

Nadia Alexandria

Midterm - INTD290

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1 How to Submit this Midterm

1. Complete your work on this midterm.
2. Scan it into PDF form using a smartphone app, scanner, or digital picture
3. Alternatively you can type up your answers in a separate file, but it still must be a PDF
4. Submit it using the link on Moodle

2 Maps of The New World

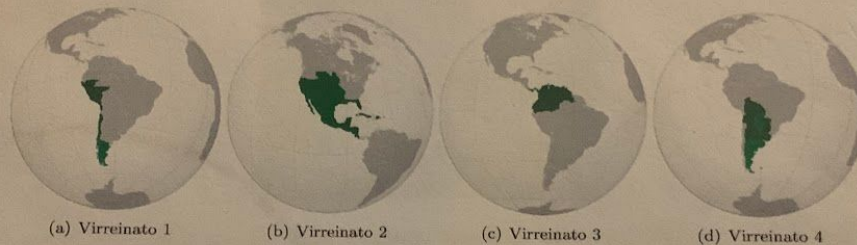


Figure 1: There were up to four *virreinos* during the Spanish colonial period of Latin American history.

1. In which of the four *virreinos* of the Spanish colonial empire (shown in Fig. 1) was the *tle huitzilin* classified by the indigenous? **B**
2. Which of the four *virreinos* excelled at the exportation of rum? **C**
3. Which of the four *virreinos* was characterized by an indigenous empire that mastered agriculture in the Andean mountains? **A**
4. The low-latitude aurora of 1789 was observed in *which cities*? In which of the four *virreinos* are these cities? List some other countries in which corresponding observations were made.
San Luis Potosí, Guadalajara, Mexico City, Puebla / B / Sweden, England, Cuba
5. List some of the locations explored by La Condamine and his Latin American colleagues, and cite the *virreinato* or *virreinos* they explored together.
Quito, San Pedro de Bumbuco, Guayaquil / C
6. The Expedición Botánica of José Celestino Mutis took place in which *virreinato*?
C
7. José Celestino Mutis took place in which *virreinato*? Mutis was the inaugural chair of the department of mathematics at the *Colegio del Rosario*. In which city is this?
Bogotá
8. In which country is the Pierre Auger Observatory located? In which *virreinato* would this country have been in the 18th century?
D Argentina

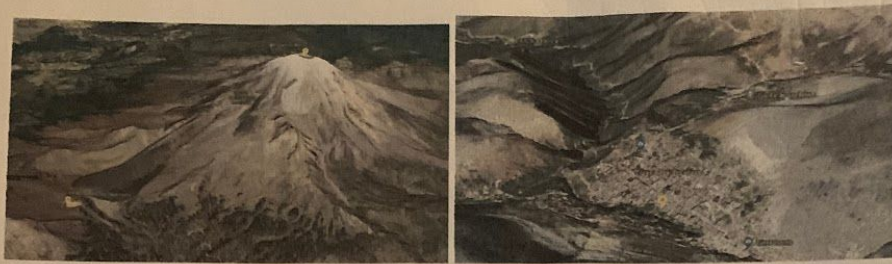


Figure 2: (Left) A physics detector near Pico de Orizaba in Mexico. (Right) A town in central Mexico.



Figure 3: A historical location in Latin America known for driving a particular economic sector.

3 Asynchronous Activity Review I

1. What is the physics detector shown in Fig. 2 (left)? Explain in basic terms the purpose of this detector and how it works.

Fig. 2 shows the High Altitude Water Chamber (HAWC) Gamma-ray observatory. This observatory has sensors that detect the blue light when the gamma rays hit a pool of water. Then math can be used to determine where the ray came from. This observatory is located in Mexico, in the Sierra Negra Mountains.

2. What is the significance of Mexican cities as pictured in Fig. 2 (right), in the context of the development of colleges and the scientific community in 18th century Mexico?

In the 18th century there was an economic growth throughout several Mexican cities because of the silver boom. This resulted in scientists, academics & miners to go to these towns. Mining colleges were established & knowledge about mining & silver boomed.

3. What city is being shown in Fig. 3? In which country is it located, and what was the historical significance of this city for international trade? Who controlled it? From where the commodity produced here originate, and how was it shipped to Europe and Africa?

