

Name \_\_\_\_\_

Choices may be used more than once or not at all.

**Matching**

1-5. Matching

- |                       |  |          |
|-----------------------|--|----------|
| A) Parasympathetic NS | Make up autonomic NS                                     | 1) _____ |
| B) Sympathetic NS     | Secretes acetylcholine onto organs                       | 2) _____ |
| C) A and B            | Secretes norepinephrine onto organs                      | 3) _____ |
|                       | Involved in control of organs during physical activity   | 4) _____ |
|                       | Involved in control of organs during rest and relaxation | 5) _____ |

6-10. Matching (efferent = outgoing)

- |                             |  |           |
|-----------------------------|--|-----------|
| A) Autonomic nervous system | Has ganglionic neurons that control visceral organs                | 6) _____  |
| B) Somatic nervous system   | Has preganglionic neurons that control ganglionic neurons          | 7) _____  |
|                             | Has alpha motor neurons that control skeletal muscle cells         | 8) _____  |
|                             | Uses one efferent neuron to connect between CNS and target cell    | 9) _____  |
|                             | Has neurons that control cardiac muscle, smooth muscle, and glands | 10) _____ |

11-15. Matching

- |                       |  |           |
|-----------------------|--|-----------|
| A) Parasympathetic NS | Alpha motor neurons secrete acetylcholine        | 11) _____ |
| B) Sympathetic NS     | Preganglionic neurons secrete acetylcholine      | 12) _____ |
| C) Somatic NS         | Cells of adrenal medulla secrete epinephrine     | 13) _____ |
| D) A and B            | (Post) ganglionic neurons secrete acetylcholine  | 14) _____ |
|                       | (Post) ganglionic neurons secrete norepinephrine | 15) _____ |

16-20. Matching

- |                   |  |           |
|-------------------|--|-----------|
| A) Norepinephrine | Is / Are lipid soluble                                     | 16) _____ |
| B) Acetylcholine  | Is / Are water soluble                                     | 17) _____ |
| C) Steroids       | Bind(s) to adrenergic alpha or beta receptors              | 18) _____ |
| D) A & B          | Binds to nicotinic-m receptors of skeletal muscles         | 19) _____ |
|                   | Binds to nicotinic-n receptors of (post)ganglionic neurons | 20) _____ |

21-25. Matching (acting on target organs)

- |                   |   |           |
|-------------------|---|-----------|
| A) Norepinephrine | Increases heart rate                          | 21) _____ |
| B) Acetylcholine  | Decreases heart rate                          | 22) _____ |
|                   | Dilates bronchial tubes                       | 23) _____ |
|                   | Constricts gastrointestinal blood vessels     | 24) _____ |
|                   | Dilates many blood vessels in skeletal muscle | 25) _____ |

26-30. Matching

- |                                    |   |           |
|------------------------------------|---|-----------|
| A) Increase cardiac rate and force | Beta-1 receptors of target organs       | 26) _____ |
| B) Contract smooth muscle          | Beta-2 receptors of target organs       | 27) _____ |
| C) Decrease cardiac rate           | Alpha-1 receptors of target organs      | 28) _____ |
| D) Relax smooth muscle             | Muscarinic-2 receptors of target organs | 29) _____ |
|                                    | Muscarinic-3 receptors of target organs | 30) _____ |

31-35. Matching (GPCRs = G-protein coupled receptors).

- |   |                        |           |
|---|------------------------|-----------|
| A) GPCRs, ↑ adenylyl cyclase, ↑ cAMP, ↑ PKA, ↑ Ca <sup>2+</sup> pumps             | Beta-1 receptors       | 31) _____ |
| B) GPCRs, ↑ adenylyl cyclase, ↑ cAMP, ↑ PKA, ↑ Ca <sup>2+</sup> , Na <sup>+</sup> | Beta-2 receptors       | 32) _____ |
| C) GPCRs, ↑ phospholipase C, ↑ IP3, ↑ Ca <sup>2+</sup>                            | Alpha-1 receptors      | 33) _____ |
| D) GPCRs, Gβδ gated K <sup>+</sup> channels                                       | Muscarinic-2 receptors | 34) _____ |
|   | Muscarinic-3 receptors | 35) _____ |

