found in fruits and vegetables
   D. Induces weight loss and free water diuresis and therefore decreases plasma volume
6. A lean 23-year old male patient with elevated blood pressure is recommended by his physician to start a therapeutic lifestyle change in order to prevent hypertension. Which of the following lifestyle changes is recommended based upon the best evidence?

A. Start a physical activity program
B. Start a stress management program
C. Avoid drinking more than 2 alcoholic drinks per day.
D. Take potassium and calcium supplements.

7. A 55-year old male patient presents with a blood pressure of 130/85. A repeat blood pressure four months later is 135/80. What can be said about this patient?

A. He has optimal blood pressure
B. He has pre-hypertension
C. He has stage I hypertension
D. He has stage II hypertension

8. A 62-year-old male presents with mild renal insufficiency, peripheral edema and 3 grams of proteinuria. What would you expect his lipid profile to show?

A. Normal cholesterol, LDL cholesterol, VLDL cholesterol and HDL cholesterol
B. Elevated Triglycerides and Apo CIII but normal LDL and HDL cholesterol
C. Elevated LDL cholesterol, Triglycerides and low HDL cholesterol
D. Low cholesterol, triglycerides and HDL cholesterol

9. A 54-year-old female presents with diabetes and moderate renal insufficiency. Which of the following would you expect?

A. Elevated plasma homocysteine levels
B. Low levels of glycine
C. Low levels of serum phosphate
D. Decreased levels of growth hormone

10. A 55 year old female patient presents with declining renal status with a GFR=25 ml/hr. You would recommend what dietary change:

A. Increase protein intake of 1-2 g/kg per day to prevent protein-energy malnutrition.
B. Restrict high protein foods and milk products to lower phosphates.
C. Recommend milk of magnesia to help with gastric emptying.
D. Use branch chain amino acids to avoid build up of uremic toxins.
11. A healthy 25 year old medical student takes a hike in the mountains on a hot day and does not bring enough drinking water with him. He becomes ill and has repeated episodes of vomiting, and at the end of his hike he goes to a clinic, where he is noted to have a blood pressure of 90/50, and to have dry mucous membranes and dry skin. Labs show: Na+ 149 mEq/L, K+ 3.2 mEq/L, HCO3- 29 mEq/L, Cl- 110 mEq/L, BUN 27 mg/dL, Cr 1.5 mg/dL. Which of the following is most likely to be true?

A. His total body sodium content is increased
B. His total body water content has not changed
C. His total body potassium content has not changed
D. His ADH level is very high
E. At the renal tubular level, there will be increased water reabsorption in the ascending limb of the loop of Henle

THE FOLLOWING TWO QUESTIONS RELATE TO THIS CASE
A 50 year old woman is admitted to the hospital with a six day history of nausea, vomiting, and diarrhea. On exam, her blood pressure is 84/60, she has dry mucous membranes and decreased skin turgor, her lungs are clear, and there is no peripheral edema. Labs show: Na+ 121 mEq/L, K+ 3.3 mEq/L, Cl- 92 mEq/L, HCO3- 21 mEq/L, and BUN is 19 mg/dL and Cr is 1.3 mg/dL. An arterial pH is 7.30. The pCO2 is 35 mmHg. The urine specific gravity is 1.030, with a urinary osmolarity of 1000 mOsm/L.

12. Why is the serum sodium abnormal?

A. Sodium has shifted intracellularly,
B. There has been excess sodium loss from her skin
C. She has a profound osmotic diuresis causing urinary sodium loss
D. There is excess medullary collecting duct reabsorption of water
E. There is a shift of sodium from the extracellular to the intracellular space

13. Why is the serum bicarbonate abnormal?

A. There is excess bicarbonate loss from the lower gastrointestinal tract
B. There is excess hydrochloric acid loss from the upper gastrointestinal tract
C. There is an increase in aldosterone effect on the cortical collecting duct
D. The abnormal bicarbonate is a compensation for acute respiratory alkalosis
E. There is excess bicarbonate loss in the urine
14. A 5-year-old boy is admitted to the hospital with a headache and a stiff neck and is presumed to have viral meningitis. He is treated empirically with antibiotics and analgesics (pain medications). On the day after admission, his blood pressure is 112/60, his temperature is 101°F, skin turgor and mucous membranes are normal, his lungs are clear, and his abdomen is soft. He is lethargic and irritable and his neck is stiff. Labs show: Na+ 115 mEq/L, K+ 4.0 mEq/L, Cl- 80 mEq/L, HCO3- 25 mEq/L, BUN 4 mg/dL, and Cr 0.1 mg/dL. Urine sodium is 67 mEq/L. Why is the serum sodium abnormal?

