FISHERIES (ALTERNATIVE B)**

(For candidates in Nigeria only)

1. PREAMBLE

This syllabus has been designed to assess Fisheries as a trade for livelihood with emphasis on the acquisition of knowledge and skills in Fisheries and entrepreneurial skills associated with the content.

Candidates will be expected to answer questions on all the topics set out in the column headed ***Syllabus***. The ***notes*** therein are intended to indicate the scope of the questions which will be set, but they are not to be considered as an exhaustive list of limitations and illustrations.

2. AIMS AND OBJECTIVES

The syllabus will therefore seek to assess candidates on:

(1) the importance of fisheries in the socio-economic development of West Africa;

(2) skills in fish farming;

(3) basic entrepreneurial skills in fisheries related vocations;

(4) the effects of water pollution on fishery resources;

(5) fish preservation and processing techniques.

3. REQUIREMENTS

(1) Schools offering Fisheries must have at least a small glass/plastic tank/aquarium and a fish pond/concrete tank.

(2) The study should be supplemented by visits to well established fish farms, fisheries research institutions, fishing companies and other institutions related to fisheries.

(3) It is recommended that candidates keep practical notebooks which should contain records of activities based on laboratory and individual observations carried out in

glass tanks/aquaria and fish farms, field trips and also records of specimens collected.

(4) Schools should prepare an album of fishery organisms, fishing gear and craft and different fish rearing facilities and equipment for teaching purposes.

4. SCHEME OF EXAMINATION

There will be **three** papers, **Papers 1**, **2** and **3** all which must be taken. **Papers 1** and **2** will be a composite paper to be taken at one sitting.

PAPER 1: Will consist of forty multiple choice objective questions all of which should be answered within 40 minutes for 40 marks**.**

PAPER 2: Will consist of **six** essay questions. Candidates will be required to

Answer **four** questions within 2 hours for 80 marks.

PAPER 3: Will be a practical paper for school candidates and alternative to practical work paper for private candidates. Each version of the paper will consist of four questions all of which should be answered within 1½ hours for 60 marks.

DETAILED SYLLABUS

CONTENTS	NOTES
A. **BASIC CONCEPTS IN FISHERIES**	
1. Introduction to Fisheries	
(a) Meaning of fisheries.	Explanation of the terms fishery and fisheries. Fisheries refer to all processes involved in fish production, processing, marketing and distribution. Fishery is one aspect of fish production.

(b) Sub-divisions of fisheries.	Knowledge of the following is required (i) Capture fisheries (fishing): - subsistence fisheries; - artisanal fisheries; - industrial fisheries. (ii) Culture fisheries (aquaculture).
2. Importance of fisheries.	Importance of fisheries e.g. food, employment, income generation, social-cultural activities, aesthetics, medicinal etc.
B. PROCESSES OF FISH PRODUCTION	
1. Capture fisheries	
(a) Different methods involved in capture fisheries.	Various methods of capture fisheries such as hook and line, cast netting, set netting, trap/trapping, trawling, harpooning should be assessed.
(b) Materials required for capture fisheries and their uses.	Assessment should include hooks, cages, knives/cutlasses, traps/basins, spears, cast nets, gill nets, seine nets, drag nets. Knowledge of the uses of the materials is required.
CONTENTS	**NOTES**
2. Culture fisheries.	
(a) Identification of common qualities of culturable fish species.	Students should have the knowledge of the qualities of culturable fish species such as hardiness, acceptability of artificial fish feeds, tolerance to poor water quality, ability to reproduce in captivity.
(b) Identification of common culturable	Students should be able to identify common culturable fishery organisms such as

