Isroilov Shukurillo

FIZIKA

shaxsiy qo'llanma

KINEMATIKA

1. Tezlik	$$v = \frac{S}{t}$$
2. To'g'ri chiziqli tekis harakatning tenlamasi	$$X = X_0 + vt$$
3. To'g'ri chiziqli tekis harakatda yo'lning vaqtga bog'liqlik grafigidan	$$v = \frac{S}{t} = \tan\alpha$$
4. Natijaviy tezlik	$$v = v_1 + v_2$$ $$v = \sqrt{v_1^2 + v_2^2 + 2v_1 v_2 \cos\alpha}$$
5. Nisbiy tezlik	$$v = v_1 - v_2$$ $$v = \sqrt{v_1^2 + v_2^2 - 2v_1 v_2 \cos\alpha}$$
6. Kater daryoda S masofaga t_1 vaqtda borib t_2 vaqtda kelgan bo'lsa	$$v_{oqim} = \frac{t_2 - t_1}{2t_1 t_2} S$$ $$v_{kater} = \frac{t_2 + t_1}{2t_1 t_2} S$$
7. Oniy tezlik	$$v = \frac{\Delta S}{\Delta t}$$
8. Notekis harakatda o'rtacha tezlik	$$v_{o`r} = \frac{S_{um}}{t_{um}}$$
9. Tekis o'zgaruvchan harakatda oniy tezlik	$$v = v_0 + at$$ $$v = \sqrt{v_0^2 + 2aS}$$ $$v = \frac{2S}{t} - v_0$$
10. Tekis o'zgaruvchan harakatda tezlanish	$$a = \frac{v - v_0}{t}$$ $$a = \frac{v^2 - v_0^2}{2S}$$ $$a = \frac{2(S - v_0 t)}{t^2}$$
11. Tekis o'zgaruvchan harakatda yo'l	$$S = \frac{v^2 - v_0^2}{2a}$$ $$S = v_{o`r} t = \frac{v + v_0}{2} t$$

12. Tekis o'zgaruvchan harakat tenglamasi	$$X = X_0 + v_0 t + \frac{at^2}{2}$$
13. Tekis o'zgaruvchan harakatda n-sekunddagi ko'chish	$$\Delta S = v_0 + \frac{a}{2}(2n - 1)$$
14. Jismlarning erkin tushishi va yuqoriga tik otilgan jism harakati uchun ,,tekis o'zgaruvchan harakat'' dagi barcha formulalar orinli, faqat	$$a = g$$ $$S = h$$
15. Jismlarning erkin tushishida tushish vaqti	$$t_{tu} = \frac{v_0}{g} = \frac{2h}{v_0} = \sqrt{\frac{2h}{g}}$$
16. Erkin tushayotgan jism oxirgi Δt vaqt ichida Δh masofani o'tgan bo'lsa, butun yo'lni o'tish vaqti; — yo'lning birinchi h_1 qismini o'tish vaqti;	$$t = \frac{\Delta h}{g\Delta t} + \frac{\Delta t}{2}$$ $$t_1 = \frac{\Delta h}{g\Delta t} - \frac{\Delta t}{2}$$
17. Erkin tushayotgan jismning yo'li teng ikkiga bo'lingan holda, yo'lning 2-yarmini Δt vaqtda o'tsa yo'lning 1-yarmini o'tish vaqti; — jismning o'tgan butun yo'li;	$$t = (1 + \sqrt{2}) \cdot \Delta t$$ $$h = g \cdot (3 + 2\sqrt{2}) \cdot \Delta t^2$$
18. Δt vaqt oralig'ida uzilgan 2 tomchi orasidagi masofa Δh bo'lsa, harakatlanish vaqtlari; —birinchi tomchiga nisbatan; —ikkinchi tomchiga nisbatan;	$$t_1 = \frac{\Delta h}{g\Delta t} - \frac{\Delta t}{2}$$ $$t_2 = \frac{\Delta h}{g\Delta t} - \frac{\Delta t}{2}$$
19. Gorizontal otilgan jismning tezligi	$$v_x = v_0$$ $$v_y = gt = \sqrt{2gh}$$ $$v = \sqrt{v_x^2 + v_y^2}$$
20. Gorizontal otilgan jismning vertikal ko'chishi yoki tushish	$$y = h = \frac{gt^2}{2}$$

balandligi	$$h = \frac{v_y^2}{2g} = \frac{g}{2v_0^2} \cdot L^2$$
21. Gorizontal otilgan jismning gorizontal ko'chishi yoki uchish uzoqligi	$$x = L = v_0 t$$ $$L = v_x \cdot \sqrt{\frac{2g}{h}}$$
22. Gorizontal otilgan jismning harakat tenglamasi	$$y = \frac{g}{2v_0^2} \cdot x^2$$
23. Ixtiyoriy t vaqtdan keyin jism tezligining gorizont bilan tashkil etgan burchagi	$$\tan \alpha = \frac{v_y}{v_x} = \frac{gt}{v_x} = \frac{\overline{2gh}}{v_0}$$
24. Gorizontal otilgan jismda tangensial tezlanish	$$a_t = \frac{g^2 t}{\overline{v_0^2 + g^2 t^2}}$$
25. Gorizontal otilgan jismda normal tezlanish	$$a_n = \frac{g v_0}{\overline{v_0^2 + g^2 t^2}}$$
26. Tezlanishlar yig'indisi	$$g = a_t + a_n$$ $$g = \overline{a_t^2 + a_n^2}$$
27. Gorizontga burchak ostida otilgan jismning tezligi	$$v_x = v_0 \cdot \cos \alpha$$ $$v_y = v_0 \cdot \sin \alpha - gt$$ $$v = \overline{v_x^2 + v_y^2}$$
28. Gorizontga burchak ostida otilgan jismning maksimal ko'tarilish balandligi	$$h_{\max} = \frac{v_0^2 \sin^2 \alpha}{2g} = \frac{g t_{tu}^2}{2}$$ $$h_{\max} = \frac{v_y^2}{2g} = \frac{L \cdot \tan \alpha}{4}$$
29. Gorizontga burchak ostida otilgan jismning ko'tarilish vaqti	$$t_k = \frac{v_0 \sin \alpha}{g} = \sqrt{\frac{2h}{g}}$$
30. Gorizontga burchak ostida otilgan jismning to'la uchish vaqti	$$t_{uch} = 2t_k$$ $$t_k = t_{tu}$$
31. Gorizontga burchak ostida otilgan jismning uchish	$$L = v_x \cdot t = \frac{4 h_{\max}}{\tan \alpha}$$

uzoqligi	$$L = \frac{v_0^2 \cdot \sin 2\alpha}{g}$$
32. Ixtiyoriy t vaqtdan keyin jism tezligining gorizont bilan tashkil etgan burchagi	$$\tan \alpha = \frac{v_y}{v_x} = \frac{v_0 \cdot \sin \alpha - gt}{v_0 \cdot \cos \alpha}$$
33. Traektoriyaning egrilik radiusi	$$R = \frac{v_x^2}{a_n}$$ $$v_0 \cdot \cos \alpha = \overline{g \cdot R}$$
34. Otilish burchagi	$$\tan \alpha = \frac{\overline{2h}}{R}$$
35. Aylana bo'ylab tekis harakatda — davr	$$T = \frac{t}{N} = \frac{1}{v} = \frac{2\pi}{\omega}$$
36. —chastota	$$v = \frac{N}{t} = \frac{1}{T} = \frac{\omega}{2\pi}$$
37. —burchak tezlik	$$\omega = \frac{\Delta\varphi}{\Delta t} = \frac{\vartheta}{R} = 2\pi v$$
38. —chiziqli tezlik	$$\vartheta = \frac{\Delta S}{\Delta t} = \omega R = \frac{2\pi R}{T}$$
39. —markazga intilma tezlanish	$$a_{m.i} = \frac{\vartheta^2}{R} = \omega^2 R$$
40. Aylana bo'ylab tekis harakat qilayotgan jism tezligining o'zgarishi — aylananing ¼ qismida — aylananing ½ qismida — aylananing ¾ qismida — aylanani to'liq o'tganda	$$\Delta v = \overline{2}v$$ $$\Delta v = 2v$$ $$\Delta v = \overline{2}v$$ $$\Delta v = 0$$
41. Aylana bo'lab notekis harakatda —burchak	$$\varphi = \omega_0 t + \frac{\varepsilon t^2}{2} = \frac{\omega^2 - \omega_0^2}{2\varepsilon}$$
42. —burchak tezlik	$$\omega = \omega_0 + \varepsilon t$$
43. —burchak tezlanish	$$\varepsilon = \frac{\Delta\omega}{\Delta t} = \frac{\omega - \omega_0}{t}$$

44. —tangensial tezlanish	$$a_t = \frac{\Delta\vartheta}{\Delta t} = \frac{\vartheta - \vartheta_0}{t} = \varepsilon R$$
45. —to'la tezlanish	$$a = a_t + a_n$$ $$a = \sqrt{a_t^2 + a_n^2}$$
46. Disk 2 nuqtasining radiuslar farqi ΔR, tezliklar farqi $\Delta v = v_1 - v_2$ bo'lsa	$$R = \frac{\vartheta_1}{\vartheta_1 - \vartheta_2} \cdot \Delta R$$ $$v = \frac{\Delta\vartheta}{2\pi\Delta R}$$
47. Aylanada harakatni tasma yordamida uzatishda va friksion uzatishda	$$\vartheta_1 = \vartheta_2$$ $$\omega_1 r_1 = \omega_2 r_2$$ $$\frac{v_2}{v_1} = \frac{r_1}{r_2}$$
48. Aylanada harakatni tishli g'ildirak yordamida uzatish	$$\frac{v_2}{v_1} = \frac{N_1}{N_2}$$

