

Team Number: _____

Team Name: _____

Participant names: _____

For Office Use Only:

Part 1: _____ / 37.5

Part 2: _____ / 36

Part 3: _____ / 39

Score: _____ / 112.5

Princeton Science Olympiad
Anatomy & Physiology

Please write all your answers here.

Part 1 – Nervous System:

1. C _____
2. B _____
3. D _____
4. B _____
5. C _____
6. C _____
7. D _____
8. C _____
9. A/B/E (1.5 Points for this question, 0.5 point for each) _____
10. A _____
11. A _____
12. B _____
13. E _____
14. C _____
15. C _____
16. E _____
17. A _____
18. E _____
19. Total 4 Points

Any two of the following: epilepsy/seizures, sleep disorders, tumors, encephalopathies, head injuries, stroke, brain death (1 point for correct disorder)

EEG detects all electrical activity in the brain from the electrodes placed on the scalp of the brain. The frequency pattern and location of electrical activity can be used to diagnose different disorders. (2 Points for description of EEG)

20. Total 5 Points (1 Point each)
 - a. F; Cerebellum
 - b. G; Wernicke's Area
 - c. H; Occipital Lobe
 - d. A; Frontal lobe
 - e. D; Medulla oblongata

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21. Total 3 Points (1 Point each)

- a. ___ Barbiturates _____
- b. ___ Alcohol
- c. ___ Caffeine

22. Total 2 Points (1 Point for each of the explanation below)

binds to and inhibits acetylcholinesterase; prevents breakdown of acetylcholine

23. Total 2 Points

Arrival of stimulus (needle), Activation of receptor, Action potential in sensory neuron, Information processed in CNS, Activation of a motor neuron, Response by effector (lifts foot)

24. Total 3 points; 1 for name of procedure, 1 for ideal location, 1 for example of disease

Name of Procedure: Called Lumbar puncture, lumbar tap or spinal tap

Ideal Location: Fluid removed from subarachnoid space inferior to L3 (inferior to L3 is also acceptable)

Example of Disease: Most commonly used to confirm suspected meningitis

Other possible disease answers: subarachnoid hemorrhage, hydrocephalus, benign intracranial hypertension, presence of malignant cells in the CSF, as in carcinomatous meningitis or medulloblastoma

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Part 2 – Sensory System

25. ___ B _____

26. ___ C _____

27. ___ A _____

28. ___ C _____

29. ___ D _____

30. ___ B _____

31. ___ D _____

32. Total 5 Points (1 Point each)

a. ___ Taste Pore _____

b. ___ Microvilli _____

c. ___ Supporting Cells _____

d. ___ Sensory cells/gustatory receptor cell

e. ___ basal cells _____

33. ___ C _____

34. ___ E _____

35. ___ C _____

36. ___ C _____

37. 4 Points... 1 point each for sentence...

Vibration of the basilar membrane causes hair bundles at apex of hair cell to bend back and forth against one another. As the stereocilia bend, the transduction channels are opened, **allowing K⁺ from the endolymph to enter the hair cell cytosol**. This produces a depolarizing receptor potential, which causes **voltage gated Ca²⁺** channels to open. **Inflow of Ca²⁺ triggers** exocytosis of synaptic vesicles containing neurotransmitters.

38. ___ C _____

39. ___ 6 Points (1 Point each) _____

a. ___ Semicircular Canals _____

b. ___ Ampulla _____

c. ___ round window _____

d. ___ Utricle _____

e. ___ Oval Window _____

f. ___ Cochlea _____

40. Total 5 Points

a. (1 point for disease identification, and 1 point for location)
Otitis Media, an acute infection of the MIDDLE EAR

Team Number: _____

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- b. Bacteria passing into auditory tube from the nasopharynx (1 Point)
- c. (1 point for auditory tubes horizontal, and 1 point for why that makes children more susceptible)

Because their auditory tubes are horizontal, which decreases drainage of fluid from the middle ear.