A. He must have been drinking large quantities of water
B. There is a decreased renal tubular reabsorption of sodium.
C. There is inappropriate ADH secretion.
D. There must be a very low concentration of antidiuretic hormone
E. There is an increased glomerular filtration rate causing increased sodium filtration

15. A 17-year-old high school student comes to see you because she is not feeling well. Her parents report that she has been trying to diet to lose weight. Her past medical history and the family history is negative, and you find no abnormalities on an initial physical examination. Lab tests show: Na+ 128 mEq/L, K+ 3.7 mEq/L, Cl- 97 mEq/L, HCO3- 24 mEq/L, BUN 9 mg/dL, and Cr 0.8 mg/dL. The urine specific gravity is 1.002 and the urine osmolality is 59 mOsm/kg. What is the most likely explanation for her hyponatremia?

A. Surreptitious use of diuretics
B. An early central nervous system malignancy
C. Ingestion of an extremely low sodium diet
D. Ingestion of very large volumes of water
E. Nephrogenic diabetes insipidus

16. A patient is brought to your emergency room after a cardiorespiratory arrest. He cannot give a history and no details about his medical history are available. An initial blood gas shows a pH of 6.90, a PCO2 of 100, and a HCO3- of 28 mEq/L. Intentional overdosage of which of the following agents is most consistent with his clinical presentation?

A. methanol
B. diuretics
C. sleeping pills
D. salicylate
E. ethylene glycol
17. A 28-year-old woman comes to see you in your clinic, and you review her bloodwork. The Na+ is 135 mEq/L, the K+ is 4.5 mEq/L, the Cl- is 100 mEq/L, and the HCO3- is 15 mEq/L. The arterial blood gas is 7.26 and the pCO2 is 30 mmHg. Which of the following diagnoses is most likely?

A. asthma  
B. distal renal tubular acidosis  
C. an aldosterone producing adenoma  
D. pregnancy  
E. chronic kidney failure

18. A 70 year old man is admitted to the hospital with worsening congestive heart failure. He has been taking progressively increasing doses of diuretics as an outpatient. On exam, the blood pressure is 110/80. He has jugular venous distension, rales, and an S3 gallop. He has 1+ lower extremity edema. His labs show a Na+ of 127 mEq/L, K+ 3.2 mEq/L, Cl- 88 mEq/L, HCO3- 35 mEq/L, BUN 25 mg/dL, and Cr 1.6 mg/dL. The arterial pH is 7.47 and the pCO2 is 45 mmHg. Which of the following processes is occurring at the renal tubular level?

A. increased proximal tubular reabsorption of chloride  
B. decreased medullary collecting duct reabsorption of water  
C. increased reabsorption of water in the ascending thick limb of the loop of Henle  
D. decreased cortical collecting duct reabsorption of potassium  
E. increased secretion of sodium in the distal convoluted tubule

19. Indicate which of the following diuretics has the ability to inhibit sodium reuptake by the greatest amount in the kidneys:

A. Spironolactone  
B. Furosemide  
C. Acetazolamide  
D. Mannitol  
E. Metolazone

THE FOLLOWING FIVE QUESTIONS RELATE TO THIS CASE
A 37-year-old woman developed insulin dependent diabetes mellitus at the age of 8 years old. Ten years ago, it was noted that she had trace proteinuria, and five years ago, a 24 hour protein excretion was 5 grams/day; it increased to 9 grams/day three years ago, and at that time the serum creatinine increased to 1.7 mg/dL. She returns to see you. She is not feeling well; she has nausea, has been vomiting, and she has been itching. Her family says she has been depressed, lethargic, and sleeping during the day. On exam, her blood pressure is 178/110, she is pale, she has a pericardial friction rub, and there are multiple areas of excoriation of her skin where she has been itching. Labs show a Na+ 128 mEq/L, K+ 5.7 mEq/L, Cl- 99 mEq/L, HCO3- 12 mEq/L, BUN of 102 mg/dL and creatinine of 11.3 mg/dL. The glucose is 78 mg/dL and the Hgb is 8.6 g/dL.
20. What is the most likely explanation for her elevated blood pressure?

