**GEOLOGY 222 FINAL**

**NAME**.....**DATE:** JUNE 23rd 1997

Answer **all** sections: Read the questions carefully.

**SECTION 1 30% of marks**

**True** or **false? Tick the appropriate box and if *FALSE* give a brief explanation why.** 1.5 marks a question, where answer is false marks will be deducted for an incorrect explanation.

| | T | F |
|---|---|---|
| 1) Phreatic environments are often oxidising environments. | ☐ | ☐ |
| 2) Petromict conglomerates are a specialised type of oligomict conglomerate. | ☐ | ☐ |
| 3) Aeolian bed forms may have angles of up to 30°. | ☐ | ☐ |
| 4) Kaolinite is associated with weathered granites as it forms by the alteration of micas. | ☐ | ☐ |
| 5) Calcite and aragonite are rhombohedral minerals while dolomite is orthorhombic. | ☐ | ☐ |
| 6) Deposition of the Messinian evaporites occurred so rapidly that greater than 2 km of salts were deposited in about 2 million years. | ☐ | ☐ |
| 7) Glauconite is a marine iron phosphate mineral. | ☐ | ☐ |
| 8) Freshwater siliceous sediments can form due to the accumulation of diatoms. | ☐ | ☐ |
| 9) *Structure grumeleuse* is believed to be formed by the merging of peloids during diagenesis . | ☐ | ☐ |
| 10) Humic organic matter derived from plants rarely gives rise to oil. | ☐ | ☐ |
| 11) Low energy carbonate lagoons are common on both ramps and rimmed shelves. | ☐ | ☐ |
| 12) Most rocks called a calcilutite would be equivalent to Dunham's lime mudstone or Folk's micrite. | ☐ | ☐ |
| 13) Meteoric pore waters are generally acidic and oxidising and so tend to leach out both carbonate and organic matter in sediments. | ☐ | ☐ |
| 15) High Mg calcite and aragonite are unstable or metastable under surface conditions. | ☐ | ☐ |
| 16) Good barrier and back barrier carbonates are found in the Mdairej and Abeih Formations of the Cretaceous of Lebanon. | ☐ | ☐ |
| 17) Muds in braided settings are generally restricted to abandoned channel deposits. | ☐ | ☐ |
| 18) Sapropelic mudrocks may be due to algal or woody plant material | ☐ | ☐ |
| 19) Macrotidal settings produce the best barriers. | ☐ | ☐ |
| 20) Dolomite takes its name from the Dolomite mountains of south central Europe. | ☐ | ☐ |

2B.

