

Ka Lekapī No Nā Lua Pele

‘Ōwehe Laulā:

E a‘o ana nā haumāna i nā ‘anopili o nā hōkūhele a me nā mahina pili i ka lua pele.

Nā Pahuhopu:

E a‘o ana ka haumana:

- e kahaki‘i a lepili i nā hi‘ona kaha a me nā ‘ili o nā hōkūhele;
- e wehewehe i nā hōkūhele me nā crusty exteriors;
- e noi‘i i ka mani ‘ana o nā mea (objects) ma muli o kona nui; a me
- e hō‘oia i nā mea pili i ka hōkūhele a i ‘ole ka mahina pili i ka lua pele.

Nā Pono Ha‘awina:

- Nā hano kānuku 1000 mililika
- Nā hue (flasks) 1000 mililika
- Nā pale wela (hot pads)
- Nā kapuahi papakau
- Nā ana wela
- Nā uaki helu manawa
- Nā māka pa‘a
- Ke pā DVD Ola Ka Honua: Volcanoes Alive
- Pepa Ha‘awina Haumana: “Nā ‘Ili Hōkūhele”
- Pepa Ha‘awina Haumana: “Ka Mani ‘Ana”

Nā Pane I Ka Pepa Ha‘awina Haumana:

Nā ‘Ili Hōkūhele:

1. Pa‘a ka ‘ili a pau ‘o Mercury, Venus, Honua, ka mahina, Mars, Io, Europa, a me Pluto.
2. He ‘ili kinoea ‘o Jupiter, Saturn, Uranus, a me Neptune
3. Mercury, Venus, Honua, ka mahina, Mars, Io, a me Europa.
4. ‘Ae, koe na‘e ‘o Pluto.
5. E ‘oko‘a ana nā pane; Mamao ‘o Pluto ‘a‘ole ‘imi loa maika‘i kekahi i kēia wahi.

Ka Mani ‘Ana:

1. Wikiwiki ka mani ‘ana o ko ka Honua mahina a me Mercury. ‘O Mars paha.
2. ‘Oi a‘e ka mani lohi o ka Honua a me Venus. ‘O Mars paha.
3. Earth, Venus, a ‘o Mars paha, akā ‘a‘ole ‘eu ‘o Mars no ka manawa lō‘ihi.
4. Mercury a me ko ka Honua mahina.
5. E ‘oko‘a ana nā pane, akā pono ka pane e wehewehe ‘oi a‘e ka ‘eu o nā hōkūhele nui ma mua o nā hōkūhele li‘ili‘i.

Ka Lekapī No Nā Lua Pele

Ke Ka'ina Hana Ha'awina:

1. E noi i nā haumāna i nā mea hi'ohi'ona o ka hōkūhele me nā lua pele. Inā pono, e nīnau i nā haumāna i ko lākou 'ike i nā lua pele ma ka Honua (e like me, ke ana wela, ka ho'okumu 'ana, a pela aku.). E kākau i nā mana'o ma ka papa ke'oke'o.
2. E wehewehe, kōkua nā kumuloli (variables) i ka lua'i 'ana o ka lua pele (volcanism) akā he mea nui nā mea ho'okumu o ka hōkūhele kekahi. Hiki i nā haumāna ke koho wale inā aia nā lua pele ma ka 'ili pa'a a i 'ole ka 'ili kinoea. Pono nā haumāna e "koho" no ke kinoea a i 'ole ka pa'a. E kākau ma ka papa ke'oke'o i ka helu o nā haumāna e koho ma waena o nā 'ili 'elua.
3. E kākā'ahi i ke pā DVD Ola Ka Honua: Volcanoes Alive a me ka Pepa Ha'awina Haumana: "Nā 'Ili Hōkūhele." E noi i nā haumāna e ho'ohana i ke pā DVD, mokuna 10 e kōkua i ka ho'okō 'ana o ka pepa ha'awina.
4. Ke pau i ka ho'okō 'ana o nā pepa ha'awina, e ho'oma'ama'a hou i nā pane. E ho'omaopopo i nā haumāna aia nā lua pele 'eu me nā 'ili pa'a ma nā hōkūhele a me nā mahina; ma nā hōkūhele 'ē a'e aia nā lua pele i hala. 'A'ole nui ka 'ike e pili ana iā Pluto inā aia kekahi mau lua pele i laila.
5. E nīnau i nā haumāna inā maopopo iā lākou aia nā lua pele 'eu ma ka Honua a ma ka hōkūhele 'o Venus, akā 'a'ohe lua pele 'eu ma ka mahina. E kākau i nā mana'o ma ka papa ke'oke'o.
6. E wehewehe no nā lua pele 'eu pono kekahi kumu wela mai loko mai. E wehewehe i nā haumāna i ka wā mua, wela nā hōkūhele a me nā mahina me nā pōhaku he nui i loko o ko kākou poe lā. Akā nā'e he mau lua pele mani i kēia manawa. Mani wikiwiki kekahi o nā hōkūhele ma mua o nā hōkūhele 'ē a'e.
7. E nīnau i nā haumāna he aha nā mea e ho'oholo ai i ka māmā o ka mani 'ana? E kākau i nā mana'o ma ka papa ke'oke'o. E noi i nā haumāna e noi'i e ho'oholo inā mani wikiwiki nā nuipa'a nui a i 'ole li'ili'i.
8. E kākā'ahi i ka Pepa Ha'awina Haumana: "Ka Mani 'Ana" a e noi i nā haumāna e ho'okō i ka noi'i.
9. E kūkākūkā i nā pane o ka papa. Inā hoihoi, e kahaki'i i ka nui o ka Honua, Venus, Mercury, Mars, a me ko ka Honua mahina ma ka papa ke'oke'o (nā anawaena: Earth = 12.7 kenimika, Venus = 12.1 kenimika, Mars = 6.7 kenimika, Mercury = 4.9 kenimika, a me ka Mahina = 3.5 kenimika).
10. E ho'omaopopo he mau lua pele 'eu ma Io a me Europa (nā lua pele pelemaka ma Io, a me cryovolcanoes ma Europa). E wehewehe ua like ka nui 'o Io a 'o Europa i ko ka Honua mahina (3.6 kenimika ke anawaena o Io a 3.1 mau kenimika ke anawaena o Europa, inā ho'ohālikelike ka nui o nā nuipa'a 'ē a'e i # 9).
11. E nīnau i nā haumāna no ke aha mai aia nā lua pele 'eu ma nā nuipa'a li'ili'i? E wehewehe ua mani kēia mau nuipa'a i ka wā i hala loa, a ma muli o kona kokoke i Jupiter a me nā mahina 'ē a'e, nui ka 'umekaumaha i nā 'ao'ao 'ē a'e. Ho'okumu kēia 'ume i ka wela. No laila, ho'owela 'o Europa a 'o Io e ka wela o ke au (tidal heating). E a'o ana kēia i nā ha'awina 'ē a'e o kēia mokuna.

