

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. 05/2020

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
1.	07/2020	Assistant Secretary (BS-16), in different Ministries/ Divisions/ Departments	<p>i. Second Class or Grade 'C' Bachelor's degree from a University recognized by HEC.</p> <p>ii. Minimum shorthand speed: 100 w.p.m. and typing speed: 50 w.p.m.</p> <p>iii. Must be computer literate.</p>	<ul style="list-style-type: none"> • Typing Test with minimum Speed of 50 W.P.M • Shorthand Test with minimum Speed of 100 W.P.M • Computer Literacy Test: <ul style="list-style-type: none"> i Microsoft Word (Typing, Formatting) ii Microsoft Excel (Typing, Graph, Calculations) iii Microsoft Power Point (Typing, Formatting, Inserting Objects) <p>Note: Computer literacy means proficiency in M.S Office (M.S Word, Power Point & Excel)</p>	<p>35 Marks</p> <p>35 Marks</p> <p>10 Marks</p> <p>10 Marks</p> <p>10 Marks</p>
2.	88/2020	Assistant Director (System Administration) (BS-17), Cabinet Secretariat, Establishment Division.	<p>Second Class or Grade 'C' Master's degree in Computer Science/Information Technology or equivalent from a University recognized by the Higher Education Commission. OR Second Class or Grade 'C' Bachelor's Degree in Computer Science/ BIT (Both four (4) years duration) or equivalent from a University recognized by the Higher Education Commission.</p>	<p>Objective Type Test (MCQ)</p> <p>Part-I</p> <p>English = 20 marks</p> <p>Part-II</p> <p>Professional Test=80 marks</p>	<p>Part-I</p> <p>Vocabulary, Grammar Usage, Sentence Structuring</p> <p>Part-II</p> <ul style="list-style-type: none"> • Software research and development, • Coding, Writing, Testing and debugging of software applications, • Program logic, • Visual Basic, C++, Java, Unix/Red Hat Linux Operating System, • Computer Networks and Internet, • Computer Graphics and Algorithms • Development of basic algorithms,

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
3.	89/2020	Programmer (BS-17), Cabinet Secretariat, Establishment Division.	<p>i) Second Class or Grade 'C' Master's degree in Computer Science/ Information Technology or equivalent from a University recognized by the Higher Education Commission.</p> <p>OR</p> <p>Second Class or Grade 'C' Bachelor's Degree in computer Science/ BIT (Both four (4) years duration) or equivalent from a University recognized by the Higher Education Commission.</p> <p>ii) Two (2) years post qualification experience of Programming/ system Analysis/ Software Development.</p>	<p>Objective Type Test (MCQ)</p> <p>Part-I</p> <p>English = 20 marks</p> <p>Part-II</p> <p>Professional Test = 80 marks</p>	<p>Part-I</p> <p>Vocabulary, Grammar Usage, Sentence Structuring.</p> <p>Part-II</p> <ul style="list-style-type: none"> • Programming in PHP, Ajax and Java Script • Designing, Analyzing & Maintenance of Software • Coding, Debugging, Testing and Documenting of Application Programme • Installation and Testing Software Package • Software Development Process, • Software Architecture, • Software Maintenance & Optimization
4.	93/2020	General Staff Officer, Grade-III (Finance Officer) (BS-17), Armed Forces Institute of Radiology and Imaging, Ministry of Defence.	<p>Second Class or Grade 'C' Bachelor's (4 years) degree in Commerce/ Accounting & Finance/ Business Administration (Finance) or equivalent qualification from a University recognized by HEC.</p> <p>OR</p> <p>Professional Examination of Institute of Cost and Management Accountants of Pakistan (ICMAP)/Certified and Accounting Professional (CFAP) Institute of Chartered Accountants of Pakistan.</p>	<p>Objective Type Test (MCQ)</p> <p>Part-I</p> <p>English = 20 marks</p> <p>Part-II</p> <p>Professional Test=80 marks</p>	<p>Part-I</p> <p>Vocabulary, Grammar Usage, Sentence Structuring.</p> <p>Part-II</p> <ul style="list-style-type: none"> • Accounting Principles & Procedures, • Scrutiny of Record for Audit Purposes, • Journal, Ledger & Cash Book, • Financial Planning & Cost Accounting, • Re-appropriation of Funds and Supplementary Grant, • Settlement of Audit Objections • Preparation of Pension Documents. • Public Procurement Rules, 2004

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
5.	100/2020	General Staff Officer Grade-III (Picture Archiving and Communication System (PACS) Administrator) (BS-17), Armed Forces Institute of Radiology and Imaging, Ministry of Defence.	i) Second Class or Grade 'C' Master's/ Bachelor's (4 years duration) degree in Computer Science/ IT/Computer System Engineering/ Computer Engineering/ Software Engineering or equivalent qualification from a University recognized by HEC. ii) International certification related to information security (CEH, CHFI or ECSA etc.)	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring Part-II <ul style="list-style-type: none"> • Software research and development, • Coding, Writing, Testing and debugging of software applications, • Program logic, • Visual Basic, C++, Java, Unix/Red Hat Linux Operating System, • Computer Networks and Internet, • Computer Graphics and Algorithms • Development of basic algorithms,
6.	102/2020	I.T Expert (Civil) (BS-17), Ministry of Defence (Defence Division).	Second Class or Grade 'C' Master's/ Bachelor's (4 years duration) degree in Computer Engineering/ Software Engineering/ Computer System Engineering or Computer Science/ Information Technology or equivalent qualification from a University recognized by HEC.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring Part-II <ul style="list-style-type: none"> • Software research and development, • Coding, Writing, Testing and debugging of software applications, • Program logic, • Visual Basic, C++, Java, Unix/Red Hat Linux Operating System, • Computer Networks and Internet, • Computer Graphics and Algorithms • Development of basic algorithms,
7.	103/2020	Assistant Anaesthetist (BS-17), Pakistan Institute of Medical Sciences, Ministry of National Health Services, Regulations & Coordination.	MBBS or equivalent qualification recognized by Pakistan Medical and Dental Council.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring. Part-II <ul style="list-style-type: none"> • Core courses of MBBS Degree Program. • Health Policies of the Government of Pakistan. • Care vs Cure for Health Management. • Major Challenges being faced by the Health Sector.
8.	104/2020	Medical Officer (BS-17), Pakistan Institute of Medical Sciences, Ministry of National Health Services, Regulations & Coordination.	MBBS Degree or equivalent qualification recognized by Pakistan Medical and Dental Council.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring. Part-II <ul style="list-style-type: none"> • Core courses of MBBS Degree Program. • Health Policies of the Government of Pakistan. • Care vs Cure for Health Management. • Major Challenges being faced by the Health Sector.

