Variant 1

What phenomenon is called resonance? Under what conditions does resonance occur?
What is the therapeutic circuit of the UHF device, what is its structure and purpose.

The attenuation coefficient β is 10 s^{-1}, the oscillation Period T is 10^{-4} s. Find the value of the logarithmic decrement of attenuation λ and specify how many times the amplitude of oscillations will decrease after a time t equal to 3 * 10^{-3}c.

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,65	0	0,65	0	0,65	0	0,65
2	0,55	2	0,6	2	0,55	2	0,65
4	0,5	4	0,6	4	0,4	4	0,6
6	0,4	6	0,5	6	0,3	6	0,55
8	0,1	8	0,4	8	0,2	8	0,5
10	0,05	10	0,35	10	0,05	10	0,3

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	24,5	3	25,5	
		6	26,0	
		9	26,5	
dielectric	24,5	3	27,0	
		6	28,0	
		9	30,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

Variant 2

1. What is called the Q-factor of the resonant circuit? What is called the resonance curve? How, using the resonance curve, to determine the Q-factor of the oscillatory circuit?
2. What is darsonvalization, what is the mechanism of its action on the body? Specify the frequency of the RF currents used in darsonvalization.
3. The oscillating circuit of the device for therapeutic diathermy consists of an inductor of 500 Hn and a capacitor of 400 pF capacity. Determine the oscillation period.

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,95	0	0,95	0	0,95	0	0,95
2	0,45	2	0,85	2	0,55	2	0,85
4	0,35	4	0,65	4	0,5	4	0,7
6	0,25	6	0,75	6	0,45	6	0,65
8	0,2	8	0,55	8	0,4	8	0,55
10	0,05	10	0,4	10	0,35	10	0,45

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	21,5	3	22,5	
		6	23,0	
		9	23,5	
dielectric	23,5	3	29,5	
		6	35,0	
		9	40,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

Вариант 3

1. What is called the natural frequency and logarithmic decrement of the attenuation of the oscillatory circuit?
2. How to adjust the therapeutic circuit of the UHF device to resonance, why do you need to do this?
3. The oscillating circuit of the device for therapeutic diathermy consists of an inductor of 45 mcH and a capacitor of 300 pF capacity. Determine the frequency of the generator.

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,55	0	0,55	0	0,55	0	0,55
2	0,35	2	0,5	2	0,45	2	0,5
4	0,3	4	0,45	4	0,3	4	0,45
6	0,2	6	0,4	6	0,2	6	0,4
8	0,15	8	0,35	8	0,1	8	0,35
10	0,05	10	0,25	10	0,05	10	0,2

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	24,0	3	24,5	
		6	25,0	
		9	26,0	
dielectric	25,0	3	27,0	
		6	29,0	
		9	35,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

Вариант 4

1. Write and comment on the formulas for calculating the amount of heat released in various tissues in an alternating electric field.
2. What is the logarithmic decrement of attenuation, how is it related to the attenuation coefficient and the oscillation period in the electric oscillatory circuit? How to determine the logarithmic decrement of the contour attenuation from the oscillation pattern?
3. The oscillating circuit of the device for therapeutic diathermy consists of an inductor of 45 mcH and a capacitor of 300 pF capacity. Determine the frequency of the generator.

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	1,0	0	1,0	0	1,0	0	1,0
2	0,85	2	0,9	2	0,7	2	0,95
4	0,6	4	0,8	4	0,6	4	0,85
6	0,5	6	0,7	6	0,4	6	0,75
8	0,4	8	0,6	8	0,25	8	0,7
10	0,3	10	0,5	10	0,15	10	0,6

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	23,0	3	24,0	
		6	24,5	
		9	24,5	
dielectric	22,0	3	28,0	
		6	30,0	
		9	39,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained. (Δt=t(измер.) - t (исх)).

Variant 5

1. What electrical circuit is called an electric oscillating circuit? How do forced oscillations occur in the oscillatory circuit?
2. What is microwave therapy, what is the mechanism of action on the body? Specify the operating frequency range.
3. How much spinal fluid has warmed more than the blood under the action of the UHF, if the electric field does not change, but the resistivity of blood and cerebrospinal fluid, respectively, equal to 1.66 Ohm·m and 0.55 Ohm·m?