DINAMIKA

1. Zichlik	$$\rho = \frac{m}{V} = \frac{3g}{4\pi RG}$$
2. Nyutonning 1-qonuni	$$F = ma$$
3. Teng ta'sir etuvchi kuch	$$F = F_1 + F_2 + \cdots + F_n$$ $$F = \sqrt{F_1^2 + F_2^2 + 2\cos a \cdot F_1 \cdot F_2}$$
4. Nyutonning 3-qonuni	$$F_1 = -F_2 \qquad F_1 = F_2$$
5. Markazga intilma kuch	$$F_{m.i} = ma_{m.i} = \frac{m\vartheta^2}{R} = m\omega^2 R$$
6. Butun olam tortishish qununi	$$F = G\frac{m_1 m_2}{R^2}$$
7. Yer sirtidan h balandlikdagi og'irlik kuchi	$$F = G\frac{m_1 m_2}{(R + h)^2}$$
8. Yer sirtida erkin tushish tezlanishi	$$g = G\frac{M}{R^2}$$
9. Yer sirtidan h balandlikdagi erkin tushish tezlanishi	$$g = G\frac{M}{(R + h)^2}$$
10. Jism og'irligi: — $\vartheta = const$ da	$$P = mg$$

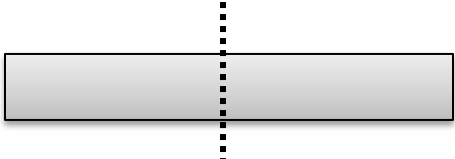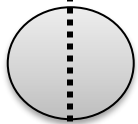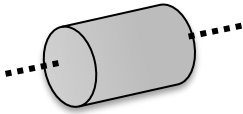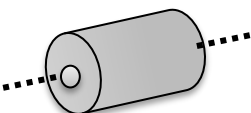|	
— a tezlanish bilan yuqoriga — a tezlanish bilan pastga	$P = m(g + a)$ $P = m(g - a)$
11. Qavariq ko'prikda jism og'irligi yoki ko'prikka bosim kuchi	$P = m\ g - a_{m.i} = m(g - \dfrac{\vartheta^2}{R})$
12. Botiq ko'prikda jism og'irligi yoki ko'prikka bosim kuchi	$P = m\ g + a_{m.i} = m(g + \dfrac{\vartheta^2}{R})$
13. Jismning solishtirma og'irligi	$d = \dfrac{P}{V} = \rho g$
14. Yuklanish	$n = \dfrac{P}{mg} = \dfrac{m(g + a)}{mg}$
15. Birinchi kosmik tezlik	$\vartheta_I = \overline{gR} = 7.9\dfrac{km}{s}$
16. Ikkinchi kosmik tezlik	$\vartheta_{II} = \overline{gR} = 11.2\dfrac{km}{s}$
17. Uchinchi kosmik tezlik	$\vartheta_{III} = 16.7\dfrac{km}{s}$
18. h balandlikdagi sun'iy(yoki tabiiy) yo'ldosh tezligi	$\vartheta = \overline{G\dfrac{M}{(R + h)}}$
19. Kopler qonuni	$\dfrac{T_1}{T_2}^2 = \dfrac{R_1}{R_2}^3$
20. Guk qonuni	$F_{el} = -k\Delta l$
21. Nisbiy deformatsiya	$\varepsilon = \dfrac{\Delta l}{l_0} = \dfrac{l - l_0}{l_0}$
22. Absolyut deformatsiya	$\Delta l = l - l_0$
23. Mexanik kuchlanish yoki zo'riqish	$\sigma = E\varepsilon = \dfrac{F}{S}$
24. Prujina bikirligi	$k = \dfrac{F_{el}}{\Delta l} = \dfrac{ES}{l_0}$
25. Mustahkamlik chegarasi σ,zichligi ρ bo'lgan, bir uchidan osilgan trosning maksimal uzunligi — havoda — suyuqlikda	$l_{max} = \dfrac{\sigma}{\rho g}$ $l_{max} = \dfrac{\sigma}{(\rho_{jism} - \rho_{suyuq})g}$

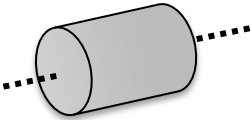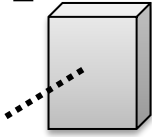|	
26. Mustahkamlik chegarasi σ,zichligi ρ bo'lgan,devorning maksimal balandligi	$$h_{max} = \frac{\sigma}{\rho g}$$
27. Ketma-ket ulangan prujina uchun	$$\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2} + \cdots + \frac{1}{k_n}$$
28. Parallel ulangan prujina uchun	$$k = k_1 + k_2 + \cdots + k_n$$
29. Ko'chmas blok — tezlanish — taranglik kuchi	$$a = g\frac{m_1 - m_2}{m_1 + m_2}$$ $$T = \frac{2gm_1 m_2}{m_1 + m_2}$$
30. Ko'char blokning FIKi η bo'lsa	$$F = \frac{mg}{2\eta}$$
31.Ishqalanish kuchi	$$F = \mu N = \mu mg$$
32. F kuch ta'sirida jism a tezlanish bilan harakatlansa	$$F = F_{ish} + ma$$
33. Tortish koeffitsienti	$$k = \frac{F}{mg}$$
34. Tormozlanishda jism tezlanishi	$$a = \mu g$$
35. Qiya tekislikda ishqalanish kuchi	$$F_{ish} = \mu N = \mu mg \cos a$$
36. Qiya tekislikda pastga harakatlantiruvchi kuch	$$F_P = mg \sin a$$
37. Qiya tekislikda jism tezlanishi	$$a = g(\sin a - \mu \cos a)$$
38. Qiya tekislikda jismni a tezlanish bilan yuqoriga tortuvchi kuch	$$F_T = F_P + F_{ish} + ma$$
39. Qiya tekislikda jismni tekis tortuvchi(yoki ushlab turuvchi) kuch	$$F_T = F_P + F_{ish}$$
40. Qiya tekislikda jismni a tezlanish bilan pastga tushsa	$$F_P = F_{ish} + ma$$
41.Qiya tekislikda jism	

— tinch turadi — tekis sekinlanuvchan harakat qiladi — tekis tezlanuvchan harakat qiladi	$\mu = tan\, a$ $\mu > tan\, a$ $\mu < tan\, a$
42. Qiya tekislikning FIKi	$\eta = \dfrac{tan\, a}{tan\, a + \mu}$
43. Stol chetida osilib turgan l uzunlikdagi ip(yoki prujina) uchun	$\mu = \dfrac{l_{os}}{l_{us}} \quad ; \quad l = l_{os} + l_{ua}$
44. Qarshilik kuchi jism tezligiga bog'liq — jism tezligi kichik bo'lganda — jism tezligi katta bo'lganda	$F_{qar} = -kv$ $F_{qar} = -kv^2$
45. Qayrilayotgan velisopedchi, motosiklchi yoki konkichi uchun	$\dfrac{mv^2}{R} \cdot tan\, a = mg; \quad \mu = tan\, a$
46. Jism impulsi	$P = mv$
47. Kuch impulsi	$I = F\Delta t = m(v - v_0)$
48. Impulsning saqlanish qonuni	$m_1 v_1 + m_2 v_2 = m_1 u_1 + m_2 u_2;$
49. Jismlar sistemasining impulsi	$P_{nat} = P_1 + P_2 + \cdots + P_n$
50. Nisbiy impuls	$P_{nis} = mv_{nis}$
51.Jismlar markaziy noelastik to'qnashgandan keying tezligi — harakat yo'nalishi bir xil bo'lganda — harakat yo'nalishi qarama-qarshi bo'lganda	$u = \dfrac{m_1 v_1 + m_2 v_2}{m_1 + m_2}$ $u = \dfrac{m_1 v_1 - m_2 v_2}{m_1 + m_2}$
52. Jismlar markaziy elastik to'qnashgandan keying tezligi – u_1 va u_2 — harakat yo'nalishi bir xil bo'lganda — harakat yo'nalishi qarama-	$u_1 = \dfrac{2m_2 v_2 - \ m_2 - m_1 \ v_1}{m_1 + m_2}$ $u_1 = \dfrac{2m_2 v_2 + (m_2 - m_1)v_1}{m_1 + m_2}$ $u_1 = \dfrac{-2m_2 v_2 - \ m_2 - m_1 \ v_1}{m_1 + m_2}$

qarshi bo'lganda	$u_1 = \dfrac{2m_2 v_2 - (m_2 - m_1) v_1}{m_1 + m_2}$
53. Mexanik ish	$A = F \cdot S \cdot \cos a = \Delta E$
54. Yerda yotgan l uzunlikdagi sterjenni gorizontga nisbatan a burchakka og'dirishda bajarilgan ish	$A = mg \dfrac{l}{2} \sin a$
55. Quvvat	$N = \dfrac{A}{t} = F \cdot v \cdot \cos a$
56. Foydali ish koeffitsiyenti (FIK)	$\eta = \dfrac{A_f}{A_u} \cdot 100\% = \dfrac{N_f}{N_u} \cdot 100\%$
57. Kinetik energiya	$E_k = \dfrac{mv^2}{2}$
58. Potensial energiya	$E_p = mgh$
59. Prujinaning potensial energiyasi	$E_p = \dfrac{k\Delta x^2}{2}$
60. Qiya tekislikdan dumalab tushayotgan slindrning kinetik energiyasi — sirpanishsiz tushayotgan bo'lsa — sirpanib tushayotgan bo'lsa	$E_k = \dfrac{3mv_0^2}{4}$ $E_k = \dfrac{5mv_0^2}{4} + \dfrac{J_0 \omega^2}{2}$
61. Massa markazi orqali o'tgan o'q atrofida erkin aylanayotgan qattiq jism energiyasi	$E_k = \dfrac{mv_0^2}{2} + \dfrac{J_0 \omega^2}{2}$

STATIKA

1. Jismning muvozanat sharti	$F_1 + F_2 + \cdots + F_n = 0$
2. Kuch momenti	$M = F \cdot l$
3. Qo'zg'alamas o'q atrofida aylana oladigan jismning muvozanat sharti yoki momentlar qoidasi	$M_1 + M_2 + \cdots + M_n = 0$

