

# GEOLOGY SYLABUS



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## INTERIM JOINT MATRICULATION BOARD EXAMINATION (IJMBE)

## **GEOLOGY SYLLABUS (REVISED 2012)**

#### Introduction I.

The word "geology" comes from the Greek word geo meaning the Earth and logos a discourse. Geology, therefore, might be described as the science that deals with the description and understanding of the Earth from its creation to present day.

Geology is essentially an observational field science, which should be taught mainly in the classroom and in the laboratory with supporting fieldwork. The study of geology involves the knowledge and application of the natural sciences (Chemistry, Physics, Biology and Mathematics).

This syllabus is designed to provide an overall knowledge of the subject, i.e. It presents the students the opportunity to note and appreciate the economic significance of naturally occurring local materials. It also provides an understanding of geological principles and processes relevant to the application of the knowledge to aspects of human endeavours.

The scope includes the following:

- General geological principles and processes;
- Identification and use of minerals, rocks and fossils;
- Simple geological field measurements, description preparation.
- Interpretation of simple geological maps.

The contents of this syllabus are expected to be taught in one academic year

(twelve calendar months)

#### Objective(s): II.

By the end of the course, students should be able to:

Define Physical Geology, mineralogy, petrology, etc.

- Understand the origin of the universe and the position of the Earth in the solar system,
- Understand the internal structures and composition of the Earth.
- Describe how the various landforms originated.

- Understand Howageorogical Readinger of formations and events are determined.
- Know the basis for correlation of strata.
- Know the environments of sedimentation.
- Know basic units in stratigraphy.
- Distinguish between a mineral and rock and describe different types of common rocks in terms of their mineralogical composition, texture and structures; to classify these rocks into the three major groups (i.e. Igneous, Metamorphic and Sedimentary) and state their uses.
- Determine the origin and mode of occurrence of igneous, metamorphic and sedimentary rocks.
- Describe the physical properties of a mineral with a view to its identification.
- Identify a mineral in common mineral assemblage.
- Determine its origin, and modes of occurrence.
- State its uses.
- Identify the economic minerals and economic deposits and their association within host rocks; their geographical locations within Nigeria; the geological conditions for their formation accumulations.
- Make crystallographic observations, which will enable them to describe correctly and identify minerals, and to relate mineralogical. properties to crystallographic features.
- Describe the major invertebrate phyla; morphology, geological history and the relationship between them.
- Understand their applications in relative age determination.
- Learn to use geological tools like topographical maps, geological hammer, hand-lens, geological compass, etc.; field observations on rock outcrops, vegetation, drainages, geological structures; locate the observed features appropriately on the topo-map of a selected area and give detailed descriptions in a field notebook; make a geological interpretation of the observed features, prepare a geological map at a given scale based on the observed features; and give a brief geological history of the area.

## **Examination Structure:**

Assessment of the subject shall be in two main parts, namely: Continuous Assessment and Examination

Continuous Assessment (C.A) (a)

be based on Continuous Adense Sessiment Component Componen performance of the candidates in the following:

- Terminal tests and assignments
- Practical
- Field school reports.
- Attendance

C.A. shall constitute 20% of the total mark. The C.A. marks are to be submitted under four (4) headings, viz: attendance, terminal tests and assignments, practical, and field school reports, where field school reportcarries08%, practical 05%, tests and assignments 05% and attendance 02%. Students' graded fieldwork reports should be submitted, along with the C.A. reports, to the Chief Examiner.

#### Examination **(b)**

The examination will consist of two theory papers and a practical paper made up as follows:

> Geology, Palaeontology (Physical PAPER I and

Stratigraphy)

(Mineralogy, Crystallography, Petrology and

Economic Geology)

PAPER III (Practical)

The three papers shall contribute 80% towards the total mark and shall be equally weighted. Each of the theory papers shall contain SEVEN questions out of which candidates will be expected to answer FIVE. In each of these papers there shall be ONE compulsory question consisting of at least THREE sub-questions covering the main areas for the paper. Thereafter candidates shall be required to attempt any FOUR questions.

> Paper III shall consist of FIVE compulsory questions with at least one question each on

- Simple geological map interpretation
- Mineralogy
- Crystallography
- Petrology
- Palaeontology

Each examination paper will be for duration of three (3) hours. Candidates will be expected to use their experience in the field when answering any relevant

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questions in any paper. Questions will be set which will test the candidate's knowledge of field techniques and the ability to apply them in relevant situations.