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,65	0	0,65	0	0,65	0	0,65
2	0,55	2	0,6	2	0,55	2	0,65
4	0,5	4	0,6	4	0,4	4	0,6
6	0,4	6	0,5	6	0,3	6	0,55
8	0,1	8	0,4	8	0,2	8	0,5
10	0,05	10	0,35	10	0,05	10	0,3

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	24,5	3	25,5	
		6	26,0	
		9	26,5	
dielectric	24,5	3	27,0	
		6	28,0	
		9	30,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

Variant 6

1. What electrical circuit is called an electric oscillating circuit? How does the frequency of forced oscillations depend on the parameters of the circuit?
2. What is inductothermy, what is the mechanism of its action on the body? Specify the operating frequency range.
3. The resistance of a therapeutic contour of the UHF unit is 6 ohms, an inductance of 30 μH and a frequency of 40 MHz. Determine the attenuation coefficient of vibrations in the circuit.

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,95	0	0,95	0	0,95	0	0,95
2	0,45	2	0,85	2	0,55	2	0,85
4	0,35	4	0,65	4	0,5	4	0,7
6	0,25	6	0,75	6	0,45	6	0,65
8	0,2	8	0,55	8	0,4	8	0,55
10	0,05	10	0,4	10	0,35	10	0,45

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	21,5	3	22,5	
		6	23,0	
		9	23,5	
dielectric	23,5	3	29,5	
		6	35,0	
		9	40,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

Variant 7

1. What is microwave therapy, what is the mechanism of action on the body? Specify the operating frequency range.
2. Explain the principle of operation of a single-stroke generator of electrical vibrations.
3. The resistance of a therapeutic contour of the UHF unit is 6 ohms, an inductance of 30 μH and a frequency of 40 MHz. Determine the attenuation coefficient of vibrations in the circuit.

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,55	0	0,55	0	0,55	0	0,55
2	0,35	2	0,5	2	0,45	2	0,5
4	0,3	4	0,45	4	0,3	4	0,45
6	0,2	6	0,4	6	0,2	6	0,4
8	0,15	8	0,35	8	0,1	8	0,35
10	0,05	10	0,25	10	0,05	10	0,2

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	24,0	3	24,5	
		6	25,0	
		9	26,0	
dielectric	25,0	3	27,0	
		6	29,0	
		9	35,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

Variant 8

1. What are the ranges of electromagnetic vibrations that are used in various therapeutic methods?
2.What is the therapeutic circuit of the UHF device, what is its device and purpose.
3. What capacity should the therapeutic circuit of devices for UHF therapy and inductothermy have, if their resonant frequencies and inductances are equal, respectively: $\nu_1 = 40$ МГц, $\nu_2 = 13{,}5$ МГц; $L_1 = 0{,}3$ мк Гн, $L_2 = 5$мкГн?

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,65	0	0,65	0	0,65	0	0,65
2	0,55	2	0,6	2	0,55	2	0,65
4	0,5	4	0,6	4	0,4	4	0,6
6	0,4	6	0,5	6	0,3	6	0,55
8	0,1	8	0,4	8	0,2	8	0,5
10	0,05	10	0,35	10	0,05	10	0,3

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	24,5	3	25,5	
		6	26,0	
		9	26,5	
dielectric	24,5	3	27,0	
		6	28,0	
		9	30,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

Variant 9

1. Draw a diagram of the UHF therapy device, explain the purpose of the main blocks.
2. What is darsonvalization, what is the mechanism of its action on the body? Specify the frequency of the RF currents used in darsonvalization.
3. The oscillating circuit of the device for therapeutic diathermy consists of an inductor of 500 Hn and a capacitor of 400 pF capacity. Determine the oscillation period.