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
9.	107/2020	Assistant Network Administrator (BS-16), Federal Public Service Commission.	Second Class or Grade 'C' Bachelor's Degree in Computer Science or Information Technology or equivalent qualification from a University recognized by the HEC.	Objective Type Test (MCQ) Part-I English =20 marks Part-II Professional Test =80 marks	Part-I Sentence Structuring, Grammar Usage. Part-II <ul style="list-style-type: none"> • Types of networks (LAN, WAN, Internet, Intranet etc.) • Network Topologies, • Network Management • Communication Protocols • OSI model • Operating Systems (Windows, Linux) • Transmission Mediums, Direction and Modes • Network Devices (Switch, Routers, and Modem), • Network security issues (Viruses, Firewall and unauthorized access),
10.	108/2020	Assistant Database Administrator (BS-16), Federal Public Service Commission.	Second Class or Grade 'C' Bachelor's Degree in Computer Science or Information Technology or equivalent qualification from a University recognized by the HEC.	Objective Type Test (MCQ) Part-I English =20 marks Part-II Professional Test =80 marks	Part-I Sentence Structuring, Grammar Usage. Part-II <ul style="list-style-type: none"> • Relational data model and algebra, • Entity Relationship Modeling, • Structured Query language, • RDBMS; Database design, • Transaction processing and Optimization concepts • Database recovery techniques, • Database security and Authorization. • Database Implementation • Physical database design: • Storage and File Structure, • Database efficiency and Tuning • Data Warehousing and Data Mining, • Emerging Database Technologies and Applications
11.	113/2020	Medical Officer (BS-17), Federal General Hospital, Chak Shahzad, Ministry of National Health Services, Regulations and Coordination.	MBBS or equivalent qualification recognized by PM&DC.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring. Part-II <ul style="list-style-type: none"> • Core courses of MBBS Degree Program. • Health Policies of the Government of Pakistan. • Care vs Cure for Health Management. • Major Challenges being faced by the Health Sector.

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
12.	127/2020	Assistant Registrar (BS-17) Federal Service Tribunal, Ministry of Law and Justice.	i) Law Graduate. ii) Two (2) years post qualification experience in Civil Courts/ Administrative Tribunals.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test = 80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring Part-II <ul style="list-style-type: none"> • Major Act • Estacode • Criminal Procedure Code • Rules of Business • Fundamental Rules/Supplementary Rules • Civil Service Regulations • Secretariat Instructions • General Financial Rules • Service Tribunal Act • Service Tribunal Procedure Rules, 1974
13.	128/2020	Reader (BS-16), Federal Service Tribunal, Ministry of Law and Justice.	Law Graduate.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test = 80 marks	Part-I Sentence Structuring, Grammar usage. Part-II <ul style="list-style-type: none"> • Appeal Rules • Criminal Procedure Code • Service Tribunal Procedure Rules, 1974 • Civil Servant Act, 1973 • Rules of Business • Estacode • Government Servant (Efficiency and Disciplinary) Rules, 1973
14.	129/2020	Assistant Geologist (BS-16 Plus 25% Special Pay), Works Department, Gilgit Baltistan, Ministry of Kashmir Affairs and Gilgit Baltistan.	i) Second Class or Grade 'C' Bachelor's degree in Geology/Earth Sciences or equivalent qualification from a University recognized by the HEC. ii) Two (2) years post qualification experience in the relevant field.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	Part-I Grammar Usage, Sentence Structuring Part-II <ul style="list-style-type: none"> • Topographical Surveying • Ore Dressing & Beneficiation • Photogrammetry/Photogeology • Metalogeny and Plate Tectonics • Mine Surveying /Field Survey • Rock Mechanics • Mineralogy and Petrology

Schemes and Syllabi for Written Examination (Descriptive) for all Posts in BS-20 & 21 advertised under Consolidated Advertisement No. 05/2020

Case No.	F.4-86/2020-R
Particulars of post	Registrar Trade Union (BS-20), National Industrial Relations Commission (NIRC), Ministry of Overseas Pakistanis & Human Resource Development.
Minimum Qualification & Experience:	<ul style="list-style-type: none"> i) Second Class or Grade 'C' LLB degree or equivalent qualification from a University recognized by HEC. ii) Seventeen (17) years post qualification experience in BS-17 and above in the field of Labour Administration. OR Five (5) years post qualification experience in BS-19 in case of initial appointment in BS-19 in the field of Labour Administration.

PAPER: PROFESSIONAL (100 MARKS)

Analysis Paper: Candidates will be required to analyse a situation related to advertised post and suggest/draw suitable solution comprising approximately **1000 words**. Candidate's research based knowledge as well as articulation, expression and technical treatment of the situation will be examined.

OR

Case Study: Candidates will be given real situation case studies related to advertised posts/ organization concerned and will be expected from the candidates to present (i) identification of issues (ii) evaluation of issues (iii) legal or case related theories (iv) evaluation of case facts if required and (v) possible solution of the case or writing judicial order, if the case so requires.

