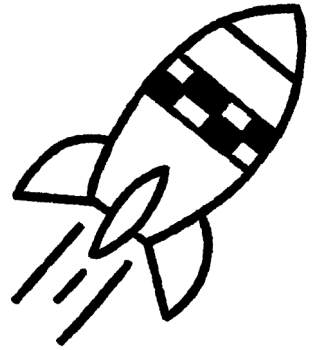


Dhumucda siligga (Thickness of a wire)



Sayniska

Cutub: Iska caabbinta (Resistance) iyo wareegyada barbar socda (parallel circuits)

Natiijo

Waxaan qeexi karaa sida batterigu u riixo (push) current-ka siligyo dhumuc kala duwan.

Erayada muhiimka ah

atom (atom)

elektaroon (electron)

bir-ion (metal ion)

iska caabbinta (resistance)

saami ah (proportional)

Erayada muhiimka ah

Atom (atom) waa qaybta ugu yar ee curiye (element) kiimiko oo jira.

Elektaroonnada (Electrons) waa charges-ka ku jira conductors-ka kuwaas oo qulqula si ay u bixiyaan current koronto.

Bir-ion (metal ion) waxaa la sameeyaa marka atom bir ah uu lumiyo hal ama in ka badan oo elektaroon (electron) ah oo uu leeyahay charge togan.

Iska caabbinta (Resistance) waa cabbirka sida ay u adag tahay in current uu qulqulo.

Labo doorsoome (variables) waa saami ah (proportional) haddii midku isbeddelo sida tiro badan oo kan kale.

Dhumucda siligga (Thickness of a wire)