41. Total 4 points

- a. Nyctalopia (1 Point)
- b. (1 point for malnutrition/not eat properly, 1 point for Vitamin A mention)
Malnutrition, leading to the lack of Vitamin A that is commonly found in fish oils, liver, and dairy products
- c. X-linked (1 Point)

Part 3 – Endocrine System

42. ___ B/D _____ (0.5 point for each)_

43. ___ B _____

44. ___ C _____

45. ___ B _____

46. ___ C _____

47. ___ B _____

48. ___ A _____

49. ___ B _____

50. ___ C _____

51. ___ F _____

52. ___ B _____

53. ___ A _____

54. ___ B _____

55. ___ D _____

56. ___ G _____

57. ___ A _____

58. ___ A _____

Team Number: _____

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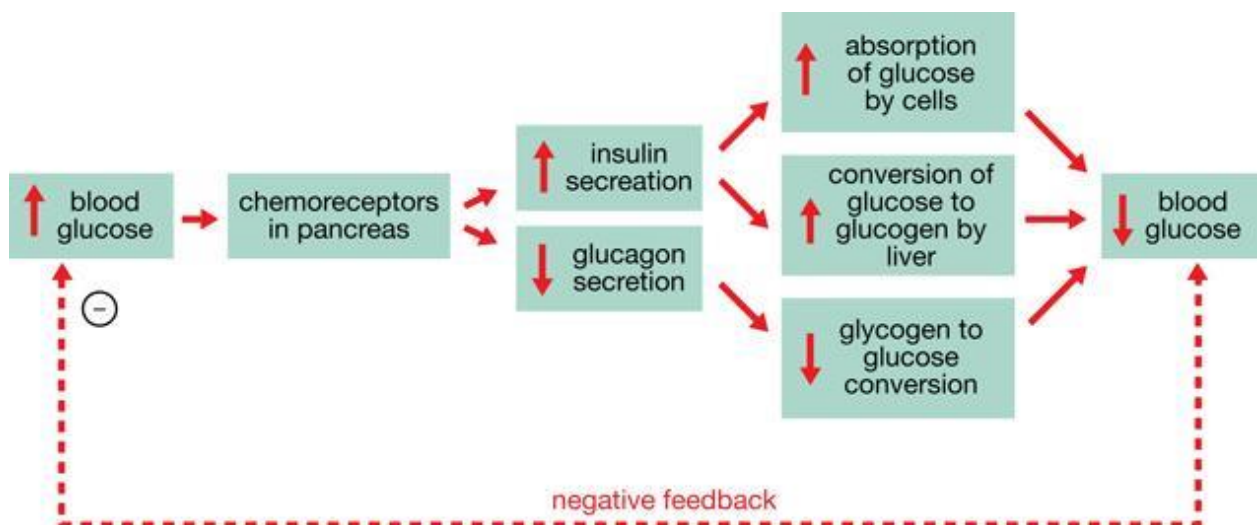
59. Total 3 Points (1 Point each)

- Diabetes Mellitus (need to specify diabetes mellitus; 0.5 points if only diabetes)
- Not enough insulin is being made.
- Acetone (ketone bodies) have a fruity odor _____

60. Total 5 Points

- Arachidonic Acid (1 Point)
- Red Blood Cells (2 Points)
- The precursor molecule is derived from phospholipids. (Linoleic acid is also an acceptable answer) (2 Points) _____

61. Total 6 Points



Regulation of Blood Glucose

- Stimulus: Increase in blood glucose (1 point)
- Increase in insulin secretion from pancreas (1 point)
- Effect:
 - increase in glucose absorption (1 point),
 - increase in conversion of glucose to glycogen in liver (1 point)
- Decrease in blood glucose (1 point)
- Negative Feedback (1 point)

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62. 4 points, 1 point per label

- a. Pars Tuberalis
- b. Pars Distalis
- c. Infundibulum
- d. Posterior Lobe/Neurohypophysis/Posterior Pituitary Gland (Any one of three)

63. Total 4 Points

- a. (1 point for disease identification, 1 point for what it is caused by)

Grave's Disease, which is caused by antibody production mimicking thyroid-stimulating hormone, resulting in continued stimulation of the thyroid gland and overproduction of the thyroid hormones.

- b. (1 point for overproduction of antibodies, 1 point for similar antibody receptors in extraocular muscle)

Overproduction of the antibodies may bind to a similar antibody receptors present in the extraocular muscle