YR 1 PHYSIOLOGY UNIT EXAMINATION 2 -- March 19, 1997.

CHOOSE THE SINGLE BEST ANSWER FOR QUESTIONS 1 - 72.

1. At the end of a normal resting inspiration, the volume of air in the lungs is:

   A. FRC

   B. ERV + TV

   C. TLC - IRV

   D. VC - RV

   E. ERV + TV - RV

2. At the end of a maximal expiration, the volume of air in the lungs is:

   A. FRC - RV

   B. IRV + RV

   C. FRC - TV

   D. TLC - VC

   E. VC - ERV - IRV

3. Which is true concerning FEF(0.2-1.2L) and/or FEF(25-75%)?

   A. During the FEF(0.2-1.2L), about 6-9 liters of air are expired.

   B. During the FEF(25-75%), less than 50% of the VC is expired.

   C. During the FEF(0.2-1.2L), less than 2 liters of air are expired.

   D. During the FEF(25-75%), a healthy young adult expires 4-6 liters of air.

   E. A and D above.

4. At the end of expiration at sea level, what is the P_{O2} in the Anatomic Dead Space?

   A. Approximately 150 mm Hg

   B. Considerably above 100 mm Hg but less than 150 mm Hg

   C. Approximately 100 mm Hg

   D. Considerably below 100 mm Hg but greater than 40 mm Hg

   E. Approximately 40 mm Hg

5. A 23 year old female medical student is participating in a study at a high altitude station near Leadville, Colorado (barometric pressure = 547 mm Hg) and is breathing 100% O_2. Which is most likely? (Assume resting conditions and normal CO_2 and R values)

   A. Her arterial O_2 concentration is slightly above the normal sea level value.

   B. Her mixed venous Hb is 100% saturated with O_2

   C. Her mixed venous O_2 concentration is at least 20 volumes percent.

   D. Her arterial blood contains at least 5 ml O_2 in physical solution per 100 ml blood.

   E. B, C, and D above.

6. Which set of data most closely describes your pulmonary status right now, assuming you're a healthy young adult? (vols. = volumes; min = minute)

	Alveolar P_{O2}	Arterial O_2	Alveolar Ventilation	Mixed Venous O_2	Mixed Venous Hb saturation
A.	150 mm Hg	20 vols.%	6000 ml/min	5 vols.%	75%
B.	100 mm Hg	20 vols.%	6000 ml/min	15 vols.%	40%
C.	100 mm Hg	20 vols.%	4200 ml/min	15 vols.%	75%
D.	150 mm Hg	15 vols.%	4200 ml/min	10 vols.%	67%
E.	100 mm Hg	20 vols.%	4200 ml/min	5 vols.%	12%

7. To correctly describe the lung's capacity to remove CO_2, Alveolar Ventilation Rate is used instead of Minute Ventilation because:

A. the TV is 500 ml but only 350 ml of gas leave the body per breath.

B. the TV is 650 ml but only 500 ml are expired per breath.

C. the last 150 ml of gas leaving the alveoli do not leave the body.

D. during inspiration, only 350 ml of outside air enters the body.

E. A and D above.

8. In the rest state, FRC is referred to as a reservoir or buffer because:

   A. it cancels the difference between Tidal Volume and Anatomic Dead Space.
   B. its ERV and RV components together are much larger than the TV.
   C. even though the ERV is expired, the RV is still much larger than the TV.
   D. its P_{02} is only a few mm Hg less than the incoming fresh air.
   E. A, B, and C above.

9. Which is true concerning lung and chest wall mechanics?

   A. At RV the lungs have no tendency to collapse but the chest wall has a great tendency to expand.
   B. If a bilateral pneumothorax occurred at 80% VC, the chest wall would expand to TLC and the lungs would collapse down to RV.
   C. If a bilateral pneumothorax occurred at FRC, the chest wall would expand up to TLC.
   D. At FRC the tendency of the lungs to collapse is exactly balanced by the tendency of the chest wall to expand.
   E. B, C, and D above.

