FEDERAL PUBLIC SERVICE COMMISSION
(Curriculum & Research Wing)

Schemes and Syllabi for Screening/Professional Tests as well as Descriptive Examination Relating to Posts Advertised under Consolidated Advertisement No. 10/2020

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
1.	193/2020	**Assistant Director** (BS-17), National Talent Pool, Ministry of Federal Education and Professional Training.	i. Second Class or Grade 'C' Master's Degree in Statistics/ Economics/ Business Administration / Computer Science ii. Two (2) years post qualification experience of Research / Surveys/ Census in the field related to employment/ Labour/ Manpower/ Population/ Programming/ Analysis.	Objective Type Test (MCQ) **Part-I** English =20 marks **Part-II** Professional Test=80 marks	**Part-I** Vocabulary, Grammar Usage, Sentence Structuring. **Part-II** • Collection and Compilation of Data, • Methods of Data Analysis, • Field Operation Plans, • Editing & Coding of Data, • Report Writing and Presentation Skill, • Quantitative Analysis, • Descriptive Statistics, • Managerial Statistics, • Research & Survey Methodology
2.	194/2020	**Assistant Director (Horticulture)** (BS-17) PAK PWD, Ministry of Housing & Works.	i. Second Class or Grade "C" B.Sc. (Honours) Degree in Agriculture ii. Two (2) years post qualification experience in the field of Horticulture/ Agriculture.	Objective Type Test (MCQ) **Part-I** English = 20 marks **Part-II** Professional Test = 80 marks	**Part-I** Vocabulary, Grammar Usage, Sentence Structuring **Part-II** ▪ Modern concept of Horticultural industry, ▪ Plant propagation, ▪ Principles of Fruit Production & Vegetable Production, ▪ Ornamental Horticulture, ▪ Medicinal and Aromatic Plant ▪ Landscape Plants, ▪ Vegetable and Flower Seed Production , ▪ Propagation and Nursery Management , ▪ Flower Production, ▪ Harvest and Handling of Horticultural Crops

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
3.	195/2020	**Librarian** (BS-17), Ministry of Religious Affairs & Interfaith Harmony.	Second Class or Grade "C" Master's degree in Library Science/ Information Sciences **OR** Graduate with Diploma in Library Science plus five years post qualification professional experience in BS-16 or eight years post qualification professional experience in a post in BS-15 and below **OR** Bachelor of Library Science plus five years post qualification professional experience in BS-16 or eight years post qualification professional experience in a post in BS-15 and below.	Objective Type Test (MCQ) **Part-I** English = 20 marks **Part-II** Professional Test=80 marks	**Part-I** Vocabulary, Grammar Usage, Sentence Structuring **Part-II** • Information Sources and Services • Cataloguing: Theory and Practice • Procurement and Maintenance of Library Books • Library Automation/Information Storage & Retrieval • Research Methods & Techniques for Librarians • Public Records, Rare Material & their Conservation • Management of Serials Publications • Rules & Procedure regarding Write Off the Library Losses • Evolution of Digital Libraries • HEC Digital Library. • Role of ICT in Library Management
4.	198/2020	**Assistant Director (Biology)** (BS-17), Marine Fisheries Department, Ministry of Maritime Affairs.	Second Class or Grade 'C' Master's Degree in Zoology/ Fisheries/ Biology/ Chemistry/ Marine Biology/ Fresh Water Biology and Fisheries/ Industrial Fishing.	Objective Type Test (MCQ) **Part-I** English = 20 marks **Part-II** Professional Test=80 marks	**Part-I** Vocabulary, Grammar Usage, Sentence Structuring **Part-II** • Structural and functional adaptations of fishes. • Fish morphology • Identification of fishes up to; Families; Order; Genus; Species • Feeding groups of fishes; Herbivore; Plankton eater; Larvivore; Carnivore; Voracious • Ecology of fishes: Freshwater; Brackish water; Marine • International and Local Laws, Regulations, Policies of fishing in deep sea and export of fish & fisheries projects.

