GEOLOGY 222 FINAL 1998

NAME.....**DATE:** JUNE 22nd 1998

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.

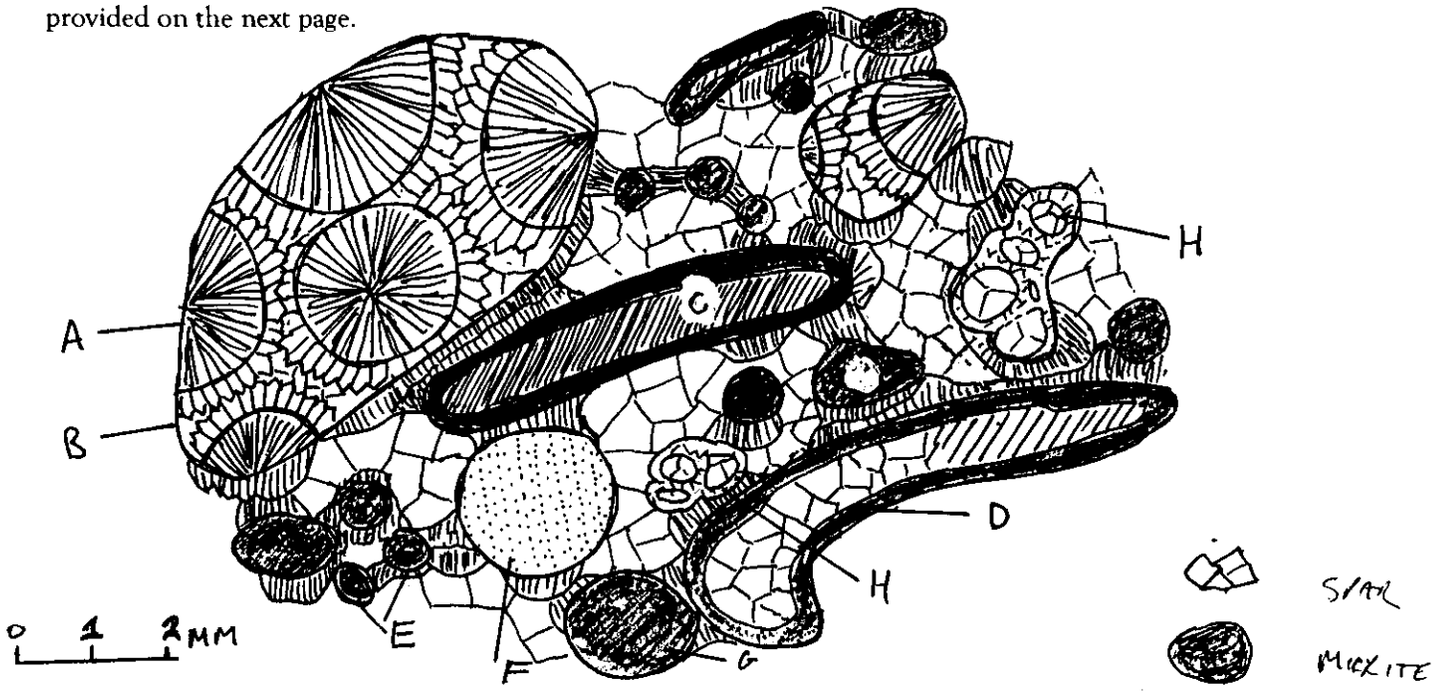
1 mark a question, where answer is false marks will be deducted for an incorrect explanation.

	T	F
1) The continental slope normally extends no deeper than 1000 m.	☐	☐
2) All things being equal the widest deltas are those with hypopycnal flow	☐	☐
3) Phreatic environments are often oxidising environments.	☐	☐
4) Kaolinite is associated with weathered granites as it forms by the alteration of micas.	☐	☐
5) Volcanoclastic sediments can be predicted to be more common on Atlantic type slopes than Pacific type slopes	☐	☐
6) Humic organic matter derived from plants rarely gives rise to oil.	☐	☐
7) Most rocks called a calcilutite would be equivalent to Dunham's lime mudstone or Folk's micrite.	☐	☐
8) Phreatic pore waters are generally acidic and oxidising and so tend to leach out both carbonate and organic matter in sediments.	☐	☐
9) Contour currents off Lebanon would flow east -west.	☐	☐
10) Muds in braided stream settings are generally restricted to abandoned channel deposits.	☐	☐
11) Kerogen in mudrocks may be due to algal or woody plant material	☐	☐
12) Macrotidal settings produce the best barriers.	☐	☐
13) Bedding in the basal Bouma sequence may be missing because of bioturbation.	☐	☐
14) Glacial tills make poor oil reservoirs because of their poor sorting.	☐	☐
15) Forams, gastropods and rudists may show intergranular porosity because of the holes within the skeletons	☐	☐
16) A spar rich carbonate must indicate high energy conditions	☐	☐
17) Folk defined the term micrite from the expression *micro*bial calc*ite* .	☐	☐
18) Fair weather wave base is only 10-15m water depth and about a fifth of the depth of the photic zone.	☐	☐
19) A feldspar rich sand is considered to be compositionally immature.	☐	☐
20) Chalk is the product of calcareous shelled radiolarians and chert is the product of silica shelled radiolarians.	☐	☐
21) Telodiagenesis is more common in rocks under angular unconformities than under disconformities.	☐	☐

	T	F
22) Large scale X beds 10-20m high are always aeolian in origin.	☐	☐
23) Oxygen levels decline smoothly from the photic zone into the deep oceans	☐	☐
24) Modern reefs occur in waters that are nutrient poor.	☐	☐
25) The lower fan of a turbidite complex will not show channels	☐	☐
26) Whitings are due to the deposition of evaporite minerals in high levels of the sea.	☐	☐
27) Tangential ooids are mainly high energy while radial ooids form under low energyconditions.	☐	☐
28) The Jurassic and the Cretaceous were major periods of lowstand.	☐	☐
29) Potassium ferrocyanide turns ferroan calcite purple.	☐	☐
30) Illite and kaolinite are the main clay minerals in older rocks	☐	☐

SECTION 2 (20% of marks)

Examine the drawing of the thin section of ROCK Z below and give answers to the questions in the spaces provided on the next page.