Schemes and Syllabi for Written Examination (Descriptive) for All Posts in BS-18 & BS-19 included in Consolidated Advertisement No. 05/2020

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.	F.4-08/2020-R
Particulars of post	Deputy Director/ Senior Meteorologist (BS-18), Pakistan Meteorological Department, Cabinet Secretariat (Aviation Division).
Minimum Qualification & Experience:	<p>Ph.D in Meteorology/ Seismology/ Hydro-Meteorology/ Hydrology/ Geophysics/ Geology/ Geography/ Physical Chemistry/ Physics/ Mathematics/ Environment/ Space Science/ Agriculture Meteorology/ Computer Science or equivalent in the field of Meteorology from a University recognized by HEC with one (1) year post qualification experience in BPS-17.</p> <p style="text-align: center;">OR</p> <p>M.Phil in one of the above subjects from a University recognized by HEC with three (3) years post qualification experience in BPS-17 in the field of Meteorology.</p> <p style="text-align: center;">OR</p> <p>i) Second Class or Grade 'C' Master's Degree in one of the above subjects from a University recognized by HEC with five (5) years post qualification experience in BPS-17 in the field of Meteorology.</p> <p>ii) Graduation with Physics or Mathematics from a University recognized by HEC.</p>

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

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

The Composition and Structure of Earth's Atmosphere, Hydrostatic Equation and its Applications, The Clausius-Clapeyron Equation, The Poisson's Equation, Adiabatic Processes, Parcel Concepts, Stability in the Atmosphere, Moisture in the Atmosphere, The Tephigram, Skew-T Log-P Diagram, Solar and Terrestrial Radiation, The Greenhouse Effect, Energy Balance at the Earth's Surface, Net Radiation, Free and Forced Convection, Temperature Inversions.

Cloud Formation, Cloud Classification, Precipitation Processes, Forms of Precipitation, Thunderstorms, Tornadoes, Hurricanes, Tropical Cyclones, Cyclones and Anti-Cyclones, Pressure Gradient Force, Coriolis Force, Friction, Geostrophic Wind, Gradient Wind, Thermal Wind, Land-Sea and Mountain- Valley Breezes, Chinook and Katabatic Winds, Jet Streams, Air Masses, Weather Fronts, Meteorological Satellites, Interpretation of Weather Satellite Imagery, Automatic Weather Stations, Weather Maps, Weather Symbols, Weather Forecasting,

The Earth's Atmosphere, Stratospheric Ozone Depletion, Energy and Radiation, Sun Angle and Seasons, Solar Radiation in the Atmosphere, Radiation Balances, Energy and Temperature, Daily Temperature Variations, Global Temperature Controls, Atmospheric Optics, Atmospheric Humidity, Cooling Processes, Condensation, Lifting Mechanisms, Static Stability, Inversions, Cloud Droplets Atmospheric Pressure, Horizontal Flow Aloft, Rotating Motion, Surface Flows, Tropical Hadley Circulation, General Circulation, Thermal

Winds, Thermally Direct Circulations, Down slope Winds, Polar Front Theory, Surface and Upper Air Weather Charts, Radar Meteorology,

Winter and Summer Rain Process, Monsoon, Floods and Drought, Meteorological Instruments (Thermometer, Barometer, Anemometer, Wing Vane, Radiometer, Sunshine Recorder etc.), Fog Formation, Impact of Fog on Crop Production.

SUGGESTED READINGS

Sr. No.	Title	Author
1.	An Introduction to Atmospheric Physics	Andrews D G
2.	An Introduction to Atmospheric Thermodynamics	Tsonis A A
3.	Meteorology Today	Donald A C
4.	Essentials of Meteorology	Macintosh D H & Thom S A
5.	Atmosphere weather and climate	Barry R
6.	Climate change causes effects and solutions by Atmospheric change	John T H
7.	Monsoon	Bin Wang

PAPER-II: PROFESSIONALMax Marks: 100Time Allowed: 3 Hours

Case No.	F.4-63/2020-R
Particulars of post	Eye Specialist (BS-18), Medical Department Of Pakistan Railways, Ministry Of Railways.
Minimum Qualification & Experience:	ii) MBBS or equivalent qualification. iii) Post graduate higher diploma/ degree, viz., MS/FRCS/ FCPS/ MRCP/ FFA or equivalent in the requisite Speciality and two (2) years post qualification clinical experience. OR Post graduate lower diploma in the requisite Speciality and four (4) years post qualification clinical experience

Part-I: 25 Marks (MCQ)

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

Part-II: (Qualification Based) (Descriptive) 50 MarksCore courses of **MBBS Degree****Part-III: (Professional) (Descriptive) 25 Marks**Core courses of Lower Diploma in **Eye Ophthalmology**.

PAPER-II: PROFESSIONAL

Max Marks: 100

Time Allowed: 3 Hours

Case No.	F.4-71/2020-R
Particulars of post	Assistant Professor (Urdu) (Male) (BS-18), Federal Government Colleges for Men, Federal Directorate of Education, Islamabad, Ministry of Federal Education and Professional Training.
Minimum Qualification & Experience:	Ph.D. Degree in the relevant subject and one (1) year post qualification teaching experience at College/University level. OR M.Phil in the relevant subject with three (3) years post qualification teaching experience at College/University level. OR Second Class or Grade 'C' Master's Degree in the relevant subject with five (5) years post qualification teaching experience at College/University level.