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
5.	199/2020	**Assistant Director (Marine)** (BS-17), Marine Fisheries Department, Ministry of Maritime Affairs.	Second Class or Grade 'C' Master's Degree in Zoology/ Fisheries/ Biology/ Chemistry/ Marine Biology/Fresh Water Biology and Fisheries/ Industrial Fishing.	Objective Type Test (MCQ) **Part-I** English = 20 marks **Part-II** Professional Test=80 marks	**Part-I** Vocabulary, Grammar Usage, Sentence Structuring **Part-II** • Structural and functional adaptations of fishes. • Fish morphology • Identification of fishes up to; Families; Order; Genus; Species • Feeding groups of fishes; Herbivore; Plankton eater; Larvivore; Carnivore; Voracious • Ecology of fishes: Freshwater; Brackish water; Marine • International and Local Laws, Regulations, Policies of fishing in deep sea and export of fish & fisheries projects.
6.	202/2020	**Inspector (Tech) (**BS-16), Intelligence Bureau.	i.B. Tech. in Electronics or equivalent in relevant subject from Government recognized Institute/ University. ii.Two (2) years post qualification practical experience in the field of Electronics. **OR** Retired JCOs/Retired Foreman of Corps of Signals with ten (10) years experience in the related field.	Objective Type Test (MCQ) **Part-I** English = 20 marks **Part-II** General Intelligence=80 marks	**Part-I** Grammar Usage, Sentence Structuring **Part-II** • Basic Arithmetic. • Current Affairs. • Pakistan Affairs & Islamic Studies • Everyday/General Science • Basic Computer Operation in MS Office **Note : (Equal weightage for each topic at Part-II)**
				Subjective Test **Technical Proficiency Test**=100 marks Qualifying Standard= 50%	**For Pre-selected candidates** • Electrical and Electronic circuits, their application and troubleshooting • Working and troubleshooting of RF Communication System • Working of CCTV Systems, Remote Control System and audio/video recording gadgets

Schemes and Syllabi for Written Examination (Descriptive) for All Posts in BS-18 & BS-19 included in Consolidated Advertisement No. 10/2020

PAPER-I: ENGLISH

Max Marks: 100 Time Allowed: 3 Hours

(i) **English Essay-50 Marks:** Candidates will be required to write an Essay in English comprising **1500 words** from a set of **six given topics.** Candidates are expected to reflect comprehensive and research based knowledge on a selected topic. Candidate's articulation, expression and technical approach to the style of English Essay writing will be examined.

(ii) **English (Composition and Précis)-50 Marks:**

The examination will test the candidate's abilities to handle Précis Writing, Reading Comprehension, Sentence Structuring, Translation, Grammar and Vocabulary, etc.

Précis Writing (10 marks): A selected passage with an orientation of generic understanding and enough flexibility for compression shall be given for précising and suggesting an appropriate title.

Reading Comprehension (10 marks)

A selected passage that is rich in substance but not very technical or discipline-specific shall be given, followed by five questions, each carrying 2 marks.

Grammar and Vocabulary (10 marks): Correct usage of Tense, Articles, Prepositions, Conjunctions, Punctuation, Phrasal Verbs, Synonyms and Antonyms etc.

Sentence Correction (5 marks): Ten sentences shall be given each having a clear structural flaw in terms of grammar or punctuation. The candidates shall be asked to rewrite them with really needed correction only, without marking unnecessary alterations. No two or more sentences should have exactly the same problem, and 2-3 sentences shall be based on correction of punctuation marks.

Grouping of Words (5 marks): A random list of ten words of moderate standard (neither very easy nor utterly unfamiliar) shall be given, to be grouped by the candidates in pairs of those having similar or opposite meaning, as may be clearly directed in the question.

Pairs of Words (5 marks): Five pairs shall be given of seemingly similar words with different meanings, generally confused in communication, for bringing out the difference in meaning of any five of them by first explaining them in parenthesis and then using them in sentences.

Translation (5 marks): Ten short Urdu sentences involving structural composition, significant terms and figurative/idiomatic expressions shall be given, to be accurately translated in English.

SUGGESTED READINGS

Sr. No.	Title	Author
1.	English Grammar in Use	Raymond Murphy (Cambridge University Press)
2.	Practical English Usage	M. Swan (Oxford University Press)
3.	The Little, Brown Handbook	H. Ramsey Flower & Jane Aaron (The Little, Brown & Co; Harper Collins)
4.	A University English Grammar	R. Quirk & S. Greenbaum (ELBS; Longmans)
5.	Write Better, Speak Better	Readers Digest Association
6.	Modern English in Action	Henry Christ (D.C. Heath & Co.)
7.	Exploring the World of English	Syed Saadat Ali Shah

PAPER-II: PROFESSIONAL

Max Marks: 100 Time Allowed: 3 Hours

Case No.	191/2020
Particulars of post	**Rehabilitation Specialist** (BS-18), National Institute of Rehabilitation Medicine, Islamabad, Ministry of National Health Services, Regulations & Coordination.
Minimum Qualification & Experience:	i. MBBS or equivalent qualification recognized by PM&DC. ii. PM&DC Level III qualification in Rehabilitation Medicine recognized by PM&DC. iii. Two (2) years post qualification experience in the relevant field.