Fig. 3 shows Potosí, a city located in Bolivia. It is located right next to a mountain filled with salt of silver. This resulted in a silver trade in the city that made Spain richer. Silver was sent to Europe & Africa by boat & silver was also used in the dollar coin in Spain.

4 Asynchronous Activity Review II

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90	•	••	•••	••••
95	•	••	•••	••••
100	•	••	•••	••••

Figure 4: A list of the numerical digits used by the Maya.

1. Work out the following addition problems using the Mayan system.

(a) $80 + 20 = 100$

(b) $365 + 365 = 730$

(c) $1024 + 512 = 1536$

2. Work out the following subtraction problems using the Mayan system.

(a) $1024 - 512 = 512$

(b) $92 - 31 = 61$

3. Work out the following addition problems using the Incan quipu:

a) $512 + 256 = 768$

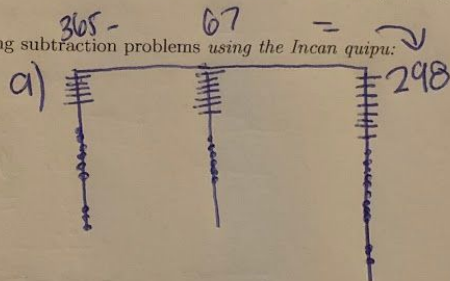
b) $11 + 89 = 100$



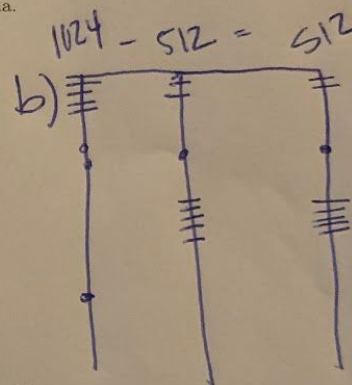
Figure 5: A physics detector near Malargüe, Argentina.

4. Work out the following subtraction problems using the Incan quipu:

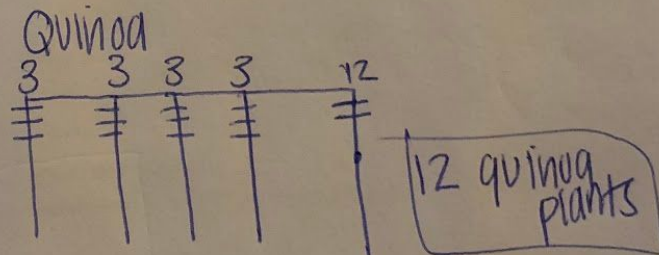
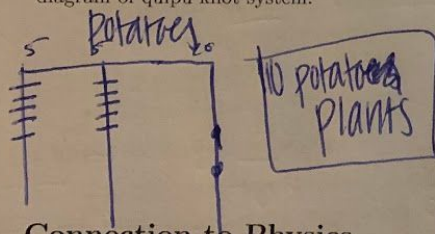
(a) $365 - 67 =$



(b) $1024 - 512 =$



5. Suppose you have six terrace plots in the Andean mountains to use to survive. You and your cohort of fellow Incans decide to grow potatoes and quinoa. Quinoa actually do better at higher altitudes than potatoes. So the plan is to use the two lowest terraces for potatoes, and the upper four for quinoa. Each terrace is 30 meters by 5 meters. A potato plant requires a 0.2 meter by 0.2 meter patch, and a quinoa plant requires a 0.3 meter patch. How many potato plants and how many quinoa plants can you plant? Store the results in a diagram of quipu knot system.



5 Connection to Physics

1. In Fig. 5, what physics detector is shown?

- A: The Large Hadron Collider
- B: The IceCube Neutrino detector
- C: The Pierre Auger Observatory
- D: The High Altitude Water Cherenkov detector

2. What is the purpose of the physics project shown in Fig. 5?

- A: To collide protons and nuclei to probe sub-atomic physics
- B: To detect signals from neutrinos that originate outside the solar system
- C: To detect cosmic rays that originate outside the solar system

3. What is a gamma ray?

- ☒ A: A photon of light
- B: A proton or nucleus from deep space
- C: A portion of the aurora borealis
- D: An ion floating in the atmosphere

4. What is located at each black dot in Fig. 5?

- ☒ A: A water tank designed to record Cherenkov radiation
- B: A radio receiver designed to record radio pulses
- C: An optical sensor designed to record visible light
- D: A telescope designed to detect infrared radiation