# DETAILED SYLLABUS

# FIRST SEMESTER SYLLABUS

S/NO	TOPICS / CONTENTS	ACTIVITIES/ PRACTICAL GUIDE	INSTRUCTIONA L MATERIALS	DURATION
1.	PHYSICAL GEOLOGY	CONTRACTOR		
	<ul><li>(i) A brief introduction to the origin of the universe; solar system.</li><li>(ii) Concept of the layered structure of the Earth</li></ul>	Interactions between tutors and students, tutorials, tests	* Layered structure of the earth  * Folding	7weeks/42hrs
	(Core, mantle and crust); the nature of the evidence for the existence and	e amount	* Faulting	
	characteristics of the layers.		Primario Inter-	
	(iii) The nature and origin of earthquakes and vulcanicity;	efaematite.  plagnetite.  cursolatie.	bee von te een	
	relationship of earthquakes and igneous activity to major earth structure.	The second secon	Service Annual Control of the Contro	
	(iv) The theories of continental drift, seafloor	Fuor e beliez etc	on the state of th	
	spreading and plate tectonics and an outline of the evidence for them.	n en	gradien 1927 grifffynstâ Grifffynstâ	
1	The form and structure of the ocean floor.	Decreased Manager Manager Manager Communication Communicat	pomonicum le 220	
	(v) The descriptions of the main types of folding and	periodyla i principal	the photos we have	
	faulting; the nature of cleavage and its relationship to other	Sugar ac.		
	structures; jointing.  (vi) Types and prucessee	principled principle stroom into	•	

weathering; soil	Section 2 to the section		1 2 Sinn
of weathering; soil formation; erosion; erosion);	BY WWW.READNIGERIANET	WORK.COM	
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denosition of Illaterials	- Land	. 7 8 9 7 7 5 70 7 8 75	
mass movement, water,	17.1	to this of Markey	Mair Trains
mass movement, wind (marine and fluvial), wind			
(Agolian) and Ice and In-	WHILL HAVE	13 7 11 7 12 1 1 1	The state of the s
resultant landform.	10 0.1 00011		
		mark at the second seco	
n - L	Determination of the	1. Streak plates	ALC: No.
2. MINEROLOGY	physical properties	2. Pen knife	evilla or
WINADAG	of minerals (e.g.	3. Mineral	
(i) Definition and general	colour, streak, luster,	specimens	A Cart of the
processes of formation of	hardness, cleavage,	4. Standard	ridj (1951)
minerals; Atomic bonding.	etc) from the	minerals for	Alra be we we
and the second s	following common	hardness	
(ii) The composition of	groups with a view	determination.	4weeks/24hrs
minerals. A simple	to naming them:	Only War in	241113
classification of minerals		The same of the same	
based on chemical	Native elements:	word video edit on ener	en en
composition into native	Copper, graphite,	State Court todays and	David .
elements, sulphides,	sulphur, etc.		acast to the
oxides, halides, carbonates,		7 134.115	STREET STREET
sulphates, phosphates and	Oxides:		a section of
silicates.	Haematite.	and the section Cal	the standards
Sincates.	magnetite,	torra e con a serial con a	100
(iii) Forms of occurrence	cassiterite,	and workings	a -349   1 W/L
e.g. crystals, crystal	limonite,	7.00	The stand
aggregates, aggregations	corundum	rannolli a lo que	Calleton .
such as fibrous, lamellar,	etc.	pi gradial subtic	bres
botryoidal, etc.	EIC.	and to find a state of the stat	minimal attent
boti yoldar, etc.	Halides:		
(iv) Physical properties a		to estroit off	(A1)
(iv) Physical properties e.g.	Fluorite, halite, etc.	scollage Jimb. Ico	eritada
colour, streak; luster;	0.1	style frag 11 ga	
hardness; fracture;	Carbonates:	I send in his bern and	1000000
cleavage; magnetism,	Calcite,	make the beatle	
density.	Dolomite	To concern they me	The fu
	Malachite,	700 1	bor out
(v) Modes of occurrence	Azurite, etc.		
and mineral assemblages.		subjection process	T (v) 1
	Sulphates:	but build I to you	r piaco:
	Gypsum,	in control delt	ar hori
	Barytes etc.	zit - ban -	1
- v - · · · · · · · · · ·	<del>-</del>	Striker and ends	
	Sulphides:		1
	Pyrite,		1
	Chalcopyrite,		
	Galena, sphalerite.		