Part-I: (MCQ) **25 Marks**
25 MCQ Questions on Part-II & Part-III.

Part-II: (Qualification Based) (Descriptive) **50 Marks**
Core courses of **MBBS Degree**

Part-III: (Professional) (Descriptive) **25 Marks**
Core courses of Level III qualification in **Rehabilitation Medicine**.

PAPER-II: PROFESSIONAL

Max Marks: 100 Time Allowed: 3 Hours

Case No.	192/2020
Particulars of post	**Director (Economics Law)** (BS-19), Petroleum Division, Ministry of Energy.
Minimum Qualification & Experience:	i. Second Class or Grade 'C' Bachelor's Degree in Law (LLB) from a University recognized by HEC. ii. Twelve (12) years post qualification experience on such position where responsible for practicing of Corporate Laws in Government/ Semi-Government/ Firm of repute.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

Part-II (Professional) (Subjective) : 75 Marks

I. Corporate Law

II. International Economic Law

- Definition and fundamental principles of international economic law
- Permanent sovereignty over natural resources (PSNR)
- The institutional structure of international economic law
- The law on natural resources
  i. The Stockholm Declaration 1972
  ii. The Charter of Economic Rights and Duties of States 1974
  iii. UN Convention on the Law of the Sea 1982
  iv. The Brundtland Commission
  v. The UN Convention on Biological Diversity 1992

III. Miscellaneous

- Law of Contract
- Law of Business Organizations
- Public International Law
- Alternate Dispute Resolution
- Insurance Laws
- Competition Law
- Interrelation of Statutes
- Conflict of Laws
- Labour Laws
- Public Interest Litigation

SUGGESTED READINGS

S. No.	Title	Author
1.	Law of Contract	Koffman, Lawrance & Macdonalid, Elizabeth
2.	The Contract Act, 1872 (Section 1-147)	
3.	Essentials of Business Law	Anthony L. Livzz
4.	A Handbook of Company Law.	Chaudhry, A.M.
5.	Principles of Public International Law	Browntee, Ian
6.	Modern Treaty Law and Practice	Aust, Anthony
7.	Treaties: http://treaties,un.org/Home.aspx	
8.	Understanding Statutes: Canons of Construction	Zafar, S.M.

PAPER-II: PROFESSIONAL

Max Marks: 100 Time Allowed: 3 Hours

Case No.	196/2020
Particulars of post	**Deputy Director (Fishing Technology)** (BS-18), Marine Fisheries Department, Ministry of Maritime Affairs.
Minimum Qualification & Experience:	i. Second Class or Grade 'C' Master's Degree in Zoology/ Fisheries/ Biology/ Chemistry/ Marine Biology/ Fresh Water Biology and Fisheries/ Industrial Fisheries. ii. Diploma or Certificate of Training from a recognized Institute for Fishing Gear Technology. iii. Five (5) years post qualification experience of Mechanized Fishing Technology and Training.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

Part-II (Professional) (Subjective) : 75 Marks

I. **Animal Diversity-Chordata**

- Hemichordates and Invertebrate Chordates: Evolutionary Perspective: Phylogenetic Relationships and considerations.
- Fishes: Structural and functional adaptations of fishes.
- Amphibian: Movement onto land and early evolution of terrestrial vertebrates.
- Reptiles: Characteristics of reptiles, adaptations in reptilians.
- Birds: Migration and navigation, adaptations.
- Mammal: Structural and functional adaptations of mammals.

II. **Principles of Animal Life**

- The chemical basis of animal life: Brief introduction to bio-molecules; carbohydrates, lipids, proteins and nucleic acids.
- Tissues Types: epithelial, connective, muscle and nervous tissue; organs and organ systems.
- Ecological Concepts: Interactions, Concepts and components of ecosystem, Food chain, Food web, Biogeochemical cycles, Forest, Biomes, Wildlife conservation and management, Environmental pollution, Green house effect, Acid rain, Global warming.