36-40. Matching

- |                        |   |           |
|------------------------|---|-----------|
| A) Endocrine signaling | Uses chemical messengers called hormones                      | 36) _____ |
| B) Neural signaling    | Uses chemical messengers released into blood                  | 37) _____ |
|                        | Uses chemical messengers called neurotransmitters             | 38) _____ |
|                        | Uses chemical messengers released into synaptic cleft         | 39) _____ |
|                        | Uses chemical messengers that are almost always water soluble | 40) _____ |

41-45. Matching

- |                       |  |           |
|-----------------------|--|-----------|
| A) Parathyroid        | Secretes hypothalamic regulatory hormones – e.g. CRH | 41) _____ |
| B) Hypothalamus       | Secretes ACTH, TSH, GH, FSH, LH, PRL                 | 42) _____ |
| C) Adrenal cortex     | Releases aldosterone, cortisol, DHEA                 | 43) _____ |
| D) Pancreatic Islets  | Secretes parathyroid hormone                         | 44) _____ |
| E) Anterior Pituitary | Secretes insulin and glucagon                        | 45) _____ |

46-50. Matching

- |                              |                      |           |
|------------------------------|----------------------|-----------|
| A) Testosterone              | Parathyroid secretes | 46) _____ |
| B) Insulin, glucagon         | Pancreas secretes    | 47) _____ |
| C) Parathyroid hormone       | Thyroid produces     | 48) _____ |
| D) Estrogens, progesterone   | Ovaries produce      | 49) _____ |
| E) Thyroxin, triiodothyronin | Testes produce       | 50) _____ |

51-55. Matching

- |                  |                              |           |
|------------------|------------------------------|-----------|
| A) Water soluble | Steroids                     | 51) _____ |
| B) Lipid soluble | Peptides                     | 52) _____ |
|                  | Norepinephrine               | 53) _____ |
|                  | Non thyroid amines           | 54) _____ |
|                  | Thyroxin and triiodothyronin | 55) _____ |

56-60. Matching

- |                  |             |           |
|------------------|-------------|-----------|
| A) Lipid soluble | CRH         | 56) _____ |
| B) Water soluble | ACTH        | 57) _____ |
|                  | Insulin     | 58) _____ |
|                  | Cortisol    | 59) _____ |
|                  | Epinephrine | 60) _____ |

61-65. Matching

- |                       |   |           |
|-----------------------|---|-----------|
| A) Non-Tropic hormone | Cortisol                                | 61) _____ |
| B) Tropic hormone     | Corticotropin (ACTH)                    | 62) _____ |
|                       | Hormone acts on target organ            | 63) _____ |
|                       | Corticotropin releasing hormone (CRH)   | 64) _____ |
|                       | Hormone acts on another endocrine gland | 65) _____ |

66-70. Matching

- |  |             |           |
|--|-------------|-----------|
| A) Binds to GPCRs                            | CRH         | 66) _____ |
| B) Binds to ligand gated channels            | ACTH        | 67) _____ |
| C) Binds to response elements of genes       | Insulin     | 68) _____ |
| D) Binds to Tyrosine kinase linked receptors | Cortisol    | 69) _____ |
|  | Epinephrine | 70) _____ |

71-75. Place the following in order in response to low blood calcium.

- |   |        |           |
|---|--------|-----------|
| A) Bone matrix is dissolved   | first  | 71) _____ |
| B) Parathyroid chief cells are stimulated                             | second | 72) _____ |
| C) Calcium and phosphate enter the blood                              | third  | 73) _____ |
| D) Parathyroid hormone (PTH) stimulates osteoclasts of bone           | fourth | 74) _____ |
| E) Parathyroid secretes parathyroid hormone (PTH) into systemic blood | fifth  | 75) _____ |

76-80. Place the following in order in response to high blood glucose.

