YouTube IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev

FIZIKA – ixtisoslashtirilgan maktablar uchun 9-sinf

Mavzu: Butun olam tortishish qonuni

Masalalarni yechilish tartibini va to`liq izohli yechimini You Tube dagi **IT-Fizika** kanalida ko`rishingiz mumkin.

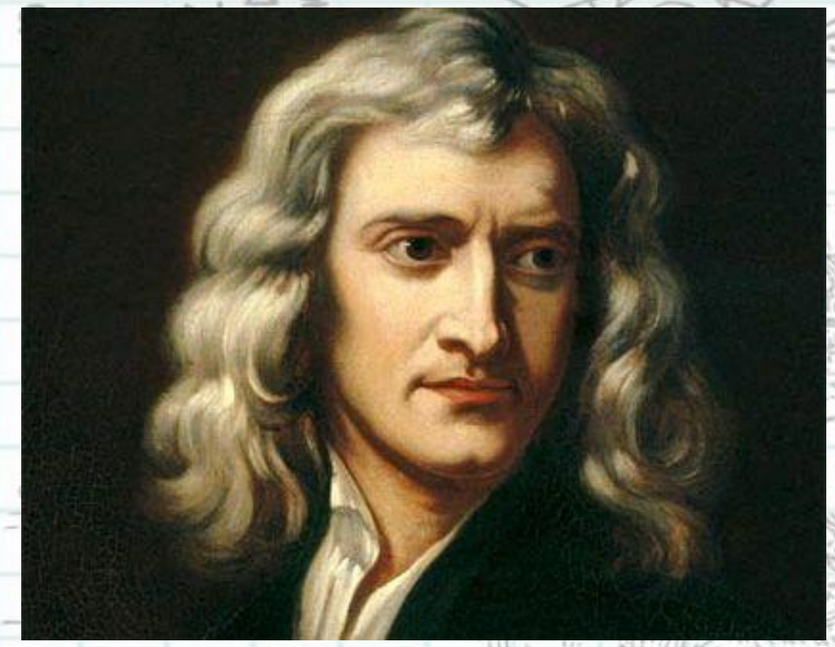
Toshkent 2021-yil

YouTube

IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev



Isaak Nyuton
(1642-1727)
Byuk Britaniya

Butun olam tortishish qonuni: Har qanday massag ega bo`lgan jismlar o`zaro tortishadi. Bu tortishish kuchi jismlarning massalari ko`paytmasiga to`g`ri praporsional, jimlar orasidagi masofaning kvadratiga teskari proparsional.

$$F = G\frac{m_1 m_2}{R^2}\ ; \qquad G = 6,67 \cdot 10^{-11}\ \frac{\mathrm{Nm}^2}{kg^2}$$

IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev

Genri Kavendish
(1731-1810)
Byuk Britaniya

G – gravitatsin doyimiy. Gravitatsion doyimining son qiymatin birinchi bo`lib tajrib yo`li bilan Genri Kavendish aniqlagan. Gravitatsion doyiming fizik manosi shuki – ikkita bir kilogramdan bo`lgan va oralaridagi masofa bir metr bo`lgan jismlarning o`zaro tortishish kuchiga son jixatda teng.