III. **Animal Form and Function**

- Digestion and Nutrition: Feeding mechanism, Digestion, Organization and regional function of alimentary canals, Regulation of food intake, Nutritional requirements
- Internal Fluids and Respiration: Internal fluid environment, Composition of blood, Circulation and respiration mechanisms
- Chemical Coordination: Endocrine System; Vertebrate endocrine glands and types of hormones, Mechanism of hormones action,

- Animal behavior: Learning, Habituation, Insight learning, latent learning, classical learning: Control of Behavior; social behaviour.

IV. **Principles of Fish Biology**

- **Fish morphology:** Head (size, shape, and orientation); Scales (types, arrangements, coloration, scale less fishes); Operculum; Fins, fin rays and fin spine (dorsal, pectoral, caudal, anal); Barbel (upper lip barbels, lower lip barbels); **Anatomy:** Skeleton (skull, backbone, spines); Brain and spinal cord; Gills (Number, size, arrangements); Vital organs (heart, liver, kidney); Viscera and mesenteries (swim bladder, stomach, spleen, pancreas, intestine, gonads).
- **Systematic:** Identification of fishes up to; Families; Order; Genus; Species; Feeding groups of fishes; Herbivore; Plankton eater; Larvivore; Carnivore; Voracious; **Ecology of fishes:** Freshwater; Brackish water ; Marine

SUGGESTED READINGS

S.No.	Title	Author
1.	Integrated Principles of Zoology.	Hickman, Jr. C.P., Keen, S. L, Larson, and Eisenhour, D.J.
2.	Zoology	Miller, S. A. and Harley, J. B.
3.	Biology	Campbell, N.A.
4.	Evolution. 2nd Edition	Douglas Futuyma
5.	Kestin Farmed Fish Quality, 2002	Kestin, S. C. and Warris, P.D.
6.	Aquaculture	Brenabe, G.
7.	Text book of Fish Culture: Breeding and Cultivation. 1973	Huet M.
8.	Animal behavior: An Evolutionary Approach. 9^{th} Edition	John Alcock

PAPER-II: PROFESSIONAL

Max Marks: 100 Time Allowed: 3 Hours

Case No.	197/2020
Particulars of post	**Deputy Director (Planning)** (BS-18), Marine Fisheries Department, Ministry of Maritime Affairs.
Minimum Qualification & Experience:	i. Second Class or Grade 'C' Master's Degree in Economics with Statistics/ Statistics/ Mathematics with Statistics. ii. Five (5) years post qualification experience in Economics Development/ Research/ Statistical Analysis and Evaluation.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & Part-III.

Part-II (Research and Planning) (Subjective) : 25 Marks

I. Project Management

Project Management, Processes Integration Management, Project Plan Development, Project Plan Execution and Overall Change Control, PERT, Gantt Chart, CPM

II. Scope Management

Initiation, Scope Planning, Scope Definition, Scope Verification and Scope Change Control.

III. Communications Management

Communications Planning, Information Distribution, Performance Reporting and Administrative Closure.

IV. Risk Management

Risk Identification, Risk Quantification, Risk Response Development and Risk Response Control.

V. Statistical Techniques

All statistical techniques related to Planning & Research

Part-III (Professional) (Subjective) : 50 Marks

I. Probability Distributions

Discrete and continuous Probability Distributions. Properties, applications of Binomial, Poisson, Hyper-geometric, Normal Distribution and its properties, Standard Normal Curve, Normal approximation to Binomial and Poisson distribution.

II. Regression Analysis & Correlation Analysis

Concepts of Regression and Correlation and their application, Simple and Multiple Linear Regression (upto three variables), Estimation of the Parameters, Method of least square, Inference regarding regression parameters. Correlation, Correlation Coefficient, Properties of Correlation Coefficient, Inference regarding correlation coefficient, Partial Correlation and Multiple Correlation (upto three variables).

III. Sampling & Sampling Distributions

Population and Sample, Advantages of Sampling, Sampling Design, Probability &Non-Probability Sampling techniques. Brief Concepts of Simple Random, Stratified, Systematic, Cluster, Multiple and Multistage Sampling. Purposive, Quota Sampling, Convenience & Accidental Sampling. Sampling with and without replacement, Application of Central Limit Theorem in Sampling, Sampling Distribution of Mean, difference between two Means, Proportion, difference between two Proportion and Variance.