- |  |        |           |
|--|--------|-----------|
| A) Pancreatic beta cells are stimulated                                  | first  | 76) _____ |
| B) Glucose is transported into cells and used or stored                  | second | 77) _____ |
| C) Pancreatic beta cells secrete insulin into systemic blood             | third  | 78) _____ |
| D) Glucose transporters are inserted into plasma membrane                | fourth | 79) _____ |
| E) Insulin binds to tyrosine kinase linked receptors in muscle and liver | fifth  | 80) _____ |

81-85. Place the following in the order they occur in response to low blood glucose.

- |  |        |           |
|--|--------|-----------|
| A) Pancreatic alpha cells are stimulated                             | first  | 81) _____ |
| B) Glucose is used or transported out of cells                       | second | 82) _____ |
| C) Pancreatic alpha cells secrete glucagon into systemic blood       | third  | 83) _____ |
| D) Stored glycogen is broken down to glucose (glucose 6-phosphate)   | fourth | 84) _____ |
| E) Glucagon binds to G-protein coupled receptors in muscle and liver | fifth  | 85) _____ |

86-90. Place the following in the order they occur in response to stress or trauma.

- |   |        |           |
|---|--------|-----------|
| A) CRH is secreted into pituitary portal vessels                          | first  | 86) _____ |
| B) CRH stimulates corticotrophs in anterior pituitary                     | second | 87) _____ |
| C) Hypothalamic parvocellular (CRH) neurons are stimulated                | third  | 88) _____ |
| D) Corticotrophs secrete Corticotropin (ACTH) into systemic blood         | fourth | 89) _____ |
| E) Corticotropin (ACTH) stimulates the adrenal cortex to produce cortisol | fifth  | 90) _____ |

91-95. Place the following in the order they occur in response to low metabolism (low body temperature).

- |  |        |           |
|--|--------|-----------|
| A) TRH is secreted into pituitary portal vessels                           | first  | 91) _____ |
| B) TRH stimulates thyrotrophs in anterior pituitary                        | second | 92) _____ |
| C) Hypothalamic parvocellular (TRH) neurons are stimulated                 | third  | 93) _____ |
| D) Thyrotrophs secrete thyrotropin (TSH) into systemic blood               | fourth | 94) _____ |
| E) Thyrotropin (TSH) stimulates the thyroid follicles to produce T4 and T3 | fifth  | 95) _____ |

96-100. Matching

- |                                      |                                       |            |
|--------------------------------------|---------------------------------------|------------|
| A) Secreted from posterior pituitary | Oxytocin                              | 96) _____  |
| B) Secreted from anterior pituitary  | Somatotropin (GH)                     | 97) _____  |
| C) Secreted from hypothalamus        | Corticotropin (ACTH)                  | 98) _____  |
|                                      | Corticotropin releasing hormone (CRH) | 99) _____  |
|                                      | Somatotropin releasing hormone (GHRH) | 100) _____ |

101-105. Matching

- |                                      |                                       |            |
|--------------------------------------|---------------------------------------|------------|
| A) Secreted from posterior pituitary | Vasopressin                           | 101) _____ |
| B) Secreted from anterior pituitary  | Prolactin (PRL)                       | 102) _____ |
| C) Secreted from hypothalamus        | Thyrotropin (TSH)                     | 103) _____ |
|                                      | Gonadotropins (FSH, LH)               | 104) _____ |
|                                      | Gonadotropin releasing hormone (GnRH) | 105) _____ |

106-110. Matching

- |                                    |                             |            |
|------------------------------------|-----------------------------|------------|
| A) Secreted from adrenal medulla   | Cortisol                    | 106) _____ |
| B) Secreted from thyroid follicles | Thyroxin                    | 107) _____ |
| C) Secreted from adrenal cortex    | Estrogen                    | 108) _____ |
| D) Secreted from ovaries           | Epinephrine                 | 109) _____ |
| E) Secreted from liver             | Insulin-like growth factors | 110) _____ |

