# Figures in Physiology

## Cell Physiology

1. Action potential of a mammalian motor neuron. Give values of both axes!
2. Action potential and changes in contraction force of a muscle fiber during a single twitch.
3. Action potentials and changes in contraction force during single twitch, incomplete and complete tetanus of a muscle fiber. (Draw the curves in proportion to each other in their amplitudes and duration!)
4. Length-tension relationship of a skeletal muscle fiber. Give values of both axes!
5. End plate potentials before and after the application of curare.

## Cardiovascular Physiology

6. Action potential recorded from a cardiac ventricular cell. (Give values of both axes in case of the human resting heart!) Draw also transmembrane currents of $Na^+$, $Ca^{2+}$ and $K^+$ ions below!
7. Time-dependent changes in membrane potential and contraction force of a ventricular muscle fiber. (Give values of both axes in case of the human resting heart!)
8. Time-dependent changes in membrane potential and transmembrane ionic currents of the sinoatrial nodal cell.
9. Action potentials recorded from the cells in sinoatrial node, atrioventricular node and in Purkinje fibers. (Give values of both axes in case of the human resting heart!)
10. Effects of sympathetic and parasympathetic mediators on the sinoatrial nodal action potential. Draw action potentials in control and in experimental conditions separately! Indicate the potential values!
11. Draw Einthoven's triangle and indicate Einthoven limb leads!
12. Draw circuit diagram of unipolar limb leads!
13. Draw circuit diagram of augmented unipolar limb leads!

14. An example of normal ECG curve represented by lead II. Indicate atrioventricular transit time and QT interval and give their values for a resting human heart!
15. An example of normal ECG curves with a normal electrical main axis represented by the 3 bipolar limb leads. (Give values of time axis in case of the human resting heart!)
16. Draw action potentials recorded from the cells of sinoatrial node and ventricular muscle fiber and also draw the ECG curve (lead II) in the same time scale! Give values for the time axis!
17. Construct main electrical axis of the heart with Einthoven's triangle!
18. Draw left atrial, aortic, left ventricular pressure and ECG curves for a cardiac cycle! Give values of both axes!
19. Draw ECG curves (lead II), the pulmonary arterial pressure and right ventricular pressure curves for a cardiac cycle in the same time scale! Give values of both axes!
20. Draw ECG curves (lead II) and changes in left ventricular volume for a cardiac cycle in the same time scale! Give values of both axes (human values)! Indicate 1st and the 2nd heart sounds!
21. Draw diagram of left ventricular pressure versus left ventricular volume (pressure-volume loop) for a single cardiac cycle during resting condition and also during an increased preload! Give values of both axes (human values)!
22. Draw diagram of left ventricular pressure versus left ventricular volume (pressure-volume loop) for a single cardiac cycle during resting condition and also during an increased afterload! Give values of both axes (human values)!
23. Draw phasic changes of left coronary blood flow and aortic pressure in the same time scale! Give values of pressure and time axes in case of thee resting human heart!
24. Changes in intravascular pressure throughout the systemic circulation. Give pressure values on the Y axis!
25. Changes in cerebral blood flow in relation with arterial blood pressure. Give values of both axes!

**Renal Physiology**

26. Changes in intravascular pressure throughout the kidney vasculature. Mark the types of vessels on X axis and give pressure values on Y axis!
27. Transepithelial transport of glucose.
28. The rate of filtered, reabsorbed and excreted glucose in relation with the plasma glucose concentration. Give plasma concentration values on X axis! Mark Tm glucose (transport maximum of tubular reabsorption) on Y axis!
29. Transport mechanism for NaCl reabsorption in the thick ascending limb of the loop of Henle.

**Respiratory Physiology**

30. Graphic representation of static lung volumes. Give normal values on Y axis!
31. Real-time tracing of tidal volume, alveolar pressure and intrapleural pressure in eupnoe (normal tidal breath). Give phases of respiration on X axis and normal values on Y axis!
32. Time-related spirogram of forced expiration. Mark FEV1 and vital capacity on Y axis and give corresponding time values on X axis!
33. Changes in ventilation during physical exercise. Give duration of the exercise on X axis and normal values on Y axis!
34. Changes in minute ventilation in relation with alveolar $pCO_2$. Give values on both axes!
35. Changes in minute ventilation in relation with alveolar $pO_2$. Give values on both axes!
36. Respiratory flow-volume relationship during normal and forced respiration.

**Physiology of blood**

37. Oxyhemoglobin dissociation curve in blood. Give normal values related to arterial and venous blood on both axes!
38. Oxyhemoglobin dissociation curve in blood with altered pH (decreased and increased from normal). Give normal values related to arterial and venous blood on both axes!
39. Oxyhemoglobin dissociation curve in blood of a mother and her fetus. Give normal values related to arterial and venous blood of the mother on both axes!
40. Mechanism of $CO_2$ uptake by red blood cells in tissues.
41. Mechanism of $CO_2$ release by red blood cells in lung capillaries.
42. Draw a figure representing the role of $Cl^-$-$HCO_3^-$ exchanger in the mechanism of hemolysis of RBCs in isoosmotic $NH_4Cl$ solution!

**Gastrointestinal Physiology**

43. Gastrin release of a G cell and its control.
44. Direct and indirect effects of gastrin on the HCl secretion of parietal cells.
45. Local reflex pathways in enteric nervous system.
46. Mechanism of HCl secretion of parietal cells.
47. Mechanism of bicarbonate secretion of pancreatic ducts.
48. Absorption of glucose and galactose by enterocytes.

**Endocrine Physiology**

49. Oral glucose tolerance test (OGTT) curve of a healthy and a diabetic patient. Give values on both axes!
50. Mechanism of insulin secretion induced by glucose in pancreatic β cells.
51. Feedback control of the secretion of parathyroid hormone. Indicate the effects of PTH!

52. Draw the relationship between PTH secretion and plasma $Ca^{2+}$ concentration in humans! Give physiological $Ca^{2+}$ concentration values on X axis!
53. Feedback control of the function of thyroid gland.
54. Feedback control of the function of adrenal cortex.
55. Feedback control of the secretion of growth hormone.
56. Hormonal control of testicular function.
57. Changes in testosterone secretion in intrauterine and postnatal life periods. Give age values on X axis!
58. Hormonal control of the ovarian function.
59. Changes in plasma FSH and LH hormone levels throughout the menstrual cycle. Give the days of the cycle and the ovulatory phase on X axis!

**Physiology of the Nervous System**

60. Receptor potential and changes in frequency of action potentials in phasic and tonic receptors: signal adaptation.
61. Draw the neuronal network of Renshaw-inhibition.
62. Signaling mechanism in the hair cell.
63. Mechanism of referred pain.
64. Neuronal network of endogenous analgesia system in the spinal cord.
65. Sensitivity of cold thermoreceptors in function of temperature in mammals. Give the temperaure values on X axis!
66. Sensitivity of warm thermoreceptors in function of temperature in mammals. Give the temperaure values on X axis!
67. Ionic currents of photoreceptors in darkness and during light.
68. Visual field and main visual pathways of both eyes.