Part-I: 25 Marks (MCQ)

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

Part-II: (Urdu) (Descriptive)**50 Marks****۱۔ اردو ادب کا مطالعہ**

- i۔ اردو زبان و ادب کی اسلامی شناخت
- ii۔ بیسویں صدی کی ادبی تحریکیں
- iii۔ پاکستانی ادب کی اصطلاح: تشکیل و روایت اور ارتقاء

۲۔ شہری ادب کا تنقیدی مطالعہ

- الف۔ دو قہیمے
- i۔ میر (غزل - انتخاب میر مولوی عبدالحق)
- ii۔ غالب (دیوان غالب)
- iii۔ حالی (مسدس)
- iv۔ اقبال (طلوع اسلام، خضر راہ، مسجد قرطبہ)

ب۔ دو جدیدے

- i۔ فیض (غزل - دست صبا)
- ii۔ راشد (نظم - ایران میں اجنبی)
- iii۔ مجید امجد (نظم - شب رفتہ)
- iv۔ ناصر کاظمی (غزل - برگ نے)

۳۔ شہری ادب کا تنقیدی مطالعہ

- الف۔ غیر افسانوی نثر
- i۔ شبلی (سیرت النبی ﷺ، جلد اول)
- ii۔ مولوی عبدالحق (خاکے، چند ہم عصر)

ب۔ افسانوی نثر

i۔ منٹو (افسانے، منٹو کے جیسے افسانے، سر قب ڈاکٹر انوار احمد، ڈاکٹر اے بی اشرف)

ii۔ احمد مدیم قاسمی (افسانے، کیاس کے پھول)

iii۔ مشتاق احمد پٹوئی (ظفر و مزاج، آب گم)

۳۔ تلخیص

۵۔ مضمون

Part-III: (Professional) 25 Marks (Descriptive)

- I. **Development of Curriculum and Instructional Material**
 - Elements of Curriculum.
 - Curriculum Development Process: Need Assessment, Formulation of Aims and Objectives, Taxonomies of Educational Objectives, Selection of Content, Development of Curricular Materials.
- II. **Process of Teaching and Teaching Strategies**
 - Process of Classroom Communication
 - Factors affecting Classroom Communication
 - Barriers to Classroom Communications
 - Use of Instructional Materials and Media
- III. **Educational Assessment and Evaluation**
 - Concept of Classroom Assessment and Evaluation
 - Distinction between Assessment, Evaluation and Measurement
 - Approaches to Evaluation: Formative Evaluation; Summative Evaluation
 - Types of Test: Essay Type; Objective Type: Multiple Choice, True-False Items, Matching Type; Principles of Construction of these Test
 - Characteristics of a Good Test: Validity, Reliability, Objectivity, Usability
- IV. **Research Methods in Education**
 - Research Instruments: Questionnaire: Interview; Test; Observation; Rating Scale
 - Research Proposal and Report Writing

مجوزہ کتب برائے مطالعہ

ڈاکٹر وزیر آغا	۱۔ تحقیق اور جدیداً روشنی
ڈاکٹر انور سدید	۲۔ اردو ادب کی تحریکیں
شیخ محمد اکرام	۳۔ آپ کوڑ
شیخ محمد اکرام	۴۔ رو کوڑ
شیخ محمد اکرام	۵۔ موج کوڑ
ڈاکٹر روبینہ شہناز	۶۔ اردو تحقیق میں پاکستانی تصورات و میت
مرتبین: ڈاکٹر رفیع الدین ہاشمی	۷۔ قابلیت کے سوال
ڈاکٹر اسماعیل عمر، ڈاکٹر وحید عشرت	
ترتیب نو: ڈاکٹر خواجہ محمد زکریا	۸۔ تاریخ ادبیات مسلمانان پاکستان و ہند
مرتب: ڈاکٹر نواز شعلی	۹۔ اردو ادب کے پچاس سال

S. No.	Title	Author
1.	Research in Education	JW Best
2.	Integrating Education Technology into Teaching	Roblyer
3.	Curriculum Development	S. M. Shahid
4.	Educational Measurement and Evaluation	S. M. Shahid
5.	Educational Administration	S. M. Shahid

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-91/2020-R
Particulars of post	General Staff Officer, Grade-II (Research & Training) (BS-18), Armed Forces Institute of Radiology and Imaging, Ministry of Defence.
Minimum Qualification & Experience:	i) Second Class or Grade 'C' Master's Degree in Statistics or Bio- statistics or equivalent qualification from a University recognized by HEC. ii) Five (5) years post qualification experience in Medical Research.

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

Part-II: (Professional) (Descriptive)

75 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.	Title	Author
1.	Principles and Procedures of Statistics	Steel, R and Torrie, J.H.
2.	Introduction to Statistical Theory, Part-I & II	Chaudhry, S.M. and Kamal, S.
3.	Fundamentals of Modern Statistical Methods	Wilcox, R.
4.	Statistical Methods	Aggarwal, Y.P.

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-92/2020-R
Particulars of post	General Staff Officer, Grade-I (Classified Radiologist) (BS-19), Musculoskeletal Radiology Department, Armed Forces Institute of Radiology and Imaging, Ministry of Defence.
Minimum Qualification & Experience:	<ul style="list-style-type: none"> i) MBBS or equivalent qualification from a University recognized by PM&DC. ii) FCPS (Radiology) or equivalent qualification recognized/registered by the PM&DC. iii) One (1) year Fellowship degree/ OJT in Musculoskeletal Radiology. iv) Seven (7) years post qualification working experience at any renowned medical imaging setup.

Part-I: 25 Marks (MCQ)

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

Part-II: (Qualification Based) (Descriptive) 25 MarksCore courses of **MBBS Degree****Part-III: (Professional) (Descriptive) 50 Marks**

- i. Core courses of FCPS in **Radiology**.
- ii. Core Courses of Specialization in **Musculoskeletal Radiology**

Note: (Equal weightage for each topic at Part-III)

PAPER-II: PROFESSIONALMax Marks: 100Time Allowed: 3 Hours

Case No.	F.4-94/2020-R
Particulars of post	General Staff Officer, Grade-I (Bio Medical Officer) (BS-19) , Armed Forces Institute of Radiology and Imaging, Ministry of Defence.
Minimum Qualification & Experience:	<ul style="list-style-type: none"> i. Second Class or Grade 'C' Master's/ Bachelor's (4 years duration) degree in Bio-medical/Electrical Engineering or equivalent qualification from a University recognized by HEC. ii. Twelve (12) years post qualification working experience at any renowned medical/ imaging set up with hands on experience in CT Scan/ MRI equipment.

