Geology 201 Final Exam, Fall 1997/1998

Exam rules apply.
Time allowed: Two hours

Section A: (40 marks)

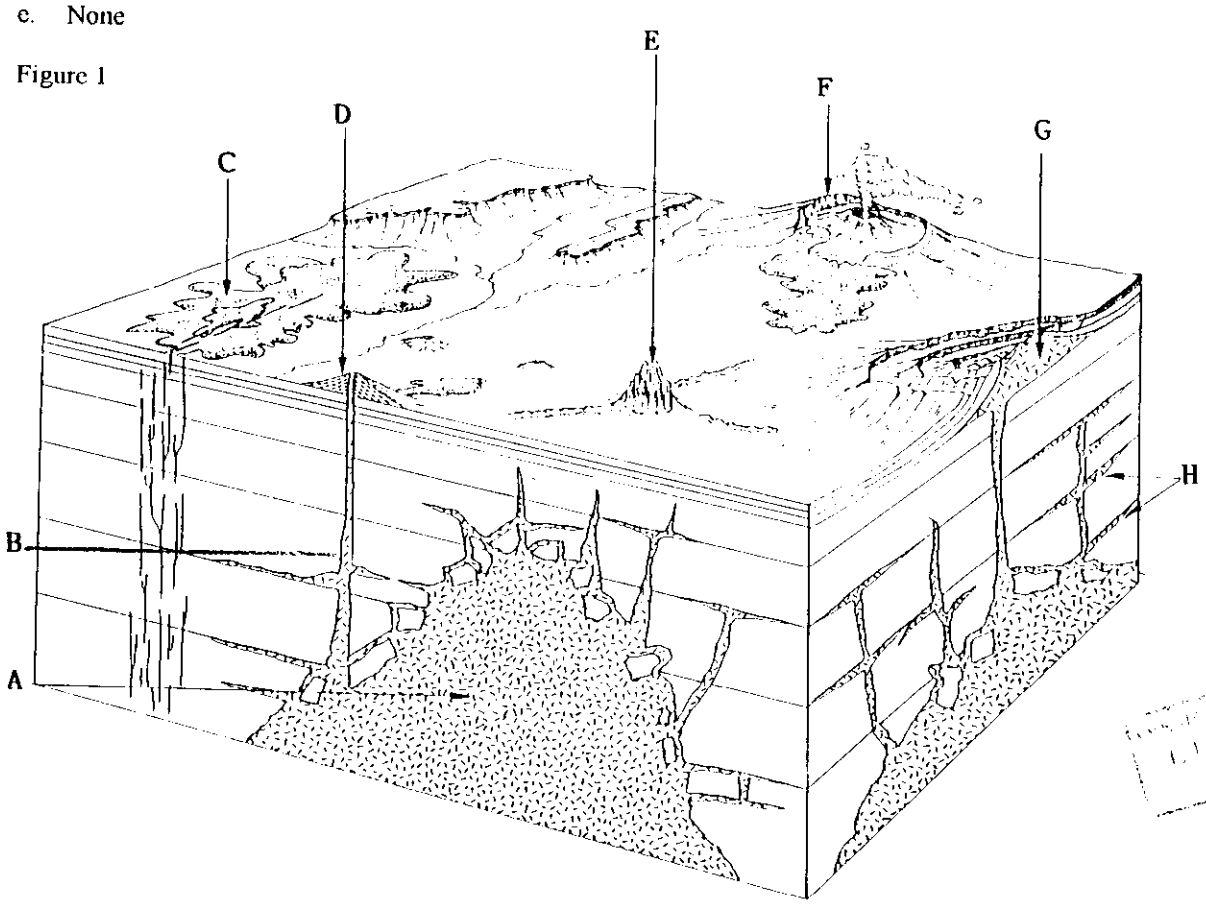
Answer the questions on the sheet provided. Note that **two** marks will be given for each correct answer and **half** a mark will be deducted for each incorrect answer.

