University of Toronto
Faculty of Arts and Sciences

HPS210H1 – Scientific Revolutions I

Final Examination
December 2016

Please read all questions carefully.
Write all answers in the exam booklet.
No aids permitted.
Good luck.

DURATION-2HRS.

THIS SHEET WILL NOT BE GRADED

Section One – Fill in the blanks (0.5 marks for each blank, 20 marks total)

1) The city of _____ in Egypt was, during the Hellenistic era, home to a famous library, many museums, and several notable natural philosophers such as Hero and Euclid.
2) _____'s method of proving geometrical theorems (generally referred to as _____ proof or proof from first principles) works by showing that some conclusion necessarily follows from the assumption of his five postulates.
3) _____ was a natural philosopher, geometer, and mathematician who lived in Syracuse and was sought out by the Romans because of his ability to design military weapons and defense, such as those used to help defend his city from Roman invasions.
4) The main source of power generation for the Romans was _____.
5) Roman roads were built primarily as a mode of transport for _____.
6) Ptolemy and Euclid had an _____ theory of vision, while Aristotle and _____ had an _____ theory of vision.
7) Arabic mathematicians introduced to the Western world a system they called "Hindu reckoning," which we now call _____.
8) The Holy Roman Emperor _____'s 9th c. edict mandated the creation of schools in all cathedrals and monasteries.
9) Unlike the Islamic translation movement which brought in and translated into Arabic everything they could find including poetry and literature, the Latin translation movement focused primarily on translating texts that dealt with _____, _____, and _____.
10) The Latin translation movement first worked with _____ language texts from Spain, but later worked on _____ language texts from Byzantium.
11) The only text of Plato know to the Latin West before the reintroduction of many Greek texts from the Islamic world was a partially translated version of his _____.
12) The Italian Renaissance was characterized by a movement known as _____, which is often described as an embrace of classical (i.e. Greek and Roman) values in aesthetics, politics, and education.
13) _____'s geocentric model of the cosmos was dominant for over 1000 years before it was replaced by _____'s heliocentric model. During the Renaissance both the Italian Astronomer _____ and the German Astronomer _____ defended this model, but the Danish Astronomer _____ found it physically absurd, choosing to develop a hybrid geo-heliocentric model that he believed maintained the virtues of both systems.

14) The number of books available during the Italian Renaissance was drastically increased because the Latin West had learned how to make _____ rather than being restricted by the use of parchment, and the development of _____ in 1450 allowed books to be mass produced.
15) _____ honoured the prince of Florence, Cosimo II de' Medici, by dedicating *The Starry Messenger* (his book of astronomical discoveries) to the prince. Additionally, he named four newly discovered _____ after the Medici family. In return, Cosimo appointed him to the position of court _____.
16) Tycho Brahe observed what he thought was a new _____ in 1572, which cast doubt on the idea that the heavens were immutable and unchangingly perfect. He also noticed two bright _____ whose path seemed to intersect the orbit of Mars, meaning that the crystalline spheres of Ptolematic physical astronomy couldn't be physically real.
17) In his mechanical philosophy, Descartes rejected all of Aristotle's kinds of causes except _____ causes.
18) Descartes gave a mechanical explanation of _____ in terms of the action of invisible screw shaped bodies on iron.
19) The _____ Experiment was famous in the seventeenth century for apparently creating a vacuum in a tube of mercury.
20) The English experimentalist _____ published novel microscopic discoveries in his popular book, *Micrographia.*
21) In addition to his three laws of motion, _____ is well known for formulating the Law of Universal _____. In formulating it he famously said that he did not know the cause of such phenomena (though he believed the ancients did) and that he would "feign no _____."
22) Lavoisier's _____-based chemistry was promoted as a Newtonian approach to studying substantial change. While he incorrectly thought that this element was the principle of _____, his theory nevertheless came to be preferred over the previously dominant _____-based chemistry.

Section Two – Short answer (10 marks for each question)

Complete **five** (5) of these ten options. Be sure to follow the directions carefully and answer the questions succinctly but with as much detail as possible. Answers should be in the form of a short paragraph, around 3-4 sentences in length. **Do not write in point form**:

1) After the decline of the Roman Empire in the 4th and 5th centuries C.E., the Latin speaking West was left without access to many Greek original texts. They didn't even have many of them in Latin translation. What was it about the way that the late Romans engaged with Greek natural philosophy that caused this?
2) Christian monastic traditions generally trace their lineage to the communities that grew up around St. Benedict of Nursia. Explain how the rules he created for those communities promoted a literary culture in the Christian monastic traditions that, many centuries later, was still generating many keen minds ready to digest all the "new" works being brought to the Latin West through their translation movement.
3) We discussed two reasons why Greek astronomical knowledge proved important for practicing Muslims because of the idiosyncratic demands of their faith. Explain why Muslims needed Astronomy to better practice their faith.
4) Briefly describe the alchemical theory we discussed in class, popular especially amongst Islamic alchemists, and explain how it suggested the possibility of being able to transmute metals into one another.

5) Describe how the condemnation of 1277 forced the scholastics to ask questions they wouldn't have otherwise, using the example of motion in a vacuum.
6) Describe Augustine's three main criteria for giving a literal interpretation of scripture and how he used them to interpret the Book of Genesis. Use as an example the issue of whether God created the universe over the course of six days or in an instant.
7) In the 12th c. many European monasteries and cathedrals were finally able to make good on a 9th c. edict, issued by the Holy Roman Emperor at the time, which required them all to open schools. In class we discussed three reasons why they were able to do this then, but not before. What were they?
8) Explain how Kepler's three laws of planetary motion were developed from his commitment to neo-Platonism and Pythagoreanism.
9) Explain how Descartes explained natural phenomena in contrast to how the Aristotelians explained them. Use an example.
10) Briefly explain why it can be difficult to see Newton as the exemplar of modern scientific method, even though his successors often portrayed him as a kind of ideal scientist. Use an example.

Section Three – Long answer (30 marks)

Complete **one** (1) of these three options. This is an opportunity to demonstrate your understanding of some broader themes or events from the course. Focus on addressing the issue at hand, and do not include extraneous information such as the names, birthdate, or life events of various individuals without showing how such information is relevant to the overall point you're making. **Again, aim to demonstrate your understanding of the broad course issues and themes**:

1) Describe the Islamic translation movement in terms of what was being translated, who was doing the translating, how they got their original texts, why they were doing all this translating, what technologies supported these efforts, and roughly when and where it occurred. Briefly indicate some ways that the Islamic translation movement contrasted with the Latin translation movement.
2) How did Galileo, a trained mathematician of relatively low socio-economic status, gain the intellectual authority of a natural philosopher? How does understanding the social context of his career path help us understand the character of both his methods and his theses? How does it help us understand his eventual conviction for vehement suspicion of heresy by the Roman Inquisition?
3) During the Italian Renaissance, and increasingly so in the years following it, natural philosophers began to suggest that there was an inherent opposition between science and religion. Explain how Abrahamic monotheism actually promoted and stimulated natural philosophical work, rather than hampering it, during the Medieval period preceding the Renaissance, thereby making much of the natural philosophy done afterwards possible.

Bonus Question (3 marks):

Derive Kepler's Three Laws from Netwon's Three Laws. Just kidding, everyone automatically gets 3 bonus marks.

Total marks: 103