Part-I: 25 Marks (MCQ)

25 MCQ Questions on Part-II.

Part-II: (Professional) (Descriptive) 75 Marks**1. Biomechanics**

- **Dynamics:** Rectilinear and curvilinear motion, Simple harmonic motion, Simple and multiple degrees of freedom, Application of these motions in human body and Biomedical machines.
- **Fluid Mechanics:** Basic concepts of Fluid Mechanics, Hydrodynamic lubrication of natural and normal synovial joints.
- **Biomedical Applications:** Mechanical properties of biological tissues and tissue mechanics, cardiac mechanics and modeling, muscle mechanics, gait kinetics, kinematics and analysis. Stress analysis and application to musculoskeletal system.

2. Bio-Instrumentation

- **Biological Systems:** Study of various Physiological systems, related biopotentials and physiological parameters.
- **Diagnostic Equipment:** invasive and noninvasive measurement techniques and related equipments.
- **Cardiovascular Measurements:** Electrocardiography, Measurement of Blood pressure, Blood flow and Cardiac output.
- **Biomedical Sensors & Transducers:** Introduction, principles, theory, design and applications.
- **Patient Monitoring Equipment:** Patient Monitors, central monitoring system, telemetry system, Gas Exchange and distributions, Respiratory therapy equipment.
- **Therapeutic Equipment:** ventilator, inhaler, defibrillator, pacemaker and heart lung machines.
- **Radiological Equipment:** concept of ionization and nonionization radiation and related equipment, medical lasers and applications.
- **Safety in Medical Equipment:** Electrical/Mechanical safety, Standards of Medical Devices, Biohazards and Safety Regulations.

3. Medical Imaging:

- **X-ray Imaging:** Physics of X-ray, Imaging with X-ray, Radiation dose, Attenuation based X-ray Imaging, X-ray Detection, X-ray Image Quality, Diagnostic Applications of X-ray Imaging, Demonstration of X-rays Equipment.

- **Principles of Computed Tomography:** Introduction to Computed Tomography and Scanners, Attenuation Tomography, Time of Flight Tomography, Reflection Tomography, Diffraction Tomography, Formulation of Attenuation Computed Tomography, Fourier Slice theorem
- **Magnetic Resonance Imaging:** Physical and physiological principle of Magnetic Resonance Imaging, MR Imaging, Formulation of MRI reconstruction, Functional MRI, BOLD MRI, Applications of MRI and fMRI
- **Positron Emission Tomography:** Physical and physiological principles of PET, PET Signal Acquisition, PET Image formation, Significance of PET, Applications of PET

SUGGESTED READINGS

S. No.	Title	Author
1.	Bio-Mechanics Principles and Application	Schnech Bronzino
2.	Basic Biomechanics of the Musculoskeletal System	Margareta Nordin, Victor H Frankel
3.	Biomechanics and Motor Control of Human Movement	David A. Winter
4.	Bio-Medical Instrumentation & Measures	Cromwell
5.	Biomedical Instruments: Theory & Design	Walter Welhowitz, Sid Deutsch and Metin Alsey,
6.	Handbook of Biomedical Instrumentation,	R.S. Khandpur,
7.	Bioinstrumentation and Biosensors	Donald L. Wise,
8.	Biomechanics and Motor Control of Human Movement	David A. Winter,
9.	Manufacturing Processes	Amstead, Begeeman and Ostwald, John Wiley & Sons
10.	The Essential Physics of Medical Imaging.	Bushberg J.T.,
11.	Foundations of Medical Imaging	Z. H. Cho,
12.	Biomedical Imaging (Principles & Application Engg: Series).	
13.	Digital Image Processing for Medical Applications	Geoff
14.	Workshop Technology, Part I & II,	W.A. Chapman, Arcold Pub,

PAPER-II: PROFESSIONALMax Marks: 100Time Allowed: 3 Hours

Case No.	F.4-95/2020-R
Particulars of post	General Staff Officer, Grade-II (Bio Medical Tech) (Cyclotron Engineer) (BS-18), Armed Forces Institute of Radiology and Imaging, Ministry of Defence.
Minimum Qualification & Experience:	<p>i) Second Class or Grade 'C' Master's degree in Electronics or Second Class or Grade 'C' Bachelor's (4 years duration) degree in Electronics Engineering or equivalent qualification from a University recognized by HEC.</p> <p>ii) Five (5) years post qualification working experience at functional PET-CT Cyclotron System at any renowned PET-CT Clinical setup</p>

Part-I: 25 Marks (MCQ)

