

## Midterm

### Maps of the New World

- 1.) In Virreinato 2 (b), or Nueva España, the hummingbird or huiztlin was classified by colors notably by the pre-Columbian peoples of the Aztec.
- 2.) In Virreinato 3 (c), or Nueva Granada, rum production was prevalent and accounted for a large amount of tax revenue.
- 3.) Virreinato 1 (a), or Perú, was home to the pre-Columbian Incans who terraced land to support agriculture in the Andes.
- 4.) According to Leon y Gama (via Ramos-Lara) the 1789 Aurora event was observed in Mexico City, Hidalgo, Guanajuato, Veracruz, San Luis Potosí, Zacatecas, and Oaxaca; all of which are located in Mexico, then Nueva España. The aurora was also observed in Spain, Sweden, England, Poland, Russia, The U.S., and Cuba.
- 5.) La Condamine undertook a geodetic mission to Virreinato 1 or Peru, but landed in Nueva Granada or Virreinato 3 and formed relationships with locals (Jesuits) in Quito. He explored and performed measurements in Nueva Granada and taught at the Universidad de Lima in Peru.

6.) José Celestino Mutis' Expedición Botánica took place in Virreinato 3 or Nueva Granada.

7.) José Mutis lived Virreinato 3 or Nueva Granada.

He was the chair of the Mathematics Department at the Colegio del Rosario in Santa Fe de Bogotá.

8.) The Pierre Auger Observatory is located in present day Argentina, which is in what was then Virreinato 4, or Río de la Plata.

### Asynchronous Activity Review I.

1.) Figure 2 (Left) shows the HAWC gamma ray observatory located near Puebla, Mexico.

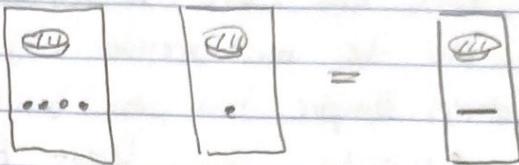
The purpose of the observatory is to detect gamma rays and cosmic rays of high energies incident upon the Earth's atmosphere. By using many water tanks scientists take advantage of an effect called Cherenkov radiation which presents itself for particles moving near the speed of light in a medium of refractive index greater than one. Typically these rays strike a particle in Earth's atmosphere and create a cascade of charged particles which, upon reaching the detector, provide data from which conclusions can be drawn about the original ray's energy and direction.

2.) Figure 2 (right) shows Real de Catorce in the state of San Luis Potosí, Mexico. Cities like this among others were of importance during the Colonial era due to extensive mining activity. Mines and the rare metals they extracted enriched the Colonial Empire but also benefitted the local municipality and virreinatos, thus Latin American individuals sought ways to maximize mining productivity. The mines thus sparked interest in technical matters such as the development of the Patis process but also interest in "modern" sciences such as engineering, chemistry, and metallurgy. The link between mining and the economy galvanized the existing scientific community to support the creation of technical colleges in Mexico, thus enlarging interest and development of the scientific community in 18th century Mexico.

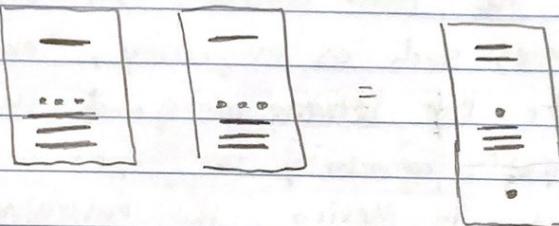
3.) Figure 3 shows the city of Potosí in Bolivia with its nearby mountain, Cerro Rico, named for its prolific silver production during the colonial era. The area was controlled by the Hapsburg empire and the extraction of the natural silver deposits from this site was so immense that the one site alone produced nearly half the world's silver for a time, inviting trade from multiple continents and funding wars backed by the Hapsburg empire and their desire for colonial expansion. In order to ship the silver from South America to Africa and Europe it had to be hauled over land to the Atlantic port of Buenos Aires, which took four to six months alone.