111-115. Matching

- |   |   |            |
|---|---|------------|
| A) Controlled by follicle stimulating hormone (FSH) | Production of cortisol                    | 111) _____ |
| B) Controlled by corticotropin (ACTH)               | Production of thyroxin                    | 112) _____ |
| C) Controlled by acetylcholine (Ach)                | Production of estrogen                    | 113) _____ |
| D) Controlled by somatotropin (GH)                  | Secretion of epinephrine                  | 114) _____ |
| E) Controlled by thyrotropin (TSH)                  | Production of insulin-like growth factors | 115) _____ |

Name \_\_\_\_\_

**Fill in**

1. \_\_\_\_\_ binds to nicotinic-n receptors in the dendrites of autonomic (post)ganglionic neurons.
2. \_\_\_\_\_ binds to muscarinic M-2, GPCRs in the heart and slows heart rate.
3. \_\_\_\_\_ binds to muscarinic M-3, GPCRs in bladder and causes contraction.
4. \_\_\_\_\_ binds to alpha-1 receptors in blood vessels and cause vascular constriction.
5. \_\_\_\_\_ binds to beta-1 receptors in the heart and increases rate and enhances force.
6. \_\_\_\_\_ binds to beta-2 receptors in the lungs and cause bronchial dilation.
7. \_\_\_\_\_ soluble chemical messengers are packaged in vesicles for secretion.
8. \_\_\_\_\_ soluble chemical messengers are synthesized and released on demand.
9. \_\_\_\_\_ suppresses the immune system.
10. Cortisol shifts cellular metabolism to use fat and protein rather than \_\_\_\_\_.
11. Decreased levels of calcium in the blood usually causes an elevation of the hormone \_\_\_\_\_ in the blood.
12. Increased consumption of sugar usually cause an elevation of the hormone \_\_\_\_\_ in the blood.
13. Decreased levels of blood cortisol caused by adrenal destruction is diagnosed as \_\_\_\_\_.
14. In the situation above (# 30) blood levels of \_\_\_\_\_ are usually elevated.
15. Increased levels of blood cortisol caused by an adrenal tumor or prednisone therapy is diagnosed clinically as \_\_\_\_\_.
16. Increased levels of blood cortisol caused by a pituitary tumor is diagnosed clinically as \_\_\_\_\_.
17. Increased levels of blood cortisol often cause an elevation of blood \_\_\_\_\_.
18. Increased levels of cortisol in the blood are usually caused by an elevation of \_\_\_\_\_ (a hormone) in the blood.
19. Increased levels of cortisol in the blood will cause increases in \_\_\_\_\_ in the blood.
- 20 \_\_\_\_\_ (a hormone) alters cellular metabolism and suppresses the immune system.
21. The \_\_\_\_\_ of the brain plays a role in detecting and responding to threats (based on memory of "bad" experiences).
22. Vasopressin and oxytocin are produced by neurons in the \_\_\_\_\_.

23. CRH and TRH are produced by neurons in the \_\_\_\_\_.
24. ACTH and TSH are produced by cells in the \_\_\_\_\_.
25. ACTH controls the production of \_\_\_\_\_ by the \_\_\_\_\_.
26. TSH controls the production of \_\_\_\_\_ by the \_\_\_\_\_.
27. General metabolism is controlled by \_\_\_\_\_ (hormone).

Name \_\_\_\_\_

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**Matching**

1-5. Matching

- |                       |  |                 |
|-----------------------|--|-----------------|
| A) Parasympathetic NS | Make up autonomic NS                                     | 1) <u>  C  </u> |
| B) Sympathetic NS     | Secretes acetylcholine onto organs                       | 2) <u>  A  </u> |
| C) A and B            | Secretes norepinephrine onto organs                      | 3) <u>  B  </u> |
|                       | Involved in control of organs during physical activity   | 4) <u>  B  </u> |
|                       | Involved in control of organs during rest and relaxation | 5) <u>  A  </u> |

6-10. Matching (efferent = outgoing)

