Syllabus and Course Scheme

B.Sc. – Botany

Semester Scheme

(w.e.f. from 2018-19)

UNIVERSITY OF KOTA
MBS Marg, Swami Vivekanand Nagar
Kota - 324 005, Rajasthan, India
Website: uok.ac.in

Semester-I

Paper-I Algae and Bryophyta

Paper-II Fungi, Microbes and Plant Diseases

Practical

Semester-II

Paper-I Pteridophyta and Paleobotany

Paper-II Cell Biology and Genetics

Practical

Semester-III

Paper-I Diversity and Systematics of Gymnosperms

Paper-II Diversity and Systematics of Angiosperms

Practical

Semester-IV

Paper-I Development and Embryology of Angiosperms

Paper-II Morphology, Anatomy and Plant Breeding

Practical

Semester-V

Paper-I Plant Physiology and Biochemistry

Paper-II Ecology and Phytogeography

Practical

Semester-VI

Paper-I Molecular Biology

Paper-II Biotechnology

Practical

B.Sc. (Botany)
Syllabus of Semester Scheme

B.Sc. (Botany) I Semester-2018-19

Scheme	Duration	Max.Marks	Min.marks
Paper-I	3hrs	60	24
Paper-II	3hrs	60	24
Practicals-	4hrs	50	18

Paper-I Algae and Bryophyta

Duration: 3 Hrs Max. Marks:60

Unit-I

Algae : General Characters, Classification and economic importance, life cycle pattern in algae.

Unit-II

General account of Cyanophyceae, economic importance, life history of *Nostoc* and *Oscillatoria*, General account, Important features and life history of Chlorophyceae: *Ulothrix, Volvox, Oedogonium, Coleochaete* and *Chara.*

Unit-III

General Characters, Important features and life history of Xanthophyceae-*Vaucheria,* Phaeophyceae.-*Ectocarpus, Sargassum,* Rhodophyceae-*Polysiphonia.*

Unit-IV

Bryophyta : General Characteristics and classification of bryophyta, economic importance and alternation of generation.

Unit-V

Structure, reproduction and economic importance of Hepaticopsida-*Riccia, Plagiochasma, Marchantia* and *Porella,* Anthocerotopsida-*Anthoceros,* Bryopsida-*Sphagnum, Andreaea* and *Polytrichum.*

Paper-II Fungi, Microbes and plant disease

Duration: 3 Hrs Max.Marks:60

Unit-I

Fungi : General Characters, classification and economic importance. Important features and life history of mastigomycotina-*Phytophthora.*

Unit-II

Important features and life history of Oomycotina-*Albugo,* Ascomycotina-*Saccharomyces, Penicillium, Erysiphae, Neurospora*.

Unit-III

Important features and life history of Basidiomycotina-*Puccinia*, *Ustilago* and *Agaricus*, Deuteromycotina-*Colletotrichum* and *Alternaria.*

Unit-IV

Viruses and Bacteria: General account of viruses and mycoplasma, Bacteria-structure, nutrition, reproduction and economic importance, General account of cyanobacteria.

Unit-V

Plant diseases and general account of lichens, special studies about green ear disease, white rust, stem rust disease of wheat, smut disease, citrus canker, Tobacco mosaic disease, Little leaf disease of brinjal.

Books Recommended :

1. Vashistha, B.R. 1989, Algae, S. Chand and Co. Delhi.
2. Vashistha, B.R. 1989, Fungi, S. Chand and Co. Delhi.
3. Pandey S.N. & other. 1995, A Text Book of Botany Vol. I, Vikas Publications Dehli.
4. Pandey S.N. & other1995, A Text Book of Botany Vol. II, Vikas Publications Dehli.

PRACTICAL

Microscopic preparation and study of the following algal material: *Nostoc, Oscillatoria, Ulothrix, Dictyota, Chlamydomonas, Volvox, Coleochaete, Oedogonium, Vaucheria, Chara, Ectocarpus Sargassum* and *Polysiphonia*.

Staining of different types of Bacteria.

Study of some locally available plant diseases caused by Viruses. Mycoplasma, Bacteria and Fungi in field/laboratory.

TMV, Little leaf of Brinjal. Citrus canker.