fishery organisms.	*Clariasspp*, T*ilapia*, H*eterobranchus, shrimp, sea weeds*.
(c) Culture facilities.	Assessment should include description of culture facilities such as ponds, tanks, race ways, cages, pens.
C. **TYPES OF FISH CULTURE FACILITIES AND CULTURE SYSTEMS**	
1. Fish ponds.	Knowledge of different types of fish ponds: earthen ponds, concrete tanks, plastic tanks, fibre glass tanks etc is required.
(a) Types of fish ponds.	Assessment should be limited to the components of fish ponds: inlets, outlets, dykes/embankments/walls, monks and spillways.
(b) Components of fish ponds.	Explanation of monoculture, poly culture and integrated fish farming is required.
2. Systems of aquaculture.	Assessment should include the extensive, intensive and semi intensive systems of aquaculture management.
(a) Types of aquaculture.	
(b) Management systems in aquaculture.	
3. Water quality control and monitoring.	Conditions of water that promote good health of fishery organisms for survival should be assessed .
(a) Definition of water quality.	Assessment should cover the various water quality parameters such as dissolved oxygen (DO), pH, temperature, turbidity, conductivity.
(b) Water quality parameters.	
CONTENTS	**NOTES**
(c) Methods of monitoring water quality.	Knowledge of the methods used in monitoring water quality: DO meter, wrinkler method, pH meter, litmus test etc is required.
(d) Water pollution.	Knowledge of water pollution should be assessed under the following headings:

(e) Optimum water parameter ranges	- causes (poisons, sewage, debris, household refuse); - prevention and control. Knowledge of optimum water parameter ranges is required: - DO(5.0 – 8.0 mg/l); - pH(6.5 – 8.0); - turbidity (secchi disc measurement less than 30 cm).
D. **FISH FEEDS AND FEEDING** 1. Fish feed/food materials. (a) Identification of different fish feed/food materials	Knowledge of natural fish food (phytoplankton and zooplankton) and artificial fish feed should be covered. A clear distinction between food and feed should be made.
(b) Nutritive value of fish feed ingredients	Assessment should cover energy yielding ingredients (corn, wheat bran, garri, rice bran etc.) and protein yielding ingredients (soya bean, fish meal, groundnut cake etc.). Details of ration formulation and biochemical details are not required.
2. Fish feeding. (a) Feeding regime for fish.	Knowledge should cover explanation of feeding regime such as 3% - 5 % of fish body weight based on age/size is required.
(b) Ideal feeding periods for fish.	Knowledge of ideal feeding periods based on age/size is required.
CONTENTS	**NOTES**
(c) Methods of feeding.	Assessment should cover feeding methods such as broadcasting, spot/point feeding, automated feeding.
E. **FISH POND PREPARATION AND MANAGEMENT** 1. Fish pond construction	Assessment would cover site selection; construction of earthen ponds: land

2. Pond preparation (a) Tools required for pond preparation. (b) Preparation of ponds for stocking. 3. Pond management. (a) Meaning of pond management. (b) Pond management practices. F. **FISH HARVESTING AND POST HARVESTING PROCESSES** 1. Materials and methods for harvesting fish. (a) Fishing gear (b) Construction and mending of fishing gear. (c) Methods of fish harvesting. (d) Fishing crafts	measurement/mapping, staking, excavation, building of dykes etc; construction of concrete ponds: land measurement/mapping, staking, stripping of the top soil, concrete base or casting, building with correct mixtures of sand, gravel and cement etc. Knowledge of tools such as digger, head pan, cutlass, wheelbarrow, spade, hand trowel is required. Knowledge of maintenance activities of old and new ponds should include: - flushing of water; - repair of leakages/cracks; - liming and fertilization - drying and cleaning etc. Assessment should cover monitoring water quality, daily checking of leakages/seepage, methods of feeding and stocking, stocking rate and time etc. Knowledge of the various fishing gear is required. Knowledge of the materials used for construction and mending of fishing gear is required. Details of construction and mending are required. Assessment should cover the various methods of harvesting fish Knowledge of the various types of fishing crafts is required.
CONTENTS	**NOTES**
2. Post-harvest handling of fish	

(a) Materials and methods for processing fish. (b) Methods of fish preservation. (c) Packaging materials for fish (d) Marketing channels for fish.	Assessment should cover the different methods of fish processing and preservation. A clear distinction between fish processing and fish preservation should be made.
G. **FISH SEED PRODUCTION** 1. Brood stock selection and handling. (a) Differences between male and female sexually matured fishes. (b) Qualities of good breeders.	Knowledge of the qualities of good breeders should include hardiness, ability to breed in captivity, large size, without defects etc.
(c) Ways of handling brood stock .	Assessment should cover ideal period of transporting fish; duration in confinement and careful handling of brood stock.
2. Artificial breeding (a) Meaning and importance of artificial breeding.	Assessment should cover: the meaning of artificial breeding as 'manipulating the sexually matured fish to spawn or reproduce in captivity'; importance of artificial breeding such as to: - obtain high quality hybrids; - obtain large quantity of fish seed; - make fingerlings readily available.
(b) Steps involved in artificial breeding of fishes.	Brood stock selection, conditioning, inducement, stripping, fertilization and incubation of fertilized eggs should be assessed.
CONTENTS	**NOTES**