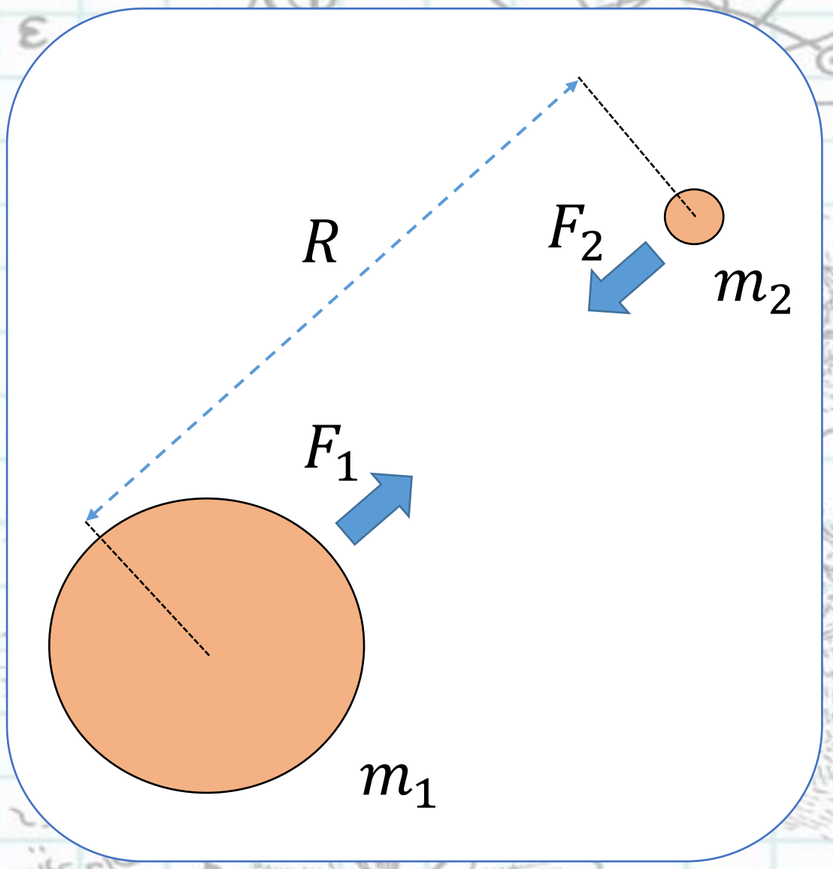
$$F = G\frac{m_1 m_2}{R^2}\ ; \qquad G = 6,67\cdot 10^{-11}\ \frac{\mathrm{Nm}^2}{kg^2}$$

YouTube

IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev



Butun olam tortishish qonuniga ko`ra massaga ega bo`lgan jismlar o`zaro tortishar ekan. Bu tortishish kuchlari har doyim o`zaro teng bo`ladi $F_1 = -F_2$. Ya'ni Quyosh massasi Yer massasidan 330000 marta katta. Quyosh Yeni qanday kuch bilan o`ziga tortsa. Yer ham Quyoshni huddi shunday kuch bilan o`ziga tortadi.

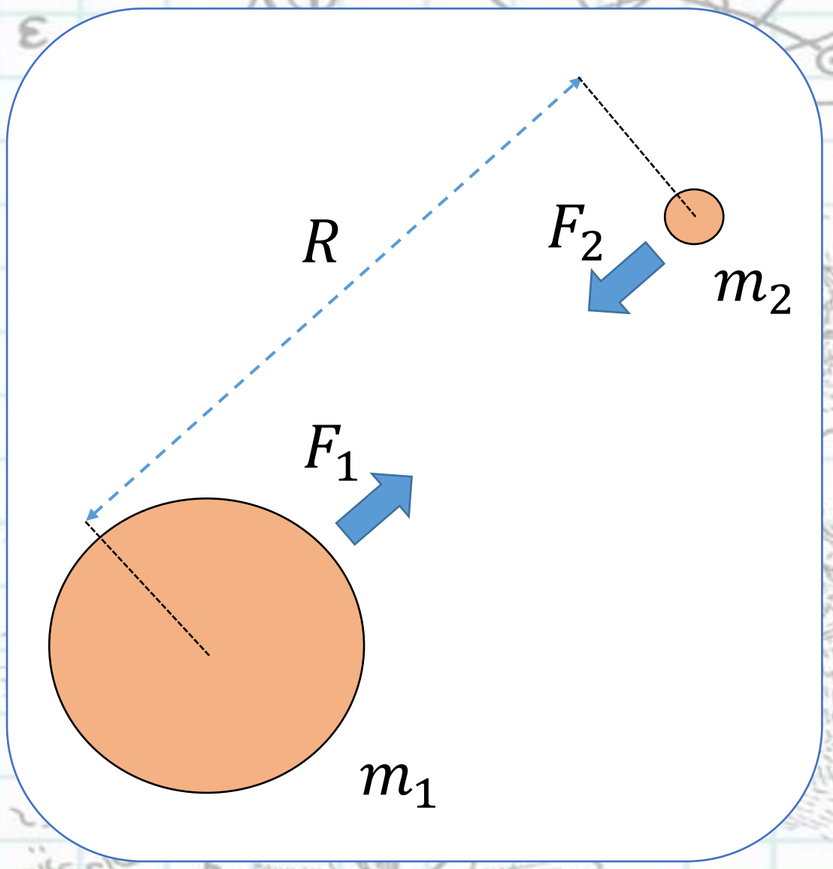
$$F = G\frac{m_1 m_2}{R^2}\ ; \qquad G = 6,67 \cdot 10^{-11}\ \frac{\mathrm{Nm}^2}{kg^2}$$