Green ear disease of Bajra.
Study of External morphology and microscopic preparations of following Bryophytes: *Riccia, Marchantia, Plagiochasma, Anthoceros, Sphagnum Andreaea* and *Polytrichum*.

Marking Scheme

There shall be a practical examination of four hours duration and the distribution of marks shall be as follows:-

	Students	
	Reg.	Ex.
1. Preparation, Mounting and Identification of Algae	5	7
2. Preparation, Mounting and Identification of Bryophyta	5	7
3. Preparation, Mounting and Identification of Fungi	6	8
4. Bacterial Staining	3	4
5. Plant disease (specimen/mounting)	3	4
6. Spots 1-5	15	15
7. Viva-Voce	5	5
8. Practical Record	8	-
TOTAL	**50**	**50**

बी.एस.सी. (वनस्पति विज्ञान) I - सेमेस्टर 2018–19

परीक्षा योजना	अवधि	अधिकतम अंक	न्यूनतम अंक
प्रष्न पत्र –I	3 घंटे	60	24
प्रष्न पत्र –I	3 घंटे	60	24
प्रायोगिक परीक्षा	4 घंटे	50	18

प्रष्न पत्र –I शैवाल एवं ब्रायोफायटा

समय : 3 घंटे **अधिकतम अंक : 60**

इकाई– I

शैवाल :– सामान्य गुण, वर्गीकरण एवं आर्थिक महत्व, शैवालो में जीवन चक्र प्रारूप

इकाई– II

सायनोफाइसी का सामान्य विवरण, आर्थिक महत्व, नोस्टोक एवं ओसिलेटोरिया का जीवन इतिहास, क्लोरोफाइसी का सामान्य विवरण, महत्वपूर्ण लक्ष्ण एवं जीवन इतिहास :– यूलोथ्रिक्स, वोल्वोक्स, ऊडोगोनियम, कोलियोकीट एवं कारा

इकाई– III

सामान्य गुण, महत्वपूर्ण लक्षण एवं जीवन इतिहास–जेन्थोफाइसीः वाउचेरिया, फियोफाइसीः एक्टोकार्पस, सारगासम, रोडोफाइसी : पोलीसाइफोनिया

इकाई– IV

ब्रायोफायटा : सामान्य लक्षण, वर्गीकरण, आर्थिक महत्व एवं पीढ़ी एकांतरण

इकाई– V

संरचना, प्रजनन एवं आर्थिक महत्व – हिपेटिकोप्सिडाः रिक्सिया, प्लेजियोकाज्मा, मार्केन्षिया एवं पोरेला, एन्थोसिरोटोप्सिडाः एन्थोसिरोस, ब्रायोप्सिडा : स्फेगनम, ऐन्ड्रिया एवं पोलीट्राइकम

प्रष्न पत्र –II कवक, सूक्ष्मजीव एवं पादप रोग

समय : 3 घंटे **अधिकतम अंक : 60**

इकाई– I

कवक :– सामान्य गुण, वर्गीकरण एवं आर्थिक महत्व, मैस्टिगोमायकोटिना के मुख्य लक्षण एवं जीवन इतिहास : फायटोफ्थोरा

इकाई– II

मुख्य लक्षण एवं जीवन इतिहास – ऊमाइकोटिना : एल्बूगो, एस्कोमाइकोटिना : सेकेरोमाइसीज, पेनीसिलियम, एरीसायफी, एवं न्यूरोस्पोरा

इकाई– III

मुख्य लक्षण एवं जीवन इतिहास – बेसिडियोमाइकोटिना : पक्सीनिया, अस्टीलागो एवं एगेरिकस, ड्यूटेरोमाइकोटिना : कोलेटोट्राइकम एवं अल्टरनेरिया

इकाई– IV

विषाणु एवं जीवाणु : विषाणुओं एवं माइकोप्लाज्मा का सामान्य विवरण, जीवाणु की संरचना, पोषण, प्रजनन एवं आर्थिक महत्व, सायनोजीवाणु का सामान्य विवरण

इकाई– V

पादप व्याधियां एवं लाइकेन्स का सामान्य विवरण, हरित बाली रोग, श्वेत किट्ट, गेहूँ में किट्ट रोग, स्मट रोग, सिट्रस केंकर, टोबेको मोजेक रोग, बेंगन में लघुपर्णी रोग के बारे में विषेष अध्ययन