- |                             |  |                  |
|-----------------------------|--|------------------|
| A) Autonomic nervous system | Has ganglionic neurons that control visceral organs                | 6) <u>  A  </u>  |
| B) Somatic nervous system   | Has preganglionic neurons that control ganglionic neurons          | 7) <u>  A  </u>  |
|                             | Has alpha motor neurons that control skeletal muscle cells         | 8) <u>  B  </u>  |
|                             | Uses one efferent neuron to connect between CNS and target cell    | 9) <u>  B  </u>  |
|                             | Has neurons that control cardiac muscle, smooth muscle, and glands | 10) <u>  A  </u> |

11-15. Matching

- |                       |  |                  |
|-----------------------|--|------------------|
| A) Parasympathetic NS | Alpha motor neurons secrete acetylcholine        | 11) <u>  C  </u> |
| B) Sympathetic NS     | Preganglionic neurons secrete acetylcholine      | 12) <u>  D  </u> |
| C) Somatic NS         | Cells of adrenal medulla secrete epinephrine     | 13) <u>  B  </u> |
| D) A and B            | (Post) ganglionic neurons secrete acetylcholine  | 14) <u>  A  </u> |
|                       | (Post) ganglionic neurons secrete norepinephrine | 15) <u>  B  </u> |

16-20. Matching

- |                   |  |                  |
|-------------------|--|------------------|
| A) Norepinephrine | Is / Are lipid soluble                                     | 11) <u>  C  </u> |
| B) Acetylcholine  | Is / Are water soluble                                     | 17) <u>  D  </u> |
| C) Steroids       | Bind(s) to adrenergic alpha or beta receptors              | 18) <u>  A  </u> |
| D) A & B          | Binds to nicotinic-m receptors of skeletal muscles         | 19) <u>  B  </u> |
|                   | Binds to nicotinic-n receptors of (post)ganglionic neurons | 20) <u>  B  </u> |

21-25. Matching (acting on target organs)

- |                   |   |                  |
|-------------------|---|------------------|
| A) Norepinephrine | Increases heart rate                          | 21) <u>  A  </u> |
| B) Acetylcholine  | Decreases heart rate                          | 22) <u>  B  </u> |
|                   | Dilates bronchial tubes                       | 23) <u>  A  </u> |
|                   | Constricts gastrointestinal blood vessels     | 24) <u>  A  </u> |
|                   | Dilates many blood vessels in skeletal muscle | 25) <u>  A  </u> |

26-30. Matching

- |                                    |   |                  |
|------------------------------------|---|------------------|
| A) Increase cardiac rate and force | Beta-1 receptors of target organs       | 26) <u>  A  </u> |
| B) Contract smooth muscle          | Beta-2 receptors of target organs       | 27) <u>  D  </u> |
| C) Decrease cardiac rate           | Alpha-1 receptors of target organs      | 28) <u>  B  </u> |
| D) Relax smooth muscle             | Muscarinic-2 receptors of target organs | 29) <u>  C  </u> |
|                                    | Muscarinic-3 receptors of target organs | 30) <u>  B  </u> |

31-35. Matching (GPCRs = G-protein coupled receptors).

- |   |                        |                  |
|---|------------------------|------------------|
| A) GPCRs, ↑ adenylyl cyclase, ↑ cAMP, ↑ PKA, ↑ Ca <sup>2+</sup> pumps             | Beta-1 receptors       | 31) <u>  B  </u> |
| B) GPCRs, ↑ adenylyl cyclase, ↑ cAMP, ↑ PKA, ↑ Ca <sup>2+</sup> , Na <sup>+</sup> | Beta-2 receptors       | 32) <u>  A  </u> |
| C) GPCRs, ↑ phospholipase C, ↑ IP <sub>3</sub> , ↑ Ca <sup>2+</sup>               | Alpha-1 receptors      | 33) <u>  C  </u> |
| D) GPCRs, Gβδ gated K <sup>+</sup> channels                                       | Muscarinic-2 receptors | 34) <u>  D  </u> |
|   | Muscarinic-3 receptors | 35) <u>  C  </u> |