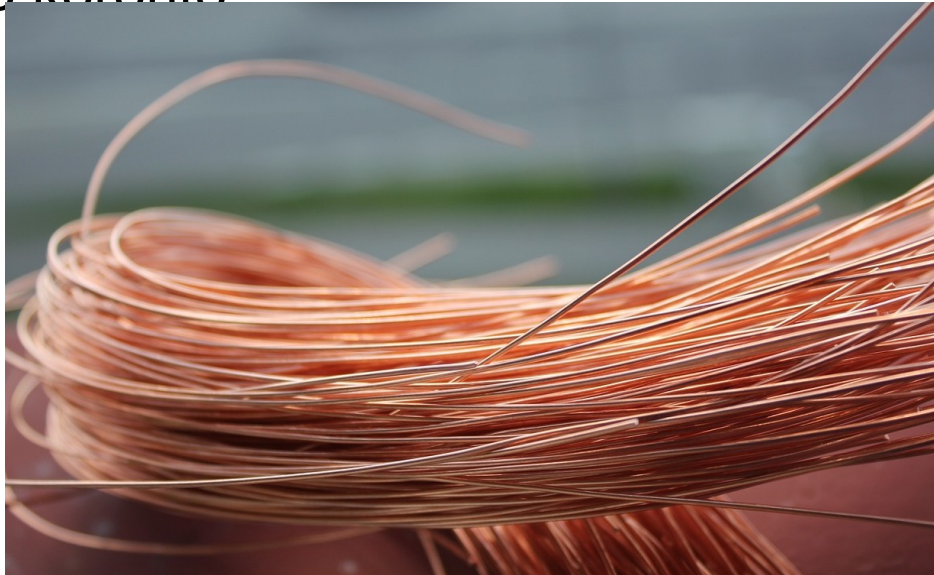


Current-ka siligyo dhumuc kala duwan

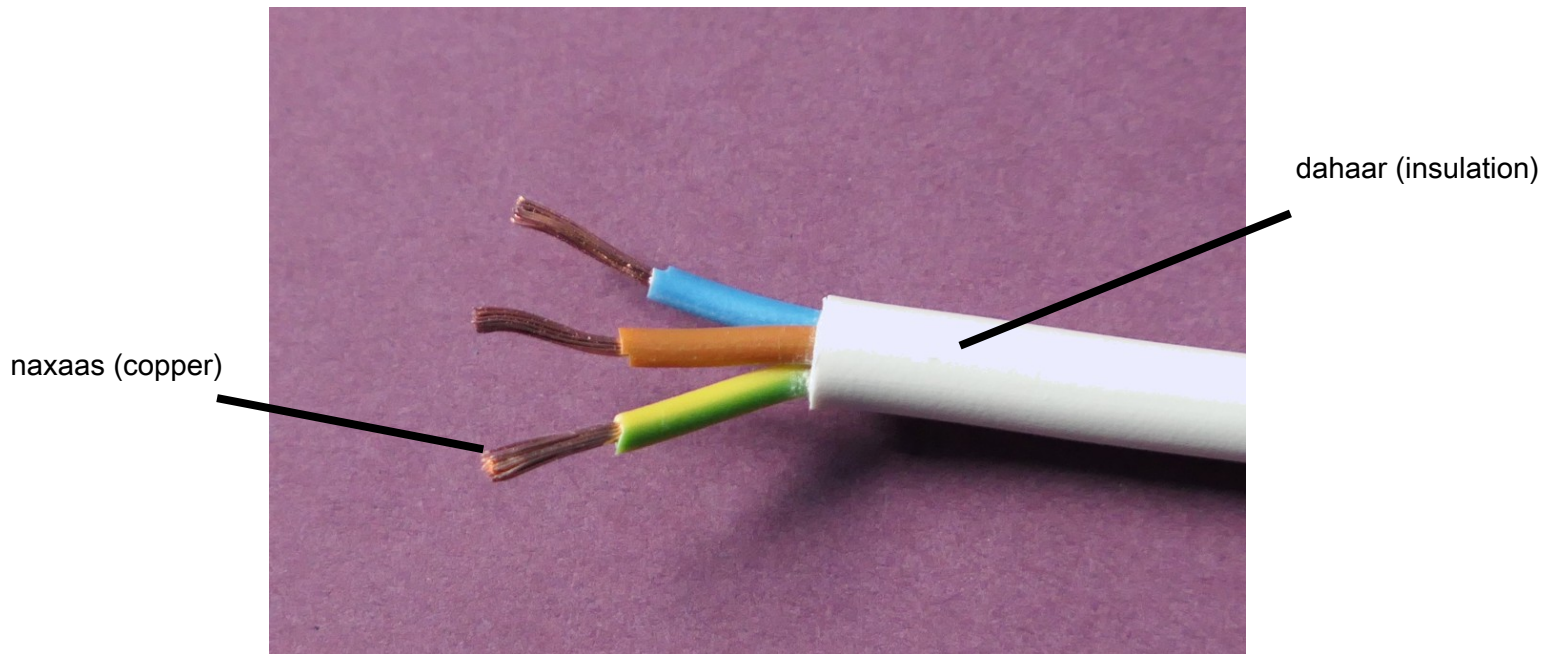


Qaab (model) loogu talagalay current koronto

Silig naxaas ah (Copper wire) waxaa loo isticmaalaa qalab badan oo koronto ah sababtoo ah waa conductor aad u wanaagsan oo koronto



Inta badan ma aragno naxaasta (copper) sababtoo ah waa sida caadiga ah waxaa lagu daboolaa insulation si looga hortago shoogga koronto (electric shocks).



Koronto (Current) maraya siligyo dhumucdoodu kala duwan tahay



Maxay siligyada naxaasta ah ee qaada korontada guriga loogu daboolay caag midab leh?

- a** si korontadu u socoto si degdeg ah
- b** si looga hortago luminta kulaylka
- c** si looga hortago shoogga korontada (electric shocks) ✓
- d** si ay u caawiyaan shaqaalaha korontada inay aqoonsadaan siligyada ✓

Siligyada naxaasta (copper) ah waxaa loo isticmaali karaa qalab badan waxaana laga heli karaa dhumuc kala duwan.

dhumuc
weyn



aad u dhuuban

dhexdhexaad

Marka elektaroon (electron) uu ka tago atamka naxaasta (copper) ee gooni ah, wuxuu ka taga ion bir ah (naxaas) oo koronto ku leh (positively charged).

ion naxaas (copper ion)

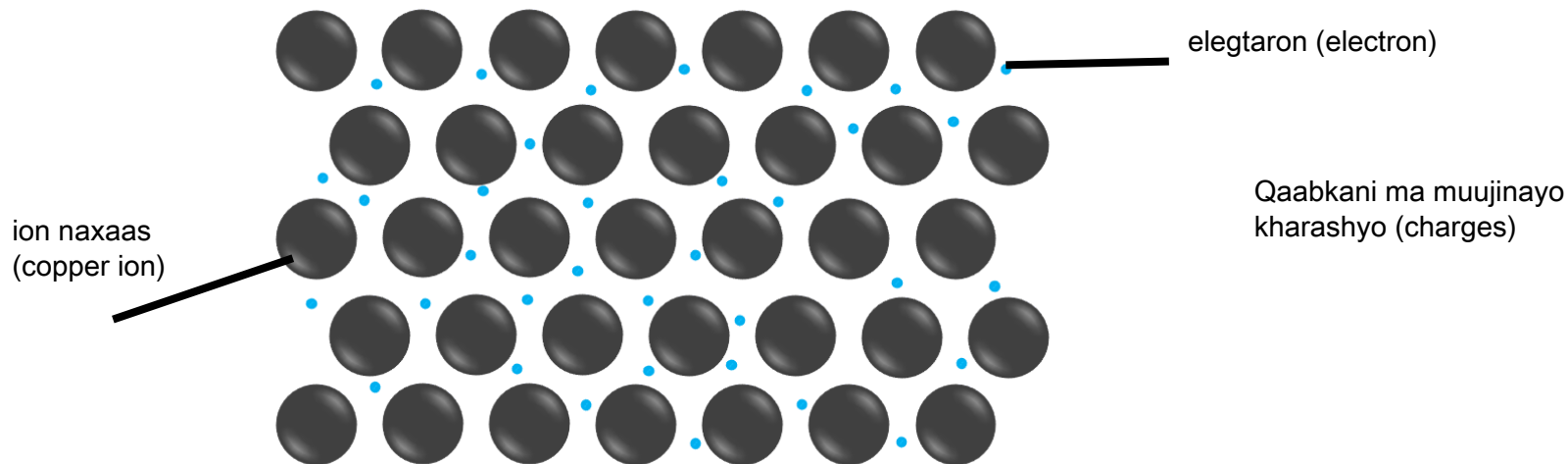


elektaron (electron)



Birta dhexdeeda, elektaroonadu (electrons) si buuxda ugama tagaan atamka laakiin waxay ku sii jiraan meel u dhow.