4. Jismlar sistemasining massa markazi		$x_0 = \dfrac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$
5. Vaznsiz richagning muvozanat sharti		$F_1 l_1 = F_2 l_2$
6. Massaga ega bo'lgan richagning muvozanat sharti		$Mg = \dfrac{2(F_1 l_1 - F_2 l_2)}{l_2 - l_1}$
7. Aylanma harakat dinamikasining asosiy tenglamasi		$M = I \cdot \varepsilon$
8. Massasi m va uzunligi l bo'lgan sterjenning uning uzunligiga tik va o'rtasidan o'tgan aylanish o'qiga nisbatan inersiya momenti		$I = \dfrac{1}{12} m l^2$
9. Massasi m va uzunligi l bo'lgan sterjenning uning uzunligiga tik va bir uchidan o'tgan aylanish o'qiga nisbatan inersiya momenti		$I = \dfrac{1}{3} m l^2$
10. Massasi m va radiusi R bo'lgan sharning o'z markazidan o'tgan aylanish o'qiga nisbatan inersiya momenti		$I = \dfrac{2}{5} m R^2$
11. Massasi m va radiusi R bo'lgan yahlit slindirning o'z o'qiga nisbatan inersiya momenti		$I = \dfrac{1}{2} m R^2$
12. Massasi m, tashqi radiusi R va ichki radiusi r bo'lgan qalin devorli kovak slindirning o'z o'qiga nisbatan inersiya momenti		$I = \dfrac{1}{2} m (R^2 + r^2)$
13. Massasi m va radiusi R bo'lgan		$I = m R^2$

yupqa (halqa) slindirning o'z o'qiga nisbatan inersiya momenti	
14. Massasi m, bo'yi a va eni b bo'lgan brusokning inersiya momenti	$I = \dfrac{1}{2}m(a^2 + b^2)$
15. Aylanma harakat qilayotgan jismning kinetik energiyasi	$E = \dfrac{I\omega^2}{2}$
16. Bosim	$P = \dfrac{F}{S} = \dfrac{F_y}{S}$
17. Gidravlik press	$\dfrac{F_1}{S_1} = \dfrac{F_2}{S_2}$ $\dfrac{h_1}{h_2} = \dfrac{F_2}{F_1}$
18. Suyuqlikning idish tubiga va yon devoriga bosimi	$P_a = \rho_s g h$ $P_{yon} = \dfrac{\rho_s g h}{2}$
19. Tutash idishlarda suyuqliklar muvozanati	$\rho_1 h_1 = \rho_2 h_2$
20. Dengiz sathidan h balandlikdagi atmosfera bosimi	$P = 10^5 - \dfrac{h}{12} \cdot 133.3 \; Pa$ $P = 760 - \dfrac{h}{12} \; mm.sim.ust$
21. Usti ochiq idishdagi suyuqlikning idish tubiga va yon devoriga bosim	$P_a = \rho_s g h + P_0$ $P_{yon} = \dfrac{\rho_s g h}{2} + P_0$
22. Ko'l tubidan ko'tarilgan pufakchaning hajmi n marta ortgan bo'lsa, ko'lning chuqurligi — $T_1 = T_2$ — $T_1 \neq T_2$	$h = 10 \; n - 1$ $h = 10 \; \dfrac{T_1}{T_2} n - 1$
23. Arximed kuchi	$F_A = p_s V_j h$
24. Ko'taruvchi kuch	$F_k = F_A - mg$

25. Jismning suyuqlikka botgan qismi	$$\dfrac{V_b}{V_j} = \dfrac{\rho_j}{\rho_s}$$
26. Suyuqlikda tezlanish — tepaga — pastga	$$a = \dfrac{\rho_s - \rho_j}{\rho_j} \cdot g$$ $$a = \dfrac{\rho_j - \rho_s}{\rho_j} \cdot g$$
27. Jism havoda h balandlikdan tushib, suvga botish chuqurligi	$$g \cdot h = a \cdot l$$
28. Suyuqlik oqimining uzluksizlik tenglamasi	$$Sv = const$$
29. Bernulli tenglamasi	$$\dfrac{\rho v^2}{2} + \rho g h + P = const$$
30. Suyuqlik qatlamlarining ichki qarshilik kuchlari	$$F_{ishq.} = -\eta\dfrac{\Delta v}{\Delta l} \cdot S$$
31. Puazeyl formulasi	$$\Delta V = -\dfrac{\pi r^4}{8\eta} \cdot \dfrac{\Delta P}{\Delta l} \cdot \Delta t$$
32. Suyuqlik ichida harakatlanayotgan shar uchun Stoks formulasi	$$F = 6\pi\eta r v$$
33. Suyuqlik oqimining quvvati	$$N = \dfrac{S\rho v^3}{2}$$
34. Idishdagi suyuqlik sathidan h balandlik pastda ochilgan teshikdan oqib chiqayotgan suyuqlikning tezligi	$$v = \sqrt{2gh}$$

MEXANIK TEBRANISH VA TO'LQINLAR

1. Garmonik tebranma harakat tenglamasi	$$X = X_0 \sin(\omega t + \varphi_0)$$ $$X = X_0 \cos(\omega t + \varphi_0)$$
2. Garmonik tebranma harakatda tezlik	$$v = x' = -v_0 \cos(\omega t + \varphi_0)$$ $$v_0 = x_0 \omega$$
3. Garmonik tebranma harakatda	$$a = x'' = a_0 \sin(\omega t + \varphi_0)$$

tezlanish	$a_0 = x_o \omega^2$
4. Garmonik tebranma harakatda bikrlik	$k = \omega^2 m$
5. Matamatik mayatnik uchun Gyugens formulasi	$T = 2\pi \sqrt{\dfrac{l}{g}}; \quad \nu = \dfrac{1}{2\pi}\sqrt{\dfrac{g}{l}}$ $\omega = \sqrt{\dfrac{g}{l}}$
6. Matematik mayatnik vertikaldan a burchak og'gan holda gorizontal tekislikda R radiusli aylana bo'ylab harakat qilayotganda	$T = 2\pi \sqrt{\dfrac{l\cos a}{g}}$
7. Mayatnik ipining uzunligi Δl ga ortganda davri ΔT ga ortgan bo'lsa, boshlang'ich davr	$T_0 = \dfrac{2\pi^2 \Delta l}{\Delta T g} - \dfrac{\Delta T}{2}$
8. Mayatnik ipining uzunligi Δl ga kamayganda davri ΔT ga kamaysa, boshlang'ich davr	$T_0 = \dfrac{2\pi^2 \Delta l}{\Delta T g} + \dfrac{\Delta T}{2}$
9. Prujinali mayatnik uchun Gyugens formulasi	$T = 2\pi \sqrt{\dfrac{m}{k}}; \quad \nu = \dfrac{1}{2\pi}\sqrt{\dfrac{k}{m}}$ $\omega = \sqrt{\dfrac{k}{m}}$
10. Prujinali mayatnik yukuning massasi Δm ga ortganda davri n marta ortsa, yukning dastlabki massasi	$m_0 = \dfrac{\Delta m}{n^2 - 1}$
11. Prujinali mayatnik yukuning massasi Δm ga kamaytirilganda davri n marta kamaysa, yukning dastlabki massasi	$m_0 = \dfrac{n^2 \cdot \Delta m}{n^2 - 1}$

12. Garmonik tebranma harakat energiyasi	$E_T = E_{k.max} = E_{p.max} = \dfrac{kx_0^2}{2}$
13. Majburiy tebranishlarda siljish	$x = \dfrac{F_0 \sin \omega t}{m(\omega_0^2 - \omega^2)}$
14. Mexanik to'lqinlar uchun	$\vartheta = \lambda \cdot v; \quad l = N \cdot \lambda$
15. Bir-biridan Δx masofada tebranayotganyassi to'lqinlardagi fazalar farqi	$\Delta \varphi = \dfrac{2\pi}{\lambda} \cdot \Delta x$
16. Tarqalayotgan yo'lqinning o'rtacha energiyasi	$\overline{E} = \dfrac{1}{2} m \omega^2 A^2$
17. To'lqin energiya zichligi	$\overline{\omega} = \dfrac{1}{2} \rho \omega^2 A^2$
18. Tovushning intensivligi yoki kuchi(balandligi)	$I = \dfrac{E}{St} = \dfrac{1}{2} \rho v \omega^2 A^2$

MOLEKULYAR FIZIKA

1. Atomning nisbiy massa birligi	$$M_r = \dfrac{m_0}{\dfrac{1}{12}m_{0C}}$$
2. Modda miqdori	$$\nu = \dfrac{N}{N_A} = \dfrac{m}{M}$$
3. Molyar massa	$$M = m_0 \cdot N_A = \dfrac{m}{N}N_A$$
4. Molekulaning o'lchami	$$d = \sqrt[3]{\dfrac{V}{N}} = \sqrt[3]{\dfrac{M}{\rho \cdot N_A}}$$
5. Gaz molekulalari orasidagi masofa	$$b = \sqrt[3]{\dfrac{kT}{P}}$$
6. Molekulalar konsentratsiyasi	$$n = \dfrac{N}{V}$$
7. Zichlik	$$\rho = \dfrac{m}{V} = n \cdot m_0$$
8. Bitta molekulaning kinetik energiyasi	$$E_k = \dfrac{m_0 v^2}{2}$$
9. Temperatura - molekulyar kinetik energiya o'lchovidir	$$E_k = \dfrac{3}{2}kT$$
10. Molekulyar kinetik nazariyasining asosiy tenglamasi	$$P = knT$$ $$P = \dfrac{2}{3}nE_k$$
11. Dalton qonuni	$$P = P_1 + P_2 + \cdots + P_n$$
12. Universal gaz doimiysi	$$R = k \cdot N_A$$
13. Gaz molekulalarining o'rtacha kvadratik tezligi	$$v = \sqrt{\dfrac{3RT}{M}} = \sqrt{v_x^2 + v_y^2 + v_z^2}$$ $$v = \sqrt{\dfrac{3P}{\rho}} = \dfrac{\omega R_B \; R_B - R_A}{S}$$
14. Temperatura; - Kelvin-Selsiy - Frangeyt - Selsiy	$$T = 273.15 + t \; K$$ $$F = \dfrac{9}{5}t + 32 \;\; {}^{0}F$$

