Sciensation Society,
SNC134, Santoshimanagar, Secunderabad-500056

Sciensation'17 Questionnaire

7th annual inter-school inter-disciplinary (un)quiz

General Instructions

- Students can send in their research write-ups in teams of three
- There are two parts- Analysis and Synthesis
- The Analysis part gives the required subject background.
- Students would have to submit both Syntheis themes, would present only one in the competition, the team which secures more points in analysis round gets the first preference to pick a particular Synthesis theme.
- The team which would have submitted the best research shall present during the event.
- Describe the background work which was done to complete the research report.
- Interesting wrong answers are valued more than correct answers, at Sciensation!
- If you disagree with any implicit assumptions in the question, please state your point of view explicitly. You'd receive extra marks.
- Sciensation is very generous when it comes to awarding points, creative answers receive extra-marks!

Selection Criterion

- Examples- Can the student provide intuitive examples to justify the logic?
- Eloquence- Were the arguments explained carefully?
- Rigor- The arguments/assertions need to be justified.
- Robustness- Can the argument break down easily? How general is it?
- Elegance- Were the arguments beautifully constructed?

Scoreboard

	Examples	Eloquence	Rigor	Robustness	Elegance
Analysis: P1	/5	/5	/5	/5	/5
Analysis: P2	/5	/5	/5	/5	/5
Analysis: P3	/5	/5	/5	/5	/5

	Examples	Eloquence	Rigor	Robustness	Elegance
First Theme	/5	/5	/5	/5	/5
Second Theme	/5	/5	/5	/5	/5

Total (Analysis + Synthesis):

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Analysis Part 1: What is Philosophy?

Q1. What is the difference between Mathematics and Science? Do we have a notion of a proof in Mathematics and Science? How do we prove a statement in Mathematics? Can we prove a statement in Science? Can we be sure that gravity would exist tomorrow? Can we disprove theories in science? Can we wait for somebody to disprove the theory? So why do we believe in a theory till someone disproves it? When do we start believing in a theory? [Falsifiability principle, Karl Popper]. Is this a question in science or a question on science? Do we need a subject which studies questions like these?

Q2. What are models? Is a map a model of the world? Why use models? Does Mathematics provide models to understand real life phenomenon? Can we have a correspondence between a real rectangle and a room? If there is a correspondence, can we calculate the amount of wire (for fencing) or carpets to cover the floor? Will these numbers still hold good if there is an earthquake? Can multiple models be used to explain the same object or phenomenon? Which model would we pick, if that's the case? Can we understand nature without models? If subjects like Mathematics, Logic are called Formal Sciences and subjects like Science, Economics, Psychology are called Empirical Sciences? Can we say that Formal Sciences exist in our mind, in a world we create, while Empirical Sciences model real world phenomenon? If that's the case, why do we have a notion of proof in Formal Science, while we don't have a proof in Empirical Sciences? Can we force our rules to be true in Formal Sciences, what about Empirical Sciences? Which subject do you think should be concerned with questions like this?

Q3. Philosophy is probably one of the oldest subjects alongside Mathematics, concerns with questions around knowledge, existence and reality. It studies the nature, principles and limitations of other subjects and can change subjects? Can Philosophy change Philosophy? Why does Philosophy change?

Q4. What is abstraction? Ancient Indian Theory- rasa theory says that the juice or the rasa is the essence of the fruit and that art must convey the essence of an event/emotion so that other people can connect with the artist. Is the fruit being crushed to a juice? Try to solve towers of Hanoi with 3 rings and try it with 4 rings, are we assuming the three ring problem as a sub-module to solve a 4-ring problem? Are we reducing the description of the solution? Are we able to think efficiently by shrinking the solution?

Q5. Do we need to understand the larger context of knowledge? While studying, should we understand the object of studies? While fighting for freedom, should we understand what freedom is? While solving a Mathemtics problem, should we understand what it means? What does x+2 = 4 mean? Can it be understood in many ways? What was the larger context of CCE reforms in Indian Education system? Do we need a discipline to investigate the larger context of a question or a subject?

Question for Discussion: After seeing these questions in Philosophy, how would you define Philosophy?

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Analysis Part2: Why Study Philosophy?

Q1. Why do we organize books in a library? Why do we need to be able to pop out the right book at the right time? Why do we need to organize ideas in our mind? Can philosophy help in organizing ideas? What do you understand by "the socio-historical context has to be understood while analyzing affirmative action in India"? Why would one understand socio-psychological context while analyzing why people form trade groups (associations based on profession, caste, religion etc)? How do the labels sociological, historical, cultural, economic, psychological help while analyzing types of contexts?