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	or Ecribed	Group-quartz,	1.10	
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1.		Garnets ventioned	GEN AND THE RESIDENCE OF THE PROPERTY OF THE P	
	The state of the state of	Tourmaline.		
		dominio sola.		
1 435		Drawing and		1817
3.		describing crystal	1. Crystal models/	
	CRYSTALLOGRAPHY	models or natural	Natural crystals	
	(i) Definition of "crystals",	erystals; inserting	2. Contact	s/24hrs
	"crystalline" and	and labeling		
	"amorphous".	crystallographic	gomonicici	
		axes; measuring		
	(ii) Atomic structure of	interfacial angles;	2	a.
1	minerals, including the	recognizing than - on		
	concepts of crystal lattice,	symmetry elements		
	unit cell, crystal forms etc.	in the crystal models;		
	Atomic bond types.	assigning a crystal to		
	(iii) Chartall	its crystal system.		
	(iii) Crystallographic axes;	d general influence of the	1 7	
	interfacial and solid angels	Agriouterate _ tage		9
	(coigns); law of constancy	The second second		
	of interfacial angels.	Table 1	252 - 1 Care - 195	
	(iv) Flements of summeters	F SEED CAND		
3	(iv) Elements of symmetry in crystals; planes of	bringerhildgematel	A total picket despersi	
£1	Symmetry: control of	Hars, parting out	A Jappan meldeponerist i	10 10
	symmetry; centre of symmetry; axes of		A Chinadaleangan a Car A Mahaman ana mahaman sa C	
	symmetry, axes of	M. L. Darwienh, aming A	per an personal maner	
The state of the s	- James y.			

1			
	(v) Classification of crystals based on the six crystal systems; examples of natural minerals in each system are to be given.		
4.	PETROLOGY I Sub-topic I: Igneous Rocks (i) The origin and occurrence of common igneous rocks.  (ii) Mineralogical composition, textures and structures of igneous rocks.  (iii) Classification of igneous rocks based on simple mineralogical composition, texture / structure.	Candidates will be required to describe specimen of the rocks listed below in terms of mineralogy and texture/structure, to give names or positioninabroad classification and to assign a specimen to its major rock group; igneous, metamorphic or sedimentary. Igneous:  Coarse – grained:  Pegmatite, gabbro, granodiorite, etc. Medium – grained:  Microgranite (including quartz porphyry), dolerite, etc.  Fine – grained and glassy: rhyolite, obsidian, pitchstone, andesite, basalt, etc.  Pyroclastic:	1. Samples of common rocks as listed above  6 weeks/36hrs
	Sub-topic II:	Pumice, tuffs, Agglomerate	(ii) Cry rath-graphs axes; intertectal and actid as rely (colour, law of rath lane) of heart sist regels
	(i) Metamorphism: major types of metamorphism (thermal / contact, dynamic	Metamorphic: Slate, phyllite, Schist, gneiss, migmatite, quartzite,	

	and regional).	ED BY WWW.READNIGERIANI	ETWORK.COM	
	(ii) Metamorphic factors; metamorphic zoning	law -	2 Simple	
	(iii)Mineralogicalcompositi	Later to the	2. Simple magnifying glass	
	on of common	Control - Colo	or hand lens	
	metamorphic rocks.		3. Pen knife	1
	(iv) Metamorphic textures and structures, e.g.	1 1/10		
,	foliation, schistocity, banding, porphyroblastic,	r importante de la compositione		G
	augen, etc.	editions.		
Zinz	September 1	•	Company of the proof of	er jud so e sem up lo
		•	el election	3Weeks/18hrs