15. Izotermik jarayon	$P_1 V_1 = P_2 V_2; \quad T = const$
16. Izobarik jarayon	$\dfrac{V_1}{T_1} = \dfrac{V_2}{T_2}; \quad P = const$
17. Izoxorik jarayon	$\dfrac{P_1}{T_1} = \dfrac{P_2}{T_2}; \quad V = const$
18. Adiabatik jarayon (Puasson tenglamasi)	$PV^{\gamma} = const; \quad TV^{\gamma-1} = const;$ $TP^{\frac{\gamma}{\gamma-1}} = const; \quad \gamma = \dfrac{i+2}{i}$
19. Ideal gaz bosimining termik koeffitsiyenti	$\beta = \dfrac{\Delta P}{P_0 \Delta T}$
20. Ideal gaz hajmining termik koeffitsiyenti	$\beta = \dfrac{\Delta V}{V_0 \Delta T}$
21. Klapeyron tenglamasi	$\dfrac{PV}{T} = kN = const$
22. Mendeleyeev- Klapeyron tenglamasi	$\dfrac{PV}{T} = \nu RT$
23. Loshmit soni	$N_L = \dfrac{N_A}{V_0}$
24. Moddaning ichki energiyasi	$U = E_k + E_p$
25. Bir atomli ideal gazning ichki energiyasi	$U = \dfrac{3}{2} \nu RT$
26. Bitta molekulaning kinetik energiyasi	$E_k = \dfrac{i}{2} kT$
27. Jismni isitish uchun sarflangan issiqlik miqdori	$Q = c \cdot m \cdot \Delta T$
28. Issiqlik balansi tenglamasi	$Q_1 + Q_2 + Q_3 = Q_1' + Q_2' + Q_3'$
29. Suyuqlik aralashmasining temperaturasi	$t = \dfrac{m_1 t_1 + m_2 t_2}{m_1 + m_2}$
30. Yoqilg'ining to'la yonish issiqligi	$Q = q \cdot m$
31. Yoqilg'ida ishlaovchi dvigatelning FIKi	$\eta = \dfrac{N_{foyda} \cdot t}{q m_{yoq}} \cdot 100\%$
32. Avtomobil o'zgarmas tezlik bilan ketayotgan bo'lsa	$\dfrac{NS}{v} = \eta q m_{yoq}$

TERMODINAMIKA

1. Termodinamikaning 1-qonuni	$Q = \Delta U + A$ $\Delta U = Q + A^T$
2. Izotermik jarayon uchun termodinamikaning 1-qonuni	$T = const \Rightarrow \Delta U = 0$ $Q = A = P\Delta V$
3. Izoxorik jarayon uchun termodinamikaning 1-qonuni	$V = const \Rightarrow A = 0$ $Q = \Delta U = \dfrac{3}{2}\nu R\Delta T$
4. Izobarik jarayon uchun termodinamikaning 1-qonuni	$P = const; \quad Q = \Delta U + A$ $A = \nu R\Delta T = P\Delta V = \dfrac{2}{5}Q$ $\Delta U = \dfrac{3}{2}\nu R\Delta T = \dfrac{3}{5}Q$
5. Adiabatik jarayon uchun	$Q = 0; \quad \Delta U + A = 0$ $\dfrac{3}{2}\nu R\Delta T = -P\Delta V$
6. Solishtirma issiqlik sig'imi	$c = \dfrac{Q}{m\Delta T}$
7. Molyar isssiqlik sig'imi	$C_M = M \cdot c$
8. O'zgarmas hajmdagi molyar isssiqlik sig'imi	$C_V = \dfrac{i}{2}R$
9. O'zgarmas bosimdagi molyar isssiqlik sig'imi	$C_P = C_V + R; \quad A = R$ $C_P = \dfrac{i+2}{2}R$
10. Real issiqlik mashinasining FIKi	$\eta = \dfrac{Q_1 - Q_2}{Q_1} \cdot 100\%$ $A = Q_1 - Q_2$
11. Ideal issiqlik mashinasining FIKi (Karno sikli uchun)	$\eta = \dfrac{T_1 - T_2}{T_1} \cdot 100\%$
12. Erish issiqligi	$Q = r \cdot m$
13. Bug'lanish issiqligi	$Q = \lambda \cdot m$
14. Absolyut namlik	$\rho = \dfrac{m}{V}$
15. Nisbiy namlik	$\varphi = \dfrac{\rho_a}{\rho_T} \cdot 100\% = \dfrac{P_a}{P_T} \cdot 100\%$
16. Xo'llash burchagi	

- xo'llaydigan suyuqlik - xo'llamaydigan suyuqlik	$\varphi < \dfrac{\pi}{2}$ $\varphi > \dfrac{\pi}{2}$
17. Sirt taranglik kuchi	$F = \sigma \cdot l$
18. Sirt taranglikda sirt energiyasi va bajarilgan ish	$W = \sigma \cdot S$ $A = \sigma \cdot \Delta S$
19. Laplas formulasi - xo'llaydigan suyuqlik - xo'llamaydigan suyuqlik	$P = \dfrac{2\sigma}{R}$ $P > 0$ $P < 0$
20. Kapilyarlarda suyuqlikning ko'tarilish balandligi	$h = \dfrac{2\sigma}{\rho g R}$
21. Jyuren formulasi	$h = \dfrac{2\sigma}{\rho g R} \cdot \cos a$
22. Tomchilar soni	$N = \dfrac{mg}{\sigma l} = \dfrac{mg}{\sigma 2\pi R}$
23. Jismlarni issiqlikdan kengayishi	$l = l_0\,(1 + \alpha t)$ $V = V_0\,(1 + \varphi t)$

ELEKTROSTATIKA

1. Zaryadlarning karralik qonuni	$q = n \cdot e; \quad n \in Z$
2. Zaryadlarning saqlanish qonuni	$q_1 + q_2 + \cdots + q_n = const$
3. Kulon qonuni	$F = \dfrac{k}{\varepsilon} \cdot \dfrac{q_1 q_2}{r^2}; \quad k = \dfrac{1}{4\pi\varepsilon_0}$
4. Elektr maydon kuchlanganligi	$E = \dfrac{F}{q}$
5. Maydonlarning superpozitsiya (ustms-ust tushib qolish) prinsipi	$E = E_1 + E_2 + \cdots + E_n$ $E = \sqrt{E_1^2 + E_2^2 + 2\cos a \cdot E_1 E_2}$
6. Kuchlanganlik oqimi	$N = ES$
7. Ostrogradskiy – Gauss teoramasi	$N = \dfrac{q_1 + q_2 + \cdots + q_n}{\varepsilon_0}$
8. Zaryad sirt zichligi	$\sigma = \dfrac{q}{S}$
9. Tekis zaryadlangan cheksiz tekislikning maydon kuchlanganligi	$E = \dfrac{\sigma}{2\varepsilon_0 \varepsilon}$
10. Qarama-qarshi ishorali tekis zaryadlangan cheksiz parallel tekisliklarning maydon kuchlanganligi	$E_{ich} = \dfrac{\sigma}{\varepsilon_0 \varepsilon}; \quad E_{tash} = 0$
11. Nuqtaviy zaryadning r masofadagi maydon kuchlanganligi	$E = \dfrac{k}{\varepsilon} \cdot \dfrac{q}{r^2}$
12. Tekis zaryadlangan shar yoki sferaning maydon kuchlanganligi - r > R - r = R - r < R	$E = \dfrac{k}{\varepsilon} \cdot \dfrac{q}{r^2}$ $E = \dfrac{\sigma}{\varepsilon_0 \varepsilon}$ $E = 0$
13. Gorizontal yo'nalishdagi elektr maydonida elektronning tezlanishi	$a = \dfrac{eE}{m_e} = \dfrac{eU}{m_e \cdot d}$

14. Vertikal yo'nalishdagi elektr maydonida q zaryadning dinamik tenglamasi	$ma = \pm qE \pm mg$
15. Muhitning nisbiy dielektrik singdiruvchanligi	$\varepsilon = \dfrac{F_{vakuum}}{F_{muhit}} = \dfrac{E_{vakuum}}{E_{muhit}}$
16. Elektr dipoli	$p = q \cdot l$
17. Ikki nuqtaviy zaryad potensial energiyasi	$W_p = \dfrac{k}{\varepsilon} \cdot \dfrac{q_1 q_2}{r}$
18. Nuqtaviy zaryad potensiali	$\varphi = \dfrac{W_p}{q} = \dfrac{k}{\varepsilon} \cdot \dfrac{q_1}{r}$
19. Elektr maydonida nuqtaviy zaryadni ko'chirishda bajarilgan ish	$A = qEl$ $A = E_{p.1} - E_{p.2}$ $A = \Delta\varphi \cdot q$
20. Kuchlanish	$U = \Delta\varphi = E \cdot q$
21. q_1 zaryadli R_1 radiusli shar q_2 zaryadli R_2 radiusli shar bilan tutashtirilgandan keyingi zaryadlar	$q'_1 = R_1 \cdot \dfrac{q_1 + q_2}{R_1 + R_2}$ $q'_2 = R_2 \cdot \dfrac{q_1 + q_2}{R_1 + R_2}$
22. q_1 zaryadli R_1 radiusli shar q_2 zaryadli R_2 radiusli shar bilan tutashtirilgandan keyingi umumiy potensial	$\varphi_{um} = \dfrac{R_1\varphi_1 + R_2\varphi_2}{R_1 R_2}$
23. φ_0 potensialga ega n ta shar birlashtirilganidan hosil bo'lgan bitta kata sharning potensiali	$\varphi = \sqrt[3]{n^2} \cdot \varphi_0$
24. Yakkalangan o'tkazgichning elektr sig'imi	$C = \dfrac{q}{\varphi}$
25. Yakkalangan sharning elektr sig'imi	$C = \dfrac{\varepsilon R}{k}$
26. Kondensatorning elektr sig'imi	$C = \dfrac{q}{\varphi_1 - \varphi_2} = \dfrac{q}{U}$
27. Yassi kondensatorning elektr sig'imi	$C = \dfrac{\varepsilon \varepsilon_0 \cdot S}{d}$

