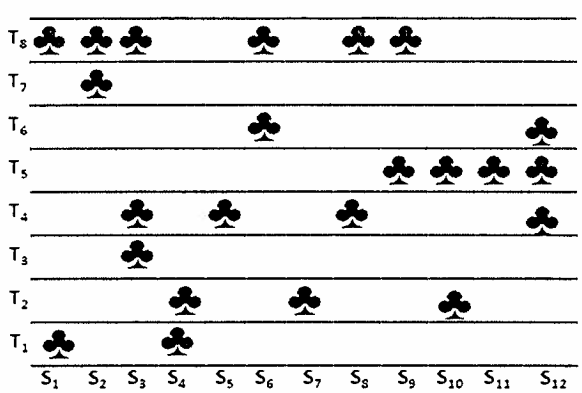
Indian Institute of Science Education and Research (IISER) Kolkata
Principles of Paleontology (ES4202)
Mid-term examination, Total points: 50

Name: _____, **ID**_____

Please DO NOT write long essays. Correct answers should not be more than 3-4 lines.

1. In the following diagram the time intervals are represented by T_i (where i=1,2,3,....8). The species are represented by S_i (where i=1,2,3,....12). Each "♣" marks a time interval in which the corresponding plant species is sampled; intervening blank spaces are gaps in the record of species.



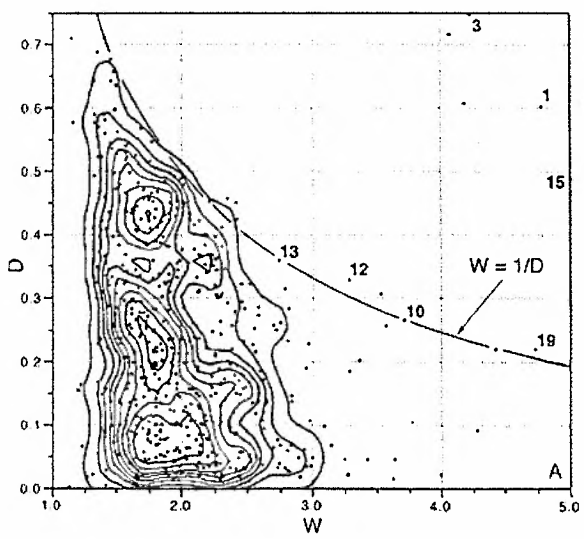
a) Please calculate the total paleontological completeness for the species S_1 through S_{12}. (3)

b) When calculating the completeness, we exclude the intervals of first and last appearance. Why? (2)

c) S_1 represents a vascular plant while S_{12} is a non-vascular plant. Comment on the reliability of this record. (3)

d) Explain the rationale behind "range through" assumption. (2)

2. This is a plot of shell geometry of ammonoids with density-contour overlays using Raupian morphospace parameters.



a) Explain the axes. (2)

b) Why is there a significant absence of ammonoids in the right-upper half of the plot? (3)

c) There was a non-lethal predatory attack in the early ontogeny of a coiled cephalopod shell. You have studied the trace of the attack (repair mark) without destroying the shell. Which one of the following values most accurately represents the cephalopod you studied? Explain. (3)

i) W=2.1, T=0, D=0.1 ii) W=2.2, T=0, D=0.5

d) "Homeothermy does not always imply endothermy". With an example from recent biota, justify this claim. (2)

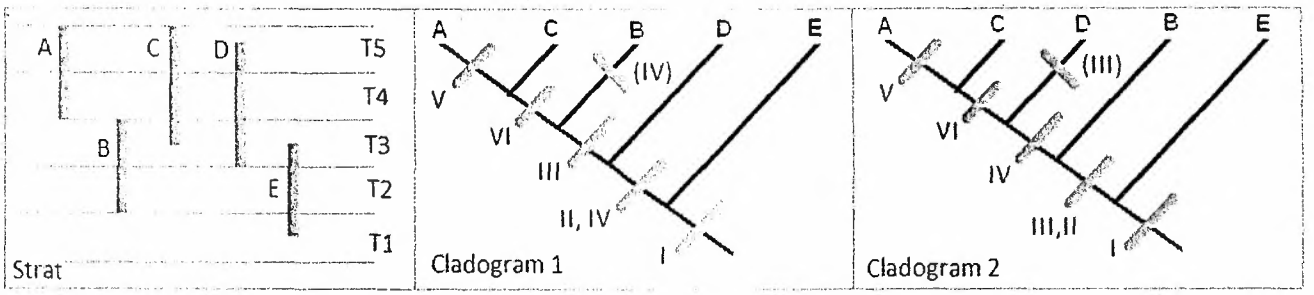
3. Feel free to use diagrams to establish your point in answering the following questions:

a) Why did we reject the "splitter plate hypothesis" as an explanation of crinoid wing plate? (3)

b) State the similarity/ies between the Trilobite lens and Decartes-Huygens designed lens? What is the difference between the two? What was the functional advantage of such deviation? (2+1+2)

c) What is effect of encrustation on preservation potential? (2)

4. The stratigraphic record shows the following pattern for five species (A-E). Comparing the characters, you have developed the following cladograms.



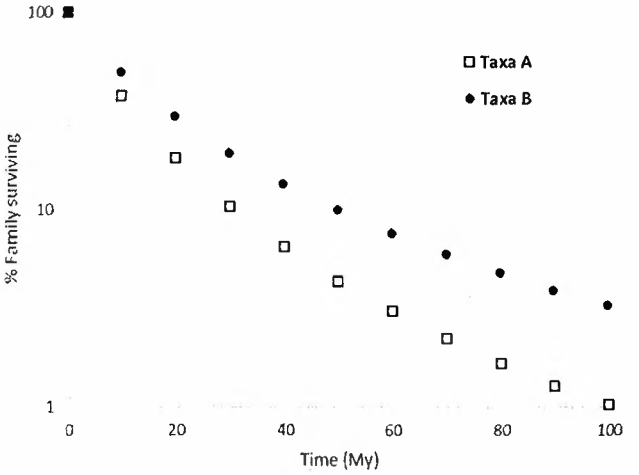
a) Please construct the corresponding character matrix. (3)

b) Which of the following cladograms would you choose? Explain. (3)

c) If T5 represents Recent, please identify stemgroup and crowngroup in the appropriate cladogram. Please do it in the question paper. (2)

d) Provide an example of a polyphyletic group using appropriate cladogram. Please specify all the details. (2)

5. This is a plot of survivorship analyses performed on two families of molluscs. Using the plot please try to answer the following questions.



a) State the nature of extinction rate over time that is observable in both the taxa. (2)

b) Explain the mechanism behind such temporal trend in extinction rate. (3)

c) What is the difference between Taxa A and B in terms of extinction rate? (2)

d) Two species of Taxa A are showing a size doubling over a million year. Average generation span for each of the species are 10 and 30 years respectively. Is the rate of morphological evolution same for the two species? Do you need any other information to comment? (3)