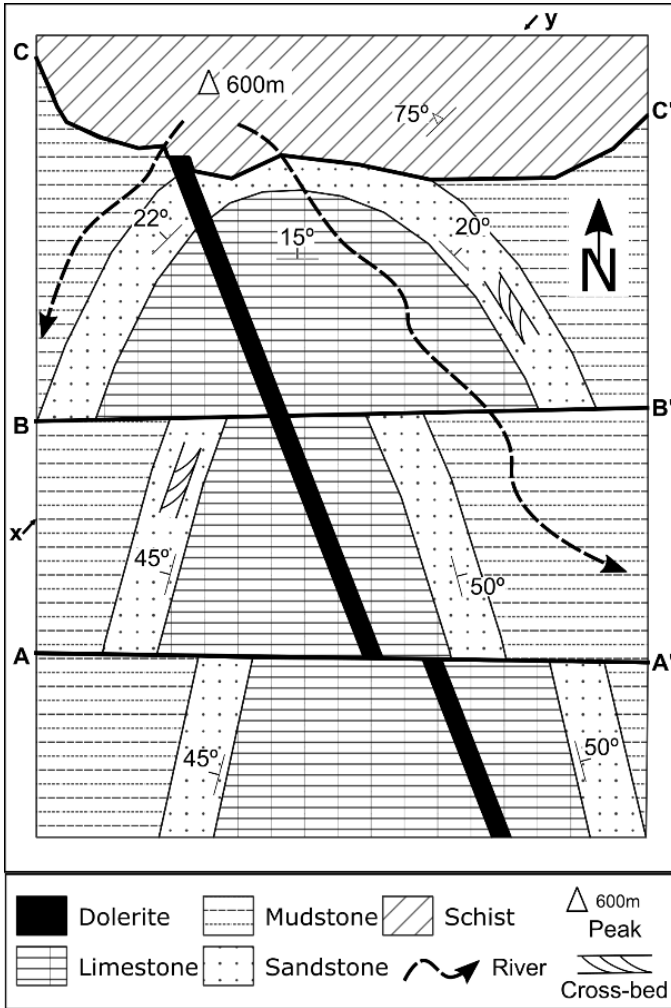


Part-I

(One question, twenty-five marks)

1.



Interpret the map and answer the following.

a) State the nature of the geological features marked as AA', BB' and CC', and justify your answer in each case. 3x3=9

- b) Comment on relative ages of the features marked AA', BB' and CC'. 3x2=6
- c) Arrange the lithological units in decreasing order of their geological ages. 4
- d) How would you interpret the dip variation of the sandstone unit? Draw a sketch structural cross section along the line xy. 3+3=6

Part-II

(Five questions, eight marks each)

2. Two pleochroic minerals show absorption colours in shades of green under polarizing microscope. What other optical properties have to be observed in order to distinguish the two minerals, and identify them as biotite and hornblende? Give justification for your answer.
3. Andalusite is a product of thermal metamorphism of pelitic rocks. Give a critical assessment of the statement in the light of stability fields for Al_2SiO_5 polymorphs.
4. How can sedimentary processes concentrate and form resources? Give an example of a resource formed by a sedimentary process.
5. What is meant by the term 'primary dolomite'?
'The majority of dolomites have formed by replacement of pre-existing carbonate minerals.' Explain how original crystal/grain size, mineralogy and timing of dolomitization control the preservation of original fabric/texture of fossiliferous limestones after dolomitization.
6. Discuss the functional significance of the following morphological features:
- Selenizone of gastropods.
 - Septal neck of ammonoids.
 - Anterior warping/ folding of rhynchonellid brachiopods.
 - Unpaired, incised and longer ambulacrum of heart-shaped echinoids.

Part-III

(Choose the correct answer from the given alternatives and justify. Five questions, four marks each)

7. Olivine is a solid solution of Forsterite (Fo) and Fayalite (Fa). A melt with Fo/Fa ratio of 1:1, cools leading to first crystallization of olivine. The proportion of Fo and Fa in the early crystallized olivine is

- a) greater than 1.
- b) less than 1.
- c) equal to 1.
- d) indeterminate.

8. Which of the following is a trace fossil?

- a) Traces left by dragging of dead ammonite shell in a marine rock.
- b) Impression of a leaf in Permian carbonaceous shale.
- c) Excavation made by a crab in a Quaternary sedimentary rock.
- d) Clutches of dinosaur eggs in continental Jurassic rocks.