(c) Equipment and materials used in the artificial breeding of fish	Assessment should cover knowledge of equipment and materials such as basins, happa net, hatching troughs, syringes, aquaria tanks, microscope.
3. Managing and nursing fish seed	Assessment should include maintaining optimum water condition (aeration), feeding with natural food organisms (plankton), introduction of artificial feed based on size, separation of dead/unfertilized eggs from hatchlings, transferring to production/grow-out ponds/tanks, sorting of shooters/jumpers etc.

PRACTICAL FISHERIES

CONTENTS	NOTES
A. FISH CULTURE	
1. Environmental conditions in fish habitats.	Measurement of environmental conditions is required: temperature, dissolved oxygen, pH and turbidity.
2. Tools and equipment used in fish culture.	Identification, uses and maintenance of fishery tools and equipment e.g. secchi disc, water pump, pelleting machine, aerators.
3. Common culturable fish species.	Identification of common culturable fish species in your country is required. Knowledge of scientific names is required.
4. Fish feed and materials.	Identification of types of fish feed and uses of fish feed materials is required.
5. Materials for pond preparation	Identification and uses of materials for pond preparation: lime , fertilizers etc is required
B. FISHING GEAR AND CRAFT	
1. Fishing gear.	Identification, description and uses of fishing

2. Fishing craft.	gear e.g. gill net, cast net, seine, traps. Identification of parts and their functions should be assessed. Maintenance of fishing gear is also required. Identification, description, uses and maintenance of fishing craft should be assessed.
C. FISH PROCESSING AND PRESERVATION	
1. Fish processing and preservation.	Assessment should include the identification of common processed and preserved fish; identification and uses of common processing and preservation methods.
2. Equipment used in fish processing and preservation.	Identification and uses of fish processing equipment e.g. knives, measuring bowls, weighing balances, hand gloves; fish preservation equipment e.g. freezer, smoking kiln.
3. Fish products and by-products.	Identification and uses of fish products and by-products e.g. fish scales, fish oil, fish skin.
4. Fish packaging materials.	Identification of fish packaging materials e.g. fish boxes, nylon, baskets, cardboard

LIST OF FACILITIES AND MAJOR EQUIPMENT

ITEM NO.	EQUIPMENT	QUANTITY REQUIRED
1	DO(Dissolved Oxygen) meter	2
2.	pH meter	2
3.	Conductivity meter	2
4.	Thermometer	50
5.	Water Test Kits	2
6.	Microscopes	4
7.	Magnifying Glass	30
8.	Aquaria Tanks	5

9.	Hatching Troughs	5
10.	Nursery Tanks/Ponds	3
11.	Demonstration Ponds	1 or more
12.	Scoop Nets	10
13.	Aerators and Accessories	10
14.	Plastic Sieves	10
15.	Compounded Feeds	Many bags
16.	Grinding Machines	2
17.	Charts and Pictures	Assorted
18.	Video Clips in Fisheries	Assorted
19.	Pelleting Machine	1
20.	Dissection Kits	2
21.	Water Pumps	2
22.	Secchi Disc	2
23	Model Gillnet	1
24	Model Cast net	1
25	Model Siene net	1
26	Model traps	Assorted
27	Model hooks and line	2
28	Model trawl net	1
29	Netting materials	Assorted
30	Hooks packets	20(nos 1-20)
31	Nylon ropes	1
32	Mounting twine	1
33	Canoe	1
34	Paddles	2
35	Gutting knives	10
36	Measuring boards	5
37	Weighing balances	2
38	Hand gloves	30
39	Freezers	2
40	Ovens	2
41	Kilns	2
42	Fish drying racks	2
43	Fish boxes	5
44	Salting trays/basins	5
45	Sun-drying mats	5
46	Cardboards box	5
47	Nylon	10(bundles)
48	Baskets	10