

National Exams December 2015

98-Pet-A1, Principles of Stratigraphy & Sedimentation

3 hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a **NO CALCULATOR PERMITTED EXAM**. This is a **closed book exam**.
3. This exam paper consists of three pages (including this cover page). There are two parts: **Part A** (Questions 1-11) conveys questions related to sediments, sedimentary rocks and sedimentary processes whereas **Part B** (questions 12-18) conveys questions related to Stratigraphy.
4. In Part A, the questions 1 to 4 are 10 marks each whereas questions 5 to 11 are 5 marks each. Choose any number of questions that make a total of 45 marks. In Part B, the questions 12 to 14 are 10 marks each whereas questions 15 to 18 are 5 marks each. Answer a number of questions that make a total of 30 marks. **Thus, the maximum attainable mark is 75/75 (45 for Part A + 30 for Part B).**
5. Most questions require an answer in essay format. Clarity and organization of the answers are important.
6. **Please note:** The first number of questions permitted to answer in each part (i.e., Part A & Part B) will be marked as they appear in the answer book. Thus, do not answer more than what you have been asked to answer.

Part A: Questions related to Sediments, sedimentary rocks and Sedimentary processes

Answer any number of questions (1 to 11) that make a total of 45 points.

Question 1 (10 points)

1. There are a number of sedimentary structures that indicate paleocurrent flow directions.
 - a) State two examples of such kind of directional sedimentary structures and explain how they indicate the paleoflow direction.
 - b) State the different directional patterns that result from plotting paleocurrent data on a rose diagram.
 - c) Give at least one depositional system for each paleocurrent pattern.

Question 2 (10 points)

2. A) What are the various components that constitute a sandstone rock? Give examples of each constituent.
- C) Sketch classification of sandstones by using QFL ternary diagram.

Question 3 (10 points)

3. Explain the terms wackestone, packstone, grainstone, rudstone and framestone.

Question 4 (10 points)

4. Describe and Sketch a deltaic depositional system. Depict the various subenvironments and the nature of sediments that accumulate in each subenvironment.

Question 5 (5 points)

5. Stylolites are features commonly present in carbonate rocks and formed due to _____ .
 - a) Burrowing
 - b) wave actions
 - c) compaction
 - d) tidal action

Question 6 (5 points)

6. Explain the differences in origin between bedded and nodular cherts.

Question 7 (5 points)

7. Explain Bouma sequence. What does it represent?

Question 8 (5 points)

8. Explain and sketch how rip currents and longshore currents form? Discuss their effect on sediment dispersal.

Question 9 (5 points)

9. Sketch an ideal schematic log of fine-grained sediments in storm-dominated shelves between fair-weather wave base and storm wave base. Annotated important sedimentary features in the log.

Question 10 (5 points)

10. Shells made of CaCO₃ commonly form in marine environments. Explain potential alterations that may affect such grains with respect to increasing depth of the marine environment (falling from sea surface down to deep abyssal plains).

Question 11 (5 points)

11. Nereites ichnofacies indicates _____ depositional setting.

a) Sandy shore	b) shallow marine semiconsolidated substrate
c) deep marine (abyssal) zone	d) Rocky coast

Part B: Questions related to stratigraphy (Answer questions that make a total of 30 marks).

Question 12 (10 points)

12. Explain the term "facies" and Walther's Law of Succession of Facies.

Question 13 (10 points)

13. Explain the term unconformity. Describe and sketch the different types of unconformities.

Question 14 (10 points)

14. Explain the term depositional sequence. What are the system tracts that constitute a depositional sequence? Explain how these system tracts are related to sea level changes.

Question 15 (5 points)

15. What are the fundamental units of Lithostratigraphy and Biostratigraphy. Define each one of them.

Question 16 (5 points)

16. List the systems that constitute the Paleozoic, Mesozoic and Cenozoic eras, starting from the oldest to the youngest in each era.

Question 17 (5 points)

17. Explain the terms (i) transgression and (ii) regression.

Question 18 (5 points)

18. Explain the different types of contacts that separate between conformable lithostratigraphic units (i.e., one unit above the other).