9. Analysis of zircon from an Archaean granite shows presence of ^{238}U , ^{235}U , ^{208}Pb and ^{207}Pb . Assuming all Lead to be radiogenic, and no Lead loss, relative abundance of these Pb isotopes is best given by

- a) $^{207}\text{Pb}/^{235}\text{U} > ^{206}\text{Pb}/^{238}\text{U}$.
- b) $^{206}\text{Pb}/^{238}\text{U} > ^{207}\text{Pb}/^{235}\text{U}$.
- c) $^{206}\text{Pb}/^{235}\text{U} = ^{207}\text{Pb}/^{238}\text{U}$.
- d) $^{206}\text{Pb}/^{238}\text{U} = ^{207}\text{Pb}/^{235}\text{U}$.

10. Which of the following conditions is the most favourable for generation of subcritical climbing in current ripple cross-lamination (ripple drift)?

- a) Down-current ripple migration rate is high, rate of rise of the accumulation surface due to suspension fallout is low.
- b) Down-current ripple migration rate is moderately high, rate of rise of the accumulation surface due to suspension fallout is moderately high.

- c) Down-current ripple migration rate is low, rate of rise of the accumulation surface due to suspension fallout is high.
- d) Down-current ripples migration rate is nil, rate of rise of the accumulation surface due to suspension fallout is very high.

11. The upper and lower boundaries of Biostratigraphic units

- a) always match with that of the lithostratigraphic units.
- b) never match with that of the lithostratigraphic units.
- c) match with that of the lithostratigraphic units only in the Mesozoic.
- d) may match with that of the lithostratigraphic units.

Part-IV

(Choose the correct answer from the given alternatives. No Justification is required. Fifteen questions, one mark each)

12. Which one of the following is the correct sequence of events in the Wilsonian cycle?

- a) Breakup of continents – Seafloor spreading – Subduction – Collision.
- b) Seafloor spreading – Breakup of continents – Subduction – Collision.
- c) Breakup of continents – Subduction – Collision – Seafloor spreading.
- d) Subduction – Collision – Seafloor spreading – Breakup of continent.

13. Which one of the following is a plate boundary as well as a strike-slip fault?

- a) Himalayan Frontal fault.
- b) Great Boundary fault.
- c) Great Glen fault.
- d) San Andreas fault.

14. Which of the following is a geostationary satellite?

- a) Landsat.
- b) Insat.
- c) IRS.
- d) SPOT.

15. Oxygen built up in the Earth's atmosphere because

- a) of seafloor spreading.
- b) rocks weathered and released their oxygen.
- c) algae and other organisms employed photosynthesis.
- d) oxygen settled on the Earth from planets further from the sun.

16. Which of the following forms of silica is likely to be present around meteorite impact crater site?

- a) Lechatelierite.
- b) Coesite.
- c) Cristobalite.
- d) Stishovite.

17. What are the two most abundant elements in the Earth's crust?

- a) Iron and magnesium.
- b) Oxygen and silicon.
- c) Nitrogen and oxygen.
- d) Silicon and calcium.

18. Why is basalt finer grained than gabbro?

- a) Gabbro formed from quick cooling of magma.
- b) Basalt formed from quick cooling of lava.
- c) Basalt has a mafic composition.
- d) Gabbro has a mafic composition.

19. Which of the following is NOT a process of physical (mechanical) weathering?

- a) Frost wedging.
- b) Unloading.
- c) Thermal expansion.
- d) Dissolution.

20. Which of the following silicate minerals are most resistant to chemical weathering?

- a) Quartz.
- b) Olivine.
- c) Hornblende.
- d) Potassium Feldspar.

21. What major change occurs during metamorphism of limestone to marble?

- a) Calcite grains recrystallize to larger and interlocking grains.
- b) Clays crystallize to micas, forming a highly foliated, mica-rich rock.
- c) Limestone grains react to form quartz and feldspars.
- d) Calcite grains are dissolved away leaving only the residue.

22. Which of the following kinds of aeolian dunes will form when the sand supply is abundant and prevailing wind direction is variable?

- a) Star.
- b) Linear.
- c) Barchan.
- d) Transverse.

23. Which of the following has a superficial similarity with a solitary coral

- a) Rudistid bivalves.
- b) Ammonoids.
- c) *Discoyclina*.
- d) *Alveolina*.

24. Which of the following is a microfossil

- a) *Hantkenina*.
- b) *Barapasaurus*.
- c) *Physa*.
- d) *Bellorophon*.

25. Individuals preserved in a rolled state are common among fossilized forms of

- a) Trilobites.
- b) Bivalves.
- c) Archosauromorphs.
- d) Colonial corals.

26. Which of the following landforms are characteristic of glacial landform?

- a) Outwash fan.
- b) Erg.
- c) Atoll.
- d) Meanders.