A. psychological stress related to her illness
B. decreased glomerular filtration of sodium
C. toxic effect of hyperkalemia on cardiac cells
D. shifts of fluids due to the high BUN and creatinine levels
E. a direct effect of hyperglycemia on the blood vessels

21. What other laboratory abnormality would be expected?

A. low serum phosphorus
B. low serum calcium
C. low parathyroid hormone level
D. high hemoglobin level
E. high serum albumin

22. Which other symptoms would be expected?

A. diarrhea
B. involuntary muscle twitching
C. increased hair growth
D. jaundice
E. absence of urine output

A renal biopsy would probably show the following picture on PAS stain. (Use separate answer key)

23. The pathological term for this condition is _________ (in 2, 3, or 4 words) (3pts)

24. In this case of diabetes mellitus and hypertension, the renal arterioles would probably show _________ (2 words preferred) (3pts)
THE FOLLOWING TWO QUESTIONS RELATE TO THIS CASE.

A 40 year old African American man has been diagnosed with diabetes mellitus and is on dietary therapy; he comes to see you for a follow up visit. He is mildly obese, his blood pressure is 138/82, and the rest of the exam is normal. He has a normal electrocardiogram and urine analysis and the BUN is 11 mg/dL with a creatinine of 1.0 mg/dL.

25. Which of the following statements is correct?

A. His blood pressure is at an acceptable level of control  
B. Compared to someone with a blood pressure of 120/80, this patient is at a higher risk for the development of kidney failure  
C. The plasma renin activity is likely to be abnormal  
D. A low salt, low calorie diet will not effectively decrease his blood pressure  
E. He should have serum and urinary catecholamines measured

26. If he were to be started on a blood pressure medication, which of the following anti-hypertensive drugs would be most effective for inhibiting aldosterone secretion:

A. Enalapril  
B. Prazosin  
C. a-Methyldopa  
D. Nitroprusside  
E. Atenolol

27. A 21-year-old man suffers a seizure after intravenous cocaine use. On physical examination, he is a drowsy man with a temperature of 39 C, pulse of 110/minute, and a blood pressure of 175/100 mmHg. There are multiple venipuncture sites on the left forearm. There is a cardiac murmur. There is no hepatosplenomegaly. There is diffuse tenderness to palpation over his buttocks, back, and posterior aspects of his legs. Labs show BUN of 25 mg/dL, creatinine of 3.8 mg/dL, K+ of 4.9 mEq/L, creatinine phosphokinase (CPK) of 10350 IU/L. The urine analysis shows pH 5, specific gravity 1.012, trace proteinuria, and 4+ hematuria. Urine microscopy shows: no erythrocytes, 1-3 leukocytes, and many brown pigmented casts. The urine analysis is most consistent with which of the following diagnoses?

A. prerenal azotemia  
B. chronic glomerulonephritis  
C. HIV nephropathy  
D. rhabdomyolysis  
E. acute interstitial nephritis
28. Which of the following casts found upon microscopic examination of the urinary sediment are suggestive of acute tubular necrosis?

A. red blood cell casts
B. white blood cell casts
C. muddy granular casts
D. hyaline casts
E. waxy casts

29. The renal handling of which substance below consists solely of glomerular filtration and proximal tubular reabsorption?

A. Water
B. Small proteins (<45,000 Daltons)
C. Hippuric acid
D. Creatinine
E. Potassium

30. The normal homeostatic response to ingestion of highly salted food involves decrease in

A. Atrial filling
B. Proximal tubular reabsorption of Na
C. Baroreceptor stimulation
D. Glomerular filtration rate
E. Water Ingestion

31. Under conditions of limited water intake the minimum volume of urine needed to excrete the body's daily urinary solute is 500ml. Which one of the following statements is true?