1. A radioactive isotope with an atomic number of 90 and an atomic mass of 232 undergoes decay by α-emision. The resultant isotope has:
a. An atomic number of 92 and an atomic mass of 232.
b. An atomic number of 91 and an atomic mass of 231.
c. An atomic number of 89 and an atomic mass of 232.
d. An atomic number of 88 and an atomic mass of 228.
e. An atomic number of 86 and an atomic mass of 226.

2. Three atoms A, B and C have atomic numbers of 28, 9 and 3 respectively. They are likely to interact in which of the following ways?
a. Atom A will share one electron with atom B and share one electron with atom C.
b. Atom A will share one electron with atom B. Atom C will not bond.
c. Atom A will transfer two electrons to atom B and share one electron with atom C.
d. Atom B will share one electron with atom C. Atom A will not bond.
e. Atom C will transfer one electron to atom B. Atom A will not bond.

3. A silicate mineral has the following basic formula SiO_3. How many oxygens does each tetrahedra share?
a. One
b. Two
c. Three
d. Four
e. None

Figure 1

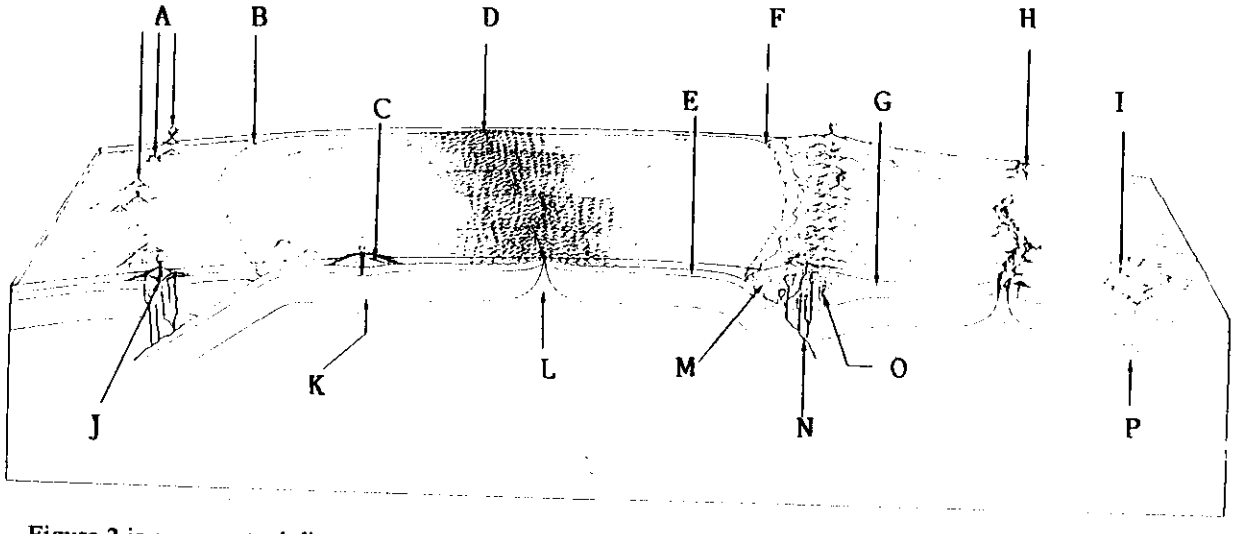


4. Figure 1 is a diagrammatic section of part of the crust showing the various types of igneous rock bodies and the landforms developed on igneous rock. Assign each of the features A – H with the appropriate term selected from the list below:

1) Diatreme
2) Fissure eruption
3) Dyke
4) Sill
5) Batholith
6) Strato volcano
7) Caldera
8) Laccolith

a. A = 8, B = 4, C = 1, D = 2, E = 5, F = 7, G = 3, H = 6
b. A = 5, B = 4, C = 3, D = 1, E = 2, F = 8, G = 7, H = 6
c. A = 5, B = 3, C = 2, D = 6, E = 1, F = 7, G = 8, H = 4
d. A = 1, B = 3, C = 1, D = 2, E = 7, F = 5, G = 6, H = 3
e. A = 5, B = 4, C = 1, D = 2, E = 5, F = 7, G = 8, H = 3

Figure 2.