36-40. Matching

- |                        |   |                  |
|------------------------|---|------------------|
| A) Endocrine signaling | Uses chemical messengers called hormones                      | 36) <u>  A  </u> |
| B) Neural signaling    | Uses chemical messengers released into blood                  | 37) <u>  A  </u> |
|                        | Uses chemical messengers called neurotransmitters             | 33) <u>  B  </u> |
|                        | Uses chemical messengers released into synaptic cleft         | 39) <u>  B  </u> |
|                        | Uses chemical messengers that are almost always water soluble | 40) <u>  B  </u> |

41-45. Matching

- |                       |  |                  |
|-----------------------|--|------------------|
| A) Parathyroid        | Secretes hypothalamic regulatory hormones – e.g. CRH | 41) <u>  B  </u> |
| B) Hypothalamus       | Secretes ACTH, TSH, GH, FSH, LH, PRL                 | 42) <u>  E  </u> |
| C) Adrenal cortex     | Releases aldosterone, cortisol, DHEA                 | 43) <u>  C  </u> |
| D) Pancreatic Islets  | Secretes parathyroid hormone                         | 44) <u>  A  </u> |
| E) Anterior Pituitary | Secretes insulin and glucagon                        | 45) <u>  D  </u> |

46-50. Matching

- |                              |                      |                  |
|------------------------------|----------------------|------------------|
| A) Testosterone              | Parathyroid secretes | 46) <u>  C  </u> |
| B) Insulin, glucagon         | Pancreas secretes    | 47) <u>  B  </u> |
| C) Parathyroid hormone       | Thyroid produces     | 48) <u>  E  </u> |
| D) Estrogens, progesterone   | Ovaries produce      | 49) <u>  D  </u> |
| E) Thyroxin, triiodothyronin | Testes produce       | 50) <u>  A  </u> |

51-55. Matching

- |                  |                              |                  |
|------------------|------------------------------|------------------|
| A) Water soluble | Steroids                     | 51) <u>  B  </u> |
| B) Lipid soluble | Peptides                     | 52) <u>  A  </u> |
|                  | Norepinephrine               | 53) <u>  A  </u> |
|                  | Non thyroid amines           | 54) <u>  A  </u> |
|                  | Thyroxin and triiodothyronin | 55) <u>  B  </u> |

56-60. Matching

- |                  |             |                  |
|------------------|-------------|------------------|
| A) Lipid soluble | CRH         | 56) <u>  B  </u> |
| B) Water soluble | ACTH        | 57) <u>  B  </u> |
|                  | Insulin     | 58) <u>  B  </u> |
|                  | Cortisol    | 59) <u>  A  </u> |
|                  | Epinephrine | 60) <u>  B  </u> |

61-65. Matching

- |                       |   |                  |
|-----------------------|---|------------------|
| A) Non-Tropic hormone | Cortisol                                | 61) <u>  A  </u> |
| B) Tropic hormone     | Corticotropin (ACTH)                    | 62) <u>  B  </u> |
|                       | Hormone acts on target organ            | 63) <u>  A  </u> |
|                       | Corticotropin releasing hormone (CRH)   | 64) <u>  B  </u> |
|                       | Hormone acts on another endocrine gland | 65) <u>  B  </u> |

66-70. Matching

- |  |             |                  |
|--|-------------|------------------|
| A) Binds to GPCRs                            | CRH         | 66) <u>  A  </u> |
| B) Binds to ligand gated channels            | ACTH        | 67) <u>  A  </u> |
| C) Binds to response elements of genes       | Insulin     | 68) <u>  D  </u> |
| D) Binds to Tyrosine kinase linked receptors | Cortisol    | 69) <u>  C  </u> |
|  | Epinephrine | 70) <u>  A  </u> |

71-75. Place the following in order in response to low blood calcium.

- |   |        |                  |
|---|--------|------------------|
| A) Bone matrix is dissolved   | first  | 71) <u>  B  </u> |
| B) Parathyroid chief cells are stimulated                             | second | 72) <u>  E  </u> |
| C) Calcium and phosphate enter the blood                              | third  | 73) <u>  D  </u> |
| D) Parathyroid hormone (PTH) stimulates osteoclasts of bone           | fourth | 74) <u>  A  </u> |
| E) Parathyroid secretes parathyroid hormone (PTH) into systemic blood | fifth  | 75) <u>  C  </u> |

76-80. Place the following in order in response to high blood glucose.