10. A healthy 23 year old male whose VC is 5 liters inspires 2.0 liters from a spirometer. The valve connecting his airways to the spirometer is then closed and the subject relaxes his respiratory muscles. Which is true concerning the "relaxation" pressure observed in his airways ? (Assume the subject started inspiring from FRC)

A. It is below atmospheric pressure.

B. It is at atmospheric pressure.

C. It is above atmospheric pressure.

D. It is the net result of the two positive elastic recoil forces across both the chest wall and across the lungs.

E. C and D above.

11. Which is true concerning surface tension in the lungs?

A. The normal amount of surfactant reduces surface tension in healthy lungs down to a negligible level.

B. In the absence of surfactant, alveoli with small radii collapse into alveoli with large radii.

C. Surfactant is maximally concentrated at the air-liquid interface at the end of inspiration.

D. In normal lungs, surface tension accounts for less than half of the positive elastic recoil.

E. B, C, and D above.

12. Which is true concerning the normal work of breathing?

A. Inspiration requires active respiratory work only when one breathes at tidal volumes in excess of 1 liter.

B. Expiration does not require significant active respiratory work under rest conditions.

C. Expiration under rest conditions does not require active respiratory work because there is no resistance to airflow during expiration.

D. The elastic work of inspiration does not provide sufficient energy to overcome expiratory airflow resistance under rest conditions.

E. A, B, and C above.

13. A female inspires from FRC and utilizes part of her IRV. Her lung compliance is 0.2 liters per cm water and her airways resistance is 2 cm water per liter per second. If her pleural pressure at FRC was -6 cm water, what is her pleural pressure at the point when she has inspired 2 liters of air and the airflow rate is 2 liters per second?

A. - 20 cm water

B. - 16 cm water

C. - 14 cm water

D. - 10 cm water

E. 0 cm water

14. Which factor(s) increase(s) airways resistance ?

A. Turbulent flow in the small airways of a normal subject performing an FVC maneuver.

B. Sympathetic stimulation of airways smooth muscle.

C. Constriction of alveolar ducts and bronchioles due to a higher than normal alveolar P_{CO2}.

D. Loss of alveolar elastic recoil.

E. B, C, and D above.

15. Which is true concerning alveolar ventilation?

A. If a normal subject inspires from FRC, more of the incoming air is distributed to the apical lung areas than the basal areas.

B. Lung areas with very long Time Constants empty faster than normally.

C. The Dynamic Compliance of asthmatics is lower than normal due to the presence of very short Time Constants.

D. Removal of CO_2 depends on Alveolar Ventilation rather than on Minute Ventilation because the Anatomic Dead Space at the start of inspiration contains alveolar gas.

E. B and C above.

16. In changing from rest to exercise, the alveolar-capillary surface area doubles and the thickness of that barrier is halved. The mixed venous P_{O2} falls from 40 to 20 mm Hg and the alveolar P_{O2} rises from 90 to 95 mm Hg. The exercise diffusion rate is _____ times the rest diffusion rate.

A. 8

B. 6

C. 4

D. 3

E. 1.5

17. Which is true concerning Diffusing Capacity of the lung D(l)?

A. D(l) rises as the partial pressure driving gradient rises.

B. D(l) rises as the alveolar-capillary surface area rises.

C. D(l) rises as the thickness of the alveolar-capillary barrier rises.

D. Carbon monoxide (CO) is used to measure D(l) because CO is perfusion-dependent for its flux across the alveolar-capillary membrane.