Q2. What is the difference between the representation and interpretation of an object? Can we understand the same concept in multiple ways? How can we understand fractions? Can we understand 1/3 as one part amongst three parts or the size such that three equal parts make a whole? Can we understand 4/5 as 4 cakes shared by 5 people or 4 parts out of 5 parts or 4 parts of size 1/5? Why do we need representations for abstract objects? Do representations help in computing consequences quickly?

Q3. What is a concept? If you utter this sentence "I drank a glass of water", would it make sense to somebody who comes from a (hypothetical) culture which drinks water with hands? Would this culture have a concept of a glass? What is a good textbook? What is a tasty dosa? Can concepts be understood as a generalization of experiences? Does language provide us with the required conceptual apparatus? We can make observation which a dog can, how are we able to interpret it differently? What is the difference between optical apparatus and conceptual apparatus? John Searle says that "Forms of experience which we call human are impossible without language. Concepts shape experience. Labels like love/hate shape our experience." Does this imply that objects' existence depends on language? Or does this mean that language doesn't make the world, but what counts as an object comes from a language? Why was that person unable to recognize a glass, was it because the glass didn't exist?

Q4. Problem Reduction: Polya teaches problem reduction- of changing new problems to old problems which we already understand. Which system of classification is useful while learning problem solving- hard/easy or old/new? Does this argument apply to Mathematical problems alone?

Q5. Do we have a lot of assumptions/pre-suppositions which we take for granted? For instance, do we assume equality of human-beings? Did we have a time when hierarchy was taken for granted? Should we be able to question these pre-suppositions? How do you think philosophical thought was important in freedom struggle? How do you think philosophical thought would have changed the way we conduct experiments and evaluate decisions objectively? Does philosophy help in overcoming potential biases? Is this statement in itself an assumption and does it involve any assumptions?

Question for discussion: How does philosophy help in challenging assumptions and pre-suppositions?

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Analysis Part3: How to Use Philosophy?

Q1. Why should Philosophy be studied along with History? For example, if you are discussing a problem of ethics and justice, if a Philosopher talks of types of hierarchies, would you want to look at the time frame while judging his/her theories? Why would you want to factor changing philosophical thought while critiquing the theory of the Philosopher? If you're evaluating an experiment, would you want to understand the type of experiments carried out during the time frame? How would you critique the work of ancient Indian astronomers? How would you critique the calculations of Srinivasa Ramanujan who found out patterns which needed months to verify? Is this argument just about the techno-historical context or is it also about the change in thought systems across time?

Q2. Why would we study old theories which have been debunked by experiments? For instance, Aristotlean Physicists believed that experiments are pointless as experimental conditions are different from natural conditions. Aristotle was firm in his belief that a heavy ball and a lighter ball would fall at a different time, if thrown from the same height. Galileo went on to do an experiment to prove it wrong. Why do we study the change in thought from Aristotlean Paradigm to Cartesian Paradigm to Baconian Paradigm? Chemistry's precursor was alchemy, why do we still study these old theories?

Q3. What do you understand by the phrase "abstracting out insights of empirical detail"? Empiricism can crudely be understood as "seeing is believing". What would be the limitation of empirical knowledge? Can we remember a lot of empirical knowledge? Is Darwin's Theory of evolution (survival of the fittest) one such example of "abstraction"? Is demand-supply dynamics one such example of abstraction? Can you think of three related examples and abstract out a general principle?

Q4. Feynman says that there is a difference between knowing the name of something and understanding something, do you agree? Can you give an example? Do we give labels to ideas in our mind? Do these common labels enable communication? Do these labels involve more labels? More instance, if Adolf Hitler's strategy is called blitzkrieg, we understand it as lightening, but isn't lightening another label, isn't quick another label? Would we then have infinite regress?

Q5. If one has to be able to provide examples to prove his/her argument or to understand something, how can one utilize Philosophy? Is this similar to Google search in some way? If the whole world uses "Chinese" to describe the food which you like and if you search for "noodles" would you be able to locate your food? Would an awareness of Philosophy or philosophical concepts or great thinkers' ideas help you in cataloguing examples and ideas? How do we learn to connect the dots?

Question for discussion: Present an example of how you used philosophy to understand something.

