

National Exams: May 2018

17-Pet-A1, Principles of Stratigraphy and 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 CLOSED BOOK, NO CALCULATOR PERMITTED EXAM.
3. This exam paper consists of four pages (including this cover page). There are two parts: **Part A** (Questions 1-10) conveys questions related to Sedimentology and Sedimentary Processes whereas **Part B** (questions 11-19) conveys questions related to Stratigraphy and sedimentary basin analysis.
4. Part A consists of 10 questions. Questions 1 and 2 must be answered, each one is 10 points worth ($2 \times 10 = 20$ points). Answer any five of the remaining eight questions (3 to 10). Each of these questions is 6 points worth ($5 \times 6 = 30$ points). Therefore, this Part A has total marks 50 ($20 + 30 = 50$ points). Do not answer more than what is required.
5. Part B consists of 9 questions. Answer any **six** questions of your choice. Each question weighs 5 points. Therefore, this Part B has total marks of **30** ($6 \times 5 = 30$).
6. **The maximum attainable grade is 80/80 (50 for Part A and 30 for Part B).**
7. Most questions require an answer in essay format. Clarity and organization of the answers are important.
8. **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, don't answer more than what you were instructed to answer.

Part A: Sedimentology and sedimentary processes

In this part, answer questions 1 and 2, and any other five questions of your choice from the remaining eight questions (i.e., 3 to 10). Questions 1 and 2 are 10 points each whereas questions 3 to 10 are 6 points each. Thus, the total marks for this Part A is 50.

Question 1: What is the procedure of sandstone classification? Provide the different classes or types 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).**

Answer only five of the questions 3 to 10. Each question weighs 6 points

Question 3: Define the term "lithofacies". Give an example of a lithofacies succession by sketching a vertical stratigraphic log that grade from subtidal through intertidal to supratidal carbonate lithofacies units (i.e., shallowing-upward succession). Show the sedimentary structures expected in each lithofacies. Give a legend as a key for your sketch and/or give brief description beside each lithofacies. **6 points.**

Question 4: Describe a deltaic depositional system with its subenvironments and lithofacies attributes. Sketch a prograding deltaic system. **6 points.**

Questions 5: What is the difference between conglomerates and breccias? Breccias can be generated by different process. State the different processes responsible for the genesis of breccias. **6 points.**

Question 6: Negatively-skewed grain-size frequency curve indicates _____ **6 points.**

- | | |
|---------------------------------------|--|
| a) excess in coarse-grained particles | b) excess in fine-grained particles |
| c) well-sorted particles | d) excess in both fine- & coarse-grained particles |

Question 7: Define the term coal. Also provide the sequence of the coal series, based on its carbon content evolvment (from low to high fixed carbon content). **6 points.**

Question 8: Explain the principal kinds of (modern) deep-sea sediments. **6 points.**

Question 9: What are the major differences between modern warm-water and cool-water carbonates? **6 points.**

Question 10: Describe porosity-enhancing and porosity-destroying diagenetic processes. **6 points.**

Part B: Stratigraphy and sedimentary basin analysis:

This part consists of nine questions (11 – 19). Answer any six questions of your choice. Do not answer more than six. Each one “weighs” 5 points (total = 6 X 5 = 30 points)

Question 11: Describe the building blocks of sequence stratigraphy and relate them to the relative sea level changes (or base level changes).

Question 12: Explain the application of Oxygen stable isotopes to the study of stratigraphy, particularly for the Quaternary stratigraphic studies.

Question 13: What is the difference between Geochronostratigraphy and geochronology? State each ones' hierarch of units and show how these units correspond to one another (i.e., geochronostratigraphic units versus geochronologic units). Table format is acceptable.

Question 14: Apparent first appearance and last appearance data of fossils may be misleading because of ____
a) differences in origination b) migration c) local facies control d) a, b & c

Question 15: Explain Walther's Law and how it is applicable to the study of sedimentary rocks. Sketch(es) with descriptions are welcome.

Question 16: Define the following four terms: (i) Taxon-range biozone, (ii) Lithofacies, (iii) Parasequence and (iv) Isopach map.

Question 17: Well logs are useful tools for stratigraphic correlation. Explain and give two examples of well logs for lithologic correlations of stratigraphic sections. You may produce hypothetical curves of different sections showing how they correlate to one another.

Question 18: Origin of sedimentary basins is related to crustal movements and plate-tectonic processes. State and describe the major kinds of sedimentary basins and their tectonic settings.

Question 19: Match the words "a to l" with their proper meaning from the listed phrases "i to xii".
Write the letter of your choice on the dash line at the end of each phrase.

- a) Chronocorrelation, b) stratigraphy, c) biocorrelation, d) lithocorrelation, e) diachronous,
f) transgression, g) tongue, h) composite-stratotype, i) diastem, j) suite, k) cliniform,
l) Accommodation space

- i. Sloping surfaces of prograding strata. _____
- ii. Zone where sediments can accumulate. _____
- iii. Setting equivalence of rock units with similar lithology and stratigraphic position. _____
- iv. Boundary of a geologic unit characterized by age difference in different locations that the unit occurs. _____
- v. Minor geologic time gap or stratal discontinuity shorter than the resolution of biostratigraphic dating. _____
- vi. Expressing similarity of fossil content and biostratigraphic position. _____
- vii. Landward migration of the shoreline. _____
- viii. Identifying correspondence of strata in age. _____
- ix. A lithodemic unit next higher in rank to lithodeme. _____
- x. Classification, nomenclature, correlation, and interpretation of stratified rocks. _____
- xi. A unit that wedges out beyond the boundaries of the stratigraphic unit in which it belongs to. _____
- xii. Combination of several reference sections (which may include a type section) required to demonstrate the range or totality of a stratigraphic unit. _____