E. A, B, and D above.

18. Which is true concerning O_2 transport?

A. If arterial P_{O2} is 150 mm Hg, O_2 content is about 30 volumes %.

B. The P(50) for O_2 on Hb is the % saturation of Hb with O_2 when the arterial P_{O2} is 50 mm Hg.

C. The normal P(50) for arterial blood is less than that for venous blood.

D. Increases in P_{CO2}, temperature, pH and 2,3-DPG all cause an increase in the P(50) for Hb-transported O_2.

E. B and D above.

19. Which is true concerning CO_2 transport?

A. The arterial-mixed venous concentration difference for CO_2 is slightly less than that for O_2 because the arterial-mixed venous partial pressure difference is less for CO_2 than for O_2.

B. The diffusional flux of CO_2 across the alveolar-capillary membrane is normally perfusion-dependent.

C. Normally at rest conditions, nearly 2/3 of the tissue-generated CO_2 is carried back to the lungs as bicarbonate ion.

D. A and B above.

E. B and C above.

20. Which is true concerning Ventilation/Perfusion (V/Q) ratios?

A. Physiological Shunt refers to areas where V/Q values are necessarily zero.

B. Alveolar Dead Space refers to areas where V/Q ratios are high but not necessarily infinity.

C. Physiological Dead Space normally is only slightly greater than Anatomic Dead Space.

D. A and B above.

E. B and C above.

21. Which is true concerning Ventilation/Perfusion phenomena?

A. At FRC, apical end-pulmonary capillary blood has a higher P_{O2} than in basal lung areas.

B. At FRC, basal end-pulmonary capillary blood has a higher pH than in apical areas.

C. Much more gas exchange occurs in apical lung areas than in basal areas because apical Ventilation/Perfusion ratios are higher.

D. Apical end-pulmonary capillary blood has an O_2 content which is about 50% higher than in basal areas.

E. A, C, and D above.

22. Which is true concerning Ventilation/Perfusion (V/Q) phenomena?

A. Arterial blood normally more closely resembles end-pulmonary capillary blood of apical lung areas rather than basal areas.

B. High V/Q areas cannot compensate for hypoxemia caused by low V/Q areas because the high V/Q areas are on the plateau of the HbO_2 curve.

C. As long as there are no low V/Q parts of the lung where V/Q = 0, administration of air with a high O_2 concentration may help to alleviate the hypoxemia caused by these low V/Q areas.

D. A and B above.

E. B and C above.

23. Which type of hypoxia has a greater than normal arterial-mixed venous partial pressure difference AND a relatively normal arterial O_2 concentration?

A. Hypoxic hypoxia

B. Anemic hypoxia

C. Stagnant hypoxia

D. A and B above

E. B and C above

24. Which type of hypoxia has a much greater than normal arterial-mixed venous O_2 concentration difference?

A. Stagnant hypoxia

B. Histotoxic hypoxia

C. Anemic hypoxia

D. Hypoxic hypoxia

E. C and D above

25. Administration of air with a much higher than normal O_2 concentration would significantly alleviate the hypoxia due to:

A. right to left shunt.

B. diffusion impairment.

C. stagnant hypoxia.

D. anemic hypoxia.

E. histotoxic hypoxia.

26. Which is true concerning the usual effects of aging?

A. Arterial pH falls significantly.

B. Closing Capacity decreases.

C. Arterial P_{CO2} rises above 50 mm Hg.

D. Lung compliance increases.

E. Chest wall compliance increases.

27. It would not be too unusual to observe an arterial P_{O2} lower than 85 mm Hg in a normal 90 year old female because:

A. her Closing Capacity exceeds her FRC.

B. normal aging may gradually produce measurable Physiological Shunt.

C. premature collapse of her basally located airways during the Closing Capacity test leads to an early decrease in the expired concentration of the tracer gas which was used in the initial part of the inspired air.

D. All the above.

E. A and B above.

28. Which is true concerning respiratory control?

A. A brainstem transection between the Apneustic and Pneumotaxic Centers with the vagi severed results in a relatively normal breathing pattern.

B. The airway stretch receptors of the lungs do not play a major role in regulation of respiration until the Tidal Volume exceeds about 1 liter.

C. A brainstem transection below the level of the medullary respiratory center, but with the vagi left intact, results in a relatively normal breathing pattern.