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Synthesis Theme1: Philosophy of Mathematics and Science

Q1. How would you expect science and religion to interact? How do you think science would have change after it split from religion? If science assumes a creator can it assume a rulebook which explains the world? If science doesn't assume a creator, does it imply that such a rulebook doesn't exist? If such a rule-book needn't exist, how does it affect the process of scientific investigation? Do we have to have a steady and consistent operation of rules which can describe the world? Can we be certain about our rules and can they be time invariant? Can we ever come up with absolute truths?

Q2. How does Falsifiability principle affect the way we look at science? Why do we have the notion of one correct answer? Why a notion of consistency of rules? If all theories can potentially go wrong, if the legendary Physicist Newton's theory could be contradicted with experimental observations, what does it mean? Does it give the license to try new hypotheses? How does it show science as a way of life? Now, how about you observe things around you and how would you make choices?

Q3. What is Mathematics? Do all Philosophers of Mathematics have to take the same stand? Can we [Platonists] believe that Mathematical objects are abstract and that they do not have spatiotemporal properties and are eternal and unchanging? Can we [Empiricists] rather believe that, just like science, Mathematical objects cannot be known apriori and they can only be found by empirical research? How about a view [Monists] that all real world objects are also mathematical objects and the only objects which exist in the world are mathematical objects- all structures that exist physically also exist mathematically. Can we [Logicists] believe that Mathematical objects exist apriori and mathematical structures can be reduced by logic, as a result Mathematical objects require no intuition and are just analytic? How about [Formalists] the thought that Mathematics is of statements of manipulations of certain rules? Can we rather assert [Intuitionists] that only those branches of Mathematics which can be experienced should be pursued? Which of the views do you personally subscribe to? Can you state a few examples of Mathematical experiences which defend your view?

Q4. Why do we study old theories and old experiments? Why study Aristotlean Physics if we currently use the Baconian paradigm? What is the point in studying phlogiston theory in chemistry? Why should a scientist/researcher's work be investigated as per the time context? Can you give one example of a past theory presented in P3 which helped you in understanding present theories?

Q5. How did Philosophy of science affect the tools of science? Limitations of science? Do scientists now believe in experiments? How does this changing nature of philosophical thought change the society?

Question for Discussion: How do History and Philosophy of Science affect Science & Science-Education? Why should we study History and Philosophy of Science? Can you justify your arguments with examples?

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Synthesis Theme2: Philosophy of Language

Q1. Language has two components- syntax and semantics. If syntax is about rules, principles and processes around structures of sentences, can you think of an example of a syntactical rule of any one language? If semantics is about deriving meaning from components like words, phrases, paragraphs, can you think of a semantic rule in any one language? If semiotics is about study of meaningful communication and sign making, how do you think semantics is different from semiotics? How do these three ideas help us in analyzing a language?

Q2. Think of any one incident and try to describe it in detail. Can you think of details which we usually avoid? Do you have words to describe all the details? If cognition is about thinking and entropy is about randomness, what would cognitive entropy mean? Would you have a clutter of ideas if you'd try to describe everything around this event? Can your description be compared to a messy room? Can you describe your event in two or three languages? Can we say that languages reduce cognitive entropy?

Q3. Should semantics also involve the study of social conventions? How do social conventions influence interpretation? How are content and context related? Apart from the Socio-Cultural context, what other variables should be factored into the context? Historical-context? Psychological-context? Economic context? Political context? How would you interpret this sentence- "No nation can rise to the height of glory unless your women are side by side with you"? What if we tell you that the speaker is M.A.Jinnah? Can you give an example of a sentence whose meaning changes based on the context?

Q4. Can we think without words? Is a word merely a label for an idea/concept? Are our thoughts influenced by our repository of words? Can we have languages without a notion of left-right, top-down, front-back? Research shows that cultures using these kinds of languages are very good at identifying directions (North/South/East/West), why do you think so? Can we have languages without numbers, languages with just 1, 2, few and many? Do languages change the way we think? Does time have to move from left to right? Can we have languages with time moving from future to past? Does language provide the ability to think abstract and think of new possibilities- of purple cows?

Q5. In P2, we discussed that Philosophy helps in challenging our implicit assumptions and pre-suppositions. How does Philosophy of Language help in this regard? Do we have implicit assumptions within the conceptual apparatus which we use to understand the world? Is language itself a pre-supposition? Do we have "black boxes" in languages, how do we identify them? How would our understanding of the world change in the light of Philosophy of Language?

Question for discussion: How do the ideas discussed above change the way you study something? Justify your arguments with suitable examples.

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