Siliga naxaasta (copper) dhexdiisa, waxaa jira ion naxaas (copper ions) oo leh elegtaroono (electrons) oo si dabacsan u haya. Elegtaroonadu (electrons) waxay u dhaqaaqi karaan ion ilaa ion iyo inta u dhaxaysa.



Ion-ka naxaasta (copper) ayaa ku xidhan meeshooda.

Waa maxay kharashka (charge) uu yeelan doono atom-ka naxaasta (copper) haddii uu lumiyo elektaroon (electron)?

a

toogan (positive)



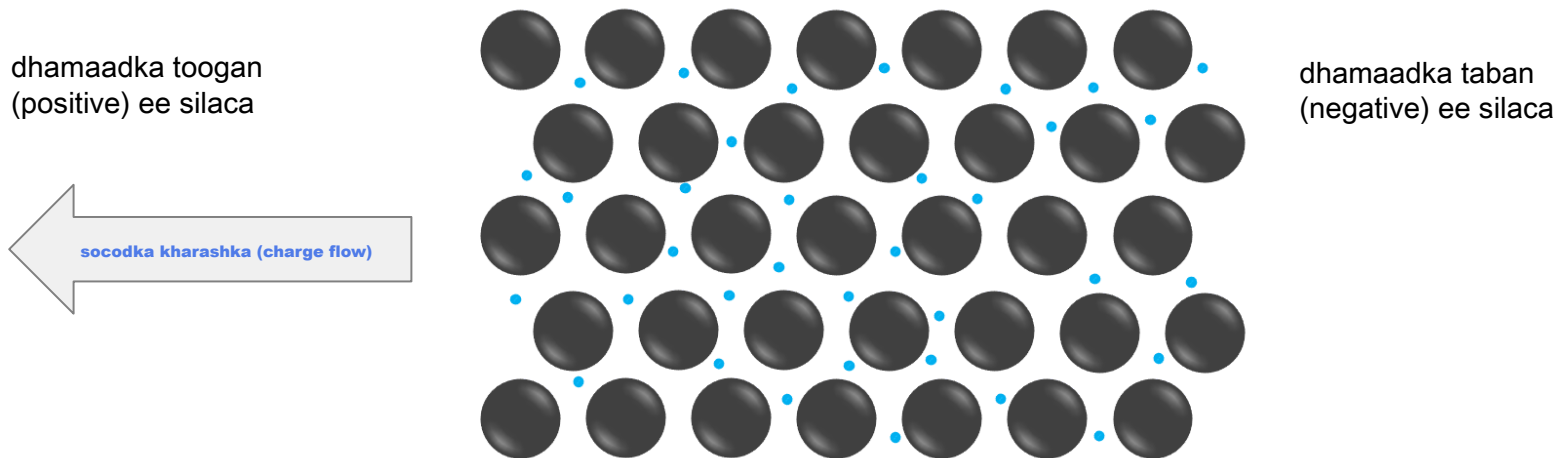
b

taban (negative)

c

kharash la'aan – dhexdhexaad (neutral)

Haddii batteri (battery) lagu xiro silaca, cidhifyada silaca ayaa noqonaya kuwo kharash leh (charged) oo elektaroonnada (electrons) 'dhaqaaqaan' (drift) iyagoo silaca dhex mara, oo ka tallaabsanaya ion ilaa ion.



Badan 'badweynta elektaroonnada' (sea of electrons) ayaa 'dhaqaaqi karta' (drift) silaca dhexdiisa iyada oo ka socota dhamaadka taban (negative) ilaa dhamaadka toogan (positive) ee batteriga (battery), taasoo keenta qulqul (current).

Kee ayaa sababa qulqulka (current) birta dhexdeeda?

a badweynta elektaroonnada (sea of electrons) ee dhexdaaqaaysa ✓

b ion-yada dhaqaaqaya

c atamka (atoms) sida elektaroonnada (electrons) wata

Biraha (metals) sida qalinka (silver), naxaasta (copper) iyo dahabka (gold) ayaa ah kuwa ugu fiican ee qaadiya (conductors) oo u oggolaada 'badweynta elektaroonnada' (sea of electrons) inay si sahal ah u dhaqaaqdo.



Tani waxay ugu wacan tahay sida atamka (atoms) birta loo habeeyay, sida elektaroonnada (electrons) loo xidho, iyo sida birta u saafiga (pure) tahay.

Biraha qaarkood sida constantan (constantan), nichrome (nichrome) ama bir (steel) sidoo kale waa wadeyaal wanaagsan oo koronto (electricity) ah, laakiin kama wanaagsana lacagta (silver), dahabka (gold) ama naxaasta (copper).