D. A and C above.

E. None of the above.

29. Which is true concerning control of breathing?

A. When arterial P_{O2} falls from the normal 100 mm Hg down to 80 mm Hg, there is a very significant increase in respiratory drive.

B. At high altitude, the alveolar P_{CO2} is much lower than at sea level because inspired air at high altitude contains less CO_2 than at sea level.

C. When arterial P_{CO2} rises by only a few mm Hg, there is a noticeable increase in respiratory drive.

D. A and C above.

E. B and C above.

30. Which is true concerning pleural space?

A. Any small amount of air which enters the pleural space is eventually removed because of the lower than atmospheric pressure of venous blood in the area.

B. Small amounts of fluid in the pleural space are removed because the colloid osmotic pressure of pulmonary capillary blood is much higher than that in the systemic circulation.

C. Blood in the bronchial veins has a total partial pressure which is less than atmospheric pressure because the R value is usually greater than 1.0.

D. A and B above.

E. B and C above.

Abbreviations

ECF or **ECV**, extracellular fluid or volume
ICF or **ICV**, intracellular fluid or volume
ISF or **ISV**, interstitial fluid or volume
L, liter. **ml**, milliliter
PV, plasma volume
TBW, total body water
TBWt, total body weight
mg, milligrams
mg %, milligrams / 100 ml
ug, microgram
mEq, milliequivalents
mOs, milliosmoles
GFR, glomerular filtration rate
RBF, renal blood flow
RPF, renal plasma flow
V, urine flow rate
PAH, para-aminohippuric acid
$\mathbf{T_m}$, tubular (transport) maximum
$\mathbf{P_{osm}}$, plasma osmolality
$\mathbf{U_{osm}}$, urine osmolality

31. Which is FALSE?

A. TBW / TBWt > 60% in a healthy, but obese, young adult female.

B. TBW / TBWt > 60% in a healthy, lean, male child.

C. TBW / TBWt = 60% in a healthy, lean, young adult male.

D. TBW / TBWt < 60% in a healthy, lean, elderly male.

E. TBW / TBWt < 60% in a healthy, lean, young adult female.

32. Which is FALSE?

A. TBW = ICV + ECV

B. ISV = 33% (one third) of ECV

C. ICV / ECV = 2 / 1

D. ECV = 33% (one third) of TBW

E. ISV = ECV - PV

33. Which is FALSE?

A. The concentrations of glucose in ISF and plasma are equal.

B. ISF Cl ion concentration is slightly greater than plasma Cl ion concentration (Gibbs-Donnan effect).

C. Na, Cl, and HCO_3 ions are the major extracellular solutes.

D. Plasma Na ion concentration is slightly greater than ISF Na ion concentration (Gibbs-Donnan effect).

E. The osmolalities of ISF and plasma are exactly equal.

Questions 34 - 36 relate to the following data.

Initially, P_{OSM} = 300 mOs / L of H_2O, TBW = 30 L, and ECV = 10 L.

After drinking 1.5 L of H_2O and absorbing it from the gut:

34. Plasma osmolality (in mOs / L of H_2O) =

A. 272

B. 279

C. 286

D. 293

E. 300

35. ECV (in L) =

A. 10.0

B. 10.5

C. 11.0

D. 11.5

E. 12.0

36. ICV (in L) =

A. 22.0

B. 21.5

C. 21.0

D. 20.5

E. 20.0

37. Which decreases P_{osm}?

A. forming 1 L of hypertonic urine

B. secreting 1 L of sweat (osmolality = 150 mOs/L of H_2O)

C. losing 1 L of H_2O in expired air

D. vomiting 1 L of gastric acid (osmolality = 300 mOs/L of H_2O)

E. hemorrhaging 1 L of blood

38. Which intravenous fluid produces the largest decrease in the ICV?

A. 1 L of 6 g% albumin (60,000 grams / mole)

B. 1 L of 5 g% glucose (180 grams / mole)

C. 1 L of 2.7 g% NaCl (58 grams / mole)

D. 1 L of 1.8 g% NaCl

E. 1 L of 0.9 g% NaCl

39. Which is FALSE?

A. Venous obstruction tends to decrease PV and increase ISV.

B. Increasing total peripheral resistance tends to decrease PV and increase ISV.

C. When ECV is increased, ISV tends to increase but PV tends to remain constant.

D. Both hematocrit and plasma colloid oncotic pressure (Pi_C) tend to decrease during hemorrhagic hypotension (low blood pressure due to blood loss).

E. Increasing average systemic capillary hydrostatic pressure tends to decrease PV and increase ISV.

40. Which decreases RBF but has little or no effect on GFR?

A. constriction of afferent and dilation of efferent arterioles

B. dilation of both afferent and efferent arterioles

C. constriction of efferent arterioles

D. constriction of both afferent and efferent arterioles

E. dilation of afferent and constriction of efferent arterioles

41. Which increases GFR?

A. a decrease in the ultrafiltration coefficient (K_f)

B. a decrease in glomerular capillary hydrostatic pressure (P_C)

C. an increase in tubular fluid hydrostatic pressure (P_t)

D. a decrease in efferent arteriolar resistance

E. a decrease in plasma colloid oncotic pressure (Pi_C)

42. If arterial plasma or serum creatinine concentration (A_{Cr}) is four times the normal value, then:

A. blood urea nitrogen (BUN) is approximately four times the normal value.

B. creatinine clearance (C_{Cr}) is approximately one fourth the normal value.

C. creatinine excretion rate is approximately normal.

D. GFR is approximately one fourth the normal value.

E. all the above

Questions 43 and 44 relate to the following data.

arterial inulin concentration (A_{in})	=	2 mg%
arterial glucose concentration (A_{glu})	=	600 mg%
urine inulin concentration (U_{in})	=	100 mg%
urine glucose concentration (U_{glu})	=	600 mg%
urine flow (V)	=	1 ml/minute

43. Which is FALSE?

A. Every minute, 6 mg of glucose are excreted.

B. Inulin clearance (C_{in}) = GFR.

C. Glucose clearance (C_{glu}) = 50 ml/minute.

D. GFR = 50 ml/minute.

E. Every minute, 300 mg of glucose are filtered.

44. Which is FALSE?

A. Every minute, 294 mg of glucose are reabsorbed.

B. Glucose T_m = 294 mg/minute.

C. Glucose threshold is less than 600 mg%.

D. If A_{glu} doubled (increased to 1200 mg%), then glucose excretion rate would double.

E. V = 60 ml/hour.

45. In the proximal tubule:

A. glucose ("d" optical isomer) and Na ions are co-transported across the lumenal (apical) membrane.

B. metabolic intermediates (such as lactate) are reabsorbed by T_m mechanisms.

C. inorganic phosphate ions (HPO_4 and H_2PO_4) are reabsorbed by a T_m mechanism.

D. amino acids ("l" optical isomers) and Na ions are co-transported across the lumenal (apical) membrane.

E. all the above

46. Which is FALSE concerning the proximal tubule?

A. Organic bases or cations (such as creatinine) are reabsorbed by one or more T_m mechanisms.

B. Fractional reabsorption of H_2O is almost constant, averaging 60 - 80% of filtered H_2O.

C. Tubular fluid never has an osmolality higher than the osmolality of ISF in the renal cortex.

D. Absolute reabsorption of H_2O is about proportional to the GFR; if GFR doubles, reabsorption of H_2O also about doubles.

