**pirveli SesarCevi weris amocanebis amoxsna.**

**1.1 muxti daxril sibrtyeze (3 qula)**

***m masis Saibas, romelic q muxtiT aris damuxtuli, akaveben α daxrilobis mqone daxril sbtyeze. B induqciis magnituri veli sibrtyis marTobulia. Saiba gaaTavisufles. ipoveT Saibis moZraobis Camoyalibebuli siCqare. xaxunis koeficientia μ.***

**amoxsna**

cxadia, rom Tu μ>tg α Saiba ver imoZravebs da misi siCqare nulis toli iqneba. μ<tg α SemTxvevaSi Saiba daiwyebs Camosrialebas da masze imoqmedebs siCqaris marTobuli *F*l lorencis Zala da traeqtoria gamruddeba. Camoyalibebuli moZraobis dros tolqmedi Zalis nolTan gatoleba iZleva

daxril sibrtyeze dagegmileba iZleva

aqedan

**1.2 siTbogamtaroba. (4 qula)**

***ganvixiloT L sigrZis erTgvarovani Rero, romlis ganivkveTis faTobia S, xolo siTbogamtarobaa k. Rero Tboizolirebulia, garda pirveli (x=0) kidura kveTis, sadac inarCuneben mudmiv T0 temperaturas. Reros moculobis yoveli erTeuli drois erTeulSi gamoyobs ω siTbos raodenobas. gansazvreT temperaturis ganawileba Reros gaswvriv T(x). risi tolia Reros meore bolos (x=L) temperatura?***

**miTiTeba:** *Tqven gamogadgebaT furies kanoni, romlis Tanaxmad araerTgvarovnad gacxeleboli Reros ganivi kvqTis farTobis erTeulSi drois yovel erTeulSi gadatanili siTbos raodenoba q tolia*

*sadac k aris siTbogamtaroba, xolo minusi miuTiTebs, rom siTbo gadadis cxeli nawilidan civisken.*

**amoxsna**

Reros Tboizolirebis gamo siTburi balansi niSnavs, rom nemismieri *x* koordinatis wertilida Reros bolomde (*x=L*) gamoyofili siTbi unda mTlianad gamosxivdebodes:

integrirebis Sedegad aqedan miviRebT

da Reros meore bolos temperaturaa

***1.3. Tanamgzavri atmosferoSi (8 qula)***

***ganvixiloT atmosferos zeda fenebSi dedamiwis xelovnuri Tanamgzavris moZraoba. aq Tanamgzavrze moqmedebs damamuxruWebeli Zala, romelic proporciulia atmosferos simkvrivis, Tanamgzavris ganivkveTis farTobis da misi siCqaris kvadratis Fwin=CρSV2 , sadac C uganzomilebo koeficientia, romelic damokidebulia Tanamgzavris formaze.***

***es Zala mcirea da Tanamgzavrs SeuZlia wlobiT ibrunos dedamiwis garSemo, magram misi orbitis radiusi TandaTan mcirdeba, Sesabamisad icvleba Tanamgzavris siCqare. gTavazobT ganixiloT Tanamgzavris dinamika dawvrilebiT:***

***1.3.1 m masis Tanamgzavri moZraobs R0 radiusis orbitaze. dedamiwis masaa M, gravitaciuli mudmivaa G. gansazRvreT Tanamgzavris v0 siCqare, T0 brunvis periodi da E0 sruli meqanikuri energia.***

***axla gaviTvaliswinoT winaaRmdegobis Zala. atmosferos simkvrive mocemul simaRleze iyos ρ0, Tanamgzavris ganivkveTis farTobi ki S. dedamiwis garSemo erTi Semobrunebisas orbitis radiusi da Tanamgzavris siCqare mcired icvleba, amitom winaaRmdegobis Zala am dros mudmivad SeiZleba CaiTvalos.***

***1.3.2 gansazRvreT Tanamgzavris orbitis radiusis da siCqaris fardobiTi cvlileba, ΔR/R0 da ΔV/V0 dedamiwis garSemo erTi Semobrunebisas.***

***1.3.3 gansazRvreT Tanamgzavris aτ tangencialuri aCqareba am orbitaze.***

***1.3.4 gansazRvreT, ra Vn0 siCqariT uaxlovdeba Tanamgzavri dedamiwis centrs am simaRleze. atmosferos simkvrive ρ=ARα kanoniT rom icvlebodes, maSin α–s garkveuli mniSvnelobisaTvis Vn0 siCqare mudmivi darCeboda. gansazRvreT α–s es mniSvneloba.***

**amoxsna:**

**1.3.1**

**1.3.2** dedamiwis garSemo erTi Semobrunebisas winaaRmdegobis Zalis muSaobis gansazRvrisas SegviZlia winaaRmdegobis Zala mudmivad CavTvaloT, xolo traeqtoria wrewirad, amitom

energiis mudmivobisa da gardaqmnis kanonis Tanaxmad gvaqvs

SevinarCunoT mcire wevrebis umciresi xarisxebi, maSin

am sami tolobidan miiReba

miaqcieT yuradReba, rom winaaRmdegobis Zalis moqmedebisas Tanamgzavris siCqare izrdeba!