Marka la baarayo iska caabinta (resistance), waxaan inta badan isticmaalnaa siligyo constantan (constantan) ama nichrome (nichrome) sababtoo ah iska caabintoodu (resistance) waa sarreeyaa oo si fudud ayaa loo qiyaasi karaa.



Qulqulka (Current) siligyo dhumucdoodu kala duwan tahay



Hubi

Siligyadan (dhumuc, qaab iyo dherer isku mid ah) kee baa leh iska caabinta (resistance) ugu sarreysa?

a

silig dahab (gold wire)

b

silig constantan (constantan wire) ✓

c

silig lacag (silver wire)

d

silig naxaas (copper wire)

Labadan silig ee naxaasta (copper) ah waa isku dherer.



Siligga dhumucdiisu weyn tahay wuxuu u furan yahay:

- **atomyo naxaas (copper atoms) oo badan, sidaas darteedna wuxuu leeyahay**
- **elektronno (electrons) badan oo qaadi kara**
- qulqul (current) weyn.

Marka, siligga dhumucdiisu weyn tahay wuxuu yeelan doonaa iska caabin (resistance) hoose.

Qulqulka (Current) siligyo dhumucdoodu kala duwan tahay

Run mise been?

Labadan silig, siligga dhuuban wuxuu leeyahay iska caabin (resistance) yar.



Run



Been



Sabab u sheeg jawaabtaada

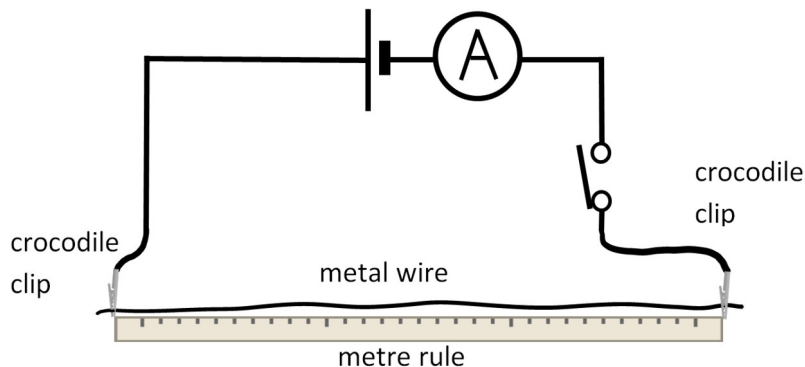
a Waxaa jira bir (metal) yar oo uu dhaqaalaha (charge) dhex mari karo ✓

b Waxaa jira ionno bir (metal ions) oo ka yar jidka dhaqaalaha (charge).



Tijaabi inta qulqul (current) ee qaadi kara dhumuc kala duwan oo silig ah.

- Isticmaal saddex dhumuc oo silig nichrome (nichrome wire) ah.
- Isticmaal ammeter (ammeter) si aad u cabbirto current (current) iyada oo loo marayo 1.0 m oo mid kasta ah.
- Cabbir current (current) ee maraya silig kasta saddex jeer oo xisaabi celceliska current (current) ee mid kasta.



- 1) Sharax waxa aad heshay.
- 2) Sharax sida aad u hubisay in natiijooyinkaagu ay yihiin kuwa sax ah oo lagu kalsoonaan karo.

dhumucda siligga	current (A)			
	1	2	3	celcelis
dhumuc weyn				
dhexdhexa ad				
dhuuban				

Natiijooyin tusaale ah:

dhumucda siligga	current (A)			
	1	2	3	celcelis
dhumuc weyn (SWG 30)	0.477	0.472	0.481	0.477
dhexdhexaad (SWG 36)	0.179	0.180	0.175	0.178
dhuuban (SWG 38)	0.111	0.055	0.113	0.112

Qiyaastii labaad ee siliga dhuuban wuxuu ahaa mid aan caadi ahayn (anomalous) marka looma adeegsan xisaabinta celceliska (mean).

1) Sharax waxa aad heshay.

Natiijooyinku waxay muujiyeen in siligga ka dhuuban uu yeesho current (current) hooseeya.

Siligyo dhuuban waxay leeyihiin iska caabin (resistance) sare oo ku saabsan socodka current (current).

2) Sharax sida aad u hubisay in natiijooyinkaagu yihiin kuwa sax ah (accurate) iyo kuwo la isku halleyn karo (reliable).

Waxaan hubiyay in natiijooyinkaygu yihiin kuwa sax ah (accurate) oo la isku halleyn karo (reliable) anigoo qaaday akhrinno soo noqnoqda (repeat readings) oo ku qiyaasay korantada (current) ilaa saddex meelood oo jajab tobanle ah.

Waxaan raadiyay qiyaaso aan caadi ahayn (anomalous measurements) oo aanan u adeegsan xisaabinta celceliska (mean).

Markii aan qiyaasayay dhererka siliga ilaa 1 mitir, waxaan hubiyay in siligu toosan yahay oo kala goysyada yaxaasta (crocodile clips) ay si sax ah ugu yaalliin dhibcaha 0.0 cm iyo 100.0 cm.