IV. Statistical Inferences

Estimation: Point Estimation, Properties of a good Estimator. Interval Estimation. Interval Estimation of Population mean. Large and small sample confidence intervals for Population Mean. Hypothesis Testing: Types of errors. Hypothesis Testing for Population Mean. Inferences for Two Population Means. Inferences for the Mean of Two Normal Populations using Independent Samples (variances are assumed Equal). Inference for Two Populations Mean using Paired Samples. Inferences for Population Proportions. Confidence Intervals and hypothesis Testing for Population Proportion. Inferences for Two Populations Proportions using Independent Samples, Estimation of sample size. Analysis of categorized data. Goodness of fit tests. Contingency tables. Test of independence in contingency tables.

V. Design of Experiments

One-way and Two-way Analysis of Variance, Design of Experiments, Concepts of Treatment, Replication, Blocking, Experimental Units and Experimental Error, Basic Principles of Design of Experiments, Description, Layout and Statistical Analysis of Completely Randomized Design (CRD), Randomized Complete Block Design (RCBD), Multiple Comparison tests (LSD test).

SUGGESTED READINGS

S. No.	Titles	Author
1.	Project Management Body of Knowledge,	Project Management Institute (PMI) standards committee
2.	Software Project Management	S.A. Kelkar, A Concise Study, Prentice Hall of India.
3.	Principles and Procedures of Statistics	Steel, R and Torrie, J.H.
4.	Introduction to Statistical Theory, Part-I & II	Chaudhry, S.M. and Kamal, S.
5.	Fundamentals of Modern Statistical Methods	Wilcox, R.
6.	Statistical Methods	Aggarwal, Y.P.

PAPER-II: PROFESSIONAL

Max Marks: 100 Time Allowed: 3 Hours

Case No.	200/2020
Particulars of post	**Director (Planning & Statistics)** (BS-19), Marine Fisheries Department, Ministry of Maritime Affairs.
Minimum Qualification & Experience:	i. Second Class or Grade 'C' Master's Degree in Economics with Statistics/ Statistics/ Mathematics with Statistics. ii. Twelve (12) years post qualification experience in Economics Development/ Research/ Statistical Analysis and Evaluation.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & Part-III.

Part-II (Research and Planning) (Subjective) : 25 Marks

I. Project Management

Project Management, Processes Integration Management, Project Plan Development, Project Plan Execution and Overall Change Control, PERT, Gantt Chart, CPM

II. Scope Management

Initiation, Scope Planning, Scope Definition, Scope Verification and Scope Change Control.

III. Communications Management

Communications Planning, Information Distribution, Performance Reporting and Administrative Closure.

IV. Risk Management

Risk Identification, Risk Quantification, Risk Response Development and Risk Response Control.

V. Statistical Techniques

All statistical techniques related to Planning & Research

Part-III (Professional) (Subjective) : 50 Marks

I. Probability Distributions

Discrete and continuous Probability Distributions. Properties, applications of Binomial, Poisson, Hyper-geometric, Normal Distribution and its properties, Standard Normal Curve, Normal approximation to Binomial and Poisson distribution.

II. Regression Analysis & Correlation Analysis

Concepts of Regression and Correlation and their application, Simple and Multiple Linear Regression (upto three variables), Estimation of the Parameters, Method of least square, Inference regarding regression parameters. Correlation, Correlation Coefficient, Properties of Correlation Coefficient, Inference regarding correlation coefficient, Partial Correlation and Multiple Correlation (upto three variables).

III. Sampling & Sampling Distributions

Population and Sample, Advantages of Sampling, Sampling Design, Probability &Non-Probability Sampling techniques. Brief Concepts of Simple Random, Stratified, Systematic, Cluster, Multiple and Multistage Sampling. Purposive, Quota Sampling, Convenience & Accidental Sampling. Sampling with and without replacement, Application of Central Limit Theorem in Sampling, Sampling Distribution of Mean, difference between two Means, Proportion, difference between two Proportion and Variance.