Ka Mana'o Hou A'e: Mani wikiwiki nā hōkūhele li'ili'i ma mua o nā hōkūhele nui no ka mea nui ka 'ili alo (surface area) o nā hōkuhele li'ili'i pili i ka pihanahaka (volume) o nā hōkūhele nui. No laila, hā'ule wikiwiki ka wela o nā hōkūhele li'ili'i. Ke pau ka Pepa Ha'awina Haumana: "Ka Mani 'Ana," hiki i nā haumāna ke ho'omaulia ka 'ili alo o ka wai i loko o ka hano kōnuku a ho'ohālikelike i ka 'ili alo i ka lākiō pihanahaka (volume ratio) o nā wai me ka pihanahaka nui a li'ili'i. 'O kēia ka ha'ilula o ka 'ili alo o kekahi paukū 'oloka'a: $2 \pi r^2 + 2 \pi r h$. E ho'ohana ana nā haumāna i kēia ha'ilula e loa'a ka 'ili alo o ka wai, a laila e pu'unaue i ka pihanahaka o ka wai i loko o ka hano kōnuku e loa'a ka 'ili alo o ka lākiō pihanahaka (volume ratio).

Nā ‘Ili Hōkūhele

Ka ‘Ike Hou A‘e: ‘O kēia nā hōkūhele inner, ‘o ia ho‘i ‘o Mercury, Venus, Earth, a me Mars, he mau evidence kēia mau hōkūhele o nā lua pele ‘eu a me nā lua pele i hala. He mau lua pele pū nā mahina kokoke i Saturn a me Jupiter. No ke aha mai aia nā lua pele ma kēia mau mahina a me hōkūhele a ma kekahi o nā hōkūhele, ‘a‘ohe lua pele? ‘O ka pane ho‘i ma muli o ka ho‘okumu ‘ana o ka hōkūhele.

Nā Kuhikuhi: E nānā i ke pā DVD Ola Ka Honua: Volcanoes Alive a e holo navigate i ka Mokuna 10 e ho‘okō i ka pepa ha‘awina. E kahaki‘i i kekahi māhele cross o nā hōkūhele pākahi ma ka pakuhi ma lalo nei. E lepili i nā māhele kinoea, kinowai, a me pa‘a. E kākau i nā hōkūhele a me nā mahina me nā ‘ili pa‘a.

	E kahaki‘i i ka māhele cross-section. E lepili i nā māhele kinoea a/a i ‘ole nā māhele pa‘a.	E wehewehe e pili ana i ka ‘ili. Pa‘a, kinowai, a i ‘ole kinoea?
Mercury		
Venus		

Inoa: _____

Pepa Ha'awina Haumana

Nā 'Ili Hōkūhele

Honua		
Ko Ka Honua Mahina		
Mars		

Inoa: _____

Pepa Ha'awina Haumana

Nā 'Ili Hōkūhele

Jupiter		
Io		
Europa		

Inoa: _____

Pepa Ha'awina Haumana

Nā 'Ili Hōkūhele

Saturn		
Uranus		
Neptune		

Inoa: _____

Pepa Ha‘awina Haumana

Nā ‘Ili Hōkūhele

Pluto		
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1. E kākau i nā hōkūhele a me nā mahina me nā ‘ili pa‘a.