A. Total obligatory oral water intake is, therefore, 500 cc/day.
B. A low Na diet would permit daily solute excretion in less than 500ml urine.
C. A maximum urinary dilution of 50 mosm/L is required to excrete daily solute in 500 ml urine.
D. Significant water reabsorption in the ascending loop of Henle is required to excrete daily solute in 500ml urine.
E. Reduced glomerular filtration of water is required to excrete daily solute in 500ml urine.
32. A 25-year-old woman has dizziness on standing. No fluid losses have been noted (no vomiting, diarrhea or polyuria). Blood pressure is 110/70 mm Hg lying and 80/40 mm Hg standing. Urine shows color yellow, S.G. 1.020, pH 5.5, glucose and protein negative, sediment negative, sodium 38 mEq/L. Serum electrolytes show Na 135, K 5.1, Cl 105 and HCO₃ 20 mEq/L. This patient's problem is most likely:

A. cardiogenic shock
B. diuretic abuse
C. diabetes mellitus
D. laxative abuse
E. primary adrenal insufficiency

33. A renal biopsy with focal proliferative glomerulonephritis and prominent IgA mesangial deposits would be typically seen in a patient with:

A. multiple episodes of gross hematuria
B. multiple episodes of edema
C. pulmonary hemorrhage and nephritis
D. a family history of auditory, ocular and renal abnormalities
E. anti-mesangial antibodies

34. In patients with acute poststreptococcal glomerulonephritis, it would be unusual to have:

A. severe hypertension
B. heart failure from volume overload
C. anuria
D. a streptococcal pharyngitis 1 day previously
E. hypocomplementemia

35. Renal failure primarily due to acute tubular necrosis occurs in the following settings:

A. Septic shock with renal failure
B. ACE inhibitor use in a volume depleted state.
C. Focal and segmental glomerulosclerosis
D. Subacute bacterial endocarditis
E. Nephrotoxic reaction to methicillin
36. Which one of the following statements is true regarding Starling forces that act within a normal glomerulus?

A. The hydrostatic pressure (PGC) and the colloid oncotic pressure (TGC) within the glomerular capillaries act synergistically (i.e., in the same direction) to increase plasma filtration through the capillary wall
B. The colloid oncotic pressure (TGC) along the glomerular capillary is constant
C. Elevations in afferent arteriolar resistance results in reduction of hydrostatic pressure within the glomerular capillary (PGC) and consequently reduces GFR
D. Mesangial cells play a role in the regulation of GFR by way of effects on the colloid oncotic pressure within the glomerular capillary (TGC).
E. Filtration occurs throughout the length of the glomerular capillary because the hydrostatic pressure gradient (ΔP) always exceeds the colloid oncotic pressure gradient (ΔΠ).

37. A 30 year old woman has severe diarrhea and abdominal pain and comes to the emergency room, where she is noted to have a blood pressure of 88/60, dry mucous membranes, and a diffusely tender abdomen. Her Na+ is 129 mEq/L, her K+ is 2.9 mEq/L, her Cl- is 110 mEq/L, and the HCO3- is 16 mEq/L. The BUN is 16 mg/dL and the creatinine is 0.7 mg/dL. The most likely explanation of her hypokalemia is

A. gastrointestinal K+ loss
B. shift of K+ inside cells because of the acid-base disturbance
C. increased glomerular filtration of K+
D. decreased distal tubular delivery of K+
E. surreptitious use of diuretics

38. Which patient would be likely to have a potassium level of 7.1 mEq/L

A. A 40 year old woman with an insulin secreting tumor
B. A 71 year old man with renal artery stenosis
C. A 22 year old woman receiving beta agonist therapy for asthma
D. A healthy 21 year old man on a high potassium diet
E. A 28 year old man with severe muscle trauma after a crush injury

39. Which of the following statements concerning labetalol are CORRECT:

A. It is an inhibitor of angiotensin converting enzyme (ACE)
B. It can be used in the treatment of a hypertensive emergency
C. It is a blocker of α1 and β1 adrenergic receptors
D. A and B
E. B and C
40. Indicate which of the following statements concerning fluoxetine (Prozac) are CORRECT:

A. Clinical relief of depression is usually observed between 3 and 4 days post-initiation of therapy
B. It's IC₅₀ for inhibiting norepinephrine uptake into noradrenergic nerve terminals is lower than its IC₅₀ for inhibiting serotonin uptake into serotonergic nerve terminals
C. At clinical doses, it does not produce significant inhibition of muscarinic receptors
D. A and B
E. B and C

41. J.W. is a 53-year-old male who is a heavy consumer of alcoholic beverages on a daily basis. After he sprains his ankle, he decides to take up to 8 acetaminophen (Tylenol) tablets a day for pain relief. Why might that be a bad idea?