## **Total 144hrs**

# SECOND SEMESTER SYLLABUS

		15 11 75 6 2115
PETROLOGY II	()	con W . C.
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Sub-topic III: Sedimentary		10 million of the
Rocks	'	pergraph one man introvite percy
ROCKS		heurghische vann Sydering und
(i) Origin of the components	Sedimentary:	ban grittem at str.
of a sedimentary rock (Refers	Conglomerate,	4weeks/24hrs
to physical geology.	breccia,	10H: W . // // // // // // // // // // // // /
Weathering, erosion,	sandstones	bestseem as its or gribus,
transportation and deposition /	(including	and Maley said. Water
chemical precipitation).	arkose,	treatment ( limited by ag.
	greywacke,	the state of the state of the state of
(ii) Diagenetic processes	quartzose	gellation and wave procedualing
, a gament processes	sandstone,	States beam and water reased to
(iii) Primary sedimentary	glauconitic	EL-Carla
structures and textures.	sandstone,	
	micaceous	at vicasum aut it see their
(iv) A simple classification of	flags, grits);	segment about the particular control
sedimentary rocks into broad	shale, marl,	(una personal passing - mar)
groups (clastic, organic and	mudstone,	

	chemical).	T	
	oneimeary.	limestones	
		(including	
		oolitic and	- could refer the Aug   - 1
		organic types,	(SIRES 18th Courses)
7		chalk,	
1 1		dolomitic	a Learning Learning Europe Millian
	etrut research		n marrie la
		limestone)	10.1
		simple	a management of the Control of the C
1		evaporites	
		(gypsum,	regulated additional SM (v)
		halite	Loud Christians etc.
		dolomite),	recorded and individual
		chert and flint,	La se desa reference
		coals.	
11 - 1		coais.	
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1			
6.	ECONOMIC CEST CO.	1	
0.	ECONOMIC GEOLOGY	· .	
	(2) (FI)		
	(i) The origin and distribution		4weeks/24hrs
1	of the main types of economic		2 71113
1 664	mineral deposits with		
	emphasis on Nigerian		the amount is a second of the
1	examples.		
	•		
	(ii) Fuels: Nature, origin and	2018	COMD SENT PRESENT MES GWOOD
1	occurrence of coals; petroleum		
	and natural gas.		
	and natural gas.		
1	(iii) W-4		
	(iii) Water:		PETROLO IX II
1	Geological factors governing		
	the accumulation of		Sab-topic I I: Sedimentary
	groundwater and the storage		Rocks
	of surface water; hydrological		
è	cycle, permeability and	9.8	duración de control de la cont
1	porosity. Artesian structures;	DVM 195 mile ogs	Cargar of the composition
	springs and wells. Water	Ships Freds.	of a sodime tray rock (Refera-
	quality (chemical, physical		in physical scolors.
	and biological). Water	i jamedana) s	Westbornin browns
	treatment (filesetian 1 ::	s abgitues"	Consportates and deposition /
	treatment (filtration, boiling,	the state of the state of	sherologi gre initutioni
1 3	chlorination, etc.). Water	A Mark Commence	
7	pollution and water protection.		
	Water borne and water-related	i in the little	(ii) Diagonet c processes
	diseases.	Sang-anse	
,	· · · · · · · · · · · · · · · · · · ·	- attenuating	the Princy schemenary
	(iv) Rocks as raw materials: In	i sztanikádlad	Machines and textures a
	the construction industries	l op er konteangier i	
	(roads dams have		1 to a golden character at long of a
1	(IVaus, udille notings said		
	(roads, dams, houses, etc), manufacturing industries	. The fact well a	most con other germanos.