5. Figure 2 is a conceptual diagram showing the origin of magma according to plate tectonic theory. Using the list of terms below, label the major geological features A-I.

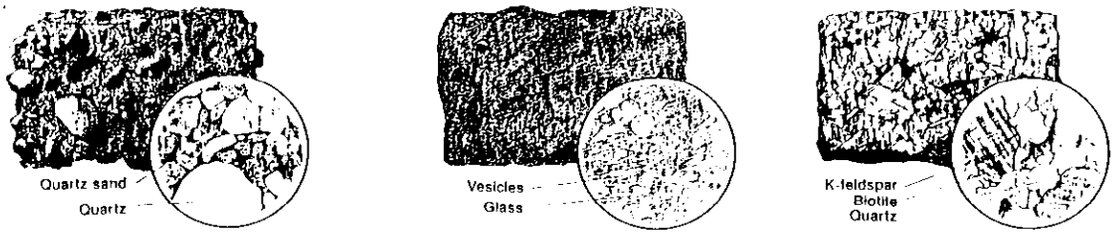
1) Oceanic crust
2) Continental crust
3) Shield volcano
4) Island arc
5) Mid-oceanic ridge
6) Trench
7) Rift valley
8) Fissure eruption

a. A = 1, B = 2, C = 3, D = 4, E = 5, F = 6, G = 7, H = 8, I = 8
b. A = 4, B = 6, C = 3, D = 5, E = 1, F = 6, G = 2, H = 7, I = 8
c. A = 3, B = 6, C = 4, D = 7, E = 2, F = 6, G = 1, H = 8, I = 5
d. A = 4, B = 2, C = 3, D = 5, E = 1, F = 6, G = 2, H = 7, I = 8
e. A = 5, B = 6, C = 4, D = 7, E = 3, F = 6, G = 1, H = 2, I = 8

6. With reference to figure 2 and the list below, label the areas J-P where the following processes occur. Note that any given process may occur in more than one environment.
    1) Generation of basaltic magma
    2) Generation of rhyolitic magma
    3) Andesitic volcanism
    4) Granitic intrusions
    5) Compression and folding

a. J =1, K = 2, L = 3, M = 5, N = 4, O = 1, P = 5
b. J =2, K = 3, L = 1, M = 5, N = 3, O = 2, P = 3
c. J =2, K = 2, L = 1, M = 5, N = 2, O = 4, P = 1
d. J =3, K = 1, L = 3, M = 5, N = 1, O = 3, P = 4
e. J =3, K = 1, L = 1, M = 5, N = 2, O = 4, P = 1

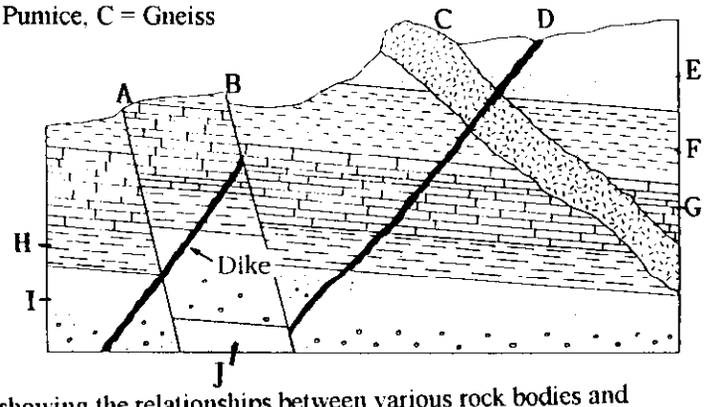
Figure 3.