- |  |        |                  |
|--|--------|------------------|
| A) Pancreatic beta cells are stimulated                                  | first  | 76) <u>  A  </u> |
| B) Glucose is transported into cells and used or stored                  | second | 77) <u>  C  </u> |
| C) Pancreatic beta cells secrete insulin into systemic blood             | third  | 78) <u>  E  </u> |
| D) Glucose transporters are inserted into plasma membrane                | fourth | 79) <u>  D  </u> |
| E) Insulin binds to tyrosine kinase linked receptors in muscle and liver | fifth  | 80) <u>  B  </u> |

81-85. Place the following in in the order they occur in response to low blood glucose.

- |  |        |                  |
|--|--------|------------------|
| A) Pancreatic alpha cells are stimulated                             | first  | 81) <u>  A  </u> |
| B) Glucose is used or transported out of cells                       | second | 82) <u>  C  </u> |
| C) Pancreatic alpha cells secrete glucagon into systemic blood       | third  | 83) <u>  E  </u> |
| D) Stored glycogen is broken down to glucose (glucose 6-phosphate)   | fourth | 84) <u>  D  </u> |
| E) Glucagon binds to G-protein coupled receptors in muscle and liver | fifth  | 85) <u>  B  </u> |

86-90. Place the following in the order they occur in response to stress or trauma.

- |   |        |                  |
|---|--------|------------------|
| A) CRH is secreted into pituitary portal vessels                          | first  | 86) <u>  C  </u> |
| B) CRH stimulates corticotrophs in anterior pituitary                     | second | 87) <u>  A  </u> |
| C) Hypothalamic parvicellular (CRH) neurons are stimulated                | third  | 88) <u>  B  </u> |
| D) Corticotrophs secrete Corticotropin (ACTH) into systemic blood         | fourth | 89) <u>  D  </u> |
| E) Corticotropin (ACTH) stimulates the adrenal cortex to produce cortisol | fifth  | 90) <u>  E  </u> |

91-95. Place the following in the order they occur in response to low metabolism (low body temperature).

- |  |        |                  |
|--|--------|------------------|
| A) TRH is secreted into pituitary portal vessels                           | first  | 91) <u>  C  </u> |
| B) TRH stimulates thyrotrophs in anterior pituitary                        | second | 92) <u>  A  </u> |
| C) Hypothalamic parvicellular (TRH) neurons are stimulated                 | third  | 93) <u>  B  </u> |
| D) Thyrotrophs secrete thyrotropin (TSH) into systemic blood               | fourth | 94) <u>  D  </u> |
| E) Thyrotropin (TSH) stimulates the thyroid follicles to produce T4 and T3 | fifth  | 95) <u>  E  </u> |

96-100. Matching

- |                                      |                                       |                   |
|--------------------------------------|---------------------------------------|-------------------|
| A) Secreted from posterior pituitary | Oxytocin                              | 96) <u>  A  </u>  |
| B) Secreted from anterior pituitary  | Somatotropin (GH)                     | 97) <u>  B  </u>  |
| C) Secreted from hypothalamus        | Corticotropin (ACTH)                  | 98) <u>  B  </u>  |
|                                      | Corticotropin releasing hormone (CRH) | 99) <u>  C  </u>  |
|                                      | Somatotropin releasing hormone (GHRH) | 100) <u>  C  </u> |

101-105. Matching

- |                                      |                                       |                   |
|--------------------------------------|---------------------------------------|-------------------|
| A) Secreted from posterior pituitary | Vasopressin                           | 101) <u>  A  </u> |
| B) Secreted from anterior pituitary  | Prolactin (PRL)                       | 102) <u>  B  </u> |
| C) Secreted from hypothalamus        | Thyrotropin (TSH)                     | 103) <u>  B  </u> |
|                                      | Gonadotropins (FSH, LH)               | 104) <u>  B  </u> |
|                                      | Gonadotropin releasing hormone (GnRH) | 105) <u>  C  </u> |