प्रायोगिक कार्य

निम्न शैवाल का सूक्ष्मदर्षी की सहायता से अध्ययनः नोस्टोक, ओसिलेटोरिया, यूलोथ्रिक्स, डिक्टीयोटा, क्लेमाइडोमोनास, वॉल्वॉक्स, कोलियोकीट, ऊडोगोनियम, वाउचेरिया, कारा, एक्टोकार्पस, सारगेसम पोलीसाइफोनिया विभिन्न प्रकार के जीवाणुओं का अध्ययन स्थानीय प्राप्त पादप व्याधियां जो विषाणु, माइकोप्लाज्मा, जीवाणु और कवकों के कारण उत्पन्न होती है का अध्ययन टी.एम.वी., बैंगन का लघुषर्णी रोग, सीइट्रस केंकर, बाजरे का हरित बालि रोग, इथर डीजीज ऑफ बाजरा बाह्य

आकारिकी एवं सूक्ष्मदर्शी अध्ययन : ब्रायोफाइटा रिक्सिया, मार्केन्षिया, प्लेजियोकाज्मा, एंथोसिरोस, स्फेगनम, ऐन्ड्रिया एवं पोलीट्राइकम

अंक विभाजन

प्रायोगिक परीक्षा एक दिवस में 4 घंटे की अवधि की आयोजित की जायेगी, जिसमें अंको का वितरण निम्न प्रकार से होगा।

	विद्यार्थी	
	नियमित	पूर्व
1. स्लाइड निर्माण, मांउटिग एवं पहचान – शैवाल	5	7
2. स्लाइड निर्माण, मांउटिग एवं पहचान –ब्रायोफायटा	5	7
3. स्लाइड निर्माण, मांउटिग एवं पहचान – कवक	6	8
4. जीवाणु अभिरंजन	3	4
5. पादप रोग (प्रतिदर्ष/माउंटिग)	3	4
6. प्रतिदर्श 1–5	15	15
7. मौखिक	5	5
8. प्रायोगिक रिकार्ड	8	–
कुल	50	50

B.Sc. (Botany) II Semester

Scheme	Duration	Max.Marks	Min.marks
Paper-I	3hrs	60	24
Paper-II	3hrs	60	24
Practicals-	4hrs	50	25

Paper-I Pteridophyta and Paleobotany

Duration: 3 Hrs Max. Marks:60

Unit-I

Pteridophyta: General characteristics of first vascular land plants, types of steles, Heterospory & Seed habit. classification of Pteridophytes.

Unit-II

Important characteristics of Psilopsida, Lycopsida, Sphenopsida, and Pteropsida, Alternation of generations Structure and Reproduction of Lycopodium.

Unit-III

Structure and Reproduction of *Selaginella, Equisetum, Adiantum* and *Marsilea.*

Unit-IV

Paleobotany: Geological times cale, Fossilization, Types of fossils, Techniques of fossil study.

Unit-IV

General characters of *Rhynia, Lepidodendron, Calamites, Cladoxylon* in brief. Aims & objectives of paleobotany

Paper-II Cell Biology and Genetics

Duration: 3 Hrs Max. Marks:60

Unit-I

The cell envelopes : Plasma membrane, bilayer lipid structure, functions of the cell wall, ultra structure of prokaryotic and eukaryotic cells.
Structure and function of other organelles: Golgi bodies, Endoplasmic Reticulum, Peroxisomes, vacuoles.

Unit-II

Structure and function of nucleus : Ultrastructure, nuclear membrane, nucleolus.
Chromosome organization : Morphology, Centromere and telomere, chromosome alterations, deletion, duplication, translocation, inversion, variations in chromosome number, aneuploidy, polyploidy, sex chromosomes.

Unit-III

DNA the genetic material ; DNA structure, replication of DNA, protein interactions, Nucleosome model, genetic code, satellite and repetitive DNA, cell division-Mitosis, Meiosis.

Unit-IV

Genetic Inheritance : Mendelian laws of segregation and independent assortment Linkage analysis, allelic and non allelic interaction.
Gene expression : Structure of gene, transfer of genetic information, transcription,translation, protein synthesis, ribosomes.