YouTube

IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev



Massaga ega bo`lgan jismlar orasida o`zaro tortishish kuchi bor ekan. Manashu kuch ta'sirda jismlar bir-biriga nisbatan *a* tezlanish oladi. Agarda $m_1 \gg m_2$ shart bajarilsa, u holda m_2 massali jism, m_1 jism tomon *a* tezlanish bilan harakatlanadi. Ushbu *a* tezlanish quydagicha hisoblanadi va u *gravitatsion maydon kuchlanganligi* deb ataladi.

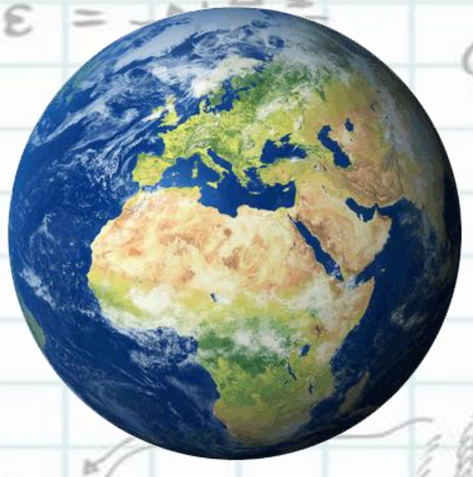
$$F = G\frac{m_1 \cancel{m_2}}{R^2} = \cancel{m_2} a \quad \Rightarrow \quad a = \frac{Gm_1}{R^2}$$

YouTube

IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev



Yer

$R_{yer} = 6{,}4 \cdot 10^6\ m$

$m_{yer} = 6 \cdot 10^{24}\ kg$

Gravitatsion maydon kuchlanganligi – jism massasiga to`g`ri proparsional, jism massa markazidan kuzatilayotgan nuqtagacha bo`lgan masofaning kvadratiga teskari proparsonal.

Demak har bir sayora o`zini gravitasion maydon kuchlanganligiga ega. Bu kuchlanganlik sayora sirtidan uzoqlashilgan sari kamayib boradi. Yer uchun gravitatsion maydon kuchlanganligining son qiymati $(h \ll R)$ $\mathrm{g} = 9{,}81\ \frac{m}{s^2} = const.$

$$g = \frac{Gm_{yer}}{R^2_{yer}} = \frac{6,67 \cdot 10^{-11} \cdot 6 \cdot 10^{24}}{\left(6,4 \cdot 10^6\right)^2} \approx 9.81\ \frac{m}{s^2}$$

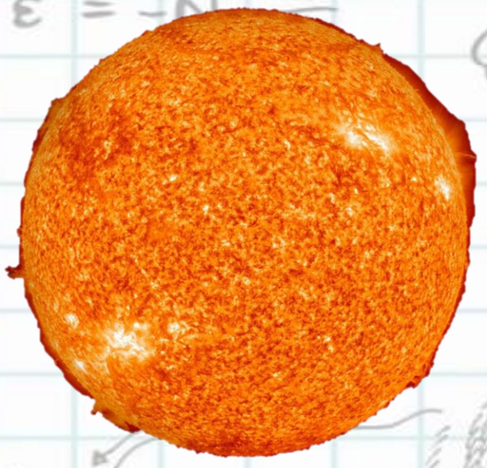
YouTube

IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev

Gravitatsion maydon kuchlanganligi formulasini osmon jismlari zichligi orqali ifodalasak quydagi ko`rinishga keladi.



Quyosh

$R_q = 6{,}96 \cdot 10^8\ m$

$m_q = 1{,}2 \cdot 10^{30}\ kg$

$$g = \frac{Gm}{R^2} = \frac{G\rho V}{R^2} = \frac{G\rho 4\pi R^3}{R^2 3} = \frac{4\pi G\rho R}{3}$$