7. The rocks A, B and C shown in figure 3 would be best described as:

a. A = Conglomerate, B = Pumice, C = Granite
b. A = Conglomerate, B = Obsidian, C = Gabbro
c. A = Sandstone, B = Ash tuff, C = Gneiss
d. A = Breccia, B = Slate, C = Quartzite
e. A = Quartz Arenite, B = Pumice, C = Gneiss

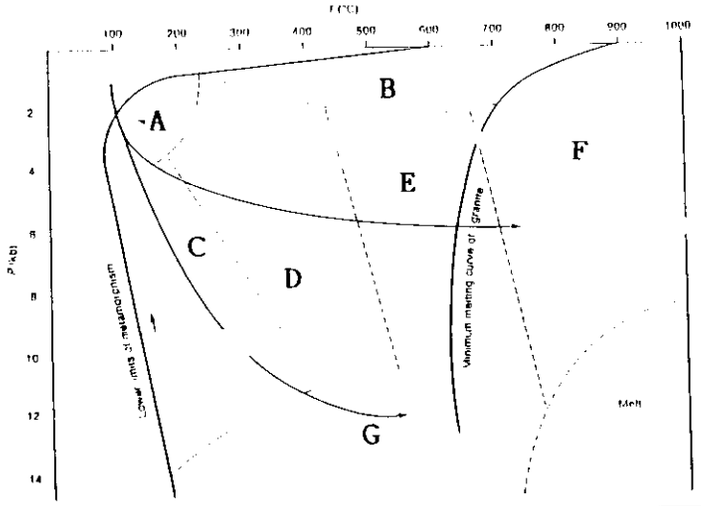
Figure 4



8. Figure 4 is a cross-section showing the relationships between various rock bodies and structures. The relative age of each rock body and structure (1 = oldest, 2 = next oldest etc.) is:

a. A = 5, B = 6, C = 1, D = 3, E = 10, F = 7, G = 2, H = 4, I = 9, J = 8
b. A = 8, B = 10, C = 7, D = 9, E = 6, F = 5, G = 4, H = 3, I = 2, J = 1
c. A = 5, B = 8, C = 1, D = 2, E = 7, F = 6, G = 4, H = 3, I = 9, J = 10
d. A = 8, B = 7, C = 2, D = 9, E = 6, F = 5, G = 4, H = 3, I = 10, J = 1
e. A = 1, B = 3, C = 5, D = 7, E = 9, F = 2, G = 4, H = 6, I = 8, J = 10

Figure 5

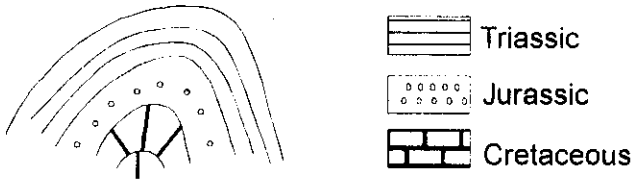


9. Figure 5 is a diagram showing how metamorphic facies A – G are related to temperature and pressure. Using the list below, identify the correct position for each metamorphic facies

1) Eclogite
2) Amphibolite
3) Blueschist
4) Greenschist
5) Zeolite
6) Hornfels
7) Granulite

a. A = 5, B = 6, C = 4, D = 2, E = 7, F = 3, G = 1
b. A = 6, B = 5, C = 3, D = 1, E = 2, F = 4, G = 7
c. A = 5, B = 6, C = 3, D = 4, E = 2, F = 7, G = 1
d. A = 1, B = 2, C = 3, D = 7, E = 6, F = 4, G = 5
e. A = 2, B = 6, C = 7, D = 5, E = 1, F = 3, G = 4

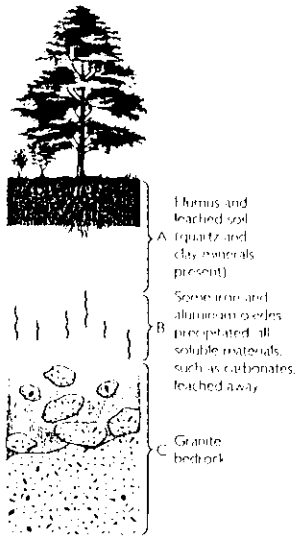
Figure 6.



