

National Exams May 2015

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 exam. Any non-communicating calculator is permitted.
3. This exam paper consists of three pages (including this cover page). There are two parts: **Part 1** (Questions 1-13) conveys questions related to Sedimentary Processes, Depositional Environments and Diagenesis whereas **Part 2** (questions 14-18) conveys questions related to Stratigraphy.
4. **Answer eight (8) questions of Part 1 and four (4) questions of Part 2.** Each question of both parts is worth 10 points. Thus, the eight questions of Part 1 add up to 80 points whereas the four questions of Part 2 add up to 40 points. **The maximum attainable is 120/120.**
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 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.

May 2015 – 04-Geol-A3, Sedimentation and Stratigraphy
Part 1: Sedimentary processes, depositional environments & diagenesis.

Answer 8 out of the questions 1 to 13 (10 points each question, 8 X 10 = 80)

- 1- What are the products of subaerial weathering?
- 2- State classification of limestone rocks by Dunham (1964) with the modification by Embry and Klovan (1972). Table format is acceptable.
- 3- Describe the difference among arenite and wacke sandstones. Which one of the two types of sandstones makes better petroleum reservoir?
- 4- Describe how sorting, mud content and roundness affect the maturity level of sandstones.
- 5- Which of the following framework particles in sandstones reflect the lithology of the source (provenance) area?
 - a) Lithic fragments
 - b) feldspathic grains
 - c) micas
 - d) monocrystalline quartz grains
 - e) polycrystalline quartz grains
- 6- The orientation of directional sedimentary structures is useful for paleocurrent analysis.
 - a) State three sedimentary structures that can give paleocurrent directions of the flows that originated them.
 - b) Paleocurrent directions from such kind of sedimentary structures may show different directional patterns when plotted as rose diagram. State three possible patterns and their significance in terms of depositional environments.
- 7- Anhydrite and gypsum may be preserved in different structural groups. State these structural groups and explain their origin.
- 8- What are sedimentary phosphorites? Explain the processes of their origin.
- 9- Explain the term “Diagenesis”. State two diagenetic processes that enhance and two that reduce reservoir qualities of rocks.
- 10- Which of the following rock types does not include among carbonaceous sedimentary rocks?
 - a) Coal,
 - b) Oil Shale
 - c) Dolomite
 - d) Bitumens
 - e) Anthracite
- 11- Explain how and where fluvial point bars form (you may add a sketch to support your answer).

12- Explain the concept of ichnofacies and its importance in the study of sedimentary rocks.

13- Certain sedimentary rocks may contain small scale, synsedimentary folds and faults that are not caused by tectonic stresses. State such kind of sedimentary structures, explain their possible causes and how you would distinguish them from apparently similar, but tectonically-induced structures.

Part 2: Questions on Stratigraphy and Stratigraphic principles. Answer four of the questions 14 to 18 (10 points each. Total points to answer: 10 X 4 = 40)

14- Describe how sea level changes affect the vertical stacking pattern of sediments. Sketching is helpful.

15- Explain the different types of stratigraphic discontinuities that represent significant temporal gaps between rock units in the stratigraphic record.

16- Explain the difference between Sequence Stratigraphy and Lithostratigraphy.

17- Which of the following points is not applicable to the use of caliper curve of a borehole? _____

- a) Distinguishing porous / permeable zones from non-porous zones.
- b) Identification of the nature of fluids present in subsurface.
- c) Identification of boundaries of stratigraphic intervals.
- d) Lithologic interpretation of the well tract.
- e) Thicknesses of stratigraphic units.

18- The figure (right) shows correlation of two sections by using biostratigraphic data. Section 1 is the main reference section for the basin in study. A line of correlation between Section 1 and Section 2 is shown. Explain what can be inferred from the line of correlation in its three segments marked as A, B & C.