IV. Statistical Inferences

Estimation: Point Estimation, Properties of a good Estimator. Interval Estimation. Interval Estimation of Population mean. Large and small sample confidence intervals for Population Mean. Hypothesis Testing: Types of errors. Hypothesis Testing for Population Mean. Inferences for Two Population Means. Inferences for the Mean of Two Normal Populations using Independent Samples (variances are assumed Equal). Inference for Two Populations Mean using Paired Samples. Inferences for Population Proportions. Confidence Intervals and hypothesis Testing for Population Proportion. Inferences for Two Populations Proportions using Independent Samples, Estimation of sample size. Analysis of categorized data. Goodness of fit tests. Contingency tables. Test of independence in contingency tables.

V. Design of Experiments

One-way and Two-way Analysis of Variance, Design of Experiments, Concepts of Treatment, Replication, Blocking, Experimental Units and Experimental Error, Basic Principles of Design of Experiments, Description, Layout and Statistical Analysis of Completely Randomized Design (CRD), Randomized Complete Block Design (RCBD), Multiple Comparison tests (LSD test).

SUGGESTED READINGS

S. No.	Titles	Author
1.	Project Management Body of Knowledge,	Project Management Institute (PMI) standards committee
2.	Software Project Management	S.A. Kelkar, A Concise Study, Prentice Hall of India.
3.	Principles and Procedures of Statistics	Steel, R and Torrie, J.H.
4.	Introduction to Statistical Theory, Part-I & II	Chaudhry, S.M. and Kamal, S.
5.	Fundamentals of Modern Statistical Methods	Wilcox, R.
6.	Statistical Methods	Aggarwal, Y.P.

PAPER-II: PROFESSIONAL

Max Marks: 100 Time Allowed: 3 Hours

Case No.	201/2020
Particulars of post	**Director (Research & Assessment)** (BS-19), Marine Fisheries Department, Ministry of Maritime Affairs.
Minimum Qualification & Experience:	i. Second Class or Grade 'C' Master's Degree in Zoology/ Fisheries/ Biology/ Chemistry/ Marine Biology/ Fresh Water Biology and Fisheries/ Indus trial Fishing. ii. Twelve (12) years post qualification experience of Research and Assessment in Marine Fisheries/ Fisheries Product.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

Part-II (Professional) (Subjective) : 75 Marks

I. Animal Diversity-Chordata

- Hemichordates and Invertebrate Chordates: Evolutionary Perspective: Phylogenetic Relationships and considerations.
- Fishes: Structural and functional adaptations of fishes.
- Amphibian: Movement onto land and early evolution of terrestrial vertebrates.
- Reptiles: Characteristics of reptiles, adaptations in reptilians.
- Birds: Migration and navigation, adaptations.
- Mammal: Structural and functional adaptations of mammals.

II. Principles of Animal Life

- The chemical basis of animal life: Brief introduction to bio-molecules; carbohydrates, lipids, proteins and nucleic acids.
- Tissues Types: epithelial, connective, muscle and nervous tissue; organs and organ systems.
- Ecological Concepts: Interactions, Concepts and components of ecosystem, Food chain, Food web, Biogeochemical cycles, Forest, Biomes, Wildlife conservation and management, Environmental pollution, Green house effect, Acid rain, Global warming.
- Evolution: Darwinian evolutionary theory based on natural selection and the evidence, Microevolution: Genetic variation and change within species, Macroevolution: Species and speciation (Allopatric, Parapatric and Sympatric speciation)

III. Animal Form and Function

- Digestion and Nutrition: Feeding mechanism, Digestion, Organization and regional function of alimentary canals, Regulation of food intake, Nutritional requirements
- Internal Fluids and Respiration: Internal fluid environment, Composition of blood, Circulation and respiration mechanisms

- Chemical Coordination: Endocrine System; Vertebrate endocrine glands and types of hormones, Mechanism of hormones action,
- Animal behavior: Learning, Habituation, Insight learning, latent learning, classical learning: Control of Behavior; social behaviour.