9. The fold shown above is best described as:
a. Neutral syncline
b. Antiformal anticline
c. Antiformal syncline
d. Synformal syncline
e. Synformal anticline

10. A rock that is subjected to extension in two directions in the ductile field will result in which of the following types of structure.
a. Cylindrical folding
b. Domes and basins
c. Chocolate tablet boudinage
d. Listric faulting
e. Strike-slip faulting

Figure 7



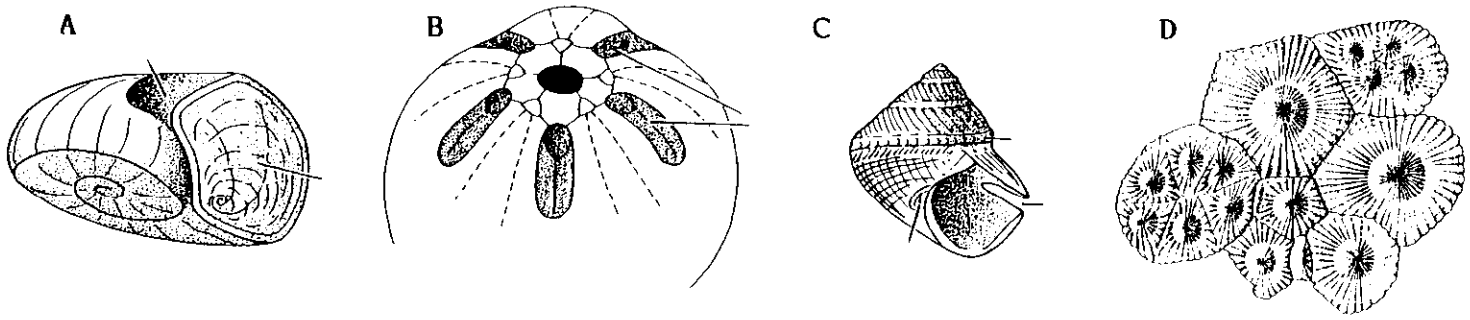
11. The soil profile shown in figure 7, would be best described as:
a. A residual soil formed in a temperate environment: A pedalfer
b. A residual soil found in a desert environment: A palaeosol
c. A transported soil found in a desert environment: A pedocal
d. A transported soil found in a wet environment: A laterite
e. A transported soil found in a wet environment: A pedalfer

12. The chemical reaction $CaSO_4 \rightarrow CaSO_4 .2H_2O$ is:
a. A common oxidation reaction within the sulphides
b. A common dissolution reaction within the carbonates
c. A common reduction reaction in the sulphates
d. A common hydration reaction within the sulphates
e. A common hydration reaction within the sulphides

13. A sedimentary rock is composed of 30% oolites, 50% fossils and 20% matrix (very fine calcite that cannot be seen by the naked eye). The rock is best described as:
a. Dolomite
b. Bioclastic limestone
c. Biooomicrite
d. Oobiosparite
e. A fossiliferous marble

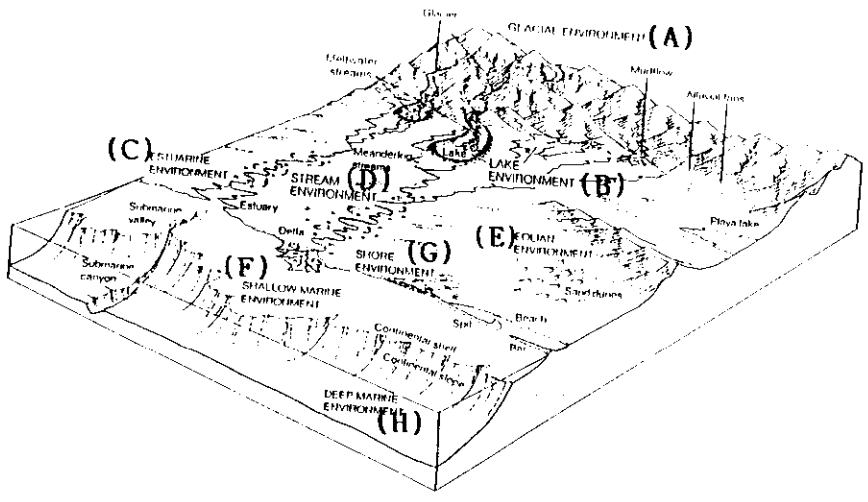
14. The high temperature, high pressure polymorph of Kyanite is
a. Chlorite
b. Garnet
c. Staurolite
d. Sillimanite
e. Trydimite