28. Slindirik kondensatorning elektr sig'imi	$$C = \frac{2\pi\varepsilon\varepsilon_0 L}{\ln\frac{R_2}{R_1}}$$
29. Sferik kondensatorning elektr sig'imi	$$C = \frac{4\pi\varepsilon\varepsilon_0 \cdot R_1 \cdot R_2}{R_1 - R_2}$$
30. Yassi kondensator qoplamalari orasidagi fazoning yarmi ε_1 qolgan yarmi ε_2 dielektrik bilan to'ldirilgan bo'lsa, uning sig'imi - vertikal yarmi - gorizontal yarmi	$$C = \frac{2\varepsilon_1\varepsilon_2\varepsilon_0 S}{(\varepsilon_1 + \varepsilon_2) \cdot d}$$ $$C = \frac{(\varepsilon_1 + \varepsilon_2) \cdot \varepsilon_0 S}{2d}$$
31. Kondensatorlarni parallel ulash	$$q = q_1 + q_2 + \cdots + q_n$$ $$U = U_1 = U_2 = \cdots = U_n$$ $$C = C_1 + C_2 + \cdots + C_2$$
32. Kondensatorlarni ketma-ket ulash	$$q = q_1 = q_2 = \cdots = q_n$$ $$U = U_1 = U_2 = \cdots = U_n$$ $$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots + \frac{1}{C_2}$$
33. Zaryadlangan o'tkazgich energiyasi	$$W = \frac{q \cdot \varphi}{2}$$
34. Zaryadlangan kondensator energiyasi - Yassi kondensator uchun	$$W = \frac{q \cdot U}{2}$$ $$W = \frac{\varepsilon\varepsilon_0 E^2}{2} \cdot Sd$$
35. Elektrostatik maydon energiya zichligi	$$\omega_e = \frac{W}{V} = \frac{\varepsilon\varepsilon_0 E^2}{2}$$

O'ZGARMAS TOK

1. Tok kuchi	$$I = \frac{q}{t} = q_0 n S v$$
2. Tok zichligi	$$j = \frac{I}{S} = q_0 n S$$
3. Qarshilik	$$R = \rho_{s.q} \cdot \frac{l}{S}$$

4. Zarjirning bir qismi uchun Om qonuni	$$I = \frac{U}{R}$$
5. O'tkazgichlarni ketma-ket ulash	$$I = I_1 = I_2 = \cdots = I_n$$ $$U = U_1 + U_2 + \cdots + U_n$$ $$R = R_1 + R_2 + \cdots + R_n$$
6. O'tkazgichlarni parallel ulash	$$I = I_1 + I_2 + \cdots + I_n$$ $$U = U_1 = U_2 = \cdots = U_n$$ $$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}$$
7. O'lchash chegarasidan n marta katta tok kuchini o'lchash uchun ampermetrga parallel ulangan shuntning qarshiligi ampermetr ichki qarshiligidan (n-1) marta kichik bo'lishi kerak	$$I = n \cdot I_a$$ $$R_{sh} = \frac{R_a}{n-1}$$
8. O'lchash chegarasidan n marta katta kuchlanishni o'lchash uchun voltmetrga ketma-ket ulangan shuntning qarshiligi voltmetr ichki qarshiligidan (n-1) marta katta bo'lishi kerak	$$U = n \cdot U_V$$ $$R_{sh} = (n-1) \cdot R_V$$
9. Zanjirning bir qismi uchun Joul-Lens qonuni	$$Q = A = U \cdot I \cdot t$$ $$Q = I^2 \cdot R \cdot t = \frac{U^2}{R} \cdot t$$
10. Tok quvvati	$$N = \frac{A}{t} = U \cdot I$$
11. Elektr yurituvchi kuch	$$\varepsilon = \frac{A_T}{q} = U_R + U_r$$
12. Berk zanjir uchun Om qonuni	$$I = \frac{\varepsilon}{R+r}$$
13. Qisqa tutashuv toki	$$I = \frac{\varepsilon}{r}$$
14. Akkumlyatorni zaryadlashda	$$U_{zaryad} = \varepsilon + I_{zaryad} \cdot r$$
15. Akkumlyatorni razryadlashda	$$U_{razryad} = \varepsilon - I_{razryad} \cdot r$$
16. Ikkita manba ketme-ket	$$\varepsilon_{um} = \varepsilon_1 \pm \varepsilon_2 \pm \cdots \pm \varepsilon_n$$

ulanganda	$$r_{um} = r_1 + r_2 + \cdots + r_n$$
17. Ikkita manba parallel ulanganda	$$\varepsilon_{um} = r_{um} \cdot \frac{\varepsilon_1}{r_1} \pm \frac{\varepsilon_2}{r_2} \pm \cdots \pm \frac{\varepsilon_n}{r_n}$$ $$\frac{1}{r_{um}} = \frac{1}{r_1} + \frac{1}{r_2} + \cdots + \frac{1}{r_n}$$
18. Manbaning FIK i	$$\eta = \frac{R}{R + r} = \frac{U}{\varepsilon} = \frac{N_f}{N_T}$$
19. Elktr dvigatelning FIK i	$$\eta = \frac{N_{um}}{I \cdot U} = \frac{F \cdot v}{I \cdot U}$$
20. Kirxgofning 1-qoidasi	$$q = q_1 + q_2 + \cdots q_n$$ $$I = I_1 + I_2 + \cdots I_n$$
21. Kirxgofning 2-qoidasi	$$I_1 R_1 + I_2 U_2 + \cdots + I_n R_n =$$ $$= \varepsilon_1 + \varepsilon_2 + \cdots + \varepsilon_n$$
22. To'liq zanjir uchun Joul-Lens qonuni	$$Q = A = \varepsilon \cdot I \cdot t$$ $$Q = I^2 \; R + r \; \cdot t = \frac{\varepsilon^2}{R + r} \cdot t$$
23. Tok manbaidagi samarasiz quvvat	$$N_s = I^2 \cdot r$$
24. Tashqi zanjir quvvati (foydali quvvat)	$$N_f = I^2 \cdot R = U \cdot I$$
25. Tok manbaining to'liq quvvati	$$N_T = N_s + N_f = I^2 (R + r)$$
26. Manbaga ulangan istemolchidagi maksimal quvvat R = r bo'lganda amalga oshadi	$$N_{max} = \frac{\varepsilon^2}{4r}$$
27. Kuchlanishning ayni bir qiymatida elektr quvvatlari N_1, N_2, … , N_n bo'lgan o'zaro ketme-ket ulangan qarshiliklardan tashkil topgan zanjirning umumiy quvvati	$$\frac{1}{N} = \frac{1}{N_1} + \frac{1}{N_2} + \cdots + \frac{1}{N_n}$$
28. Kuchlanishning ayni bir qiymatida elektr quvvatlari N_1, N_2, … , N_n bo'lgan o'zaro parallel ulangan qarshiliklardan tashkil topgan zanjirning	$$N = N_1 + N_2 + \cdots + N_n$$

umumiy quvvati	

TURLI MUHITLARDA

ELEKTR TOKI

1. Metall o'tkazgich qarshiligining temperaturaga bog'liqligi	$R = R_0\ 1 + \alpha t$ $\rho = \rho_0(1 + \alpha t)$ $\alpha = \dfrac{1}{273°C}$
2. Elektrolitlarda o'tkazgich qarshiligining temperaturaga bog'liqligi	$R = R_0\ 1 - \alpha t$ $\rho = \rho_0(1 - \alpha t)$ $\alpha = \dfrac{1}{273°C}$
3. Elktrolitdan o'tayotgan umumiy tok	$I = I^+ + I^-$
4. Elektrolitlarda tok zichligi	$j = q_- n_- v_- - q_+ n_+ v_+$
5. Faradeyning 1-qonuni	$m = k \cdot q$
6. Faradeyning 2-qonuni	$k = \dfrac{1}{F} \cdot \dfrac{M}{n}$
7. Faradeyning birlashgan qonuni	$\dfrac{m}{It} = \dfrac{M}{n} \cdot \dfrac{1}{eN_A}$
8. Dissotsiatsiyalanish darajasi	$\beta = \dfrac{n}{n_0}$
9. Elektronning to'qnashish oldidagi energiyasi	$\dfrac{mv^2}{2} = eEl$
10. Elektron neytral atomni ionlashtirish sharti	$\dfrac{mv^2}{2} \geq A_i$
11. Elektronni metalldan ajratib chiqarish uchun kerak bo'ladigan chiqish ishi	$A = e \cdot \Delta\varphi$
12. Elektron anodga yetib borishida elektr maydon bajargan ish va elektroning tezlanishi	$A = qU$ $a = \dfrac{eU}{md}$

13.Xususiy yarim o'tkazkichlarda to'la tok	$I = I_{elektron} + I_{teshik}$ $I_{elektron} = I_{teshik}$

MAGNIT MAYDON

1.	Bir jinsli magnit maydonida tokli yassi konturga ta'sir etuvchi kuch momenti	$M = I \cdot S \cdot B \cdot \sin a$
2.	Magnit momenti	$P_m = I \cdot S$
3.	Parallel toklarning o'zaro ta'siri	$F = \dfrac{\mu\mu_0}{4\pi} \cdot \dfrac{2I_1 I_2}{r} \cdot l$
4.	Magnit maydon induksiya vektori	$B = \dfrac{M_{max}}{P_m}$
5.	Muhitning nisbiy magnit singdiruvchanligi	$\mu = \dfrac{B}{B_0}$
6.	Magnit maydon kuchlanganligi	$H = \dfrac{B}{\mu\mu_0} = I \cdot \dfrac{N}{l}$
7.	Amper kuchi	$F_A = I \cdot B \cdot l \cdot \sin a$
8.	Bio-Savar-Laplas qonuni	$\Delta B = \dfrac{\mu\mu_0}{4\pi} \cdot \dfrac{I\Delta l}{r^2} \cdot \sin a$
9.	Cheksiz to'g'ri tok hosil qilgan magnit maydon induksiyasi	$B = \dfrac{\mu\mu_0}{4\pi} \dfrac{2I}{r}$
10.	Aylanma tokning magnit maydon induksiyasi	$B = \mu\mu_0 \dfrac{I}{2r}$
11.	Tokli solenoid o'zagidagi magnit maydon induksiyasi	$B = \mu\mu_0 In = \mu\mu_0 I \dfrac{N}{l}$
12.	Tokli toroidning magnit maydon induksiyasi	$B = \mu\mu_0 In = \mu\mu_0 I \dfrac{N}{2\pi r}$
13.	Magnit maydon uchun superpozitsiya prinsipi	$B = B_1 + B_2 + \cdots + B_n$ $B = \sqrt{B_1^2 + B_2^2 + 2\cos a \cdot B_1 B_2}$
14.	Lorens kuchi	$F_L = qvB \cdot \sin a$
15.	Magnit maydonidagi harakatlanayotgan zaryadli	$R = \dfrac{mv}{qB}$