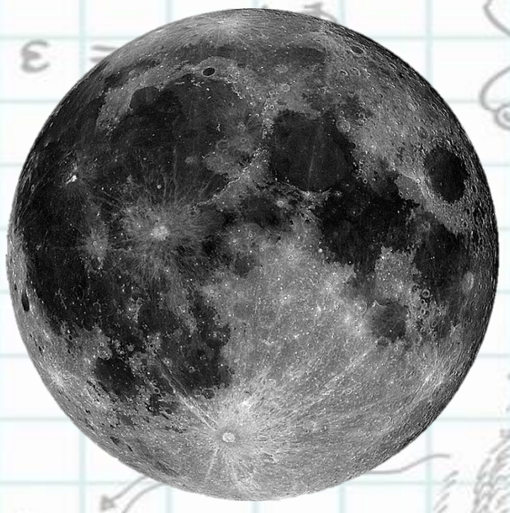
$$g_q = \frac{4 \cdot 3{,}14 \cdot 6{,}67 \cdot 10^{-11} \cdot 1{,}41 \cdot 10^3 \cdot 6{,}96 \cdot 10^8}{3} \approx 274\ \frac{m}{s^2}$$

YouTube

IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev



Gravitatsion maydon kuchlanganligi sayora sirtidan $h \ll R$ balandliklarda taqriban doyimiy qiymatga ega deb olinadi. Ammo h balandlik yetarli darajada katta bo`lganda. Gravitatsion maydon kuchlanganligi kamayib boradi va buni hisoblash formulasi quydagicha bo`ladi. g_0 sayora sirtidagi gravitatsion maydon kuchlangaligi yoki erkin tushish tezlanish.

Oy

$R_{oy} = 1{,}7 \cdot 10^6\ m$

$m_{oy} = 7{,}3 \cdot 10^{22}\ kg$

$$g_h = \frac{Gm}{(R+h)^2} = g_0 \cdot \left(\frac{R}{R+h}\right)^2$$

$h = R$ shart bajarilsa

$$g_h = g_0 \cdot \left(\frac{R}{R+R}\right)^2 = g_0 \cdot \frac{1}{4} = \frac{g_0}{4}$$

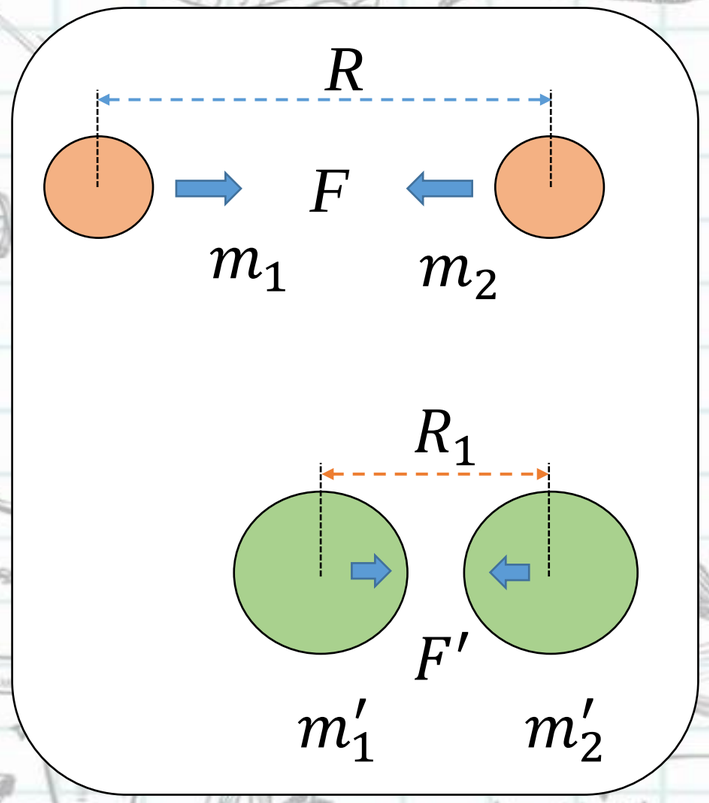
YouTube

IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev

Ikki jismdan har birining massasi 2 marta oshirilsa va ular orasidagi masofa 2 marta kamaytirilsa, ularning o‘zaro tortishish kuchi qanday o‘zgaradi?