Figure 8

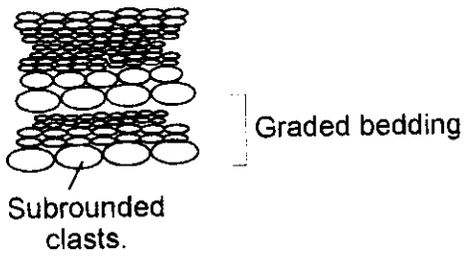


15. Four fossils A, B, C and D are shown in figure 8. Fossil A was found in rocks belonging to the Ordovician period. Fossil B was found in rocks belonging to the Tertiary period. Fossil C was found in rocks belonging to the Carboniferous period and fossil D was found in rocks belonging to the Silurian period. If we were to list the fossils in order from the oldest to the youngest then the answer would be:
a. A, B, C, D
b. D, C, B, A
c. C, D, A, B
d. A, D, C, B
e. B, C, A, D

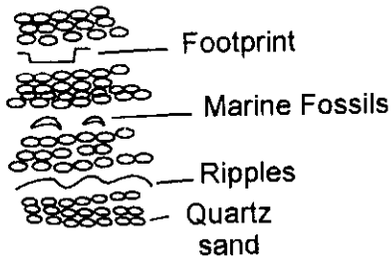
Figure 9



10a



10b



16. Figure 9 is a schematic diagram showing the various depositional environments A – H in which sediments may be deposited. Figure 10a shows a sedimentary rock sequence. In which of the environments shown in figure 9 could the rock sequence shown in figure 10a have been deposited?

a) A
b) B and H
c) C and F
d) D and G
e) E and A

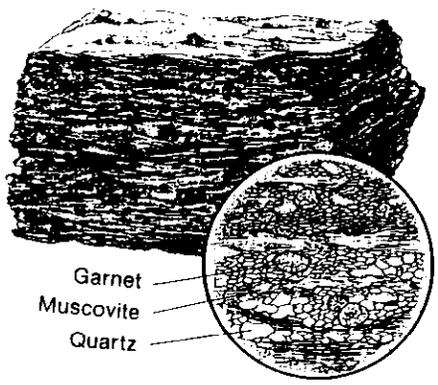
17) A sedimentary rock sequence is shown in figure 10b. In which of the environments shown in figure 9 could this rock sequence have been deposited?

a) A
b) B and H
c) C and D
d) G
e) E and F

18) Mg_2SiO_4 and Fe_2SiO_4 are two silicate minerals. Which of the following statements about these two minerals is true.

a) Mg_2SiO_4 is a single chain silicate and Fe_2SiO_4 is a double chain silicate
b) Mg_2SiO_4 and Fe_2SiO_4 are both ring silicates in which Mg replaces Fe and vice versa by ionic substitution.
c) Mg_2SiO_4 is a framework silicate and Fe_2SiO_4 is a ring silicate
d) Mg_2SiO_4 is a sheet silicate and is Fe_2SiO_4 a double chain silicate
e) Mg_2SiO_4 and Fe_2SiO_4 are both unit silicates in which Mg replaces Fe and vice versa by ionic substitution.