zarrachaning harakat traektoriyasining radiusi	
16. Zaryadli zarraning aylanish davri	$$T = \frac{2\pi m}{qB}$$
17. Zaryadning harakat tezligi	$$v = \sqrt{\frac{2qU}{m}}$$
18. Magnit oqimi	$$\Phi = B \cdot S \cdot \cos a$$
19. Tokli o'tkazgichni magnit maydonida ko'chirishda bajarilgan ish	$$A = IBl\Delta x$$ $$A = I\Delta\Phi = I \ \Phi_2 - \Phi_1$$
20. Elektromagnit induksiya qonuni	$$\varepsilon_i = -\frac{\Delta\Phi}{\Delta t} = \frac{A}{q}$$
21. O'ramlar soni N ta bo'lgan g'altakda vujudga keluvchi induksion EYUK	$$\varepsilon_i = -N \cdot \frac{\Delta\Phi}{\Delta t}$$
22. Fuko toki	$$I_\Phi = \frac{\varepsilon_i}{R}$$
23. Bir jinsli magit maydonida o'zgarmas v tezlik bilan harakatlanayotgan l uzunlikdagi o'tkazgichda hosil bo'ladigan induksion EYUK	$$\varepsilon_i = v \cdot B \cdot l \cdot \sin a$$
24. S yuzali, N ta o'ramga ega bo'lgan ramka magnit maydonida o'zgarmas ω sikllik chastota bilan aylanayotda yuzaga keluvchi induksion EYUK	$$\varepsilon_i = \omega NBS \sin \ \omega \cdot t$$
25. Induktivlik	$$L = \frac{\Phi}{I}$$
26. Uzunligi l bo'lgan ko'ngdalang kesim yuzi S bo'lgan solenoidning induktivligi	$$L = \frac{\Phi}{l} = \mu\mu_0 n^2 V$$
27. G'altaklar ketma-ket ulansa	$$L = L_1 + L_2$$

28. G'altaklar parallel ulansa	$\dfrac{1}{L} = \dfrac{1}{L_1} + \dfrac{1}{L_2}$
29. Kunturda hosil bo'lgan o'zinduksiya EYUK	$\varepsilon = -L \cdot \dfrac{\Delta I}{\Delta t}$
30. G'altak magnit maydon energiyasi	$W = \dfrac{\Phi \cdot I}{2} = \dfrac{B^2 V}{2\mu\mu_0}$ $W = \dfrac{LI^2}{2} = \dfrac{\Phi^2}{2L}$
31. Magnit maydon energiya zichligi	$\omega = \dfrac{W}{V} = \dfrac{B^2}{2\mu\mu_0}$

ELEKTROMAGNIT TABRANISH VA TO'LQINLAR

1. Elektromagnit tebranishlarda elektromagnit maydonning to'la energiyasi	$W_{to\prime la} = W_{elektr}^{max} = W_{magnit}^{max}$ $W_{to\prime la} = W_{elek} + W_{mag} = const$
2. Tebranish konturida elektr maydon energiyasining maksimal qiymati	$W_{elektr}^{max} = \dfrac{q_0^2}{2C}$
3. Tebranish konturida magnit maydon energiyasining maksimal qiymati	$W_{magnit}^{max} = \dfrac{LI_0^2}{2}$
4. Tebranish konturida elektro magnit tebranishlar tenglamasi	$Q = -\dfrac{1}{LC} q$
5. Tebranish konturi uchun Tomson formulasi	$T = 2\pi \sqrt{LC}; \quad \nu = \dfrac{1}{2\pi \sqrt{LC}}$ $\omega = \dfrac{1}{\sqrt{LC}}$
6. Kondensatordagi zaryadning maksimal qiymati	$q_0 = \dfrac{I_0}{\omega}$
7. Kondensatordagi kuchlanishning maksimal	$U_0 = \omega \cdot LI_0$

qiymati	
8. G'altakdagi tok kuchining maksimak qiymati	$$I_0 = \omega \cdot q = \frac{U_0}{\omega \cdot L}$$
9. O'zgaruvchan elektr tokida zaryad va tok kuchi	$$q = q_0 \sin \omega t + \varphi_0$$ $$i = I_0 \cos \omega t + \varphi_0$$
10. O'zgaruvchan tok zanjirida resistor - R	$$i = I_0 \cos \omega t$$ $$u = U_0 \cos \omega t$$ $$N = I_0 U_0 \cos^2 \omega t$$ $$R = \frac{u}{i} = \frac{U_0}{I_0}$$
11. Tok kuchi va kuchlanishning effektiv qiymati	$$I_{ef} = \frac{I_0}{2} = \frac{U_{ef}}{R}$$ $$U_{ef} = \frac{U_0}{2} = I_{ef} R$$
12. Aktiv qarshilikda tok kuchi va kuchlanish bir xil fazada tebranadi	$$\Delta\varphi = 0$$
13. Aktiv qarshilikda o'zgaruvchan tok quvvatining o'rtacha qiymati	$$N_{o'r} = \frac{I_0 U_0}{2} = I_{ef} \cdot U_{ef}$$
14. O'zgaruvchan tok zanjirida kondensator - C	$$u = U_0 \cos \omega t$$ $$i = -I_0 \sin \omega t = I_0 \cos \omega t + \frac{\pi}{2}$$ $$N = -\frac{I_0 U_0}{2} \sin 2\omega t$$
15. Kondensatorda sig'im qarshilik	$$X_C = \frac{U_0}{\omega C}$$
16. Kondensatorda kuchlanish tok kuchidan π\2 faza orqada yuradi	$$\Delta\varphi = \frac{\pi}{2}$$
17. Kondensatorda quvvat ajralmaydi	$$N = 0$$
18. Tok kuchi va kuchlanishning aplitudalari	$$I_0 = \frac{U_0}{X_C}$$ $$U_0 = I_0 \cdot X_C$$
19. O'zgaruvchan tok zanjirida	$$u = U_0 \cos \omega t$$

g'altak - L	$i = I_0 \sin \omega t = I_0 \cos\left(\omega t - \dfrac{\pi}{2}\right)$ $N = \dfrac{I_0 U_0}{2} \sin 2\omega t$
20. G'altakning induktiv qarshiligi	$X_L = \omega L$
21. G'altakda kuchlanish tok kuchidan π\2 faza oldinda yuradi	$\Delta \varphi = \dfrac{\pi}{2}$
22. G'altakda quvvat ajralmaydi	$N = 0$
32. G'altakdagi induksion EYUKning maksimal qiymati	$\varepsilon_{i0} = \omega L I_0$
23. Tok kuchi va kuchlanishning aplitudalari	$I_0 = \dfrac{U_0}{X_L}$ $U_0 = I_0 \cdot X_L$
24. Ketma-ket ulangan rezistor, kondensator va g'altakdan iborat o'zgaruvchan tok zanjirida;	$u = U_0 \cos \omega t$ $I_0 \cos(\omega t + \varphi)$
25. Kuchlanish va tok kuchi tebranishlari orasidagi fazalar farqi - oldinda - orqada	$\varphi = \arccos \dfrac{R}{Z}$ $\varphi = \text{arctg} \dfrac{X_L - X_C}{R}$ $\varphi > 0$ $\varphi < 0$
26. Zanjirdagi umumiy kuchlanish	$U_{um} = \sqrt{U_R^2 + (U_L - U_C)^2}$
27. Zanjirdagi umumiy tok	$I_{um} = I_R$
28. O'zgaruvchan tok zanjirida to'la qarshilik	$Z = \sqrt{R^2 + (X_L - X_C)^2}$
29. Tok kuchi va kuchlanishning aplitudalari	$I_0 = \dfrac{U_0}{Z}$ $U_0 = I_0 \cdot Z$
30. Tok kuchi va kuchlanishning effektiv qiymati	$I_{ef} = \dfrac{U_{ef}}{Z}$ $U_{ef} = I_{ef} \cdot Z$
31. O'zgaruvchan tokning quvvati	$N = I_{ef} \cdot U_{ef} \cdot \cos \varphi$ $N = I_R \cdot U_R$

32. Quvvat koeffitsiyenti	$\cos \varphi = \dfrac{R}{Z} = \dfrac{R}{\sqrt{R^2 + \left(X_L - X_C\right)^2}}$
33. Issiqlik isrofi orqali yo'qolgan quvvat	$\Delta N = \dfrac{N^2}{U^2 \cos^2 \varphi} \cdot R$
34. Transformatorlarda	$\dfrac{U_1}{U_2} = \dfrac{N_1}{N_2} = \dfrac{I_2}{I_1}$

35. Transformatsiya koeffitsiyenti
   - pasaytiruvchi
   - kuchaytiruvchi
	$K = \dfrac{U_1}{U_2}$
	$K > 1$
	$K < 1$

36. Transformator g'altaklaridagi quvvat	$P_1 = I_1 U_1$ $P_2 = I_2 U_2$
37. Transformatorning FIKi	$\eta = \dfrac{P_2}{P_1}$
38. Uzatish liniyasida kuchlanish n marta ortsa energiya sarfining kamayishi	$n^2 \ marta$
39. Juft magnit qutblar soni N marta ortganda, tokning o'zgarish chastotasining ortishi	$N \ marta$
40. Elektromagnit to'lqinlarning muhitda tarqalish tezligi	$\vartheta = \dfrac{c}{n}; \quad n = \sqrt{\varepsilon \mu}$
41. Elektromagnit to'lqinning muhitdagi to'lqin uzunligi	$\lambda = \dfrac{\lambda_0}{n} = \dfrac{\lambda_0}{\sqrt{\varepsilon \mu}}$
42. Elektromagnit to'lqinlarning tarqalish tezligi	$\vartheta = \lambda \cdot \nu; \quad \vartheta = \dfrac{E}{B}$
43. Elektromagnit to'lqin uzunligi	$\lambda = 2\pi \cdot c \sqrt{LC}$
44. Ikki to'lqinning fazalar farqi bo'yicha yo'llar farqi	$\Delta x = \dfrac{\lambda}{2\pi} \cdot \Delta \varphi$
45. Ikki to'lqinning yo'llar farqi bo'yicha fazalar farqi	$\Delta \varphi = \dfrac{2\pi}{\lambda} \cdot \Delta x$
46. Radiolakatorning ob'ektni sezish uzoqligi	$S = \dfrac{c \cdot t}{2 \cdot N}$