E. Organic acids or anions (such as PAH) are secreted by one or more T_m mechanisms.

47. In the proximal tubule:

A. Cl ions are actively reabsorbed.

B. H and Na ions are counter-transported across the lumenal (apical) membrane on the same carrier.

C. H_2O reabsorption by osmosis is due primarily to the reabsorption of solutes by T_m mechanisms.

D. HCO_3 and Na ions are co-transported across the lumenal (apical) membrane on the same carrier.

E. K ions are passively secreted.

48. "S" is a solute with no electrical charge (valence of zero), which is completely reabsorbed from proximal tubular fluid by a secondary active transport mechanism located on the lumenal (apical) membrane. Predict the most likely relative concentrations of "S" in tubular fluid (S_1), inside the tubular cell (S_2), and in the renal ISF (S_3). (Hint: it might help to draw a diagram of a cell with tubular fluid on one side and ISF on the other side)

A. $S_1 < S_2 < S_3$

B. $S_1 < S_2 > S_3$

C. $S_1 = S_2 = S_3$

D. $S_1 > S_2 < S_3$

E. $S_1 > S_2 > S_3$

49. Which does NOT occur after inhibiting renal carbonic anhydrase activity?

A. Excretion of titratable acid decreases.

B. Excretion of HCO_3 ions increases.

C. Urine pH decreases.

D. Urine flow (V) increases.

E. Urine osmolality decreases.

50. Which is FALSE concerning the loop of Henle?

A. The descending limb is relatively permeable to H_2O.

B. H_2O, but little or no solute, is reabsorbed in the descending limb.

C. Cl ions are reabsorbed by a secondary active transport mechanism (Na, K, and 2 Cl co-transporter) in the ascending limb.

D. Solute, but little or no H_2O, is reabsorbed in the ascending limb.

E. The ascending limb is relatively permeable to H_2O.

51. Which is FALSE concerning the cortico-medullary osmotic gradient?

A. It decreases if tubular fluid flow rate through the loop of Henle increases above normal.

B. It increases if tubular fluid flow rate through the loop of Henle decreases slightly below normal.

C. It decreases if solute reabsorption in the loop of Henle decreases.

D. It increases if blood flow through the vasa recta capillaries decreases to zero.

E. It decreases if blood flow through the vasa recta capillaries increases above normal.

52. A drug which inhibits solute reabsorption in the loop of Henle is given to a person who has been excreting hypertonic urine. Which effects are MOST likely?

A. increased V, increased excretion of Na and K ions, decreased U_{osm}

B. increased V, no change in excretion of Na and K ions, decreased U_{osm}

C. increased V, increased excretion of Na ions, no change in excretion of K ions, decreased U_{osm}

D. increased V, no change in excretion of Na and K ions, increased U_{osm}

E. increased V, increased excretion of Na and K ions, increased U_{osm}

53. Which is FALSE concerning the distal tubule and collecting duct?

A. Antidiuretic hormone (ADH or vasopressin) increases H_2O permeability.

B. Antidiuretic hormone increases H_2O reabsorption.

C. Parathyroid hormone increases secretion of inorganic phosphate ions (HPO_4 and H_2PO_4).

D. Aldosterone increases reabsorption of Na ions.

E. Aldosterone increases secretion of K ions.

54. In the distal tubule and collecting duct:

A. for every H ion secreted, an HCO_3 ion diffuses or is transported into the renal ISF.

B. H ions can be secreted against a large (2-3 unit) pH gradient.

C. for every Na ion reabsorbed, either a Cl ion is reabsorbed or a K or an H ion is secreted.

D. the presence of unreabsorbable anions increases the secretion of K and H ions.

E. all the above

55. Which is MOST unexpected in a severely dehydrated person?

A $U_{osm} / P_{osm} < 1.0$

B. P_{osm} > 300 mOs/L of H_2O

C. high plasma concentration of antidiuretic hormone (ADH, vasopressin)

D. high plasma concentration of aldosterone

E. plasma Na concentration > 140 mEq/L of H_2O

56. Which BEST explains an increase in urine flow rate (V) after drinking 2 L of water and absorbing it from the gut?

A. The PV is increased, which leads to an increase in arterial blood pressure, which leads to an increase in GFR, which leads to an increase in V.