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,95	0	0,95	0	0,95	0	0,95
2	0,45	2	0,85	2	0,55	2	0,85
4	0,35	4	0,65	4	0,5	4	0,7
6	0,25	6	0,75	6	0,45	6	0,65
8	0,2	8	0,55	8	0,4	8	0,55
10	0,05	10	0,4	10	0,35	10	0,45

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	21,5	3	22,5	
		6	23,0	
		9	23,5	
dielectric	23,5	3	29,5	
		6	35,0	
		9	40,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

Variant 10

1. What is the mechanism of action of the UHF magnetic field on matter?
2. How to adjust the therapeutic circuit of the UHF device to resonance, why do you need to do this?
3. The oscillating circuit of the device for therapeutic diathermy consists of an inductor of 45 mcg and a capacitor of 300 pf capacity. Determine the frequency of the generator.

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,55	0	0,55	0	0,55	0	0,55
2	0,35	2	0,5	2	0,45	2	0,5
4	0,3	4	0,45	4	0,3	4	0,45
6	0,2	6	0,4	6	0,2	6	0,4
8	0,15	8	0,35	8	0,1	8	0,35
10	0,05	10	0,25	10	0,05	10	0,2

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	24,0	3	24,5	
		6	25,0	
		9	26,0	
dielectric	25,0	3	27,0	
		6	29,0	
		9	35,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

Variant 11

1. Write and comment on formulas for calculating the amount of heat released in various tissues in an alternating electric field.
2. What is the purpose of the therapeutic circuit in the UHF device? Draw a diagram of it and specify the purpose of the elements
3. What is the resonant frequency in the RLC circuit, consisted of an inductor of 2 mHn and a capacitor of 5 mkF capacity?

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	1,0	0	1,0	0	1,0	0	1,0
2	0,85	2	0,9	2	0,7	2	0,95
4	0,6	4	0,8	4	0,6	4	0,85
6	0,5	6	0,7	6	0,4	6	0,75
8	0,4	8	0,6	8	0,25	8	0,7
10	0,3	10	0,5	10	0,15	10	0,6

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	23,0	3	24,0	
		6	24,5	
		9	24,5	
dielectric	22,0	3	28,0	
		6	30,0	
		9	39,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.
(Δt=t(измер.) - t (исх)).

Variant 12

1. Physical processes occurring in tissues under the influence of high-frequency currents and fields. Use in medicine.
2. The relevance of the UHF therapy method.

3. Which of the tissues of the blood or cerebrospinal fluid warms up more and how many times under the influence of UHF, if the electric field strength does not change, and the resistivity of the blood and cerebrospinal fluid are equal to 1.66 Ohm м m and 0.55 Ohm·m, respectively?

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,65	0	0,65	0	0,65	0	0,65
2	0,55	2	0,6	2	0,55	2	0,65
4	0,5	4	0,6	4	0,4	4	0,6
6	0,4	6	0,5	6	0,3	6	0,55
8	0,1	8	0,4	8	0,2	8	0,5
10	0,05	10	0,35	10	0,05	10	0,3

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	24,5	3	25,5	
		6	26,0	
		9	26,5	
dielectric	24,5	3	27,0	
		6	28,0	
		9	30,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

Variant 13

1. The value of the UHF therapy method.
2. Draw a diagram and consider the principle of operation of a two-stroke generator of electric vibrations.
3. The active resistance of the therapeutic circuit of the UHF device is 5 kOhm, the inductance is 25 μH, and the frequency is 40 MHz. Determine the attenuation coefficient of vibrations in the circuit.

Laboratory UHF: based on the data obtained, plot the distribution of the high-frequency field I=f(L).

table 1

up		down		up		down	
L, cm	I, mA	L, cm	I, mA	L, cm	I, mA	L, cm	I, mA
0	0,95	0	0,95	0	0,95	0	0,95
2	0,45	2	0,85	2	0,55	2	0,85
4	0,35	4	0,65	4	0,5	4	0,7
6	0,25	6	0,75	6	0,45	6	0,65
8	0,2	8	0,55	8	0,4	8	0,55
10	0,05	10	0,4	10	0,35	10	0,45

Dynamics of heating of the electrolyte and dielectric in the UHF field.

Table 2

Substance	t, °C (initial)	Time, min.	t, °C	Δt, °C
electrolyte	21,5	3	22,5	
		6	23,0	
		9	23,5	
dielectric	23,5	3	29,5	
		6	35,0	
		9	40,0	

Based on the obtained data, plot the temperature change over time. Explain the data obtained.

sample plotting