25 MCQ Questions on Part-II.

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

- I. **Electricity & Electronics:** Electricity & Magnetism; Electrical potential, Resistance, Laws of resistance, Conductance, Conductivity, Impedance, Ohm law, Resistance in series and in parallel, practical resistors, work, power, Energy, Joule's law of electric field intensity, Gauss's Theorem, Capacitor, Capacitance, Capacitors in parallel and series. Force on a conductor in a magnetic field, electrical and magnetic circuits, leakage flux, Relation between magnetism and electricity, Induced emf, induced current and directions, Faraday's laws of electromagnetic inductions, Lenz's law, dynamically induced emf, Self inductance, mutual inductance and inductance in series/parallel, magnetic hysteresis, Energy stored in magnetic field, Generation of alternating currents and voltages.
- II. **Electrical Machines**
DC Motors: Shunt, Series and Compound Motors, Speed and Torque Relations.
Transformers: Principle, Construction, Voltage transformation ratio, Step-up/stepdown transformers, Copper & Iron Losses, Transformer connections; delta and star.
AC Motors: Induction motor, Synchronous motor, Performance, Efficiency. Single phase and three phase Motors.
Generators: Principle, Construction, Different components of generators. AC Generators, DC Generators.
- III. **Quality Management Systems:** QA models. Deming, Juran Crosby, Quality circles, management responsibility, quality planning, purchasing, design process and design validation, quality audit, corrective and preventive measures.
- IV. **Medical Imaging:**
 - **X-ray Imaging:** Physics of X-ray, Imaging with X-ray, Radiation dose, Attenuation based X-ray Imaging, X-ray Detection, X-ray Image Quality, Diagnostic Applications of X-ray Imaging, Demonstration of X-rays Equipment.
 - **Principles of Computed Tomography:** Introduction to Computed Tomography and Scanners, Attenuation Tomography, Time of Flight

Tomography, Reflection Tomography, Diffraction Tomography, Formulation of Attenuation Computed Tomography, Fourier Slice theorem

- **Magnetic Resonance Imaging:** Physical and physiological principle of Magnetic Resonance Imaging, MR Imaging, Formulation of MRI reconstruction, Functional MRI, BOLD MRI, Applications of MRI and fMRI
- **Positron Emission Tomography:** Physical and physiological principles of PET, PET Signal Acquisition, PET Image formation, Significance of PET, Applications of PET

SUGGESTED READINGS

S.No.	Title	Author
1.	Manufacturing Processes for Engineering Materials	Kalpakgjian
2.	Electrical Technology	B.L. Tharaja
3.	Electronic Devices and Circuits.	Bogart
4.	DC Machines	P.C. Sen
5.	Semiconductors	Manzar Saeed
6.	Handbook of Engineering Management	Dennis Lock.
7.	Total Quality Management	Dale H. Besterfield, Carol Besterfield-Michna, Glen H. Besterfield, Mary Gesterfield-Sacre
8.	The Essential Physics of Medical Imaging.	Bushberg J.T.,
9.	Foundations of Medical Imaging	Z. H. Cho,
10.	Biomedical Imaging (Principles & Application Engg: Series).	
11.	Digital Image Processing for Medical Applications	Geoff

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-96/2020-R
Particulars of post	General Staff Officer, Grade-I (Classified Radiologist) (BS-19), Neuro Radiology Department, Armed Forces Institute of Radiology and Imaging, Ministry of Defence.
Minimum Qualification & Experience:	<ul style="list-style-type: none"> i. MBBS or equivalent qualification from a University recognized by PM&DC. ii. FCPS (Radiology) or equivalent qualification recognized/registered by the PM&DC. iii. One (1) year Fellowship degree/ OJT in Neuro Radiology. iv. Seven (7) years post qualification working experience at any renowned medical imaging setup.

Part-I: 25 Marks (MCQ)

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

Part-II: (Qualification Based) (Descriptive) 25 MarksCore courses of **MBBS Degree****Part-III: (Professional) (Descriptive) 50 Marks**

- i. Core courses of FCPS in **Radiology**.
- ii. Core Courses of Specialization in **Neuro Radiology**

Note: (Equal weightage for each topic at Part-III)

PAPER-II: PROFESSIONALMax Marks: 100Time Allowed: 3 Hours

Case No.	F.4-97/2020-R
Particulars of post	General Staff Officer, Grade-I (Classified Radiologist) (BS-19), PET CT Scan Department, Armed Forces Institute of Radiology and Imaging, Ministry of Defence.
Minimum Qualification & Experience:	<ul style="list-style-type: none"> i) MBBS or equivalent qualification from a University recognized by PM&DC. ii) FCPS (Radiology) or equivalent qualification recognized/registered by the PM&DC. iii) One (1) year Fellowship degree/ OJT in PET CT. iv) Seven (7) years post qualification working experience at any renowned medical imaging setup.

Part-I: 25 Marks (MCQ)

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

Part-II: (Qualification Based) (Descriptive) 25 MarksCore courses of **MBBS Degree****Part-III: (Professional) (Descriptive) 50 Marks**

- i. Core courses of FCPS in **Radiology**.
- ii. Core Courses of Specialization in **PET CT**.

Note: (Equal weightage for each topic at Part-III)

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-98/2020-R
Particulars of post	General Staff Officer, Grade-II (Bio Medical Tech) (For Medical Physicist) (BS-18), Armed Forces Institute of Radiology and Imaging, Ministry of Defence.
Minimum Qualification & Experience:	i) Second Class or Grade 'C' Master's Degree in Applied Physics/ Radiation Physics/ Medical Physics/ Nuclear Physics or equivalent qualification from a University recognized by HEC. ii) Five (5) years post qualification working experience in any renowned medical radiation imaging setup.

Part-I: 25 Marks (MCQ)

