UNIVERSITY OF JOHANNESBURG

PROGRAM	:	BACHELOR OF ENGINEERING TECHNOLOGY *ENGINEERING METALLURGY* *EXTRACTION METALLURGY*
SUBJECT	:	**FUNDAMENTALS OF METALLURGY 1B**
CODE	:	**METMTB1 (GEOLOGY, PAPER 2)**
DATE	:	EXAMINATION 18 NOVEMBER 2017
DURATION	:	12:30 - 14:30
WEIGHT	:	60 : 40
TOTAL MARKS	:	100

EXAMINER	:	DR D H ROSE
MODERATOR	:	DR S D DU PLESSIS
NUMBER OF PAGES	:	7 PAGES

INSTRUCTIONS : *ANSWER ALL QUESTIONS.*

ALL WORK SHALL BE HANDED IN

ALL UJ EXAMINATION REGULATIONS APPLY.

NO CALCULATORS ALLOWED

REQUIREMENTS : **ONE (1) EXAM ANSWER SCRIPT PER STUDENT**

SECTION A
QUESTION 1

State if the following are true or false

1.1 The manner in which mineral grains or crystals aggregate is known as the crystal habit.

1.2 The appearance of a mineral exposed to light is known as its streak.

1.3 Minerals in the salic group are generally light in colour.

1.4 A mineral with cubic cleavage can only be galena.

1.5 When minerals break, producing flat surfaces that are parallel to crystal directions it is known as fracture.

1.6 Biotite, muscovite and phlogopite are members of the pyroxene group of minerals.

1.7 Anorthite and albite are members of the feldspar group of minerals.

1.8 Pyrite is an example of the mica group of minerals.

1.9 Salic minerals have relatively low densities compared with mafic minerals.

1.10 A fine-grained igneous rock composed of alkali feldspars with quartz as the essential minerals is known as granite.

1.11 If the silica content of a magma is relatively low, the magma is said to be basic.

1.12 In a basic magma that is cooling down slowly, calcium-rich feldspar will crystallise before sodium rich feldspar.

1.13 A sill is an igneous rock in the form of a sheet that cross-cuts the structural planes of the surrounding rocks.

1.14 Dolerite is an igneous rock composed essentially of quartz.

1.15 During diagenesis, sediment changes into a rock through the development of new minerals.

1.16 Limestone can form by either chemical or biochemical processes.

1.17 During lithification, the grain size of a sediment increases.

1.18 Clastic sedimentary rocks are classified primarily on the basis of their grain size.

1.19 Iron-ore may occur as a chemical sedimentary rock.

1.20 Carbonaceous sedimentary rocks may be characterized by high contents of carbonate.

1.21 Increases in temperature and pressure cause mineralogical changes in rocks in the process known as metamorphosis.

1.22 Clayey minerals in a sedimentary rock recrystallize to form new minerals in a zone known as a metamorphic aureole.

1.23 Gneiss forms when clay-rich sedimentary rocks undergo high-temperature but relatively low-pressure conditions.

1.24 The different ranges of temperature and pressure in which metamorphic rocks can form are referred to as metamorphic grade.

1.25 At temperatures of 800°C and higher, rocks of granitic composition begin to melt entirely and then form gneiss.

[25]

QUESTION 2

Match the rock/mineral on the left-hand side with the relevant description on the right hand side. Write your answer as '2.1 a' or '2.1 b' etc.

2.1	Granite	a.	Glacial origin
2.2	Pyrite	b.	Rhombohedral cleavage
2.3	Dolerite	c.	Contains detrital feldspar
2.4	Arkose	d.	Abyssal, acid rock
2.5	Basalt	e.	Banded metamorphic rock
2.6	Calcite	f.	Iron sulphide
2.7	Gneiss	g.	Lava
2.8	Microcline	h.	Argillaceous
2.9	Mudstone	i.	Salic mineral
2.10	Tillite	j.	Chemically-formed rock composed of microcrystalline silica
2.11	Chert	k.	Calcium sulphate mineral with a hardness of 2 on Moh's scale
2.12	Gabbro	l.	Igneous rock composed essentially of alkali feldspars
2.13	Shale	m.	Lava
2.14	Gypsum	n.	Igneous rock composed of plagioclase and augite
2.15	Trachyte	o.	Dyke rock

[15]

QUESTION 3

Give one word for the following statements

3.1 The name of a mineral which is part of a solid solution series

3.2 A salic micaceous mineral

3.3 A deep-seated ultrabasic rock

3.4 A lava rich in pyroxene and plagioclase

3.5 The extrusive equivalent of syenite

3.6 The planar surfaces which separate strata from each other

3.7 The most common mineral in arenaceous sedimentary rocks

3.8 A carbonaceous sedimentary rock

3.9 The name of a metamorphic rock intermediate between slate and schist

3.10 A magnetic mineral with a black streak

[20]