Unit-V

RNA ;regulation of gene expression in prokaryotes, Lac operon.
Genetic Variations : Mutations, spontaneous and induced mutation.
Extranuclear genome : presence and function of mitochondrial and plastid DNA, Plasmids.

PRACTICAL

Microscopic preparations and study of the following
Pteridophytes: *Lycopodium, Selaginella, Equisetum, Adiantum and Marsilea.*

Microscopic examination of fossil slides, specimen/photograph-*Rhynia, Lepidodendron Calamites and Cladoxylon.*

Marking Scheme

There shall be a practical examination of four hours duration and the distribution of marks shall be as follows-

		Students	
		Reg.	**Ex.**
1.	Preparation, mounting and Identification of vegetative part of Pteridophyta	10	12
2.	Preparation, mounting and Identification of reproductive part of Pteridophyta	4	5
3.	Smear preparation of onion root tips, study of cell division.	10	12
4.	Monohybrid / Dihybrid ratio.	3	4
5.	Spots (1-5)	10	10
6.	Viva-Voce	5	7
7.	Practical record	8	-
	Total	**50**	**50**

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B.Sc. (Botany) III Semester

Paper-I

Diversity and Systematics of Gymnosperms

Duration 3 hrs. **Max. Marks 60**

Unit-I **General Features of Gymnosperms** and their classification; Evolution and diversity of gymnosperms.

Unit-II Distribution of Gymnosperms in India, Economic importance, Affinity of Gymnosperms.

Unit-III **Fossil Gymnosperms:** Comparative account and salient features of Cycadofilicales, Cordaitales, Bennettitales.

Unit-IV **Morphology of Vegetative and Reproductive Parts:** Anatomy of root, stem and leaf; Reproduction and life cycle of ***Cycas***, ***Pinus*** and ***Ephedra.***

Unit-V **Morphology of Vegetative and Reproductive Parts:** Anatomy of root, stem and leaf; Reproduction and life cycle of ***Ginkgo, Taxus*** and ***Gnetum.***

Paper - II

Diversity and Systematics of Angiosperms

Duration 3 hrs. **Max. Marks 60**

Unit-I **Origin and Evolution of Angiosperms:** Some examples of primitive Angiosperms and Ranales.

Unit-II **Angiosperm Taxonomy:** Brief history; Aims and fundamental components; Alpha taxonomy, Omega-taxonomy, Keys, Taxonomic literature, Botanical nomenclature; Principles and rules; Taxonomic ranks; Type concept, Principle of priority.

Unit-III **Classification of Angiosperms:** Salient features of the systems proposed by Bentham & Hooker and Engler & Prantl; Major contributions of cytology, phytochemistry and taximetrics to taxonomy.

Unit-IV **Diversity of flowering plants** as illustrated by members of the families Ranunculaceae, Brassicaceae, Papaveraceae, Capparidaceae, Malvaceae, Rutaceae, Fabaceae and Apiaceae.

Unit-V **Salient Features of Some Families:** Asteraceae, Acanthaceae, Apocynaceae, Asclepediaceae, Solanaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Liliaceae and Poaceae.

SUGGESTED READINGS:-

Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms. New Age International Limited, New Delhi.

Stewart, W.M. 1983. Paleobotany and the Evolution of Plants. Cambridge University Press, Cambridge.

Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperm Taxonomy. Oliver and Boyd, London.

Heywood, V.H. and Moore, D.M. (eds) 1984. Current Concepts in Plant Taxonomy, Academic Press, London.

Jeffrey, C. 1982. An Introduction to Plant Taxonomy, Cambridge, University Press, Cambridge London.

Jones, S.B. Jr and Luchsinger, A.E. 1986 Plant Systematics (2nd edition). McGraw Hill Book Co., New York

Maheswari, J.K. 1963. Flora of Delhi. CSIR, New Delhi.

Radford, A.E. 1986. Fundamentals of plant systematics. Harper and Row, New York.

Singh, G. 1999. Plant Systematics: Theory and Practice. Oxford and IBH Pvt. Ltd., New Delhi.

Stace, C.A. 1989 Plant Taxonomy and Biosystematics (2nd edition). Edward Arnold, London.

Sharma Niranjan 2002. The flora of Rajasthan, Aavishkar Publishers Jaipur.