25 MCQ Questions on Part-II.

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

- I. **Introduction to Nuclear Physics:** Atomic & nuclear structure, artificial & natural radioactivity, Modes of radioactive decay, exponential decay, Half-life & mean life of radionuclides, radioactive decay series & equilibrium, Nuclear Reaction & reaction cross section, nuclear fission & fusion, Nuclear fuel cycle & nuclear reactors, Cyclotron & particle accelerators; Poisson and Gaussian distribution; Applications of statistical analysis; Chi-square test; Elementary concepts of probability; Test of significance; Statistical criteria for the selection and adjustment of counters, T-tests, P-values, variances, confidence intervals, statistical results and their interpretations, medical statistics.
- II. **Radiation Interaction & Detection:** Radiation sources; Interaction of radiation with matter, Basic principles of radiation detection; Design aspects of ionization chambers, Proportional and Geiger-Muller counters: Various types of scintillators; Scintillation detectors; Radiation spectroscopy using Scintillation detectors: Semiconductors; Various types of semiconductor detectors and their characteristics. Neutron sources; Neutron detection techniques and neutron spectroscopy. Basic electronic circuits and electronic equipment used in nuclear radiation detection systems; Measure of central tendency and dispersion; Concepts of sample space, events, random variables and probability; Probability distributions (discrete & continuous); Curve fitting and tests for goodness of fit; Errors and their propagation; Counting statistics.
- III. **Radiation Biology:** Physics and Chemistry of Radiation Absorption, DNA Strand Breaks and Chromosomal Aberrations, Cell Survival Curves, Radio sensitivity and Cell Age in the Mitotic Cycle, Repair of Radiation Damage and the Dose Rate Effect, Oxygen Effect and Re-oxygenation, Linear Energy Transfer and Relative Biologic Effectiveness, Acute Effects of Total-Body Irradiation, Radioprotectors, Radiation Carcinogenesis, Hereditary Effects of Radiation, Effects of Radiation on the Embryo and Foetus, Radiation Cataractogenesis, Dose-Response Relationships for Model Normal Tissues, Clinical Response of Normal Tissues, Model Tumor Systems, Time, Dose, and Fractionation in Radiotherapy, Alternative Radiation Modalities, Radiosensitizers, Hyperthermia
- IV. **Radiation Safety Principles and Techniques:** Introduction, Radiation quantities & units, International organizations setting standards, Latest IAEA Basic Safety standards, Fundamental Safety Principles, Safety standards for medical exposure, Principles & control of external & internal exposure hazards, absorbed dose estimation from external exposure, Health Physics instrumentation, Dose estimation from internally

deposited radionuclides, Radiation safety in Radionuclide therapy for patients, family members & the general public, IAEA Safety regulations for transport of radioactive materials, Radiation accident management & early medical treatment of radiation injury, Patient doses audit, Shielding and other design considerations for medical facilities, Regulatory and licensing requirements for medical facilities, Radioactive waste disposal methods, Handling of I-131 therapy patients. Practical demonstrations of radiation protection procedures in health physics, i.e., SSDL, whole body counting, bioassay counting, Verification of inverse square law, Calibration of survey meters, Bioassay technique, TLDs, Contamination and decontamination, Film badge dosimetry will be part of this course.

- V. **Physics of Nuclear Medicine:** Introduction to nuclear medicine, Radiopharmaceuticals, Basic principles & licensing considerations, Production of radioisotopes, Radioisotope generators, Dosage control techniques, Quality Control (QC) & Quality Assurance (QA) of radiopharmaceuticals, collimators, types and applications, quality control considerations in collimators, gamma camera and its components, Quality Control and Quality Assurance procedures of gamma camera, maintenance considerations, Computers in nuclear medicine: Creation of digital image, Data Analysis, Data display and formatting, Principles of SPECT and SPECT-CT, QC and QA procedures for SPECT, Introduction to non-imaging probes & solid state gamma cameras. Physics of Positron Emission Tomography (PET) and PETCT, coincidence circuitry, PET-CT camera, Quality assurance and quality control for PET-CT

SUGGESTED READINGS

S. No.	Title	Author
1.	Physics in Nuclear Medicine	Sorenson, J.A. and Phelps, M.E.
2.	Nuclear Physics	Kaplan, I.
3.	Radiation Detection & Measurements,	Knoll G. F.
4.	Nuclear Counting Statistics In Physics and Nuclear Medicine	Sorenson, J.A. and Phelps, M.E.
5.	,Radiation Biology: A handbook for teachers and students	Training course series 42
6.	Physics and Radiobiology of Nuclear Medicine,	Gopal B. Saha,
7.	IAEA Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards - Interim Ed. General Safety Requirements.	
8.	IAEA Fundamental Safety Principles, Series No. SF-1, published Tuesday, November 07, 2006. • Series, IAEA Safety Standard. Regulations for the Safe Transport of Radioactive Material. TS, 2012.	
9.	IAEA SRS-63, Release of patients after Radionuclide therapy, 2009	
10.	Physics in nuclear Medicine,	Cherry, Simon R., James A. Sorenson, and Michael E. Phelps.
11.	Nuclear Medicine Physics: A Handbook for Teachers and Students.	Bailey, D. L., and J. L. Humm.
12.	Nuclear Medicine Physics: The Basics.	Chandra, Ramesh,
13.	Essentials of Nuclear Medicine Physics and Instrumentation	Rachel A. Powsner, Matthew R. Palmer, Edward R. Powsner,

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-99/2020-R
Particulars of post	General Staff Officer, Grade-I (Classified Radiologist) (BS-19), Interventional Radiology Department, Armed Forces Institute of Radiology and Imaging, Ministry of Defence.
Minimum Qualification & Experience:	<ul style="list-style-type: none"> i) MBBS or equivalent qualification from a University recognized by PM&DC. ii) FCPS (Radiology) or equivalent qualification recognized/registered by the PM&DC. iii) One (1) year Fellowship degree/ OJT in Interventional Radiology. iv) Seven (7) years post qualification working experience at any renowned medical imaging setup.

Part-I: 25 Marks (MCQ)

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

Part-II: (Qualification Based) (Descriptive) 25 MarksCore courses of **MBBS Degree****Part-III: (Professional) (Descriptive) 50 Marks**

- i. Core courses of FCPS in **Radiology**.
- ii. Core Courses of Specialization in **Interventional Radiology**.

Note: (Equal weightage for each topic at Part-III)

PAPER-II: PROFESSIONALMax Marks: 100Time Allowed: 3 Hours

Case No.	F.4-101/2020-R
Particulars of post	General Staff Officer, Grade-I (Classified Radiologist) (BS-19), Women Imaging/ Breast Clinic/ Body Imaging Department, Armed Forces Institute of Radiology and Imaging, Ministry of Defence.
Minimum Qualification & Experience:	<ul style="list-style-type: none"> i) MBBS or equivalent qualification from a University recognized by PM&DC. ii) FCPS (Radiology) or equivalent qualification recognized/ registered by the PM&DC. iii) One (1) year Fellowship degree/ OJT in Breast/ Body imaging. iv) Seven (7) years post qualification working experience at any renowned medical imaging setup.