A. Alcohol interferes with acetaminophen's analgesic action
B. Acetaminophen interferes with alcohol metabolism
C. Alcohol interferes with acetaminophen's anti-inflammatory action
D. Acetaminophen will produce harmful metabolic products in this patient
E. Uric acid production will be elevated in this patient

42. The primary site of action of potassium-sparing diuretics in the kidney:

A. Ascending loop of Henle
B. Collecting duct
C. Descending loop of Henle
D. Early distal convoluted tubule
E. Proximal convoluted tubule

43. Drug A has a volume of distribution of 4 liters and drug B has a volume of distribution of 8 liters. Indicate which of the conclusions below can be drawn from this information concerning the half-lives of these drugs:

A. The half-life of drug A will be less than 6 hours
B. The half-life of drug B will be greater than the half-life of drug A
C. The half-life of drug B will greater than 6 hours
D. A, B and C
E. None of the above: not enough information given

$$t_{1/2} = \frac{0.693}{C_{l}}$$
44-47. Match the numbered immunopharmacological agents below with the single most appropriate lettered description. Each lettered description may be used once, more than once, or not at all.

44. α-Interferon  C
45. Cyclosporine  A
46. Daclizumab  
47. Prednisone  C

A. Immunosuppressant that interferes with calcineurin activity
B. Antibody against the CD-20 protein
C. Approved for use in chronic hepatitis B
D. Antibody against the interleukin-2 receptor
E. Immunosuppressant that inhibits arachidonic acid formation

48. Drug A is being infused intravenously at rate X. The infusion rate is now increased to 2X. Indicate which of the following statements are CORRECT with regard to drug A.

A. The metabolism of drug A will now follow zero order kinetics when the rate is increased to 2X
B. The steady state concentration of drug A will be reached faster at the 2X rate compared to the X rate
C. The steady state concentration of drug A will be twice as high with an infusion rate of 2X compared to X
D. A and B
E. B and C

49. S.R. is a 27-year-old female who is taking medication for depression. After eating a grilled cheese sandwich for lunch she experiences a sudden large increase in blood pressure. Indicate the most likely antidepressant medication that S.R. is using:

A. Phenerazine
B. Lithium
C. Sertraline
D. Amitriptyline
E. Fluoxetine
50. Symptoms of a heroin overdosage include:

A. Coma
B. Respiratory depression
C. Dilated pupils
D. A and B
E. A, B and C

51. A lesion is produced in the primary sensory afferent neurons carrying pain signals to the dorsal horn of the spinal cord. The following will be observed in the area of the dorsal horn that normally receives signals from these neurons:

A. A decrease in enkephalin levels and an increase in opiate receptors
B. An increase in enkephalin levels and a decrease in opiate receptors
C. No change in enkephalin levels and an increase in opiate receptors
D. An increase in enkephalin levels and an increase in opiate receptors
E. No change in enkephalin levels and a decrease in opiate receptors

52. Which one of the following is TRUE for a drug whose elimination from plasma shows first-order kinetics?

A. The half-life of the drug is proportional to the drug concentration in plasma
B. The amount eliminated per unit time is constant
C. Elimination involves a rate-limiting enzyme reaction operating at its maximal velocity (V_max)
D. The rate of elimination is proportional to the plasma concentration
E. A plot of drug concentration versus time is a straight line

\[ V_d = \frac{dC}{dt} \]

53. The addition of glucuronic acid to a drug:

A. Involves cytochrome P450 activity
B. Usually leads to inactivation of the drug
C. Occurs at the same rate in adults and the newborn
D. Decreases its water solubility
E. Inhibits its excretion via the urine

54. Which of the following is a competitive benzodiazepine antagonist?

A. Alprazolam
B. Chlordiazepoxide
C. Flumazenil
D. Lorazepam
E. Triazolam
55. A 25-year-old male is seen in the emergency department. He is disoriented, but states that he has had nausea, vomiting, abdominal pain and diarrhea since he took "too many pain pills." Before he can tell you more, he loses consciousness. Liver function tests are abnormal. In addition to gastric lavage, what is the appropriate treatment?