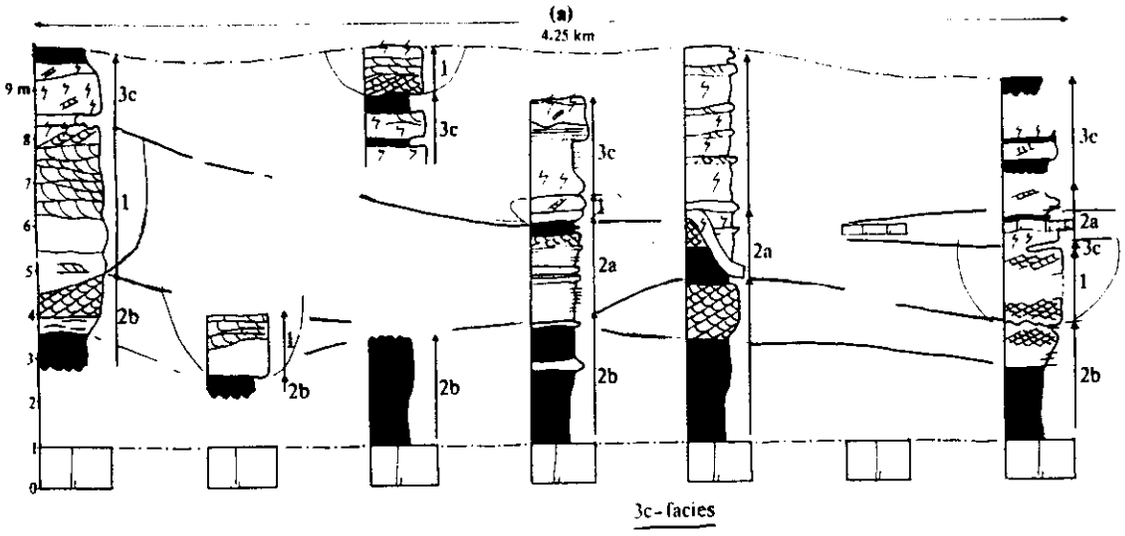
| Formation Description | | Strip Log |
|---|---|---|
| **Formation Y**<br>Algal laminated micrites and dolomites. Mudcracks, ostracods. | Light gray | |
| **Formation X**<br>Base has wavy and lenticular bedding. Mid to top interbedded shales and quartz wacke hummocky bedded sands.<br>Marine fossils common to abundant in the shales. | Greenish | |
| **Formation W**<br>Quartz arenite. Gently dipping laminations. Oscillation ripples and cross beds common. Skolithos traces. | White | |
| **Formation V**<br>Quartz conglomerates interbedded with coarse grained, large planar cross bedded quartz arenites / (L-Bar/T-Bar sequences). Sequences tend to thin and fine toward top of section. | White | |
| **Formation U**<br>Quartz arenite. Gently dipping laminations. Skolithos traces. | White | |
| **Formation T**<br>Green shales with lenticular bedding at base. Thin hummocky sequences in the middle, which thicken and change into megacross bedded medium sands at top. Marine fossils common in places. | Greenish | |
| **Formation S**<br>Feldspathic lithic wackes. Lithics include radiolarian chert, quartzite, carbonates, feldspars, and metamorphic fragments.<br>Cycles of planar bedded coarse pebbly sands passing upwards into finer sands with ripples and then shales. | Dark gray | |
| **Formation R**<br>Base interbedded black micrites and shales. Micrites contain broken, transported fossils. Shales thicken and dominate upsection. Graptolites in shales. | Dark gray to black | |
| **Formation Q**<br>Micrites, biomicrites, packed fossiliferous micrites. Small patch reefs of fossil boundstone (crinoids, bryozoans, calcareous algae, cephalopods, etc.). Some megarippled biosparmicrites. Limestones darken upsection, black at top. | Medium gray to black at top | reef |
| **Formation P**<br>Very thick sequences of algal laminated micrites and dolomites. Stromatolites, intramicrudites (flat pebble conglomerates), pelmicrites, prism (mud) cracks common.<br>Rare quartz arenite beds. Occasional herringbone cross bedding. | Light gray | |
| **Formation O**<br>Quartz arenite, minor feldspathic arenite. Skolithos abundant, cross bedding common. | White | |