Raven, P.H., Evert, R. F. and Eichhorn, S.E. 1999. Biology of Plants. 5th edition. W.H. Freeman and Co., Worth Publishers, New York

Thomas, P. 2000. Trees. Their Natural History, Cambridge University Press Cambridge.

PRACTICAL MARKING SCHEME:-

There shall be a practical examination of five hours duration and distribution of marks shall be as follows:

Time: 5 hrs **Max.Marks 50**

		EX	REGULAR
1.	A double stained section of plant part (vegetative) of Gymnosperms.	7	10
2.	T.S./L.S. of Reproductive part (Gymnosperms)	4	5
3.	(A) Description of flowering twig in semi technical language assigning its family. Give suitable diagrams	7	10
	(B) Description of reproductive parts of of a flower assigning its family. Draw floral diagram.	4	5
4.	Spots-Five (3 Marks each)	15	15
5.	Viva voce	5	5
6.	Practical record	8	-
		___	___
		Total 50	**50**

SUGGESTED PRACTICAL EXERCISES:-

Gymnosperms

Cycas

i. Habit, armour of leaf bases on the stem (if specimen is not available show photograph), very young leaf (circinate venation) and old foliage leaves, scale leaf, bulbils, male cone (specimen); microsporophyll, megasporophyll, mature seed.

ii. Study through permanent slides - normal root (T.S.), stem (T.S.) (if sections are not available show photographs), ovule (L.S.).

iii. Study through hand sections or dissections - coralloid root (T.S.), rachis (T.S.), leaflet (T.S.), microsporophyll (T.S.), pollen grains (W.M.)

Pinus

i. Habit, long and dwarf shoot showing cataphylls and scale leaves, T.S. wood showing growth rings, male cone, 1^{st} year, 2^{nd} year and 3^{rd} year female cones, winged seeds.

ii. Study through permanent slides - root (T.S.), female cone (L.S.), ovule (L.S.), embryo (W.M.) showing polycotyledonous condition.

iii. Study through hand sections or dissections - young stem (T.S.), old stem (wood) (T.L.S. and R.L.S.), needle (T.S.), male cone (L.S.), male cone (T.S.), pollen grains (W.M.)

Ephedra

i. Habit and structure of whole male and female cones.

ii. Permanent slides - female cone (L.S.).

iii. Hand sections/dissections - node (T.S.), internode (T.S.), male cone (T.S. and L.S.), pollen grains.

Ginkgo, Taxus & ***Gnetum*** - Study of morphology and anatomy of vegetative and reproductive parts.

Angiosperms

The following species are suitable for study. This list is only indicative. Teachers may select plants available in their locality.

1. **Ranunculaceae:** *Ranunculus, Delphinium*
2. **Brassicaceae:** *Brassica, Iberis*
3. **Papaveraceae:** *Argemone/Papaver*
4. **Malvaceae:** *Hibiscus, Abutilon*
5. **Rutaceae:** *Murraya, Citrus*
6. **Fabaceae:** Faboideae-*Lathyrus, Cajanus, Melilotus, Trigonella*
   Caesalpinioideae-*Cassia, Caesalpinia*
   Mimosoideae-*Acacia, Prosopis, Mimosa*
7. ***Apiaceae*****:** *Coriandrum, Foeniculum, Anethum*
8. ***Asteraceae*****:** *Helianthus, Ageratum, Sonchus, Tridax*
9. ***Acanthaceae*****:** *Adhatoda, Peristrophe*
10. ***Apocynaceae*****:** *Vinca, Thevetia, Nerium*
11. ***Asclepiadaceae*****:** *Calotropis*
12. ***Solanaceae*****:** *Solanum, Withania, Datura*
13. ***Euphorbiaceae*****:** *Euphorbia, Phyllanthus, Ricinus*
14. ***Lamiaceae*****:** *Ocimum, Salvia*
15. ***Amaranthaceae:*** *Amaranthus, Achyranthus*
16. ***Liliaceae*****:** *Asphodelus, Asparagus*
17. ***Poaceae*****:** *Avena, Triticum, Hordeum.*