radganac , amitom gvaqvs

aqac SevinarCunoT mcire wevrebis umciresi xarisxebi, maSin miiReba

**1.3.3**

**1.3.4**

SevitanoT am gamosaxulebaSi siCqaris gamosaxuleba pirveli punqtidan:

aqedan vxedavT, rom vn0 mudmivi iqneba, Tu anu anu α= \_1/2

**1.4. dedamiwis temperatura (10 qula)**

***warmovidginoT dedamiwa rogorc Zalian didi siTbogamtarobis Rd=6370km radiusis myari birTvi. miviCnioT misi orbita L=150·106 km radiusis wrewirad. mzis radiusia Rm=696·103 km, xolo misi zedapiris temperaturaa Tm=5800 K.***

***1.4.1 SeafaseT dedamiwis zedapiris Td saSualo temperatura. mzec da dedamiwac CaTvaleT absoluturad Sav sxeulebad. atmosferos gavlena ar gaiTvaliswinoT.***

***miTiTeba: Stefan-bolcmanis kanonis Tanaxmad, T absoluturi temperaturis absoluturad Savi sxeulis zedapiris yoveli erTeuli farTobidan drois erTeulSi gamosxivebuli energiaa σT4,sadac σ = 5,67·10\_8vt/m2·K4 Stefan-bolcmanis mudmivaa.***

***axla gaviTvaliswinoT atmosferos gavlena.***

***atmosfero srulad STanTqavs gamosxivebas, romlis talRis sigrZe λmin=8,00 mkm-dan λmax=12,0 mkm-mde SualedSia.***

***CaTvaleT, rom Tbogadacema dedamiwis zedapirsa da atmosferos Soris mxolod gamosxivebiT xorcieldeba. CaTvaleT, rom atmosferos temperatura ar icvleba simaRlis mixedviT.***

***mzis da dedamiwis temperaturebi mniSvnelovnad gansxvavebulia, amitom maTi gamosxivebuli energiis didi nawili sxvadasxva talRis sigrZeebze modis. amis gamo maT gamosxivebas atmosfero gansxvavebulad STanTqavs.***

***1.4.2 SeafaseT atmosferos mier mzis gamosxivebis Am STanTqmis koeficienti da dedamiwis gamosxivebis Ad STanTqmis koeficienti.***

***miTiTeba: a)STanTqmis koeficienti ewodeba STanTqmuli intensiobis Sefardebas dacemulTan.***

***b)plankis formulis Tanaxmad, Savi sxeulis gamosxivebis intensioba mosuli talRis sigrZis Sualedze (λ-Δλ/2)–dan (λ+Δλ/2)–mde, miaxloebiT ganisazRvreba formuliT***

***sadac e neperis ricxvia, c=3,00×108 m/wm vakuumSi sinaTlis siCqarea, h=6,63×10-34 j⋅wm plankis mudmivaa, k=1,38×10-23 j/K bolcmanis mudmivaa, T Savi sxeulis absoluturi temperaturaa.***

***1.4.3 SeafaseT dedamiwis zedapiris saSualo temperatura am SemTxvevaSi. ugulebelyaviT mzis gamosxivebis STanTqma atmosferos mier.***

**amoxsna:**

**1.4.1**mzis gamosxivebuli simZlavrea **(0,5 qula)**. mzidan dedamiwa Cans rogorc L manZiliT daSorebuli Rd radiusis wre, amitom dedamiwaze moxvedrili simZlavre iqneba

dedamiwis gamosxivebuli simZlavrea damyarebuli temperaturis dros P0=P1, rac gvaZlevs

Td=279K

**1.4.2**mzis gamosxivebis intensiobaa

mzis gamosxivebis intensioba mosuli talRis sigrZis im diapazonze, romelic STainTqmeba atmosferos mier aris

aq λ=10 mkm STanTqmis diapazonis Sua talRis sigrZea.

mzis gamosxivebis STanTqmis koeficientia Am=ΔIm/Im=0,941⋅10-3

dedamiwis gamosxivebis intensiobaa

dedamiwis gamosxivebis intensioba mosuli talRis sigrZis im diapazonze, romelic STainTqmeba atmosferos mier aris

aq λ=10 mkm STanTqmis diapazonis Sua talRis sigrZea.

mzis gamosxivebis STanTqmis koeficientia Ad=ΔId/Id=0,250

P1

dedamiwa

atmosfero

P0

P2

P2

(1-Ad)P1

AdP1

**1.4.3** situacia atmosferos gaTvaliswinebiT sqematurad gamosaxulia naxatze.

mzidan dedamiwas ecema simZlavris gamosxiveba, romlis STanTqmas atmosferoSi ugulebelvyofT. atmosferodan dedamiwis zedapirs xvdeba raRac P2 simZlavre da amdenive gamosxivdeba kosmosSi. dedamiwa gamoasxivebs simZlavres. misi Ad nawili STainTqmeba atmosferos mier, xolo danarCeni (1\_ Ad) nawili midis kosmosSi. rodesac dedamiwisa da atmosferos temperaturebi damyarebulia, sruldeba energetikuli balansis pirobebi:

P0+P2=P1 da 2P2= AdP1. aqedan P1=P0/(1\_ Ad /2) saidanac miiReba .