SECTION B

MULTIPLE CHOICE

1. The following are physical properties which can be used to identify rock-forming minerals:

   (a) colour
   (b) smell
   (c) crystal shape
   (d) (a) and (b)
   (e) (b) and (c)
   (f) (a) and (c)
   (g) all of the above
   (h) none of the above

2. Native elements

   (a) are natural earth substances composed of multiple metals.
   (b) are natural earth substances composed of carbonates.
   (c) are natural earth substances composed of sulphides.
   (d) are natural earth substances composed of oxides.
   (e) can form as any of the above.
   (f) are none of the above.

3. Amphiboles crystallise

   (a) with two cleavage sets at 60 degrees.
   (b) with two cleavage sets at right angles.
   (c) with three orthogonal cleavage sets.
   (d) with one prominent cleavage.
   (e) as none of the above

4. Feldspars may occur in

   (a) acid igneous rocks.
   (b) femic igneous rocks.
   (c) intermediate igneous rocks.
   (d) all of the above rocks.
   (e) none of the above rocks.

5. According to Bowen`s Reaction Series,

   (a) Ca-feldpar crystalises out of a cooling magma before Na-feldspar.
   (b) Na-feldspar crystalises out of a cooling magma before K-feldspar.
   (c) K-feldspar crystalises out of a cooling magma before Ca-feldspar.
   (d) (a) and (b)
   (e) (b) and (c)
   (f) (a) and (c)
   (g) all of the above
   (h) none of the above

6. Igneous rocks form when

(a) magma cools down.
(b) magma crystallises.
(c) metamorphic rocks melt.
(d) sedimentary rocks get metamorphosed.
(e) (a) and (b)
(f) (b) and (d)
(g) none of the above

7. When a basic magma crystallises, the last minerals to form are rich in

(a) SiO_2
(b) Na
(c) Mg
(d) (a) and (b)
(e) (b) and (c)
(f) (a) and (c)
(g) all of the above
(h) none of the above

8. Karoo dolerite dykes are examples of

(a) intrusive rocks.
(b) extrusive rocks.
(c) hypabyssal rocks.
(d) (a) and (b)
(e) (b) and (c)
(f) (a) and (c)
(g) all of the above
(h) none of the above

9. Gabbros are coarse-grained equivalents of

(a) basalt and dolerite
(b) trachyte and syenite porphyry
(c) andesite and diorite porphyry
(d) none of the above

10. The rocks below are examples of clastic sedimentary deposits except

(a) conglomerate.
(b) sandstone.
(c) ironstone.
(d) mudstone.

11. The odd-one-out in the list below is

(a) quartz
(b) orthoclase
(c) pyrite
(d) muscovite

12. When _____ undergoes increasing pressure and temperature, it forms marble.

(a) andesite
(b) limestone
(c) mudstone
(d) basalt
(e) all of the above
(f) none of the above.

13. The rocks below are metamorphic, except

(a) migmatite.
(b) slate.
(c) schist.
(d) kimberlite.

14. The rocks below are examples of mechanically-derived sedimentary deposits except

(a) siltstone.
(b) sandstone.
(c) conglomerate.
(d) banded ironstone

15. When solid particles released from bedrock by weathering are lithified, they produce

(a) mechanically formed sedimentary rocks.
(b) clastic sedimentary rocks.
(c) detrital sedimentary rocks.
(d) all of the above.
(e) none of the above

16. The following are arenaceous rocks, except

(a) sandstone.
(b) arkose.
(c) grit.
(d) breccia.
(e) none of the above

17. When rocks are metamorphosed, they are subjected to the following, except

(a) higher temperatures
(b) higher pressures
(c) fluid activity.
(d) lithification
(e) both C and D

18. When, due to metamorphism, femic and salic minerals occur in alternating layers, the rock is a

(a) slate
(b) schist
(c) gneiss
(d) migmatite

19. The three major types of sedimentary rocks are:

(a) organically formed, chemically precipitated and soluble sediments
(b) mechanically formed, chemically precipitated and biochemically formed
(c) soluble, insoluble and precipitated
(d) none of the above

20. The difference between a conglomerate and a breccia is:

(a) a conglomerate has angular fragments and a breccia rounded fragments
(b) a conglomerate has large cobbles and a breccia small pebbles
(c) a conglomerate has rounded fragments and a breccia angular fragments
(d) both a. and b.
(e) none of the above

(40)