106-110. Matching

- |                                    |                             |                   |
|------------------------------------|-----------------------------|-------------------|
| A) Secreted from adrenal medulla   | Cortisol                    | 106) <u>  C  </u> |
| B) Secreted from thyroid follicles | Thyroxin                    | 107) <u>  B  </u> |
| C) Secreted from adrenal cortex    | Estrogen                    | 108) <u>  D  </u> |
| D) Secreted from ovaries           | Epinephrine                 | 109) <u>  A  </u> |
| E) Secreted from liver             | Insulin-like growth factors | 110) <u>  E  </u> |

111-115. Matching

- |   |   |                   |
|---|---|-------------------|
| A) Controlled by follicle stimulating hormone (FSH) | Production of cortisol                    | 111) <u>  B  </u> |
| B) Controlled by corticotropin (ACTH)               | Production of thyroxin                    | 112) <u>  E  </u> |
| C) Controlled by acetylcholine (Ach)                | Production of estrogen                    | 113) <u>  A  </u> |
| D) Controlled by somatotropin (GH)                  | Secretion of epinephrine                  | 114) <u>  C  </u> |
| E) Controlled by thyrotropin (TSH)                  | Production of insulin-like growth factors | 115) <u>  D  </u> |



Name \_\_\_\_\_

**Fill in**

1. **Acetylcholine** binds to nicotinic-n receptors in the dendrites of autonomic (post)ganglionic neurons.
2. **Acetylcholine** binds to muscarinic M-2, GPCRs in the heart and slows heart rate.
3. **Acetylcholine** binds to muscarinic M-3, GPCRs in bladder and causes contraction.
4. **Norepinephrine** binds to alpha-1 receptors in blood vessels and cause vascular constriction.
5. **Norepinephrine** binds to beta-1 receptors in the heart and increases rate and enhances force.
6. **Norepinephrine** binds to beta-2 receptors in the lungs and cause bronchial dilation.
7. **Water** soluble chemical messengers are packaged in vesicles for secretion.
8. **Lipid** soluble chemical messengers are synthesized and released on demand.
9. **Cortisol** suppresses the immune system.
10. Cortisol shifts cellular metabolism to use fat and protein rather than **glucose**.
11. Decreased levels of calcium in the blood usually causes an elevation **parathyroid** hormone in the blood.
12. Increased consumption of sugar usually cause an elevation of the hormone **insulin** in the blood
13. Decreased levels of blood cortisol caused by adrenal destruction is diagnosed clinically as **Addison's disease**.
14. In the situation above (# 30) blood levels of the hormone **corticotropin (ACTH)** are usually elevated.
15. Increased levels of blood cortisol (hypercortisolism), regardless of cause, is diagnosed clinically as **Cushing's syndrome**.
16. Increased levels of blood cortisol caused by a pituitary tumor is diagnosed clinically as **Cushing's disease**.
17. Increased levels of blood cortisol often cause an elevation of blood **glucose**.
18. Increased levels of cortisol in the blood are usually caused by an elevation of **ACTH** (a hormone) in the blood.
19. Increased levels of cortisol in the blood will cause increases in **glucose** in the blood.
20. **Cortisol** (a hormone) alters cellular metabolism and suppresses the immune system.
21. The **amygdala** of the brain plays a role in detecting and responding to threats (based on memory of "bad" experiences).
22. Vasopressin and oxytocin are produced by neurons in the **hypothalamus**.

23. CRH and TRH are produced by neurons in the **\_\_hypothalamus\_\_**.
24. ACTH and TSH are produced by cells in the **\_\_anterior\_\_ \_\_pituitary\_\_**.
25. ACTH controls the production of **\_\_cortisol\_\_** by the **\_\_adrenal\_\_ \_\_cortex\_\_**.
26. TSH controls the production of **\_\_thyroxin\_\_** by the **\_\_thyroid\_\_ \_\_follicles\_\_**.
27. General metabolism is controlled by **\_\_thyroxin\_\_** (hormone).