6 Vocabulary

1. What is the meaning of the term *rationalism*?

- ☒ A: The idea that reason rather than experience is the foundation of certainty in knowledge
- B: Encapsulating the idea of *I think, therefore I am*.
- C: Using scientific instruments
- D: Relying on measurements and sensory experience to discover the truth

2. What is the meaning of the *Nahuatl* term *abuizotl*?

- A: A horse
- B: A hummingbird
- ☒ C: An otter
- D: An alligator

3. What is the meaning of the *Nahuatl* term *tomatl*?

- A: Smoked fish
- B: Smoked chili
- C: An herb to help digestion
- ☒ D: A tomato

4. What is *cinchona*?

- A: An herb used to treat indigestion
- ☒ B: A shrub or tree used to create quinine
- C: A flower used in religious rituals of the *Mexica* people
- D: A plant that can form a treatment for syphilis

5. Define the word *torpor*, as it pertains to animal behavior.

- A: The ability to hover in midair during flight using rapid wingbeats
- ☒ B: Lowering internal body temperature and metabolism to levels that render the individual immobile and in a hibernating state
- C: The ability to break open the shells of mollusks using tools
- D: The ability to distinguish complex sounds in songs or calls

6. Who were the *Jesuits*?

- A: Formally known as the Order of Preachers, this is a Catholic order founded by Saint Dominic
- B: Formally known as the Order of Friars Minor, this is a Catholic order founded by Saint Francis
- C: Formally known as *Los Amigos del País*, these were mining officials who formed guilds to further economic interests of their region
- ☒ D: Formally known as the Society of Jesus, this is a Catholic order founded by Saint Ignace of Loyola

7 Free Response Section

1. **Kepler's Laws, and Newtonian Physics** Discuss the varying levels of acceptance within scientific and academic communities in Nueva Granada and Perú in the late 18th century.

Nueva Granada & Perú were mostly traditional & liked scholasticism. Experimentation and knowledge were not as accepted. However, some scientists liked the idea of empiricism & wanted to push the limits to learn more about the universe. However, because the church/crown were in control, things like Newtonian physics was being taught. This was until power changed to the dominicans.

2. **The aurora of 1789** Discuss the significance of the aurora borealis in 1789 that was visible from Mexico City. List several researchers who made observations of this aurora and other auroras, and explain what they found.

There were 3 Mexican Scientists (Jose Antonio Alzate y Ramirez, Jose Pangel & Antonio Gama) that were the 1st scientists to observe/analyze the low latitude auroras. Prior to this, it was believed that auroras could not be seen at such low latitudes. As time went on, scientists were able to use geometry to find how high the latitude of the aurora was.

3. **Herbal medicine in the 16th century** Give several examples of treatments for various ailments in the body used by Europeans and indigenous Latin Americans in the 16th century. Explain the theory of the four humors and why this influenced the European treatments, but not the indigenous ones.

The 4 humors broke down the body into 4 different fluids. Each fluid is different in temp, moisture & color. It also related to the 4 earth elements. European med. used this theory, while indigenous people tended not to. For example; For broken bones, Europeans used manure with wine on the bone, while the Natchal used fruit & herbs to set the bone. It was the same for things like diarrhea. Europeans used dog urine, ground pig feet, but the Natchal used herbs & fruit as well.

4. **The Inquisition, the Catholic Church, and Scientific Traditions** Discuss several examples of the following:
(a) Catholic censorship of knowledge flowing from Europe to Latin America (b) Catholic censorship of knowledge flowing from Latin America to Europe (c) contributions to Latin American science by Catholic scholars and explorers (d) knowledge that was recorded or translated from indigenous sources by Catholic priests, monks, or nuns

- a) Catholics controlled universities. As a result, things like books & the printing press were censored. This cause the spread of information to be slow & biased.
- b) Catholics held authority & did not take scientific discoveries that went against their beliefs seriously. So much so, that scientists would be looked at as bad. This resulted in Europe not gaining information like good herbal medicines & data about auroras.
- c) Missionary groups helped in mapping some parts of Spanish America. Xico Bishop Campanon published a description of the different animals & plants in a certain area.
- d) Some examples are Jean Baptiste Labat's book on America's Islands & the book on Amazon river govt & life by Jose Gumilla. However, this documentation is sometimes seen as being unreliable.