Part-I: 25 Marks (MCQ)

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

Part-II: (Qualification Based) (Descriptive) 25 MarksCore courses of **MBBS Degree****Part-III: (Professional) (Descriptive) 50 Marks**

- i. Core courses of FCPS in **Radiology**.
- ii. Core Courses of Specialization in **Breast/Body Imaging**

Note: (Equal weightage for each topic at Part-III)

PAPER-II: PROFESSIONALMax Marks: 100Time Allowed: 3 Hours

Case No.	F.4-117/2020-R
Particulars of post	Deputy Chemical Examiner (BS-18), Pakistan Customs Department, Federal Board of Revenue, Revenue Division.
Minimum Qualification & Experience:	(i) Second Class or Grade 'C' Master's degree in Chemistry/ Analytical Chemistry from a recognized University. (ii) Five (5) years post qualification experience of analytical work in a 1 st Class Laboratory in BS-17 or equivalent post.

Part-I: 25 Marks (MCQ)

25 MCQ Questions on Part-II.

Part-II: (Professional) (Subjective)**75 Marks****I. Basic Concepts of Chemistry**

- Chemical Nomenclature (this unit required for credit)
- Atomic Structure
- Periodic Table
- Lewis Structure
- Chemical Reactions
- Stoichiometry
- Acid-Base Chemistry

II. Inorganic Chemistry

- Atomic Structure
- Chemical Periodicity
- Chemical Bonding
- Oxidation States and Oxidation number
- Acid and Bases
- Chemistry of elements
- Extraction of metals
- Nuclear Chemistry
- Coordination Compounds

III. Organic Chemistry

- Bonding and shapes of Organic Molecules
- Chemistry of aliphatic compounds
- Stereochemistry of carbon compounds
- Organometallic compounds
- Active methylene compounds
- Chemistry of biomolecules

IV. Spectrometry

- Basic components of spectrometer
- Use of spectrometer

V. Spectroscopy

- Principles of Spectroscopy
- Types of Spectroscopy
- Spectroscopy and its applications

VI. Physical Chemistry

- Gaseous state
- Thermodynamics:
- Phase rules and its applications
- Solutions and solubility
- Colligative properties
- Electro-chemistry
- Chemical Kinetics
- Photochemistry
- Catalysis
- Colloids

VII. Chromatography

- Principles of Chromatography
- Method of performing Chromatography
- Types of Chromatography
- Uses of Chromatography

VIII. Electron microscopy

- Working of microscope and its uses
- Difference between an Ordinary Microscope and Electron Microscope
- Different types of electron microscope

SUGGESTED READINGS

S.No.	Title	Author
1.	Atkin's Physical Chemistry, 9 th ed. 2010	Atkins, P. and Paula, J. D.
2.	Inorganic Chemistry, 5 th ed. 2010	Shriver, D. and Atkins, P.
3.	Textbook of Inorganic Chemistry 2013	Chaudhary, S. U.
4.	Organic Chemistry, 8 th ed. 2012	John, E. M.
5.	Introduction to Spectroscopy, 4 th ed., 2009	Pavia, D. L., Lampman, G. M., Kriz, G.S. and Vyvyan, J. R.,
6.	Organic Spectroscopy 2006	Younas, M.

PAPER-II: PROFESSIONALMax Marks: 100Time Allowed: 3 Hours

Case No.	F.4-126/2020-R
Particulars of post	Senior Agricultural Engineer (BS-19) , Federal Water Management Cell, Ministry of National Food Security and Research.
Minimum Qualification & Experience:	(i) Bachelor's Degree in Civil/ Mechanical/ Agricultural Engineering or equivalent from the recognized university (ii) Twelve (12) years post qualification experience in Designing/ Planning/ research or Execution of Projects relating to Water Management/ Economical use of water/ Land Leveling/ Agricultural Engineering.

Part-I: 25 Marks (MCQ)

25 MCQ Questions on Part-II.

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

- 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. **Water Management:** Concept of water management and its developments in Pakistan, components of water management. Irrigation system management, Soil moisture and its types, soil moisture characteristics, field capacity, wilting point, total available water, management allowed deficit, infiltration rate, hydraulic conductivity.
- VIII. **Land Levelling:** Importance of land levelling in water management, topographic survey, system layout, determining cuts and fills, land levelling equipment, laser land levelling and use of total station.
- IX. **Watercourse Design and Maintenance:** Hydraulics of open channel flow, flow profiles, design of watercourse for a command, watercourse structures, cleaning and maintenance of watercourses.

SUGGESTED READINGS

S. No.	Title	Author
1.	Shaping the Future of Water for Agriculture	World Bank, USA
2.	Participatory Rural Development in Pakistan	Khan, M. H
3.	Agriculture in Pakistan	Khan M. H.
4.	Economic Survey of Latest Years	
5.	Agricultural/Livestock/Machinery/Rural Developments Censes of Latest Years	
6.	Fundamentals of Soil Science	Henry D. Foth
7.	Irrigation Principles & Practices	Isrealson, O.W. Vaughn, E. Hansen.
8.	A Text Book of Plant Pathology	A.V.S.S. Sambamurti
9.	The Principles of Agronomy.	Harris, Franklin Stewart
10.	Crop evapotranspiration (Guidelines for computing crop water requirements),	Allen, R.G., Pereira, L.S., Raes, D. and Smith, M.
11.	OFWM Field Manual 1-4, Federal Water Management Cell.	Ministry of Food, Agriculture and Livestock, Islamabad.