B. P_{osm} is decreased, which inhibits the secretion of antidiuretic hormone (ADH), which leads to a decrease in the reabsorption of filtered water, which leads to an increase in V.

C. The plasma colloid osmotic pressure (Pi_C) is decreased, which directly leads to an increase in GFR, which leads to an increase in V.

D. The ECV is increased, which leads to a decrease in aldosterone secretion, which leads to decreased reabsorption of filtered Na ions and water in the proximal tubule, which leads to an increase in V.

E. P_{osm} is decreased, which inhibits the secretion of antidiuretic hormone (ADH), which leads to a decrease in afferent arteriolar constriction, which leads to an increase in GFR, which leads to an increase in V.

57. The basic electrical rhythm (BER) of the gastrointestinal tract refers to:

A. rhythmic and spontaneous action potentials throughout the gut.

B. spontaneous electrical activity which is initiated in Cajal cells and then spreads from muscle cell to muscle cell by gap junctions.

C. spontaneous hyperpolarizations of the circular smooth muscle cells of sphincters.

D. rhythmic electrical potentials of the intrinsic neurons of the gut.

E. rhythmic electrical potentials of the extrinsic neurons coming to the gut from the CNS.

58. During the esophageal phase of swallowing, which provides the control over the upper one third of the esophagus?

A. intrinsic motor neurons of the myenteric plexus

B. extrinsic parasympathetic neurons

C. extrinsic somatic motor neurons

D. gastrin and CCK

E. extrinsic sympathetic neurons

59. Gastric motility and secretion are stimulated before food arrives in the stomach, following the sight, smell, and taste of food. This is referred to as the cephalic phase, and the stimulation is caused by:

A. activation of sympathetic neurons.

B. activation of parasympathetic neurons.

C. presence of salivary amylase in the oral cavity.

D. increased secretin secretion.

E. reduced gastrin secretion.

60. Gastric motility and secretion are reduced when chyme begins to enter the duodenum from the stomach. This is referred to as the intestinal phase, and the reduction in gastric function is caused, in part, by:

A. inactivation of sympathetic neurons.

B. activation of parasympathetic neurons.

C. presence of salivary amylase in the stomach.

D. increased secretin secretion.

E. increased gastrin secretion.

61. Secretion of the acinar cells within the exocrine pancreas is increased by parasympathetic innervation and by the presence of _____ in the blood.

A. secretin

B. CCK

C. insulin

D. bicarbonate ions

E. hydrogen ions

62. An increase in the concentration of bile salts in the portal blood returning to the liver has which effect on hepatocyte function?

A. a decrease in the release of bile salts into the bile cannuliculi
B. an increase in the synthesis of bile salts within the hepatocyte
C. an increase in the release of bile salts into the portal blood
D. a decrease in synthesis of bile salts within the hepatocyte
E. A and D above.

63. Which is FALSE concerning fat digestion and absorption?

A. Bile salts are essential for the emulsification of fat droplets and the formation of micelles.
B. Lipases and phospholipases which digest triglycerides and phospholipids come from the exocrine pancreas.
C. Monoglycerides and fatty acids are transported into intestinal mucosal cells by transport proteins using ATP (active transport).
D. When fat digestion and absorption are compromised, so is the absorption of Vitamins A, D, E and K.
E. Fats are resynthesized within the intestinal mucosal cells.