## Asynchronous Activity Review II

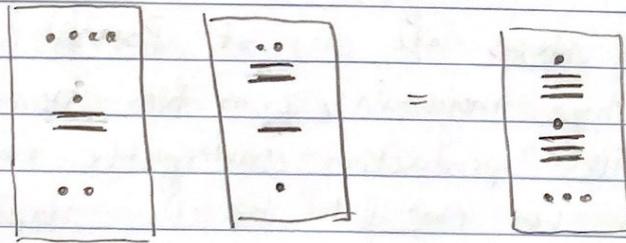
1.) a.)  $80 + 20$



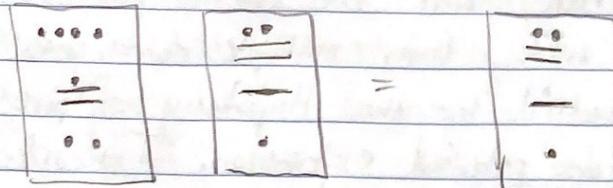
b.)  $365 + 365$



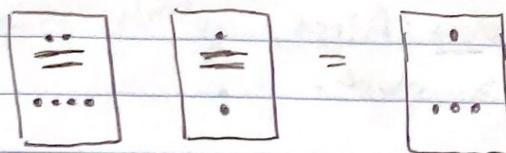
c.)  $1024 + 512$



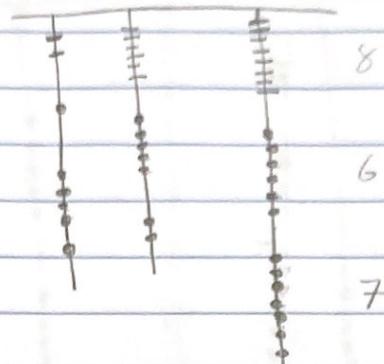
2.) a.)  $1024 - 512$