Si looga fogaado in siligu kululaado (overheating), waxaan shiday wareegga (circuit), qaaday akhrinta (reading), oo isla markiiba damiyay.

Qaabka casharka

Dhumucda siliga (Thickness of a wire)

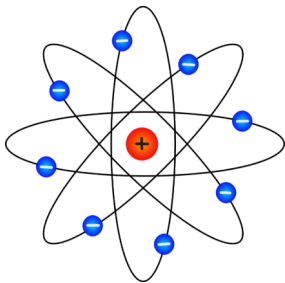


Korantada (Current) maraysa siligyo dhumucdoodu kala duwan tahay

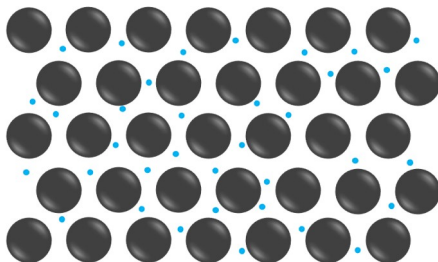


Qaab (Model) loogu talagalay korantada (electric current)

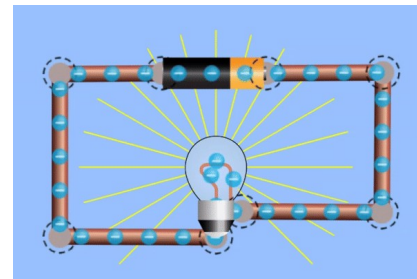
Ma arki karno elektaroonnada (electrons) oo ku qulqulaya siligyo, marka waxaan u adeegsanaa qaabab (models) kala duwan si aan u fahanno korantada (electricity).



Qaabkan (model), elektaroonnada (electrons) waa goobo waaweyn oo ku wareegaya xudunta (nucleus).



Halkan, elektaroonnada (electrons) waxay ku kala firdhiyeen ion-ka birta (metal ions) waxayna xor u yihiin inay socdaan (drift).

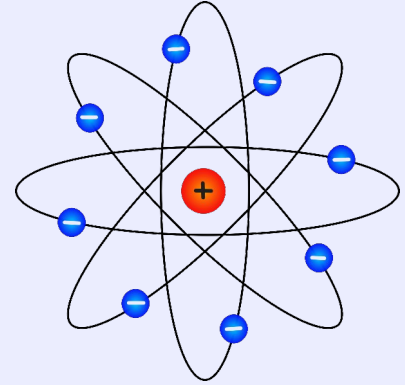


Elektaroonnada (electrons) ku jira siligu waxay ku socdaan wareegga (circuit) qaabkan (model).

Qaab (Model) loogu talagalay korantada (electric current)

Tilmaamahaa (statements) ayaa sax ah oo ku saabsan qaabkan (model)?

- a** goobaha buluugga ah waa elektaroonnada (electrons) ✓
- b** goobaha buluugga ah waa borotoonnada (protons)
- c** goobta casaanka ah waa elektaroon (electron)
- d** kubbadda cas waxay leedahay dallac togan (positive charge) ✓



Moodal loogu talagalay koronto socota (electric current)



Hubi

Yaa run ah oo ku saabsan moodalkan silig naxaasta ah?

