Mastery Series: Regulation of BP

1. Which region of the brain monitors and regulates blood pressure?
2. Which part of the brainstem monitors and regulates blood pressure?
3. Which part of the medulla regulates heart rate?
4. Which part of the medulla regulates blood pressure?
5. Essentially, these are reflexes. If blood pressure is too low, how will the medulla respond (consider both cardioregulatory and vasomotor centers)?
6. If blood pressure is too high, how will the medulla respond (again, consider both cardioregulatory and vasomotor centers)?
7. How can the limbic system affect blood pressure?
8. What hormones can **lower** blood pressure by stimulating the kidney to lose salt and water? Under what circumstances would these hormones be secreted?
9. What hormones can **raise** blood pressure? Consider where each of these hormones comes from, what the stimulus is for its release, and what its target is.
10. Describe in detail the RAAS.
11. How would each of the following medications lower blood pressure (consider the equation BP = CO X PR
    a. Beta blocker
    b. ACE inhibitor
    c. Aldosterone antagonist
    d. Calcium channel blocker
    e. Diuretics
12. How can ACTH ultimately raise blood pressure? Trace its whole path.
13. If blood flow through an arteriole is decreased, is the arteriole most likely in a constricted or dilated state?
14. If blood flow through an arteriole is decreased, is blood flow greater or lesser in the organ the arteriole is leading to?
15. If blood flow through an arteriole is decreased, what happens to systemic blood pressure?
16. During fight or flight (sympathetic stimulation), are arterioles to the
    a. Kidneys constricted or dilated
    b. Heart constricted or dilated
    c. Large skeletal muscles constricted or dilated
    d. GI organs constricted or dilated
17. Which neurotransmitter mediates blood vessel constriction and dilation?
18. How can one neurotransmitter cause some blood vessels to constrict, and others to dilate?

Regulation of Blood Pressure Mastery Series Answers

1. Brainstem
2. Medulla oblongata
3. Cardioregulatory center
4. Vasomotor centers
5. Cardioacceleratory center: Fire action potentials down spinal cord; sympathetic neurons will then exit spinal cord, synapse on SA node (releasing NE onto B1 adrenergic receptors) and speed up heart and increase its force of contraction. Vasomotor center: Fire action potentials down spinal cord; sympathetic neurons will then exit spinal cord, synapse on blood vessels and cause constriction of blood vessels leading to GI system, urinary system, and skin
6. Cardioinhibitory center: Fire action potentials down vagus nerve; parasympathetic neurons will synapse on the SA node and slow the heart down and decrease force of contraction. Vasomotor center: Fire action potentials down spinal cord; sympathetic neurons will exit spinal cord, synapse on blood vessels and cause dilation of blood vessels leading to GI system, urinary system and skin
7. Heightened emotions can cause the hypothalamus to override the medulla oblongata and increase or decrease blood pressure (increase if the emotions are excited; decrease if the emotions are relaxed)
8. natriuretic peptides (released from heart if blood pressure is high)
9. Angiotensin directly constricts blood vessels and stimulates release of ADH (which targets collecting ducts of nephrons to increase water reabsorption); and AII also stimulates release of Aldo (which targets (particularly) the DCT of the nephrons to increase salt reabsorption). Epinephrine constricts blood vessels; thyroxine increases BP by increasing HR.
10. Low blood volume/blood pressure in the kidney triggers the kidney to release renin. Renin converts circulating Angiotensinogen into Angiotensin I. ACE converts AI →AII. AII does three things: 1. Causes vasoconstriction; 2. Stimulates release of ADH from posterior pituitary gland; 3. Stimulates release of Aldo from adrenal cortex
11. a) blocks NE effects on HR and contractility (thus lowers CO); b) blocks formation of AII (thus lowers PR); c) blocks Aldo's effects on Na+ reabsorption (lowers PR); d) blocks entry of calcium into cardiac cells (lowers CO); decrease fluid volume (lowers PR).
12. Pituitary gland releases ACTH which stimulates release of steroids (including aldo) from the adrenal cortex. Aldo stimulates DCT of nephrons to reabsorb more Na+. Water follows salt, so fluid volume raises. Increased fluid increases BP.
13. Constricted
14. Decreased blood flow through the organ
15. Increases
16. a) constricted; b) dilated; c) dilated; d) constricted
17. primarily NE
18. different receptors. Skeletal blood vessels often have B2 adrenergic receptors and dilate during fight or flight; skin blood vessels often have alpha adrenergic receptors and constrict during fight or flight