	(cement, glass, clay bricks fertilizers, etc.)	BY WWW.READNIGERIANE	TWORK.COM	Committee .
7.	PALAEONTOLOGY	*		G1 19
	<ul> <li>(i) Fossil; nature, types and processes of fossilization.</li> <li>(ii) Outline of the distribution in time and space, the morphological features and geological history of the</li> </ul>	Students are to:  - Draw, label, and describe morphological features of the main groups	1. Fossil and model specimens of the main groups listed above.	5weeks/30hrs
rahit.	following main groups of invertebrate fossils.  Trilobite, scleractinian (Hexacorals), and rugose corals; crinoids, regular and irregular echinoids; articulate	invertebrate fossils listed above; -Place a specimen in its fossil group;	2. Drawing materials	84.
	brachiopods, inarticulate brachiopods (Lingula and orbiculoidea only); examples of fixed, active and burrowing types of bivalves	-Give approximate age range of its existence		(Comp. 44)
	(pelecypods); gastropods; nautiloids, goniatites, ammonites, belemnites; and graptolites.	-Give application in dating and correlation		
· .	(iii) Brief outline of the history of life, including plants and vertebrates.	- State their distribution in space and time in rock formations in Nigeria.	Hamadil Astronomic Perspective School (1997)	The second
8.	STRATIGRAPHY			
Pjt	(i) The geological column and time scale; geochronology – radiometric dating.	Interactions, tutorials, assignments, tests	Whenest Lot	5weeks/30hrs
	(ii) The geological systems, their broad characters and distribution in the international type localities, treated so as to illustrate	to Zarra bri ma ang at al Geology: Camada Hada, a	Hi autgioni 9 Getekar busketr	ndati Santati (1 Santati (1)
	general stratigraphical concepts and principles rather than successional details.	Ni accelery by C in Lamina.	is Elements of cost districts	gajandi S Saurindi Le
	(iii) Events stratigraphy: Orogenic movements; marine transgression and regression,	adedonii 1918 ga Solomor I. gasta	e standeres Palitaliand by C	otassi Kumfil

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	unconformities, cyclic sedimentation, geo-synclinal, shelf sea and vertical changes of facies; the problems and methods of classification and correlation of strata.  (iv) An outline Geology of Nigeria.	d Sudon anobad b	Concession of the continues of the conti	IAQ 5
9.	FIELD GEOLOGY Use of compass, G.P.S., topographical maps; scales; drawing of sketches; drawing of cross-sections; interpretation of simple geological maps.  (ii) Field study of examples of weathering, soil formation, erosion and sedimentation processes.  (iii) Examination in the field of igneous, metamorphic and sedimentary rocks, associated structural and other features including landforms; preparation of field notes and reports.  (iv) Preparation of simple field geology map of a small selected area (on scale 1: 1000).	Problems are to be given to students to solve in map reading, scale, compass reading, etc.	1.Topographical maps  2.Compass/elino meter  3.G.P.S.(Global Positioning System)  4.Geological hammers (1 kg type)  5. Hand-lenses	5 weeks/30hrs of field work
10	Revision		MASSIY	BELSTRATE
10	ICAISIOII	·		1week/6hrs

**Total 144hrs** 

## **Recommended Texts / Reference Materials:**

## Basic:

- 1. Holme's Principles of Physical Geology, 4<sup>th</sup> Edition, edited by M. Mcl. Duff, Published by Chapman & Hull.
- 2. Rutleys's Elements of Mineralogy by C.D. Gribble, 27<sup>th</sup> Edition, CBS Publishers and Distributors London.
- 3. Petrology for students by S.R. Nockolds, R.W. O'B. Knox and G.A. Chinner, Published by Cambridge University Press, Cambridge.

- paleontology: An Introduction by Nield and Tucker.
- 5. Stratigraphy: An introduction to Principles by D.T. Donovan, Publ. By Wiley Inter. Science.
- 6. Dictionary of Geology (Penguin).

## Recommended Further Reading Texts

- Petrology of the Igneous Rocks by F.H. Hatch, A.K. Wells and M.K. Wells. Thomas Murby & Co., London.
- Geology of Nigeria, edited by Kogbe, C.A. Published by Rock View (Nig.)
   Ltd, Jos. Nigeria, 2<sup>nd</sup> Revised Edition 1989.
- 3. Principles of Paleontology by Raup and Stanley.
- 4. Invertebrate Paleontology and Evolution, 2<sup>nd</sup> Edition by E.N.K. Clarkson, Publ. George Allen & Unwin Ltd.
- 5. Stratigraphy and Sedimentology by Krumbein and Sloss, 2<sup>nd</sup> Ed., Publ. by Freeman & Co., San Francisco.
- 6. Sedimentology (Process and Products) by M. Leeder.
- 7. Principles of Stratigraphy by Dunbar and Roger.
- 8. Field Geology by F.H. Lahee, Publ.: McGraw-Hill Book Company, New York.
- Simple Geological Structures and Maps: A Laboratory Manual by E.A. Bala, A.B.U., Press Ltd., Zaria, Nigeria.
- Sedimentary Rocks by E.J. Pettijohn. Harper and Row, Publishers, New York.
- Hydrogeology by Davis, S.N. and De Wiest, R.J.M. John Wiley and Sons, New York.