GEOMETRIK OPTIKA

1. Yorug'likning vakuumdagi tezligi	$$c = \dfrac{1}{\sqrt{\varepsilon_0 \cdot \mu_0}}$$
2. Yorug'likning muhitdagi tezligi	$$v = \dfrac{c}{n} = \dfrac{c}{\sqrt{\varepsilon \cdot \mu}}$$
3. Yorug'lik oqimi	$$\Phi = \dfrac{W}{S \cdot t}$$
4. Sfera uchun fazoviy burchak	$$\Delta\Omega = \dfrac{\Delta S}{r^2}$$
5. Yorug'lik kuchi	$$I = \dfrac{\Phi}{\Delta\Omega}$$
6. Yoritilganlik	$$E = \dfrac{\Phi}{\Delta S}$$
7. Ravshanlik	$$B = \dfrac{I}{\Delta S}$$
8. Yorug'likning 1 – qonuni	$$\Phi_0 = 4\pi \cdot I; \quad E_0 = \dfrac{I}{r^2}$$
9. Yorug'likning 2 – qonuni	$$E = E_0 \cdot \cos\alpha$$
10. Yorug'likning qaytish qonuni	$$\sin\alpha = \sin\beta$$
11. Yorug'likning sinish qonuni	$$\dfrac{\sin\alpha}{\sin\gamma} = \dfrac{n_2}{n_1}$$
12. Yorug'lik 1 – muhitdan 2 – muhitga o'tganda	$$\dfrac{v_1}{v_2} = \dfrac{\lambda_1}{\lambda_2} = \dfrac{n_2}{n_1}$$ $$\nu_1 = \nu_2 = const$$
13. Nur 1 – muhitdan 2 – muhitga o'tganda qytgan nur va singan nur o'zaro perpendikulyar bo'lsa	$$\tan\alpha = \dfrac{n_2}{n_1}$$
14. To'la ichki qaytishning chegaraviy burchagi	$$\sin\alpha_0 = \dfrac{n_2}{n_1}$$
15. O'zaro a burchak ostida yotgan ko'zgularga tushayotgan va ulardan qaytayotgan nurlar orasidagi burchak	$$\varphi = 2 \cdot \alpha$$
16. O'zaro a burchak ostida	

tushirilgan 2ta ko'zgu orasidagi nuqtaning tasvirlar soni	$$N = \frac{360^\circ}{\alpha}$$
17. Nurning prizmadan o'tgandagi og'ish burchagi	$$\delta = \alpha + \beta - \varphi$$ $$\sin \varphi \approx \varphi \Rightarrow \delta = (n-1) \cdot \varphi$$
18. Parallel plastinada nurning yo'li	$$x = \frac{d \cdot \sin(\alpha - \beta)}{\cos \beta}$$
19. Linzaning optik kuchi	$$D = \pm \frac{n_m}{F} = (n - n_m) \cdot \left(\frac{1}{R_1} + \frac{1}{R_2} \right)$$

20. Linza formulasi
  - yig'uvchi linza (qavariq)
 	
  - sochuvchi linza (botiq)
	$$\frac{1}{F} = \frac{1}{f} + \frac{1}{d}$$
	 $$\frac{1}{F} = \frac{1}{f} - \frac{1}{d}$$

21. Linzaning kattalashtirishi
  - yig'uvchi linza uchun
 	
  - sochuvchi linza uchun
 	
  - lupa uchun
	$$k = \frac{f}{d} = \frac{f-F}{F} = \frac{F}{d-F}$$
	 $$k = \frac{f}{d} = \frac{F-f}{F} = \frac{F}{d+F}$$
	 $$k = \frac{d_0}{F}; \quad d_0 = 0.25m$$

22. Ketma-ket ikkita yig'uvchi linzalar tizimiga tushayotgan parallel nurlar dastasi linzalardan chiqib parallelligicha qolishi uchun	$$l = F_1 + F_2$$
23. Yonma-yon turuvchi ikkita yupqa linza uchun - linzalar orasidagi masofa l ga teng bo'lsa	$$D = D_1 + D_2$$ $$D = D_1 + D_2 - l \cdot D_1 D_2$$
24. Fotoapparatda d_1 masofadan suratga olingan jism tasvirining o'lchami h_1, d_2 masofada esa h_2 bo'lsa, ob'ektiv linzaning focus	$$F = \frac{h_1 d_1 - h_2 d_2}{h_1 - h_2}$$

masofasi	
25. Mikroskopning kattalashtirishi	$$k = \frac{H}{h} = \frac{l}{F_1} \cdot \frac{d_0}{F_2}$$
26. Optik asboblarning ko'rinma kattalashtirishi	$$N = \frac{\tan \varphi_2}{\tan \varphi_1}$$
27. Nuqsonli ko'z foydalanishi kerak bo'lgan ko'zoynakning optik kuchi	$$D = 4 - \frac{1}{L}$$

TO'LQIN OPTIKASI

1.	Yorug'lik dispersiyasi	$$n_{qiz} < \cdots < n_{bin}$$ $$\nu_{qiz} < \cdots < \nu_{bin}$$ $$\vartheta_{qiz} > \cdots > \vartheta_{bin}$$
2.	Buger qonuni	$$I = I_0 e^{\alpha x}$$
3.	Absolyut qora jismning nur yutish qobiliyati	$$E_q = \sigma T^4$$ $$\sigma = 5.67 \cdot 10^{-8} \frac{W}{m^2 \cdot K^2}$$
4.	Rentgen trubkasiga oid formullalar	$$\frac{m\vartheta^2}{2} = \frac{h \cdot c}{\lambda_{min}} = h \cdot \nu_{max} = e \cdot U$$
5.	Quvvati N bo'lgan FIKi η bo'lgan renten trubkasidan t vaqtda chiqqan fotonlar soni	$$m = \frac{\eta \cdot N \cdot t}{h \cdot \nu}$$
6.	Interferensiyalanuvchi yorug'lik to'lqinlari, yo'llarning optik farqi yorug'lik to'lqinining yarim uzunligiga juft karrali bo'lgan holda yorug'lik intensivligining maksimumi kuzatiladi	$$\delta = 2k\frac{\lambda}{2} \quad k = 0, 1, 2, \dots$$ $$n \cdot \Delta x = m \cdot \lambda \quad m \epsilon Z$$
7.	Interferensiyalanuvchi yorug'lik to'lqinlari, yo'llarning optik farqi yorug'lik to'lqinining yarim uzunligiga toq karrali bo'lgan holda	$$\delta = 2k + 1 \frac{\lambda}{2} \quad k = 0, 1, 2, \dots$$

yorug'lik intensivligining minumimi kuzatiladi	$n \cdot \Delta x = (2m+1) \cdot \dfrac{\lambda}{2} \quad m\epsilon Z$
8. Yorug'lik tolqinlarining superpoziysiya prinsipi; $\quad x_1 = A_1 \cos(\omega t + \varphi_1)$ va $\quad x_2 = A_2 \cos(\omega t + \varphi_2)$ kogerent yassi yorug'lik tolqinlari qo'shilganda	$A^2 = A_1^2 + A_2^2 + 2A_1 A_2 \cos(\varphi_2 - \varphi_1)$
9. Agar to'lqin intensivligi amplitude kvadratiga proporsionalligini e'tiborga olsak, u holda	$I = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos(\varphi_2 - \varphi_1)$
10. Ikki yo'lqin intensivligi o'zaro teng bo'lib ular uchrashganda optik yo'llar farqi yorug'lik to'lqinining yarim uzunligiga juft karrali bo'lgan holda natijaviy intensivlik	$I_{nat} = 4 \cdot I_0$
11. Ikki yo'lqin intensivligi o'zaro teng bo'lib ular uchrashganda optik yo'llar farqi yorug'lik to'lqinining yarim uzunligiga toq karrali bo'lgan holda natijaviy intensivlik	$I_{nat} = 0$
12. Egrilik radusi R ga teng bo'lgan sferik sirtda(linzada) kuzatiladigan Nyuton halqalarining qorong'u dog'larining radiusi	$r = \sqrt{\dfrac{mR\lambda}{n}}$
13. Yorug' dog'larining radiusi	$r = \sqrt{(2m-1)\dfrac{R\lambda}{2n}}$

14. Difraksion panjarada maksimumlar sharti	$d \cdot \sin \varphi = k \cdot \lambda$
15. Difraksion panjarada minimumlar sharti	$d \cdot \sin \varphi = (2k + 1) \cdot \dfrac{\lambda}{2}$
16. Kuzatilishi mumkin bo'lgan eng katta tartib	$k_{max} = \dfrac{d}{\lambda}$
17. Maksimumlar soni	$N_{max} = 2 \dfrac{d}{\lambda} + 1$
18. Difraksion panjarada ekrangacha bo'lgan masofa L markaziy maksimumdan k tartibli maksimumgacha bo'lgan masofa x ga teng bo'lsa maksimumlar sharti	$d \cdot \dfrac{x}{\sqrt{L^2 + x^2}} = k \cdot \lambda$
19. Difraksion panjarada nurlarning og'ish burchagi	$\varphi_{qiz} > \cdots > \varphi_{bin}$
20. Qutblagichdan o'tgan yorug'lik intensivligi	$I = \dfrac{I_0}{2}$
21. Yorug'lik ikki muhit chegarasiga i_B burchak ostida tushsa, qutblanish sharti	$\tan i_B = n_{21}$
22. Molyus qonuni	$I = I_o \cos^2 \alpha$