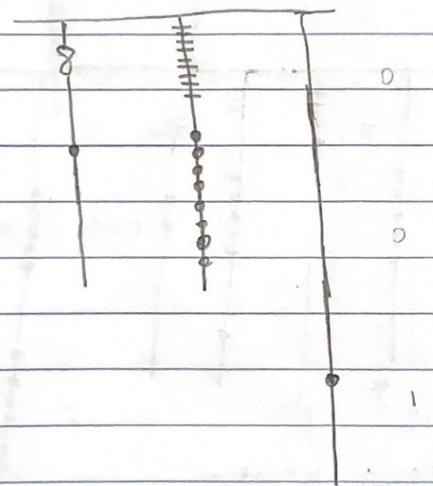
b.)  $92 - 31$



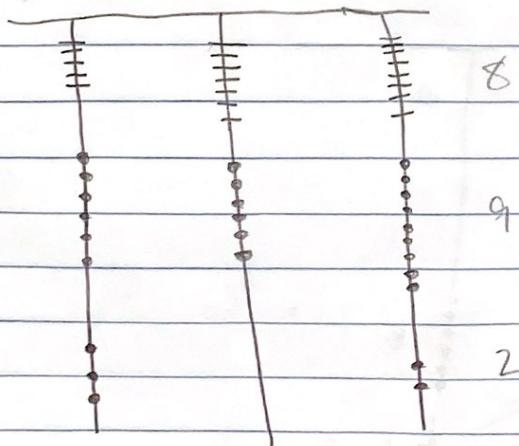
3.) a)  $512 + 256$



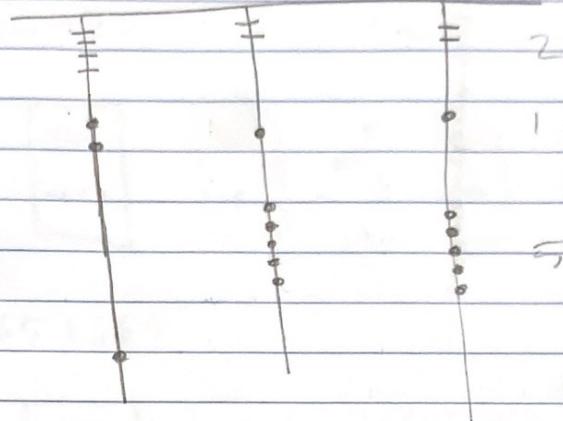
b.)  $11 + 89$



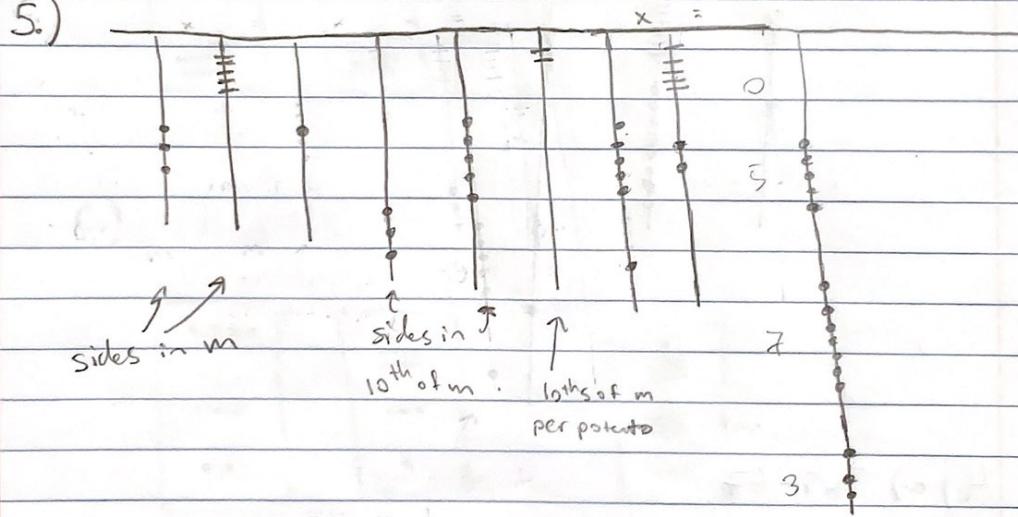
4.) a.)  $365 - 67$



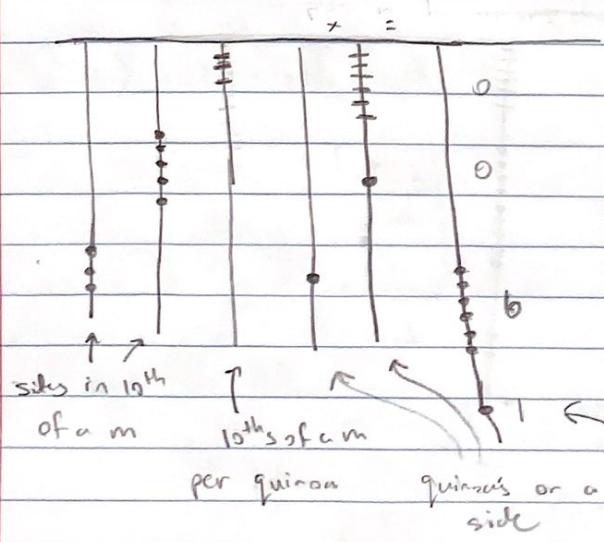
4.) b.) 1924 - 512



5.)