Berilgan:

$m_1' = 2m_1$

$m_2' = 2m_2$

$R_1' = R/2$

$\frac{F'}{F} = ?$

Yechilishi:

Ikkala hol uchun ham tortishish kuchini yozamiz.

$$F = \frac{\gamma m_1 m_2}{R^2}$$

$$F' = \frac{\gamma m_1' m_2}{R^2}$$

$$\frac{F'}{F} = \frac{m_1' m_2'}{(R')^2}\frac{R^2}{m_1 m_2} = \left(\frac{R}{R_1}\right)^2 \frac{m_1' m_2'}{m_1 m_2} = 4 \cdot \frac{2m_1 2m_2}{m_1 m_2} = 4 \cdot 4 = 16$$

$F' = 16F$ 16 marta ortar ekan

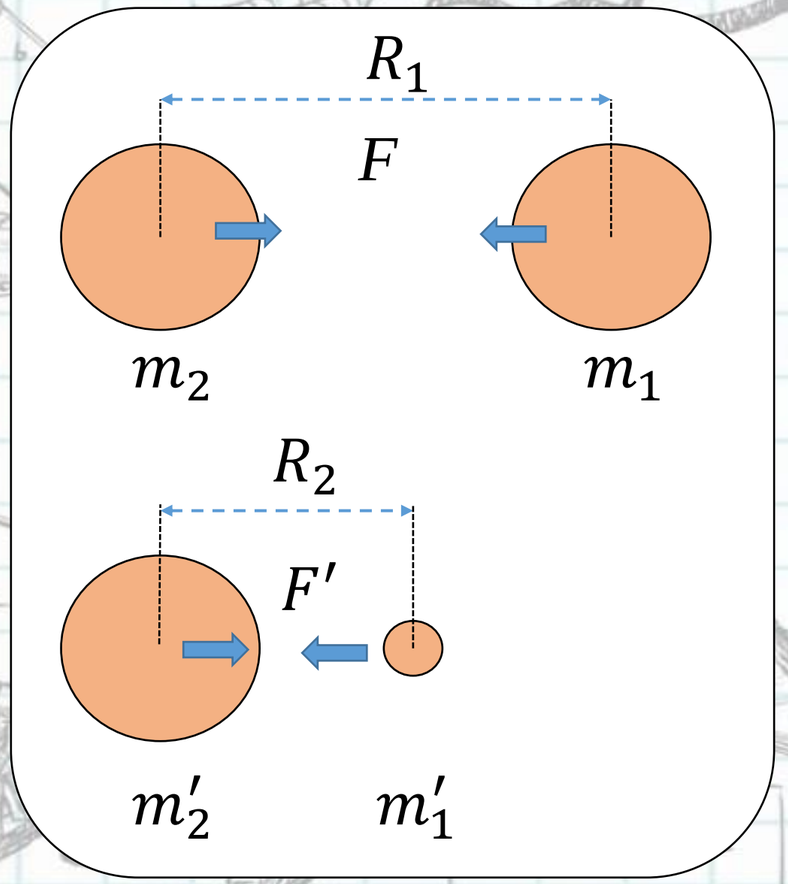
YouTube

IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev

Ikki jism orasidagi tortishish kuchi 36 marta oshgan va jismlardan birining massasi shuncha marta kamaygan bo‘lsa, ular orasidagi masofa qanday o‘zgargan?



Berilgan:

$F' = 36F$

$m_1 = 36m_1'$

$\frac{R_2}{R_1} = ?$

Yechish:

$$F = \frac{\gamma m_1 m_2}{R_1^2} \qquad F' = \frac{\gamma m_1' m_2'}{R_2^2}$$

$$\frac{R_2}{R_1} = \sqrt{\frac{\gamma m_1' m_2'}{F'} \frac{F}{\gamma m_1 m_2}} = \sqrt{\frac{m_1' F}{m_1 F'}} \qquad \frac{R_2}{R_1} = \sqrt{\frac{1}{36} \cdot \frac{1}{36}} = \frac{1}{36}$$

$R_1 = 36R_2$. Ular orasidagi masofa 36 marta kamayadi.

