

National Exams, May 2018

04-Geol-A3, Sedimentation and Stratigraphy

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 CLOSED BOOK, NO CALCULATOR PERMITTED EXAM.
3. This exam paper consists of **four pages (including this cover page)**. There are two parts: **Part 1** (Questions 1-10) consists of questions related to Sedimentology and Sedimentary Processes whereas **Part 2** (questions 11-19) contains questions related to Stratigraphy.
4. Part 1: The questions 1 and 2 are to be answered (each one is worth 10 points) whereas only five questions are to be answered from the remaining eight questions (i.e., questions 3 to 10, each one is 6 points worth). Thus, the total marks for Part 1 is $20 + 30 = 50$ points.
5. For the nine questions related to Stratigraphy (i.e., 11 to 19), only five questions are to be answered. These questions have the same "weight" in terms of marks (6 points each, answer any five of your choice but not more than five). Thus, the total marks for Part 2 is $5 \times 6 = 30$ points.
6. The maximum attainable grade is 80/80.
7. Most questions require answers in essay format. Clarity and organization of the answers are important, therefore, candidates should make their handwriting clearly legible.
8. **Please note:** The first number of questions permitted to answer in each part (i.e., Part 1 & Part 2) will be marked as they appear in the answer book. Thus, do not answer more than what you have been asked to answer. *Thank you!*

Part 1: Questions on sediments and sedimentary processes (total points = 50)

Questions 1 and 2 are must be answered. 10 points each, total 20 points.

Question 1: What is the procedure of sandstone classification? Provide the different classes of sandstone and describe (in details) each one of them. **10 points (must be answered).**

Question 2: Describe the different approaches of limestone classification based on (i) Dunham's classification (including modifications by Embry and Klovan, 1972) and (ii) Folk's classification. Table format of the applicable terms (for both types of classification) followed by the description of each limestone type is preferred. **10 points (must be answered).**

For questions 3 to 10, answer ANY FIVE of your choice (Do not answer more than 5 questions) (6 points each, 30 points total).

Question 3: Explain the difference between mineralogical and textural maturities of sandstones. What are the factors that control these sandstone properties?

Question 4: Explain the term "sorting" and its significance in terms of depositional processes. Give two examples of sediments with different sorting (one well-sorted and the other poorly-sorted) and their depositional environments.

Question 5: Explain the difference between chemical and physical (mechanical) weathering; state the products of each type of weathering.

Question 6: Define the term "paleosol" and explain how to recognize it in the field.

Question 7: Explain the different types of sedimentary basins based on the tectonic regimes that generate them.

Question 8: Explain Bouma Sequence and the properties of the various sedimentary units that constitute a complete sequence. What type of depositional model does it represent?

Question 9: State two sedimentary environments from each of the 3 depositional settings shown in the table below.

Continental environments	Marginal marine (transitional) environments	Marine environments
1-	1-	1-
2-	2-	2-

Question 10: Which one of the following depositional settings does Cruziana ichnofacies indicate?

- a) Deep marine (abyssal) zone
- b) Rocky coast
- c) Sandy shore
- d) Relatively quiet sublittoral zone

Part 2: Questions related to Stratigraphy. Answer ANY FIVE of the questions 11 to 19.

6 points each (total = 30). DO NOT ANSWER MORE THAN FIVE QUESTIONS.

Question 11: What is the fundamental unit of biostratigraphy? Describe the various ways of establishing biostratigraphic units.

Question 12: What are index fossils? What are the criteria required for a fossil to be considered as an index fossil?

Question 13: Explain the difference between chronostratigraphy and geochronology. Provide the hierarchies of chronostratigraphy and geochronology by showing how the hierarchies of one correspond to those of the other. Table format (showing the hierarchies and their correspondence) is acceptable.

Question 14: Define the term "facies". Also describe how Walther's Law of succession of facies is important for the study of the sedimentary sequences.

Question 15: What is the difference between conformable and unconformable stratigraphic contacts? Explain the all possible types (both conformable and unconformable) of stratigraphic contacts (e.g., Unit A overlain by Unit B).

Question 16: Describe the paleomagnetic application to the study of Stratigraphy.

Question 17: Choose the most appropriate term that completes the sentence.

A relatively conformable succession of genetically-related beds or bedsets bounded by marine flooding surfaces or their correlative surfaces is called _____.

- a) depositional system
- b) system tract
- c) parasequence
- d) depositional sequence

Question 18: In which system tract does the forced regression belong to? What are the conditions that allow the development of a forced regression?

Question 19: Configurations at sequence boundaries can be delineated from seismic profiles. These boundaries can be either concordant or discordant. Sketch the various possibilities of concordant and discordant upper and lower boundaries of two depositional sequences (e.g., Sequence A overlain by Sequence B).