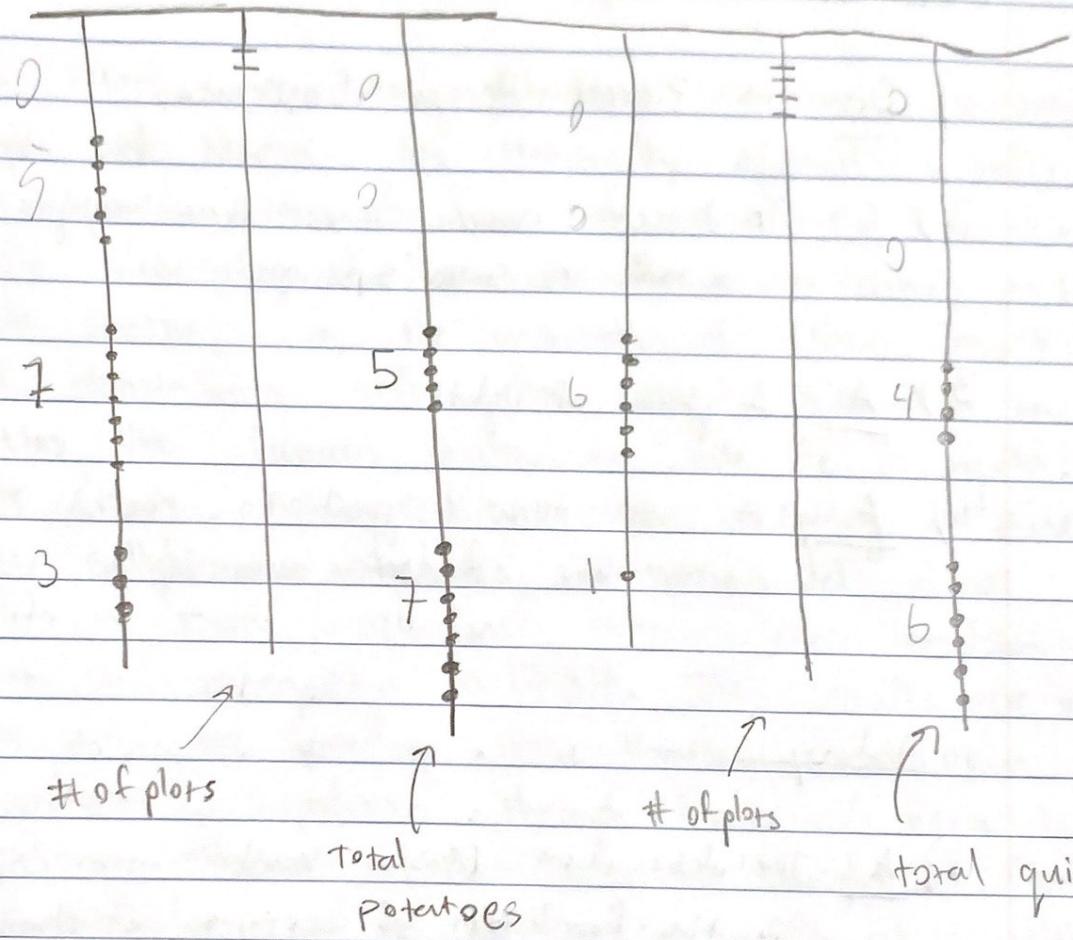


Rotated potatoes  
per plot



quintos or a total quintos per plot side

5.) cont.



## Connection to Physics

- 1.) C. The Pierre Auger Observatory
- 2.) C. To detect cosmic rays that originate outside the Solar System
- 3.) A. A photon of light
- 4.) A. A water tank designed to record Cherenkov Radiation

## Vocabulary

- 1.) A. The idea that reason rather than experience is the foundation of certainty of knowledge
- 2.) C. An otter
- 3.) D. A tomato
- 4.) B. A shrub or tree used to create quinine
- 5.) B. Lowering body temp...
- 6.) D. Formerly the Society of Jesus...