बी.एस.सी. (वनस्पति विज्ञान) सेमेस्टर III

परीक्षा योजना	अवधि	अधिकतम अंक	न्यूनतम अंक
प्रष्न पत्र –I	3 घंटे	60	24
प्रष्न पत्र –I	3 घंटे	60	24
प्रायोगिक परीक्षा	4 घंटे	50	18

iz'u i= I & chth; ikS/kksa dh fofo/krk ,oa ofxZdh&vuko`rchth

le; 3 ?kaVs ***vf/kdre vad 60***

bdkbZ-I vuko`r chth ikS/kksa ds lkekU; y{k.k] oxhZdj.k rFkk vuko`r chth, ikS/kksa dh fofoèkrk ,oa fodkl

bdkbZ –II Hkkjr esa vkuko`r chth ikS/kks dk forj.k] vkfFkZd egRo] vukoqfr chth ikniks dh ca/kqrk

bdkbZ –III thok'eh; vuko`rchth ikni] x.k lkbdsMksfQfydsYl] dksMsZbVsYl ,oa csuhVkbVsYl ds izeq[k y{k.kksa dk rqyukRed v/;;uA

bdkbZ-IV dkf;d ,oa tuu lajpukvksa dk vkdkfjdh; v/;;u] *lkbdl*] *ikbul* ,oa *bQhMªk* ds tM+] ruk o i.kZ dh vkarfjd lajpuk ,oa tuu rFkk thou pØ dk v/;;uA

bdkbZ-V *fxUxks*] *VsDll* ,oa *uhVe* dh vkdkfjdh] vkarfjd lajpuk] tuu ,oa thou pØ dk v/;;uA

iz'u i= II & chth; ikS/kksa dh fofo/krk ,oa ofxZdh % vko`rchth

le; 3 ?kaVs ***vf/kdre vad 60***

bdkbZ –I vko`rchft;ksa dh mRifÙk ,oa fodkl] iqjkru vko`rchft;ksa ,oa x.k jsusYl ds dqN lnL;ksa dk v/;;uA

bdkbZ –II ***vko`rchth ofxZdh %*** laf{kIr bfrgkl] m)s'; ,oa vk/kkjHkwr ?kVd] ,YQk&ofxZdh] vksesxk&ofxZdh] dqaft;ka] ofxZdh; lanZHk lkfgR;] okuLifrd ukedj.k] fl)kar ,oa fu;e ofxZdh; Jsf.k;ka (Ranks)] Vkbi vo/kkj.kk] izkFkfedrk ds fl)kar

bdkbZ –III ***vko`rchth ikS/kksa dk oxhZdj.k %*** cSUFke&gqdj rFkk ,Uxyj o izsUVy }kjk izLrqr oxhZdj.k i)fr;ksa dh izeq[k fo'ks"krk,sa] vko`rchth ofxZdh ds {ks= esa dksf'kdk foKku] ikni jlk;u ,oa la[;kRed ofxZdh dk izeq[k ;ksxnkuA

bdkbZ –IV ***iq"ih; ikS/kksa dh fofo/krk,sa %*** jsuudqyslh] czslhdslh] ikikojslh] dsfijsMslh

ekyoslh] :Vslh] Qscslh ,oa ,fi;slh dqyksa dk foLr`r v/;;uA

bdkbZ –V ***dqN dqyksa dk v/;;u %*** ,LVsjslh] ,sdsUFkslh] ,sikslkbuslh] ,LDysfi;sMslh] lksysuslh] ysfe;slh] vejsUFkssslh] ;wQksfcZ;slh] fyfy;slh ,oa iks,slh dh fo'ks"krk,saA

izk;ksfxd ¼ouLifr 'kkL=½

vadks dk forj.k

le;% 5 ?k.Vs **iw.kkZd% 50**

Ø-la-		vadks dk forj.k	fu;fer Nk=		iwoZ@Lo;aikBh Nk=
1-		ftEuksLieZ dkf;d Hkkx (T.S. / L.S.) f} vfHkkajftr	7		10
2-		ftEuksLieZ iztuu vax (T.S. / L.S.) f} vfHkkajftr	4		5
3-	v-	fdlh iq"i dk lsehVsfDudy Hkk"kk esa fooj.k% dqy dh igpku ¼vko';d fp=ksa lfgr½	7		10