IV. Principles of Fish Biology

- **Fish morphology:** Head (size, shape, and orientation); Scales (types, arrangements, coloration, scale less fishes); Operculum; Fins, fin rays and fin spine (dorsal, pectoral, caudal, anal); Barbel (upper lip barbels, lower lip barbels); **Anatomy:** Skeleton (skull, backbone, spines); Brain and spinal cord; Gills (Number, size, arrangements); Vital organs (heart, liver, kidney); Viscera and mesenteries (swim bladder, stomach, spleen, pancreas, intestine, gonads).
- **Systematic:** Identification of fishes up to; Families; Order; Genus; Species; Feeding groups of fishes; Herbivore; Plankton eater; Larvivore; Carnivore; Voracious; **Ecology of fishes:** Freshwater; Brackish water ; Marine

SUGGESTED READINGS

S. No.	Title	Author
1.	Integrated Principles of Zoology.	Hickman, Jr. C.P., Keen, S. L, Larson, and Eisenhour, D.J.
2.	Zoology	Miller, S. A. and Harley, J. B.
3.	Biology	Campbell, N.A.
4.	Evolution. 2nd Edition	Douglas Futuyma
5.	Kestin Farmed Fish Quality, 2002	Kestin, S. C. and Warris, P.D.
6.	Aquaculture	Brenabe, G.
7.	Text book of Fish Culture: Breeding and Cultivation. 1973	Huet M.
8.	Animal behavior: An Evolutionary Approach. 9^{th} Edition	John Alcock

PAPER-II: PROFESSIONAL

Max Marks: 100 Time Allowed: 3 Hours

Case No.	203/2020
Particulars of post	**Deputy Director** (BS-18), Federal Seed Certification & Registration Department, Ministry of National Food Security& Research.
Minimum Qualification & Experience:	i. Second Class or Grade 'C' Master's Degree in Agriculture in one of the subjects of Seed Technology, Plant Breeding, Plant Pathology, Plant Physiology, Agronomy, Plant Protection, Horticulture, Entomolo gy and Agriculture Extension or M.Sc. (Botany). ii. At least five (5) years post qualification experience in Seed certification and seed testing.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & III.

Part-II: 25 Marks

(Basic Concepts only)

I. Public Administration

II. Human Resource Management

III. Financial Management

IV. Information Technology and MS Office

Part-III: 50 Marks

(Professional)

I. **Concept of Integrated Agriculture**: Components of natural resources as bases for agriculture production (Land, Water, biological, Environmental, Solar, Energy)

II. **Challenges in Pakistan's Agriculture**: Present scenario and future prospects. Analytical overview: issues and strategies for improvement of crop management, livestock management, fisheries, cottage industry, resource management and rural development. Institutions and policies: issues and options.

III. **Elements of Climate and their Relationship with Crop Growth**: Farming Systems, biological nitrogen fixation, soil profile, structure and texture, soil fertility, soil erosion and conservation, water logging and salinity

IV. **Genetic Improvement for Crop Production**: GMO crops, Seed production technology.

V. **Horticulture**: Floriculture, landscaping, pests and diseases of agriculture crops and their control, integrated pest management.

VI. **Rainfed and Irrigated Agriculture**: Agriculture mechanization, land tenure and land reforms, role of agriculture in national economy.

VII. **Seed Production Technology**: Concept of seed technology. Definition and types of seed. Morphology of seed. Production and multiplication of quality seed. Seed sampling. Seed processing; drying, cleaning, grading, treatment. Seed quality, purity, vigor and viability. Seed longevity and storage. Seed certification. Seed distribution. Seed act and laws.

Suggested Reading

S. No.	Title	Author
1.	An Introduction to the Public Administration	E.N.Cladden
2.	Human Resource Management	H.T.Graham &Roger Bennett
3.	System of Financial Control and Budgeting, 2006	Published by Finance Division
4.	Understanding Computers: Today and Tomorrow	Deborah Morley, Charles Parker
5.	MS Office 365 Handbook: 2013 Edition	Kevin Wilson
6.	Participatory Rural Development in Pakistan	Khan, M. H
7.	Agriculture in Pakistan	Khan M. H.
8.	Fundamentals of Soil Science	Henry D. Foth
9.	Manual of Plant Production	Abdul Manan.
10.	Principles of Field Crop Production	Martin., J.H. & Leonard, W.H.
11.	Diseases of Field Crops	Dickson, J.G
12.	Irrigation Principles & Practices	Isrealson, O.W. Vaughn, E. Hansen
13.	A Text Book of Plant Pathology	A.V.S.S. Sambamurti
14.	The Principles of Agronomy.	Harris, Franklin Stewart
15.	Seed Certification Manual.	Ahmad, S.I. 1992, National Book Foundation, Islamabad.
16.	Handbook of Seed Technology	Basra, A.S. (Ed). 2006.