## Free Response Section

1.) Adherence to "new" philosophies like those of Copernicus, Kepler, and Newton was traditionally opposed generally by the Spanish Crown for fear of revolution. Education in the Viceroyalty of New Granada, particularly in the 18th century, by the attempts of the Jesuit and Dominican orders to control Education in cities like Caracas, Quito, and Santa Fe de Bogotá. The Jesuits, notably were rather accepting of these new enlightenment philosophies and propounded these ideals in their institutions prior to their expulsion from the Viceroyalty in 1767. The Jesuits were not the only ones spreading these theories. Charles La Condamine's expedition through Quito and Peru is noted to have influenced modern scientific thought in Quito in particular, and he went on to profess at the University of Lima. José Celestino Mutis is another notable proponent of these new ideals who professed in multiple institutions in Santa Fe de Bogotá, defending Copernicus' theory. In contrast to all these examples, the Dominicans favored Scholasticism and thus did not accept Newtonian theories and the like. Further, in Peru a significant figure regarding Enlightenment development was Hipólito Unanue who among other scientific activity, supported the Mercurio Peruano, a journal for Peru's scientific community.

2.) The 1789 aurora was significant because it was visible at lower latitudes than a typical aurora. It was seen in Mexico City, among other places in Nueva España, by the likes of José Antonio Alzate, Antonio León y Gómez, and José Francisco Díaz Rangel. The Mexican scientists mentioned collected data and tried to explain the cause of the aurora which was unknown. Sir Edmund Halley hypothesized that the aurora must come from the poles, as they are typically viewed at high latitudes in places like Northern Europe and North America. León y Gómez speculated a relationship between the phases of the moon and the aurora, which turned out to be incorrect like Halley's. The Mexican's did, however make predictions about the event such as the estimate of the height of the aurora above Earth based on multiple accounts from Mexico as well as Alzate's prediction that the aurora could be seen in Spain and Russia which was proved correct. Finally, Díaz Rangel made a significant discovery as to the actual nature of the aurora when he replicated the glow discharge effect by making a fluorescent light by transferring current through gas in a glass tube.

3.) The theory of the four humors comes from ancient Greek philosophers like Hippocrates in their attempt to classify what they saw as the body's primary fluids: blood, yellow bile, black bile, and phlegm. Each of these fluids had associated qualities of being either warm or cold and dry or moist. Following this theory, European medicine prescribed treatments to illness and injury by attempting to restore balance of the four fundamental fluids in the body. Adherence to this theory and treatments that certainly did not work represents the faults of scholastic tradition in middle-age Europe. By comparison, the pre-Columbian Nahua had a much more scientific or empirical approach to their treatments. For example, to treat diarrhea, the Nahua prescribed an herbal remedy of native plants mixed in water taken by mouth, or given to a baby via the mother's breastmilk if necessary. A comparative European treatment is to frighten the patient or to drink manure mixed with whe. For broken ribs, a European prescription again involved manure, this time as a plaster. By comparison, the Nahua treatment for breaks is to stretch, set, and splint while bleeding out any swollen areas. One can see that the Nahua's empirical attitude and knowledge of native flora greatly benefitted their medicine as opposed to European traditional treatments from the same era.

4.) The Spanish Crown and the Catholic church attempted to censor knowledge transfer from Europe to Latin America regarding revolutionary ideas. This included the works of Voltaire and Rousseau, two philosophers whose ideas helped inspire the French Revolution. This is also the case with scientific theories like that of Copernicus and the support that Newtonian Physics provides for Copernican observations which at this time were thought to violate scripture and the idea of the firmament. An example of censorship of Latin American knowledge is the destruction of many Incan quipu for the fear that Incans idolized them, though they appear to be mostly instruments of calculation and data storage.

Two Catholics jump out for their contributions to science in Latin America and they are Priest Jose Celestino Mutis and Charles La Condamine. Mutis is known for defending Copernican hypotheses and attempting to explain how there was no conflict with them and scripture. La Condamine's mission to try to verify Newton's claim that the Earth was not perfectly spherical is noted for having influenced the scientific community in Quito. Communication between indigenous and Catholic missionaries provided knowledge of Native medicine for example a natural cure for syphilis that was known by the indigenous.