a

waxaa jira elektaroonno xor ah oo ka badan ion-yada

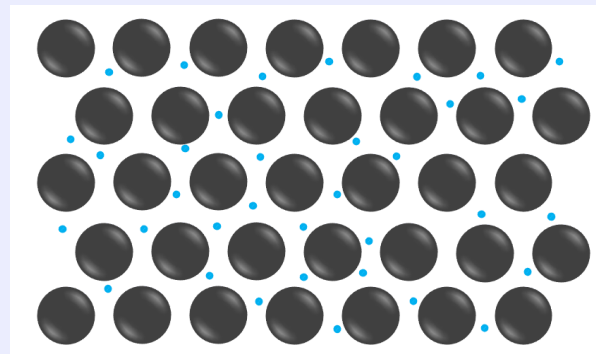
b

waxaa jira tiro siman oo elektaroonno xor ah iyo ion-yo



c

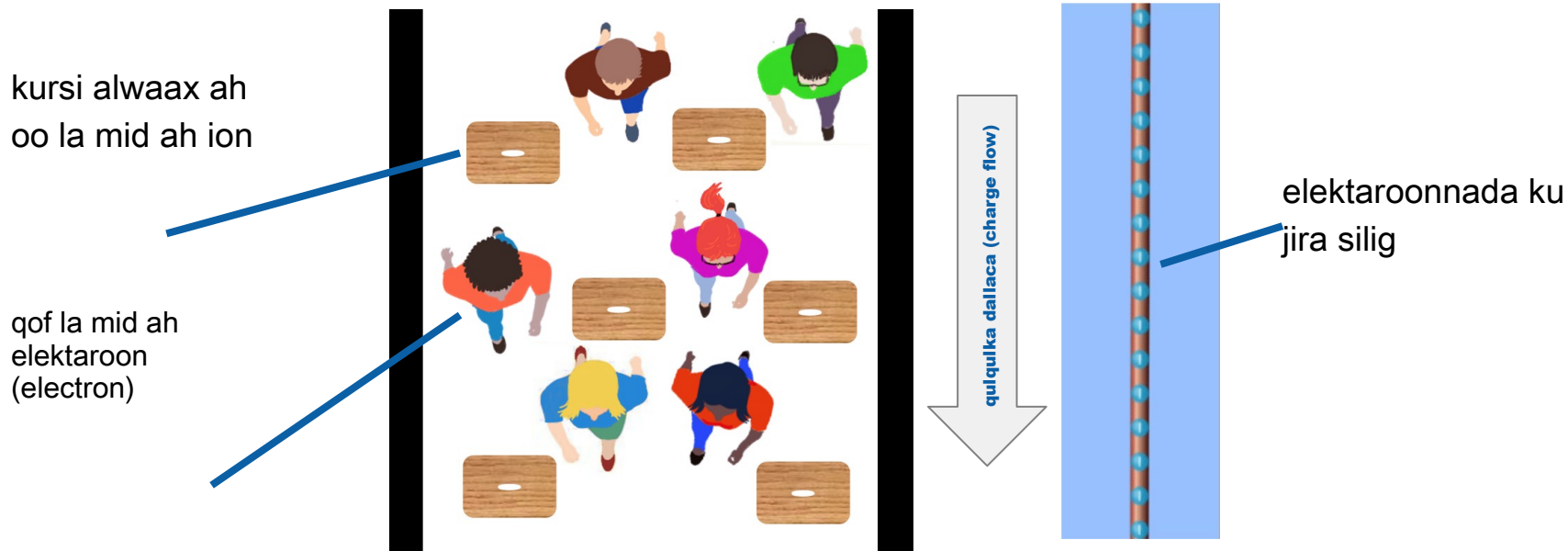
waxaa jira ion-yo ka badan elektaroonnada xorta ah



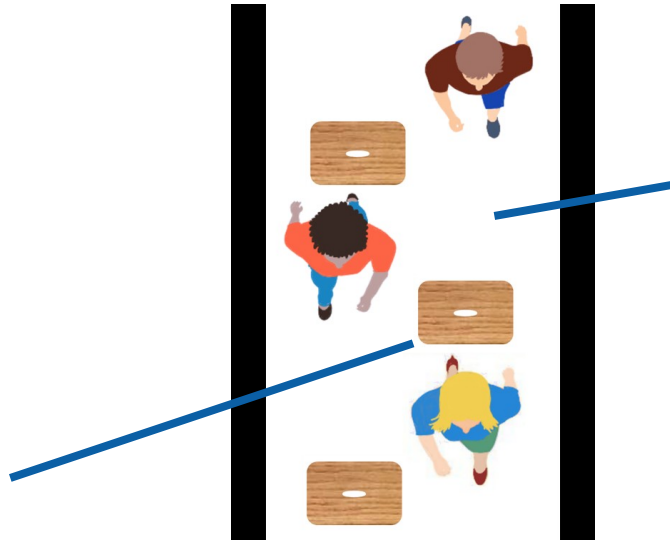
Moodal kale oo loogu talagalay korontada waa dad lugaynaya oo dhex maraya kuraasta.



Dadka dhaqaaqaya waxay la mid yihiin qulqulka dallaca (charge) ee socda.

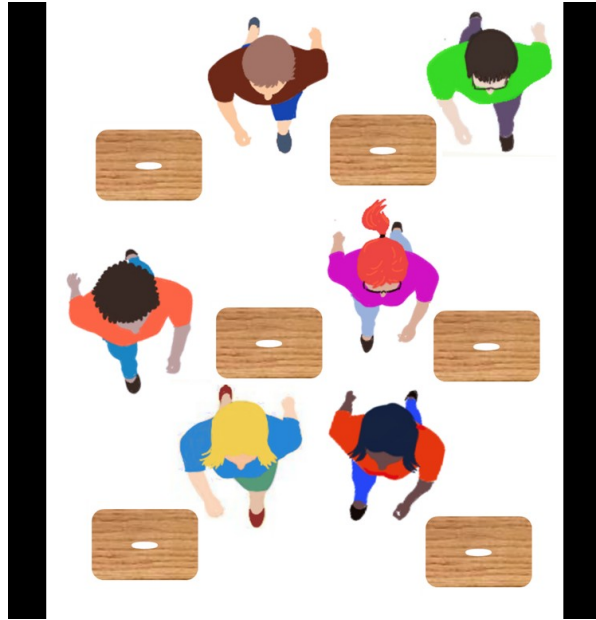


Meel cidhiidhi ah, dad yar ayaa mara waqti kasta.



Tani waxay la mid tahay iska caabin sare (high resistance) iyo koronto hoose (low current) oo ku jira silig khafiif ah.

Meel ballaadhan, dad badan ayaa mari kara.



Tani waxay la mid tahay iska caabin (resistance) hoose iyo haddana (current) sare oo ku jira silig ballaadhan.