YouTube

IT-Fizika

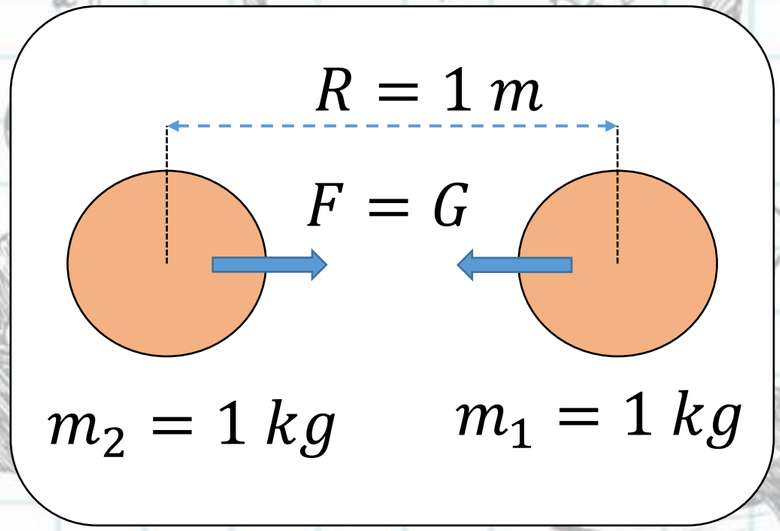
MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev

Butun olam tortishish qonunidagi gravitatsion doimiyning ma’nosini tushuntiring. Gravitatsiya doimiysining birligini ko‘rsating.

Massalari 1 kg dan va oralaridagi masofa 1 m bo‘lgan ikki jism orasidagi tortishish kuchiga teng kattalik.

$$[G] = \frac{[F]\cdot[R]^2}{[m_1]\cdot[m_2]} = \frac{1N\cdot 1m^2}{1\text{kg}\cdot 1\text{kg}} = 1\frac{N\cdot m^2}{\text{kg}^2}.$$



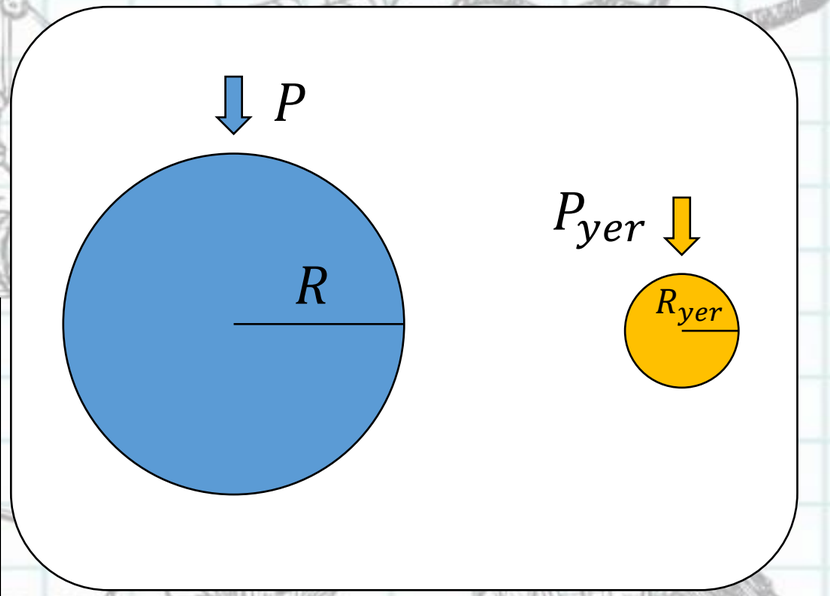
YouTube

IT-Fizika

MUHAMMAD AL-XORAZMIY NOMIDAGI AXBOROT TEXNOLOGIYALARIGA IXTISOSLASHTIRILGAN MAKTAB

Ibrohim Fayziyev

Radiusi va massasi Yernikidan 3 marta katta bo‘lgan sayyora sirtida jismning og‘irlik kuchi Er sirtidagidan qanday farq qiladi?



Berilgan:

$R = 3R_{yer}$

$M = 3M_{yer}$

$\frac{P}{P_{yer}} = ?$

Yechilishi:

Har bir sayyora uchun og`irlik kuchi formulasini yozamiz

$$P_{yer} = mg_{yer} = m\frac{\gamma M_{yer}}{R_{yer}^2} \qquad P = m\frac{\gamma M}{R^2}$$

$$\frac{P}{P_{yer}} = \frac{m\gamma M}{R^2}\frac{R_{yer}^2}{m\gamma M_{yer}} = \left(\frac{R_{yer}}{R}\right)^2 \frac{M}{M_{yer}} = \left(\frac{1}{3}\right)^2 \cdot 3 = \frac{1}{3}.$$

$P_{yer} = 3P$ Yerdagidan 3 marta kichik bo‘lar ekan