Spend some time identifying the features. The rock is entirely carbonate.

1. Object A is made of radial calcite. What is it? ..... Suggest how it formed.....
   .....
   What is the clast B it is part of? .....
   .....
2. Object C has a dark carbonate covering and a finely fibrous interior. Suggest a history for it.....
   .....

3. Object D is similar but has a coarser fabric which in places passes into coarse angular calcite spar. What has happened here? .Why might this grain be different to that of C? .....
.....
.....
4. Objects E are small micritic grains. What do you think they are? Why? .....
.....
.....
5. Object F is a dusty grain of circular cross section which goes to extinction as a single unit of calcite. What is it?..... ..... Objects G are larger and more irregular than objects E. What are they likely to be? ....
....
6. Objects H are fragments of large chambered spiral structures with a shell replaced by blocky calcite? What are these most likely to be?..... .....
.....
7. Rexamine Clast B. What is it?.....What is its lithology? ....
....
8. What does it suggest about the environment of deposition of ROCK Z ?.....
.....
.....
9. Describe the cementation in ROCK Z..... ....
....
..... .
10. What is the cementation history? .....
.....
... .
11. Give the overall depositional and diagenetic history of ROCK Z .....
.....
.....
.....
.....

SECTION 3 25% of marks Answer both parts

PART 1: Consider the geology of Lebanon from the top of the Kesrouane Formation to the Mdairej Limestone that already know and love so well. Answer the following.

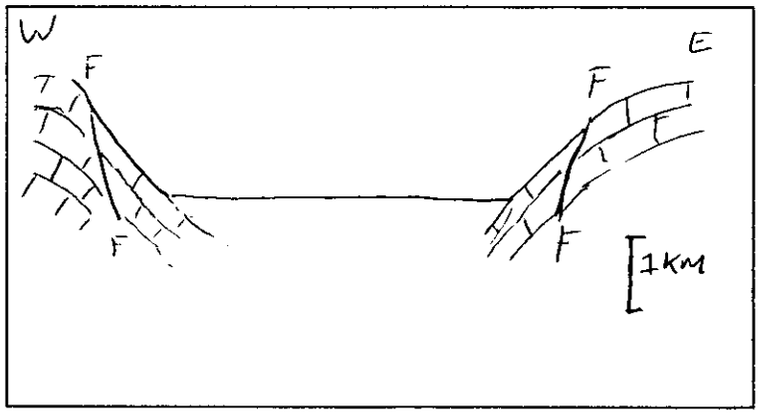
1. Explain as best you can the following.
   a) Why we think the dolomitisation in the Kesrouane Formation is secondary? What might hav caused it.
   b) How can you have 1000 plus meters of continuous shallow water (<50m depth) carbonates in the Kesrouane Formation ? *Think about it!*
   c) Why do we assume that the Bhannes Formation is subaerial? What evidence would confirm this? Why might the depositional environments have changed so abruptly from the Kesrouane to this? Why do you think this formation is so variable?
   d) The Salima Formation is locally a quartz rich grainstone. How can this form?
   e) The Chouf Sandstone has fine to medium sands, clay interbeds, wood fragments, amber, medium height cross beds etc. Suggest possible environmental models. How would you test these models? Why is there more quartz in 1 meter of the Chouf Sandstone than in 1000m of the Kesrouane Formation?
   f) Between the Salima and the Abeih Formations is a time period of perhaps 10-20 million years. Does the 50m of the Chouf Sandstone take it all up? What other possibilities are there?
   g) The Mdairej includes a variety of carbonates including bioclastic reefal debris and a widespread fine pale micrite facies. This is a very widespread unit that doesn't vary every much over Lebanon. Why do you think it is so consistent? Why are there no major reefs?
   h) You have now seen (in various degrees of detail) three sorts of Sannine Formation. From west to east these are thick cherty and slumped Rauche facies, the more widespread mountain shallow marine with gastropods, bivalves and rudists, and the Zahle facies with peritidal and supratidal facies. Explain, as best you can, the existence of these facies.

SECTION FOUR: answer two questions 25% of marks

1) What is cyclicity in sediments? Explain how cyclicity can be produced in the following circumstances. a) Fluvial dominated deltas, b) Turbidites, c) Coastal sequences.

2) Stratigraphic disconformities involving the loss of large amounts of time are commonly associated with both deep water sediments and soil horizons. a) Why? b) In which environments would you expect a more complete depositional record? c) What diagenetic processes would you expect to have occurred in marine carbonates below a soil horizon.

3) The Aammiq wetlands form the last infilling of a lake depression in the Bekaa. We may imagine the E-W cross section of the basin to be thus at the point we visited and it has probably been infilled over much of the last 2 million years. Suggest in some detail the most probable sequences you would expect to find at the basin edge and in the basin centre. Bear in mind the following a) there have been extremes of climatic fluctuations during this time, b) the Litani river runs through it, c) there has been ongoing and episodic tectonism on either flank and also to the south where the river drains out of the basin.



4) Consider the continental shelf. a) Under what circumstances will it have terrigenous clastic deposition, b) Under what circumstances will it have carbonate deposition. c) Where do the carbonates come from. d) What processes may affect shelf sedimentation?