Moodeel (model) loogu talagalay haddana (electric current)



Hubi

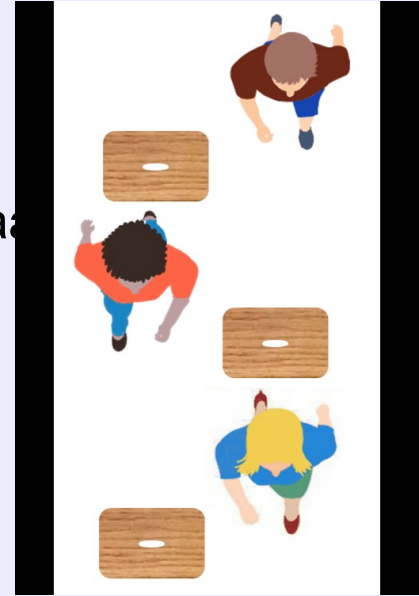
Waa kuwee odhaahyada saxda ah ee ku saabsan moodeelka dadka iyo kuraasta?

a kuraastu waxay matalaan socodka (flow) ee dallaca

b kuraastu waxay matalaan ion-yada (ions) ✓

c dadku waxay matalaan elektaroonnada (electrons) ✓

d dadka ayaa ka badan kuraasta



Moodeellada (models) korontadu waxay noqon karaan kuwo waxtar leh laakiin sidoo kale waxay noqon karaan kuwo marin habaabinaya.

faa'iidooyinka	khasaarooyinka
• waxay ka caawiyaan in la sawiro (visualise) wax aanan arki karin, tusaale ahaan elektaroonnada (electrons) • waxay isticmaalaan waxyaabo aan fahamno si ay u sharaxaan fikrado aan la taaban karin (abstract)	• waxaan inta badan u isticmaalnaa goobooyin (spheres) elektaroonnada (electrons), laakiin elektaroonnadu ma aha sidaas • waxay si khaldan u matali karaan fikradda saxda ah • waxay si aad u fudud u matali karaan fikrado

Moodeello (models) kala duwan ayaa loo isticmaali karaa in lagu sharaxo fikradda isku midka ah.

Moodeel (model) loogu talagalay haddana (electric current)

Moodeel (model) kale ayaa isticmaala waddo iyo baabuur si ay u matalaan haddana (electric current).



Waddo cidhiidhi ah waxay la mid tahay silig dhuuban oo u oggolaanaya dhawr baabuur oo keliya inay dhex maraan.



Waddo ballaadhan waxay la mid tahay silig qaro weyn oo u oggolaanaya baabuur badan inay dhex maraan.

Qiimaynta moodeelka wadooyinka iyo baabuurta.

Faa'iidooyinka:

- Waxaan isticmaalnaa wadooyinka mar walba waana kuwo aan yaqaan.
- Ballaca wadooyinka wuxuu la mid yahay dhumucda fiilada.
- Baabuurta waxay la mid yihiin elektaroonnada (electrons).
- Darawalada baabuurta waxay iska fogaadaan baabuurta kale, elektaroonnadu way is celiyaan.



Qasaarooyinka:

- Ion-ka naxaasta ee fiilada laguma muujin.
- Baabuurta si fudud ayay uga baxaan wadada, elektaroonnadu waxay ku sii jiraan fiilada.
- Baabuurta aad bay uga yar yihiin elektaroonnada ku jira fiilada.
- Darawalada baabuurta waxay doortaan meesha ay tagaan, elektaroonnada waxaa riixa hal jiho batteriga (battery).

Yaa sheegaya faa'iidada moodeelka wadooyinka iyo baabuurta?

a

darawalada baabuurta waxay dooran karaan meelaha ay tagaan

b

baabuurta waxay ka bixi karaan wadada

c

baabuurta way ka yar yihiin elektaroonnada

d

wadooyinka waa kuwo aan yaqaan



Bedka isgoysyada fiiladan waa 'A'.



Haddii bedka la labanlaabo, waxay qaadi kartaa laba jeer socodka (current).

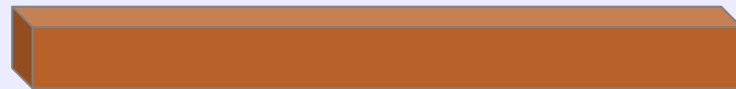


Iskaabixu (resistance) wuxuu noqon doonaa nus (halved).

Waa maxay iskaabixu (resistance) ee siliga dhumucdiisu weyn tahay?

a

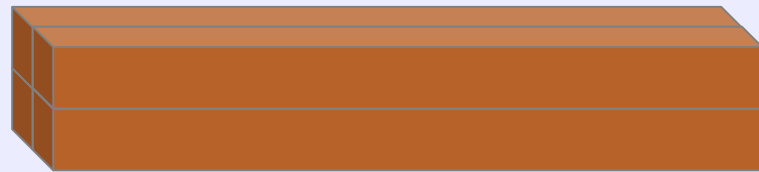
8Ω



silig dhuuban: iskaabixu (resistance) 8Ω

b

4Ω



silig dhumucdiisu weyn tahay

c

2Ω



Haddii isku danab (voltage) la isticmaalo, socodka korantadu (current) wuxuu ku xiran yahay bedka (area).

Haddii bedku (area) kordho $\times 2$, socodka korantadu (current) wuxuu kordhaa $\times 2$.