A. Naloxone
B. Pralidoxime
C. Meperidine
D. N-Acetylcysteine
E. Diazepam

56. The most common adverse effect associated with the use of tricyclic antidepressants is:

A. Anticholinergic effects
B. Seizures
C. Hepatotoxicity
D. Nephrotoxicity
E. Arrhythmias

57. Which of the following statements concerning opiates are TRUE?

A. Tolerance develops equally to all effects of opiates
B. No cross tolerance develops among different opiates
C. Opiate receptors are G-protein coupled
D. The symptoms of acute methadone withdrawal are qualitatively different from those of acute heroin withdrawal
E. None of the above

58. Indicate which of the following pairings are CORRECT:

A. Bupivacaine: Longer duration of spinal local anesthesia compared to lidocaine
B. Lidocaine: Blockade of voltage-gated sodium channels
C. Ropivacaine: Less cardiac toxicity compared to bupivacaine
D. A and B
E. A, B and C
59. Indicate which of the following drugs lower blood pressure via activation of \( \alpha_2 \) adrenergic receptors in the central nervous system:

- A. \( \alpha \)-Methyldopa
- B. Clonidine
- C. Losartan
- D. A and B
- E. B and C

60. Indicate which of the following pairings are CORRECT:

- A. Valproic acid (valproate): Used in the treatment of manic-depressive disorder
- B. Lithium: Exhibits an extremely high therapeutic index (>50) in the treatment of manic-depressive disorder
- C. L-DOPA: Useful for a fast reduction in manic symptoms in manic-depressive disorder
- D. A and B
- E. B and C

61. An 80-kg patient needs to have a therapeutic level of antibiotic \( Y \) in his plasma as quickly as possible. The desired therapeutic steady state concentration in the plasma is 4 \( \mu \)g/ml. If the volume of distribution of antibiotic \( Y \) is 0.25 liters/kg (i.e., 20 liters for this patient), what would be the intravenous loading dose of antibiotic \( Y \) for this patient?

- A. 16 \( \mu \)g
- B. 50 \( \mu \)g
- C. 20 mg
- D. 50 mg
- E. 80 mg

62. The epidural administration of fentanyl is likely to result in which of the following?

- A. Demyelination
- B. Inhibition of the release of substance \( P \)
- C. Seizures due to the formation of a neurotoxic metabolite
- D. Activation of excitatory glutamate receptors
- E. Increased levels of cyclic AMP in the spinal cord
63. Which of the following drugs is most likely to result in hypokalemia?

A. Furosemide  
B. Captopril  
C. Nitroglycerin  
D. Nicardipine  
E. Spironolactone

64. Indicate which of the following statements concerning Phase I metabolic reactions are CORRECT:

A. Phase I reactions include reactions carried out by the cytochrome P450 system  
B. The Phase I metabolism of drug A can be either increased or decreased by the presence of drug B  
C. Phase I reactions include conjugation reactions with agents like glucuronic acid  
D. A and B  
E. B and C

65. A previously healthy 40-year-old woman comes to your office with an edematous left upper extremity. The patient denies injuring the arm. A possible cause of this edema is:

A. Heart failure  
B. Hypoalbuminemia  
C. A nonsteroidal anti-inflammatory drug  
D. Venous or lymphatic obstruction  
E. Muscle disuse

66. A young woman with a recent diagnosis of cervical carcinoma presents with a several day history of fatigue and itching. The physical examination shows a blood pressure of 140/90 mmHg and a trace of ankle edema, but is otherwise normal. Laboratory testing revealed a Scr of 9.0 mg%. Which is the first test to obtain?

A. Intravenous pyelogram  
B. Urine for eosinophils  
C. Urine sodium concentration  
D. Abdominal cat scan  
E. Renal sonogram  

[Handwritten notes:  
- 1IP  
- cytoxapy - cancer]
Are the following anatomical structures derived from the mesonephric duct (A) or from the metanephric mesoderm (B)? (1 pt each)

67. Renal pelvis
68. Proximal collecting tubule
69. Ureter
70. Loop of Henle

Which arteries in the kidney run parallel to the surface and give rise to the interlobular arteries? (3 pts)

A. Afferent arteries
B. Arcuate arteries
C. Segmental arteries
D. Vasa rectae
E. Dorsalis pedis arteries

State whether right (A) or left (B) (1 pt each)

72. The renal vein which directly receives the adrenal vein and the testicular vein
73. The renal artery which is shorter
74. The kidney which occupies a slightly more superior position

Match the basic unit of the kidney which is most often affected by the injurious agent or mechanism (one best answer for each) (1 pt each)

75. Immunological mechanisms
76. Toxic or infectious agents
77. Vascular disease

A. Any or all of the four units
B. Glomeruli
C. Interstitium and tubules
Match the structure with mullerian (paramesonephric) origin (A), mesonephric (wolffian) origin (B), urogenital sinus origin (C), or none of these (D) (1 pt each)

78. Uterus  A
79. Ovarian germ cells  B
80. Vas deferens  C
81. Gartner's duct, a vestigial structure  B
82. Prostate  A

A 70 year old man presents with fever and acute renal failure. He suffers from "arthritis" and has been taking unidentified medication sent to him by his daughter who lives elsewhere. A renal biopsy is shown below.