64. Sodium ions enter intestinal mucosal cells by cotransport with glucose, amino acids, and chloride ions, and by exchanging with hydrogen ions . Sodium ions leave the intestinal cells by way of:

A. active exchange with potassium ions.

B. active exchange with calcium ions.

C. cotransport with glucose.

D. cotransport with amino acids.

E. cotransport with fatty acids.

65. Which characterizes water absorption in the gastrointestinal tract?

A. Water moves from intestinal lumen to blood by active transport molecules in the intestinal cells.

B. Water moves by osmosis and follows the absorption of ions, monosaccharides, and amino acids.

C. Water moves through the intestinal cells by a mechanism controlled by the hormone ADH.

D. Water moves only in the duodenum by unknown mechanisms.

E. Water is absorbed only in the colon.

66. Which is NOT involved in defecation?

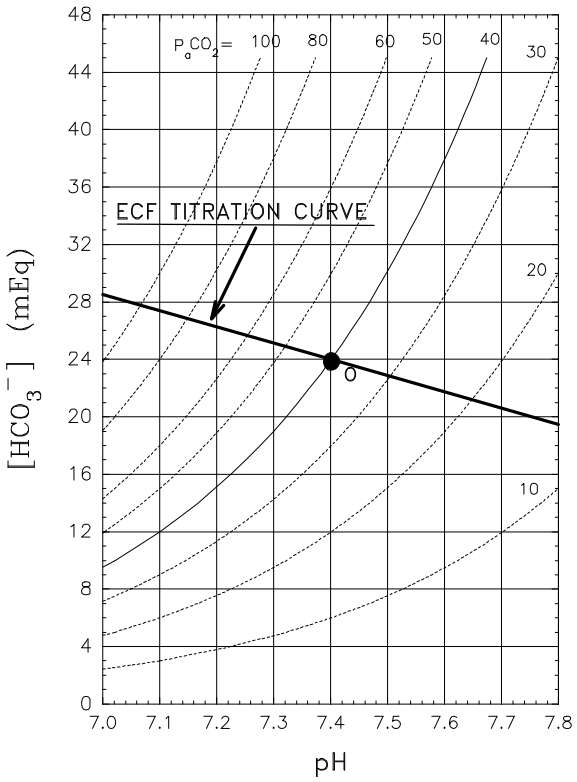
A. local intrinsic sensory neurons

B. parasympathetic neurons coming from the sacral spinal cord

C. somatic motor neurons innervating the external anal sphincter

D. somatic motor neurons innervating the internal anal sphincter

E. higher neural controls in the brain and spinal cord



For questions 67-72, consider the pH - $[HCO_3^-]$ diagram to the right (a graphical representation of the Henderson-Hasselbalch Equation).

67. Use the pH - $[HCO_3^-]$ diagram to estimate the pH of a person with: $PaCO_2$ = 80 mm Hg and $[HCO_3^-]$ = normal

A. 7.1

B. 7.2

C. 7.3

D. 7.4

E. 7.5

68. Point A in the figure most likely represents a person with

A decrease in respiratory function and little renal compensation.

B. a decrease in respiratory function and significant renal compensation

C. metabolic acidosis and little respiratory compensation

D. metabolic acidosis and significant respiratory compensation

E. normal pH and normal $PaCO_2$

69. A person has pH = 7.44 and $[HCO_3^-]$ = 30 mM. This is most consistent with

A. an acute asthma attack

B. a strongly alkaline diet

C. renal insufficiency (reduced level of function

D. a medullary tumor which stimulates the respiratory center

E. COPD (chronic obstructive pulmonary disease)

70. A patient that tested normal yesterday, today manifests a $PaCO_2$ of 55 mm Hg. Lung and kidney function tests have not been performed. Compared to normal values, what are the most likely pH and $[HCO_3$

A. lower pH and lower $[HCO_3$

B. lower pH and near normal $[HCO_3$

C. near normal pH and near normal $[HCO_3$

D. near normal pH and higher $[HCO_3$

E. higher pH and higher $[HCO_3$

71. Hydrogen ions generated in the body are buffered by

A. extracellular bicarbonate

B. plasma proteins

C. inorganic phosphates

D. intracellular proteins

E. All the above

72. Hypocapnia means:

A. minute ventilation is below normal

B. ICV osmolality is below normal

C. plasma $[HCO_3^-]$ is below normal

D. arterial $[CO_2]$ is below normal

E. plasma pH is below normal