1 Amp

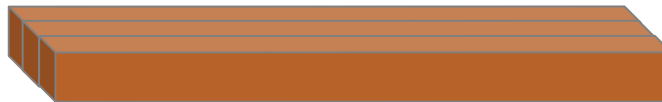


2 Amps

Haddii bedku (area) kordho $\times 3$, socodka korantadu (current) wuxuu kordhaa $\times 3$.



1 Amp



3 Amps

Socodka korantadu (current) wuxuu u dhigmaa (proportional) bedka (area), wuxuu kordhaa isla qaddarka.

Waa maxay socodka korantada (current) ee siliga dhuuban (haddii isku danab (voltage) lagu dabaqo)?

a

8 A

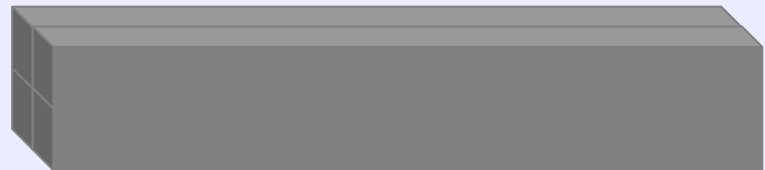
b

4 A



c

2 A

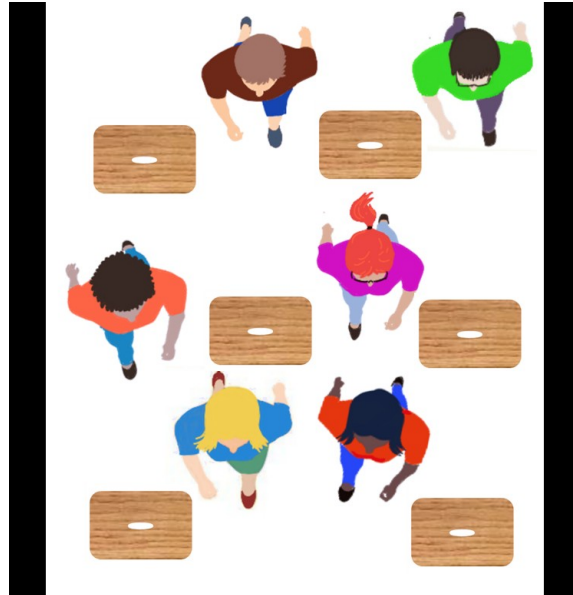


silig dhumucdiisu weyn tahay: socodka korantada (current)
16 A



silig dhuuban

- 1) Bixi saddex faa'iido oo ah qaabka (model) dadka iyo kuraasta.
- 2) Waa maxay saddex shay oo aan si fiican ugu habboonayn?



1) Bixi saddex faa'iido oo ah moodeelka dadka iyo kuraasta.

- Dadku waxay yaqaaniin kuraasta qolka, waxayna si fudud u isticmaali karaan.
- Kuraastu waxay hor istaagaan dadka, sida atomiga (atoms) hor istaaga elektaroonada (electrons).
- Inta lagu jiro ciyaarta doorka (role play), waxay tijaabin karaan xaalado kala duwan si ay u arkaan saameynta.

2) Waa maxay saddex shay oo aan si fiican u qummanayn?

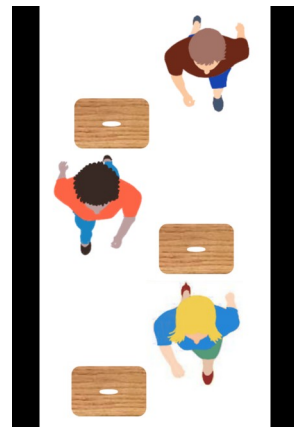
- Waxaa jira arday aad uga yar elektaroonada (electrons).
- Ardaydu waxay leeyihiin doorasho halkay tagaan, elektaroonadu (electrons) waxay ka tagaan taban (negative) ilaa togan (positive).
- Waxaa jira meelo bannaan oo weyn oo u dhexeeya kuraasta; fiilooyinka meelaha bannaan iyo elektaroonadu (electrons) aad bay u yar yihiin.
- Qolku wuxuu yeelan doonaa gidaarro ku haysta ardayda, fiiladu uma baahna gidaarro.

Soo koobid Dhumucda fiilada (thickness of a wire)

'Bad elektaroonada (sea of electrons)' waxay 'dhex socon kartaa' fiilo, u dhexaysa iyoona birta (metal ions), laga bilaabo taban (negative) ilaa dhamaadka togan (positive) taasoo keenta koronto (current).

Kordhinta dhumucda fiilada, waxay kordhisaa bedka isgoysyada (cross-sectional area) taasoo kordhisa tirada elektaroonada (electrons) ee qaadi kara koronto (current).

Korontada (current) la qaadi karo waxay u dhigantaa bedka isgoysyada (cross-sectional area) ee fiilada. Sidaa darteed, labanlaabista bedka waxay labanlaabin doontaa korontada (current).



Moodello kala duwan ayaa faa'iido u leh sharaxaadda sida korontadu (current) u dhaqanto.