83. Identify the true statement about this condition. (5pts)
   A. The medication could not be acetaminophen because that drug causes severe liver damage
   B. The interstitium and only the interstitium is involved in this inflammatory process
   C. The patient probably has peripheral eosinophilia
   D. The renal damage is due to direct toxicity and does not involve an immune mechanism
   E. The glomeruli are never affected in this disorder
84. Identify the true statement about lipoid nephrosis: (3pts)
   A. It can be recognized on light microscopy by the presence of cholesterol crystals
   B. Electron microscopy shows swollen epithelial cells with loss of foot processes
   C. The injured cell is usually the endothelial cell
   D. Patients present with hypertension and hematuria
   E. It is characterized by large immune deposits in the subepithelial region of the basement membrane

85. Renal vein thrombosis is likely to cause a pale infarct and nephritic syndrome

86. At term (40 weeks of gestation) one fourth of the kidney consists of nephrogenic (metanephric) blastema which will be utilized to form additional nephrons during the first 6 months of life

87. Papillary necrosis can result from diabetes mellitus, sickle cell anemia, or administration of analgesics

88. Differentiation of thrombotic thrombocytopenic purpura (TTP) and adult hemolytic-uremic syndrome (AHUS) is based on the presence of microangiopathic hemolytic anemia in AHUS and its absence in TTP

89. Ischemic acute tubular necrosis is characterized by focal necrosis and apoptosis at multiple sites along the nephron and occlusion of the tubule by casts containing Tamm-Horsfall protein

90. Fibromuscular dysplasia is a disease of elderly men; the lesion is confined to the intima in most cases

91. Hypothetical gene defects causing essential hypertension include genes involving aldosterone metabolism, sodium reabsorption, and transport of sodium and calcium across smooth muscle membrane

Fill in the blanks (92-95) (3pts each) (Answer on separate answer key)

92. An infant is born with autosomal recessive polycystic kidney disease. Death will probably be due to

93. Name 2 causes of acute renal failure
   a. ischemia
   b. ATN
   and ATN
   (2 words or more for each)
94. Name 2 routes via which the kidney can become infected and.

95. Autosomal dominant polycystic kidney disease is usually associated with one or both of 2 abnormal genes on chromosome 16. Name the genes or their respective encoded proteins.
The gene which accounts for about 85% of cases
\[ \text{PKD1} \quad \text{Ch. 16} \]
The gene which accounts for about 10% of cases
\[ \text{PKD2} \quad \text{Ch. 16} \]

96. All of the following statements are true about renal potassium handling EXCEPT
A. Potassium is filtered in the glomerulus
B. Potassium is reabsorbed in the thick limb of the loop of Henle
C. Potassium is reabsorbed in the medullary collecting duct
D. Potassium is reabsorbed in the proximal tubule
E. Potassium is reabsorbed in the cortical collecting duct

97. All of the following statements are true about renal hydrogen ion (H+) and bicarbonate (HCO3-) handling EXCEPT
A. The urinary pH is usually alkaline
B. Bicarbonate is filtered in the glomerulus
C. Hydrogen ion is filtered in the glomerulus
D. Hydrogen ion is secreted in the cortical collecting duct
E. Bicarbonate is reabsorbed in the proximal tubule

98. All of the following are risk factors for calcium stone formation EXCEPT
A. hypocitraturia
B. hyperuricosuria
C. low sodium diet
D. primary hyperparathyroidism
E. renal tubular acidosis

99. A 70-year-old previously healthy male, presents with a 24 hr history of no urine output. He has no uremic symptoms. Physical exam is normal except for a palpable bladder and enlarged prostate. BUN is 110 mg/dl and Scr is 10 mg/dl. A urethral catheter is passed and left in place. All of the following are in keeping with clinical picture EXCEPT:
A. Urine output 2000 cc within the next 4 hours
B. Renal ultrasound showing bilateral dilated renal pelvis and calyces
C. Mild metabolic acidosis
D. Immediate need for dialysis
E. Urine specific gravity 1.008, protein negative, 4-6 rbc/hpf
100. All of the following statements regarding tubuloglomerular feedback are true EXCEPT:

A. Tubuloglomerular feedback is a mechanism by which the kidney adjusts its vascular resistance in order to maintain renal blood flow in response to alterations in arterial pressure.