NISBIYLIK NAZARIYASI VA KVANT MEXANIKASI

1. Nisbiylik nazariyasidagi tezliklarni qo'shishning realistik qonuni	$u = \dfrac{v_1 + v_2}{1 + \dfrac{v_1 \cdot v_2}{c^2}}$
2. Vaqt qonuni	$t = \dfrac{t_0}{1 - \dfrac{v^2}{c^2}}$

3. Uzunlik qonuni	$$l = l_0 \sqrt{1 - \frac{v^2}{c^2}}$$
4. Massaning tezlikka bog'liqlik qonuni	$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$
5. Tinchlikdagi energiya	$$E_0 = m_0 c^2$$
6. Kinetik energiya	$$T = m_0 c^2 \left(\frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} - 1 \right)$$
7. To'liq energiya	$$W = E_0 + T = m_0 c^2 + \frac{m_0 v^2}{2}$$ $$W = \frac{m_0 c^2}{\sqrt{1 - \frac{v^2}{c^2}}}$$
8. Massa defekti	$$\Delta m = \frac{\Delta E}{c^2}$$
9. Impuls	$$P = \frac{m_0 c}{\sqrt{1 - \frac{v^2}{c^2}}}$$
10. Zichlik	$$\rho = \frac{\rho_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$
11. Hajm qonuni	$$V = V_0 \sqrt{1 - \frac{v^2}{c^2}}$$
12. Foton energiyasi	$$E = v \cdot h$$
13. Fotoefekt uchun Eynshteyen tenglamasi	$$vh = A_{ch} + \frac{mv^2}{2}$$
14. Fotoefektning qizil chegarasi	$$v_{min} = \frac{A}{h}; \quad \lambda_{max} = \frac{c \cdot h}{A}$$
15. Fotoefektning qizil chegarasini hisobga olgan holda Eynshteyen tenglamasi	$$hv = hv_q + \frac{mv^2}{2} = hv_q + eU$$
16. Foton massasi	$$m = \frac{E}{c^2} = \frac{v \cdot h}{c^2}$$
17. Foton impulsi	$$P = \frac{v \cdot h}{c}$$

18. Foton sirtga a burchak ostida tushganda sirt oladigan kuch impulsi, yoki foton impulsining o'zgarishi; - sirtda to'liq yutilganda - sirtdan to'liq qaytganda	$$\Delta p = \frac{\nu \cdot h}{c} \cdot \cos \alpha$$ $$\Delta p = 2 \cdot \frac{\nu \cdot h}{c} \cdot \cos \alpha$$
19. Nurlanish va yutilish chastotalari; - nurlanish - yutilish	$$\nu = \frac{W_m - W_n}{h}$$ $$\nu > 0$$ $$\nu < 0$$
23. Quvvati N bo'lgan FIKi η bo'lgan manbadan t vaqtda chiqqan fotonlar soni	$$n = \frac{\eta \cdot N \cdot t}{h \cdot \nu}$$
20. Yorug'lik bosimi	$$P = \frac{E}{c} \; 1 + R \; = \frac{I}{c}$$
21. Yorug'lik bosimi; - sirtda to'liq yutilganda - sirtdan to'liq qaytganda	$$P = \frac{W}{ctS}$$ $$P = 2 \cdot \frac{W}{ctS}$$

ATOM VA YADRO FIZIKASI

1. Kvant energiyasi	$$E = h \cdot \nu = \frac{hc}{\lambda}$$
2. n- orbitadagi elektronning aylanish radiusi va tezligi	$$r_n = n^2 \frac{\varepsilon_0 h^2}{\pi m_0 e^2} = \frac{nh}{2\pi m_e v}$$ $$v_n = \frac{e^2}{2\varepsilon_0 h} \cdot \frac{1}{n}$$
3. Atomning statsionar holatlar energiyalari	$$W_n = -\frac{m_0 e^4}{8\varepsilon_0^2 h^2} \cdot \frac{1}{n^2}$$
4. Borning 2-postulati	$$h\nu_{mn} = W_m - W_n$$ $$\nu_{mn} = \frac{m_0 e^4}{8\varepsilon_0^2 h^3} \cdot \frac{1}{n^2} - \frac{1}{m^2}$$
5. Yadroning massa soni	$$A = Z + N$$
6. Alfa siljish qonuni	$$_Z^A X \rightarrow \,_{Z-2}^{A-4} Y + \,_2^4 He$$
7. Betta siljish qonuni	$$_Z^A X \rightarrow \,_{Z+1}^{A} Y + \,_{-1}^{0} e$$
8. Betta yemirilish 3 xil; - β^- yemirilish - β^+ yemirilish - elektron qamrash	$$_Z^A X \rightarrow \,_{Z+1}^{A} Y + e^- + \nu_e$$ $$_Z^A X \rightarrow \,_{Z+1}^{A} Y + e^+ + \nu_e$$ $$p \rightarrow n + e^+ + \nu_e$$
9. Annigilyatsiya	$$e^- + e^+ \rightarrow 2\gamma$$
10. Radioaktiv yemirilish qonuni	$$N = N_0 \cdot 2^{-\frac{t}{T}}$$
11. Radioaktiv moddaning yarim yemirilish davri	$$T = \frac{\ln 2}{\lambda} = \frac{0.693}{\lambda}$$
12. Radioaktiv moddaning o'rtacha yashash vaqti	$$\tau = \frac{1}{\lambda} = 1.44 \cdot T$$
13. Radioaktiv yadrolarning aktivligi	$$A = \frac{\Delta N}{\Delta t} = \lambda N$$
14. Δt vaqt ichida radioaktiv yadrolarning aktivligi n marta kamaygan bo'lsa;	$$n = \frac{A_2}{A_1} = 2^{-\frac{\Delta t}{T}}$$
15. Massa defekti	$$\Delta M = Z \cdot m_p + N \cdot m_n - M_{ya}$$
16. Bog'lanish energiyasi	$$E = \Delta M c^2$$

17. Yadroning solishtirma bog'lanish energiyasi	$\varepsilon = \dfrac{Z \cdot m_p + N \cdot m_n - M_{ya} \cdot c^2}{A}$
18. Yadro reaksiyasi zaryadning va massaning saqlanish qonuniga bo'ysunadi	$^{A_1}_{Z_1}X + ^{A_2}_{Z_2}Y \rightarrow ^{A_3}_{Z_3}F + ^{A_4}_{Z_4}W$ $A_1 + A_2 = A_3 + A_4$ $Z_1 + Z_2 = Z_3 + Z_4$
19. Massa sonlari A_1 va A_2 bo'lgan izotoplar aralashmasidan tashkil topgan qotishmaning massa soni A, tarkibiy qismlarining massa ulushlari η_1 va η_2	$A = \eta_1 A_1 + \eta_2 A_2$
20. Nurlanish dozasi	$D = \dfrac{W}{m}$
21. Nurlanishning ekspozitsion dozasi	$D_e = \dfrac{q}{m}$

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JADVALLAR

Doimiy fizik kattaliklar		
Nomi	Belgilanishi	Son qiymati va birligi
1. Erkin tushish tezlanishi	g	$9.80665 \frac{m}{s^2}$
2. Gravitatsion doimiysi	G	$6.672 \cdot 10^{-11} \frac{N \cdot m^2}{kg^2}$
3. Atom massa birligi	$a.m.b.$	$1.6605655 \cdot 10^{-27} \, kg$
4. Avagadro soni	N_A	$6.022045 \cdot 10^{23} \, mol^{-1}$
5. Boltsman doimiysi	k	$1.380662 \cdot 10^{-23} \frac{J}{K}$
6. Universal gaz doimiysi	R	$8.31441 \frac{J}{mol \cdot K}$
7. Normal sharoitda bir mol ideal gazning hajmi		$22.41383 \cdot 10^{-3} \frac{m^3}{mol}$
8. Loshmit soni	N_L	$2.68719 \cdot 10^{25} \, m^{-3}$
9. Normal sharoitda quruq havoning zichligi	ρ_{havo}	$1.293 \frac{kg}{m^3}$
10. Elekton zaryadi	e	$1.6021892 \cdot 10^{-19} \, C$
11. Elektron massasi	m_e	$9.109534 \cdot 10^{-31} \, kg$
12. Protoning tinchlikdagi massasi	m_p	$1.6726485 \cdot 10^{-27} \, kg$
13. Neytronning tinchlikdagi massasi	m_n	$1.6749543 \cdot 10^{-27} \, kg$
14. Elektr doimiysi	ε_0	$8.854188 \cdot 10^{-12} \frac{F}{m}$
15. Kulon qonunidagi proporsionallik koeffisiyenti	k	$9 \cdot 10^9 \frac{N \cdot m_2}{C^2}$
16. Magnit doimiysi	μ_0	$12.566371 \cdot 10^{-7} \frac{H}{m}$
17. Plank doimiysi	h	$6.626176 \cdot 10^{-34} \, J \cdot s$
18. Bor radiusi	r_0	$5.291771 \cdot 10^{-11} \, m$

Ba'zi kattaliklarning sistemadan tashqaridagi birliklari	
Sistemadan tashqaridagi	Sistemadagi
1. 1 kaloriya	$4.2\,J$
2. 1 ot kuchi	$736.2\,W$
3. 1 kW·soat	$3.6 \cdot 10^6\,J$
4. 1 mm.sim.ust.	$133.3\,Pa$
5. 1 atm	$101325\,Pa$
6. 1 bar	$10^5\,Pa$
7. 1 dina	$10^5\,N$
8. 1 rad	$10^{-2}Gy$
9. 1 rentgen (R)	$2.58 \cdot 10^{-4}\,\dfrac{C}{kg}$
10. 1 zivert (Zv)	$1\,\dfrac{J}{kg}$
11. 1 ber	$10^{-2}\,\dfrac{J}{kg}$

Foydalanilgan adabiyotlar:

M.Usmonov   -   ,,Fizika oliy o'quv yurtlariga kiruvchilar uchun ma'lumotnoma''

M.H.O'lmasova   -   ,,Mexanika va molekulyar fizika''

M.H.O'lmasova   -   ,,Elektrodinamika, Tebranish va to'lqinlar''

M.H.O'lmasova   -   ,,Optika, Atom va yadro fizikasi ''