Figure 11



19. Figure 11 is a sketch of a metamorphic rock. The rock would best be described as:

a) Marble
b) Slate
c) Green schist
d) Schist
e) Gneiss

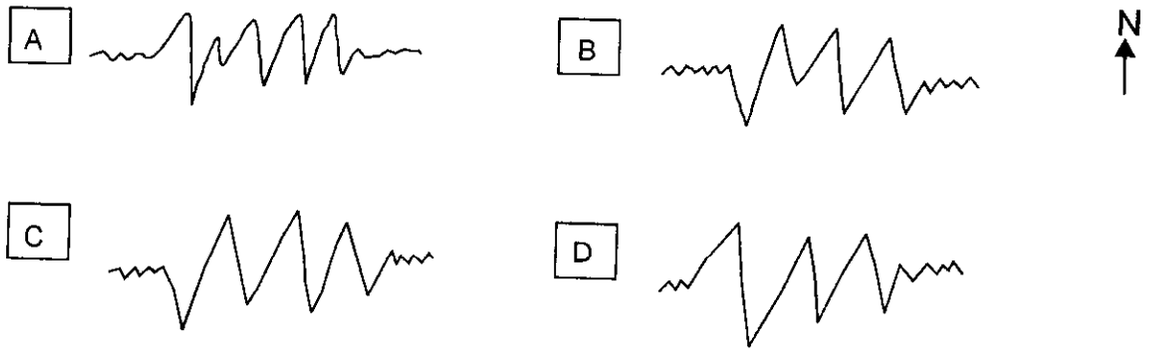


Figure 12

20. Figure 12 shows a series of records made by seismographs at four different locations. The data allowed geologists to determine that:

a) The fault was oriented N/S and showed dextral motion
b) The fault was oriented E/W and showed dextral motion
c) The fault was oriented N/S and showed sinistral motion
d) The fault was oriented E/W and showed sinistral motion
e) There is insufficient data to comment on the exact nature of the fault.

Answer the questions for section A in the table below. Remember that two marks will be given for each correct answer and half a mark will be deducted for each incorrect answer.

1	a	b	c	d	e
2	a	b	c	d	e
3	a	b	c	d	e
4	a	b	c	d	e
5	a	b	c	d	e
6	a	b	c	d	e
7	a	b	c	d	e
8	a	b	c	d	e
9	a	b	c	d	e
10	a	b	c	d	e
11	a	b	c	d	e
12	a	b	c	d	e
13	a	b	c	d	e
14	a	b	c	d	e
15	a	b	c	d	e
16	a	b	c	d	e
17	a	b	c	d	e
18	a	b	c	d	e
19	a	b	c	d	e
20	a	b	c	d	e

Section B (40 marks) **Name:**

Using **labelled diagrams** and examples explain what is meant by the following: (Remember no diagram = no grade)

1. A complex ion

2. A pegmatitic granite

3. A greywacke

4. β capture

5. Viscosity of lava

6. Metamorphic zones

7. Magnetic polarity

8. Glacial moraine

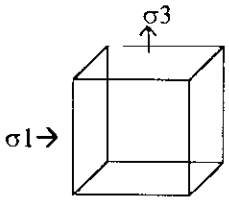
9. Seismic waves

10. Isostacy

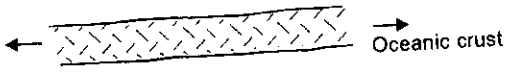
Section C (20 marks) **Name:**

Using **labelled diagrams** show the possible results of the action depicted in the figure. (Remember no diagram = no grade)

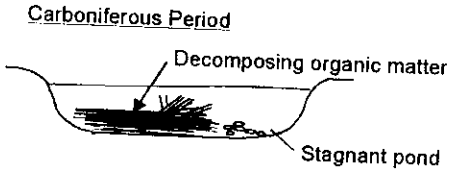
1.



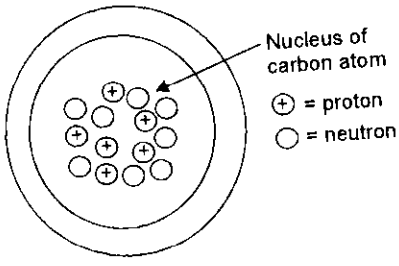
2.



3.



4.



5.