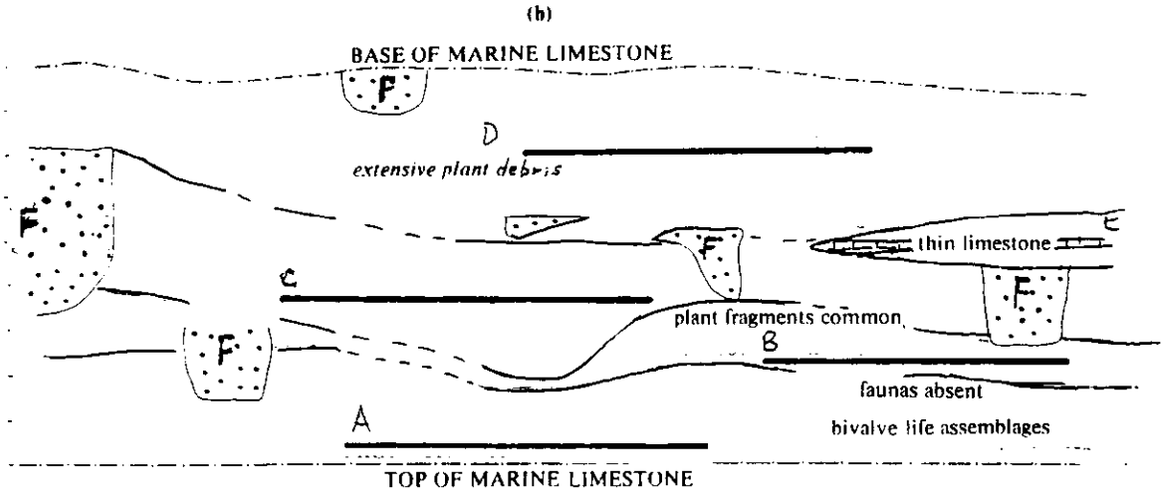
C/S | Sand | Gravel

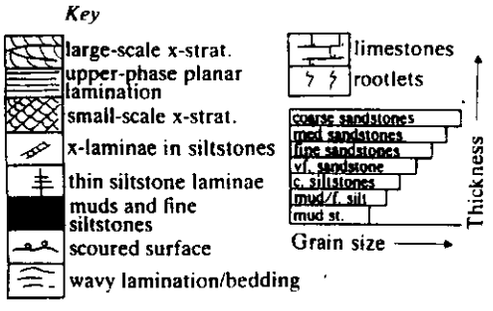
M
0
50

## SECTION 2 (40% of marks) Answer both sections

**2a** 15% Examine the diagram below of an Upper Carboniferous section.
Diagram 1 is a cross section of the various logs across the area. Note that grainsize increases to the right. Diagram 2 is the interpretative cross section




*Answer the following in the answer books .*

1) In what sort of overall environment were these rocks deposited?
2) Suggest environments or subenvironments for facies, A-E .
3) Give two possible reasons for the apparent cyclicity in this sequence.
4) Facies B and F are both primarily sand bodies. What are the pros and cons of each as hydrocarbon reservoirs?

**2B 25%** Examine the attached sheet of Paleozoic strata . Note the scale.
In the answer books

1) Give the most appropriate environmental interpretation you can for each formations O to Y. To save you asking

a) Skolithos is a vertical tube trace fossil typical of high stress environments.

b) L -Bar and T bars are longitudinal and transverse (linguoid )bars respectively.

2) Explain the variation in terrigenous type between Formation OUVW and Formation S?