2. E kākau i nā hōkūhele a me nā mahina me nā ‘ili kinoea.

3. ‘O nā hōkūhele a me nā mahina hea me nā lua pele ‘eu a me nā lua pele **i hala?**

4. Pili nā papa inoa o nā hōkūhele a me nā mahina i ka Nīnau 1 me ka Nīnau 3? _____

5. ‘A‘ole nui ka ‘ike e pili ana iā Pluto, no ke aha mai?

Ka Mani ‘Ana

Ka ‘Ike Hou A‘e:

Wela i loko o nā hōkūhele i mea e loa‘a ka lua pele ‘eu. I ka wā ma mua loa o ka poe lā, wela nā hōkūhele me nā pōhaku, he nui. Ua mani nā hōkūhele i nā māmā ‘oko‘a. ‘O ka nui o ka hōkūhele ka mea e loli ka māmā mani?

Nā Pono Ha‘awina:

- 2 mau hano kōnuku 1000 mililika
- 1 hue 1000 mililika (flask)
- 2 ana wela
- Ka uaki helu manawa
- Ke kapuahi papakau (hotplate)
- Nā pale wela (hot pads)
- Ka peni māka

Ka Wānana:

Ho‘ā‘o kēia ha‘awina i ka pihanahaka e mani wikiwiki, ka pihanahaka li‘ili‘i a i ‘ole ka pihanahaka nui. E ho‘opiha i ka hōpuna ‘ōlelo ma lalo nei:

Wānana au ‘o ka pihanahaka _____ ka mea e mani wikiwiki ma mua o ka pihanahaka _____ .

Nā Kuhikuhi:

1. E lepili i nā hano kōnuku ‘elua “li‘ili‘i” a me “nui” me ka peni māka pa‘a. E kau nā hano kōnuku i ‘elua kapuahi mai ke kapuahi papakau.
2. E ho‘owela i ka wai 800 mililika i ka hue 1000 mililika ma ke kapuahi papakau no 5 minuke ma ka wela lōpū. Wela ka wai ‘a‘ole paila piha ia.
3. E ho‘ohana i nā pale wela, e lawe ka hue mai ka wai.
4. E ninini i ka wai 200 mililika i loko o ka hano kōnuku “li‘ili‘i,” a ninini i ka wai 600 mililika i loko o ka hano kōnuku “nui.” E ho‘ohana i nā pale wela.
5. E komo ke ana wela i loko o ka hano kōnuku, a e palapala i ke ana mua o nā pihanahaka o ka wai pākahi ma ka māhele “‘Ikepili.”
6. E ho‘ohana i ka ‘uaki helu manawa e ana wela i ka wai i nā minuke 3 pākahi no 12 mau minuke. E palapala i ka māhele “‘Ikepili.”
7. Ma hope o 15 mau minuke e ho‘opā i ka hano kōnuku ma kahi 100 mililika. E nānā pono, ‘o ka hano kōnuku hea ka mea mani.

Ka Mani ‘Ana

Ka ‘Ikepili

Hano Kānuku	Ke Ana Wela Mua	3 minuke	6 minuke	9 minuke	12 minuke (ka hope)
Li‘ili‘i					
Nui					

E ho‘olawe i ke ana wela hope mai ke ana wela mua i maopopo ka loli o ke ana wela o ka pihanahaka o ka wai:

Nui: _____ - _____ = _____ Li‘ili‘i : _____ - _____ = _____

‘O ka hano kānuku hea i lilo ka wela nui? _____

‘O ka hano kānuku hea i mani wikiwiki? _____

Ua pololei ka wānana? _____

Nā Nīnau:

1. ‘Ano like ka nui o ka Honua a me Venus. Hapa ke anawaena o Mars i ka Honua. Hapakolu ke anawaena o Mercury i ko ka Honua anawaena. Hapahā ke anawaena o ka mahina i ko ka Honua anawaena.

Me kēia ‘ike, ‘o ka hōkūhele a i ‘ole mahina hea e mani wikiwiki?

2. Me kēia ‘ike ma ka helu #1, ‘o ka hōkūhele a i ‘ole mahina hea e mani lohi? _____

3. ‘O ka hōkūhele a i ‘ole mahina hea i ka helu #1 me nā lua pele ‘eu? _____

4. ‘O ka hōkūhele a i ‘ole mahina hea me nā lua pele i hala? _____

5. Pehea ka pili i ka nui o ka hōkūhele a i ‘ole ka mahina i ka ‘eu a i ‘ole ‘eu ‘ole o ka lua pele? E kākau i ka hopuna ‘ōlelo piha.