B. Increase in renal blood flow, glomerular pressure, and GFR lead to increase in delivery of tubular fluid and sodium chloride from the proximal tubule to the cortical ascending thick segment of the distal tubule, where the macula densa cells are stimulated to transmit vasodilator signals to the afferent arterioles to restore renal blood flow and GFR to pre-existing levels.

C. The juxtaglomerular apparatus consists of four structures: the macula densa, the afferent arteriole, the efferent arteriole, and the extraglomerular mesangium.

D. The macula densa may signal the juxtaglomerular cells to vary renin synthesis and release in response to variations of salt intake, extracellular fluid volume, and renal perfusion pressure.

E. Angiotensin II stimulates efferent arteriolar vasoconstriction to a greater extent than afferent arteriolar vasoconstriction.

101. In a patient with Addison’s disease (primary adrenal insufficiency), all of the following would have diuretic action EXCEPT:

A. Triamterene
B. Furosemide
C. Spironolactone
D. Chlorothiazide
E. Amiloride

102. All of the following statements concerning methadone are correct EXCEPT:

A. It has less efficacy as an analgesic compared to morphine.
B. It causes a milder withdrawal syndrome than morphine.
C. It has its greatest action on µ receptors.
D. It is effective after oral administration.
E. It has a longer duration of action than morphine.
103. Adverse reactions associated with furosemide include all of the following EXCEPT:

A. Hyperuricemia (increased plasma uric acid)
B. Tinnitus
C. Fluid and electrolyte imbalance
D. Hypotension
E. Metabolic acidosis

104. All of the following pairings are correct EXCEPT:

A. Meperidine: A synthetic opiate agonist
B. Buprenorphine: An opiate antagonist
C. Fentanyl: A synthetic opiate agonist with greater potency than morphine
D. Naltrexone: An opiate antagonist
E. Loperamide: An opiate agonist with anti-diarrheal properties

A 12 year old girl presented with gross hematuria. She had recently had a 2 day episode of nausea and diarrhea. Below are photos of light microscopy from a renal biopsy. One section is stained with H&E and the other is an immunofluorescent stain to show depositions of an immunoglobulin.
105. The following statements are true EXCEPT: (5 pts)

A. The findings are most consistent with IgA nephropathy
B. The deposits are primarily mesangial
C. The antigen involved in this entity has been clearly shown to be a product of streptococci
D. The entity from which this patient suffers has overlapping features with Henoch-Schonlein purpura
E. The absence of C1q and C4 in glomeruli points to activation of the alternative complement pathway in this entity

A 55 year old man presents with hematuria and poor appetite. The resected kidney and a section from the lesion are shown below.

106. All of the following statements about this lesion are true EXCEPT: (5 pts)

A. It is usually sporadic but can be familial
B. It has a tendency to grow into the renal vein and might even reach the right atrium as a continuous intravenous mass
C. In 98% of these cases, there is a deletion or translocation involving chromosome 3
D. The lesion shown is one of three types and is the most common of the three
E. Von Hippel-Landau syndrome is a familial condition involving the kidney, the heart, and the GI tract

Pheochromocytoma of homangioblastoma
107. A 27-year-old man comes to the emergency room with a headache. He is confused, and blood pressure is 220/140 mmHg. What would you expect to be on physical examination and lab tests.

A. Retinal hemorrhages
B. Pulmonary vascular congestion on chest x-ray
C. Left ventricular strain on electrocardiogram
D. Serum creatinine level of 2.0 mg/dl.
E. All of the above

The patient probably has vascular lesions such as that illustrated below.

108. All of the following statements are true EXCEPT: (5pts)

A. The lesion is secondary to malignant hypertension
B. The vascular lesions are limited to the kidney
C. The thickening of the wall is mainly due to excess smooth muscle in the intima
D. The patient is at risk for cerebral hemorrhage
E. The lesion is referred to as hyperplastic arteriolosclerosis and the resulting condition is referred to as malignant nephrosclerosis