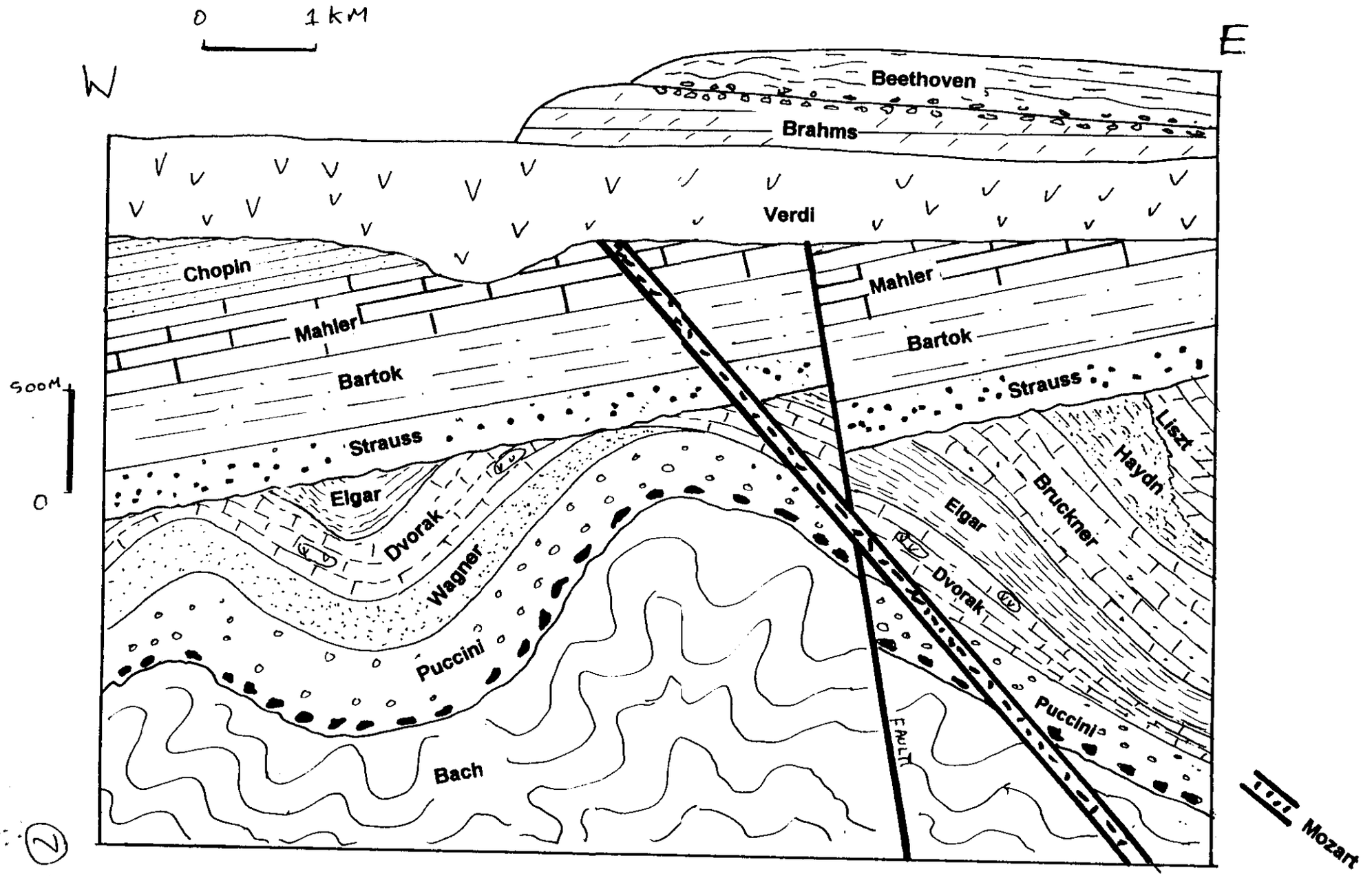
## SECTION THREE: 30%

Answer six questions briefly.

1. Lebanon's stratigraphic record is made up perhaps of 85% limestone and terrigenous clastics are scarce. Why?
2. A limestone specimen contains a lot of calcite spar. Is this an automatic index of high energy. If not, why not?
3. Why are pelagic carbonate rocks found on continental crust during particular periods of earth history but siliceous pelagics almost always confined to oceanic crust?
4. What chemical differences would you expect between a) a high latitude Holocene carbonate accumulation, b) a low latitude Holocene accumulation c) a high latitude 200 million year limestone.
5. Make a table to show the differences between ooids, pisoids and oncoids in terms of size, structure and environment of formation.
6. How might you explain a sequence with evaporites sandwiched in between deep water sediments when there is no evidence of 'yo-yo' tectonism?
7. Make a table to show the differences between BIFs and Phanerozoic ironstones in terms of composition, structure and environment of formation.
8. Why in some parts of the world is oil generated from Miocene source rocks which are 15 million years of old while in others Late Proterozoic rocks are only just generating oil?
9. Both alluvial fans and submarine fan environments show sequences which have a transition from proximal to distal. How would you differentiate between the two settings?.
10. Why does a stream point bar sequence show variations in both grainsize and sedimentary structures.
11. Why exactly do we get moraines? What features distinguish them?
12. Why when the 'carbonate factory' itself may be only a few km wide is the carbonate environment so wide?

- C.D. Walley. June 1997.

SHEET 1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W
E
Beethoven
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Verdi
Chopin
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