	c-	fdlh iq"i ds iztuu vaxks dk fooj.k@ dqy dh igpku@ iq"i vkjs[k ,oa fp=	4		5	
4-		LikWV &5 ¼izR;sd 3 vad½		15		
	15					
5-	ekSf[kd		05		05	
6-	izk;ksfxd iqfLrdk			8		&
		dqy ;ksx	***50***		***50***	

izk;ksfxd dk;Z

vuko`rchth &

lkbdl

1- ikni LoHkko rus ij i.kkZ/kkjdop lajpuk ¼;fn izfrn'kZ miyC/k u gks rks fp= fn[kkosa½] f'k'kq i.kZ ¼dqaMfyr fdly; oyu dh tkudkjh gsrq½] izkS<+ lkekU; i.kZ] 'kYd i.kZ] i= dfydk] uj 'kadq ¼izfrn'kZ½] y?kqchtk.kqi.kZ] xq:chtk.kq i.kZ ifjiDo chtA

2- tM ¼T.S.½] ruk ¼T.S.½] chtk.M ¼L.S.½ dk LFkk;h LykbM dh lgk;rk ls v/;;u ¼;fn izfrn'kZ miyC/k u gks rks fp= fn[kkosa½ A

3- dksjsykbM+ tM¼T.S.½+] jsfdl ¼T.S.½] i.kZd ¼T.S.½] y?kqchtk.kqi.kZ¼T.S.½] ijkxd.k ¼W.M.½ dk v/;;uA

ikbul

1- o`{k LoHkko] nh?kZ ,oa okeu izjksg lajpuk ¼dsVkfQYl ,oa 'kYd i.kksZ dks iznf'kZr djus gsrq½] dk"B dk T.S. ¼o`f)oy; dks iznf'kZr djus gsrq½ uj 'kadq] eknk 'akdq ¼izFke] f}rh; ,oa r`rh; o"kZ½ cht dk v/;;u A

2- tM+ ¼T.S.½] eknk 'kadq ¼L.S.½] chtkaM ¼L.S.½ o Hkzw.k ¼W.M.½ cgqcht i=h; dks fLFkrh dks iznf'kZr djus gsrq LFkkbZM dh lgk;rk ls v/;;uA

3- r:.k ruk ,oa ikS< rus dk"B ¼T.L.S. ,oa R.L.S.½] uhfMy ¼T.S.½] uj 'kadq ¼L.S. rFkk T.S.½] ijkx d.k ¼W.M.½ dk v/;;uA

bQhMªk &

1- ikni LoHkko] uj o eknk 'kadq dh lajpuk dk v/;;u ¼W.M.½A rus o tM+ rFkk 'kYd i.kZ dh lajpuk] ijkxd.k v/;;u

2- i.kZ lfU/k ¼T.S.½ i.kZ ¼T.S.] ruk ¼T.S.½] tM ¼T.S.½ 'kYd i.kZ ¼T.S.½ ,oa ijkxd.k ¼W.M.½ dk v/;;u A

3- uj 'kadq ¼T.S. and L.S.½ ,oa eknk 'kadq ¼L.S.½ A

4- ***fxUxks***] ***VsDll*** o ***uhVe*** &dkf;d o tuu Hkkxksa dh vkdkfjdh; ,oa vkarfjd lajpuk dk v/;;uA

vko`rchth

fofHkUu dqyksa ds v/;;u gsrq fuEu ikni iztkfr;ksa dk i;Zos{k.k izLrkfor gSA;g ,d lkekU; lwph gS izk/;kidksa ls vuqjks/k gS fd os vius dk;ZLFky ij miyC/k mlh dqy dh nwljh iztkfr;ksa dk Hkh v/;;u gsrq lqfo/kkuqlkj p;u dj ldrs gSa

1- ***jsuudqyslh*** & ***jsuudqyl*** o ***MsYQhfu;e*** A

2- ***czslhdslh*** & ***czslhdk***] ***vkbcsfjl o***

Iksisojslh & vktksZeksu] isisoj A

3- ***ekyoslh*** & ***fgfcLdl*** o ***,C;wfVyksu*** A

4- ***:Vslh*** & ***eqjk;k*** o ***lkbVªl*** A

5- ***Qscslh***%***QscksbMh*** & ***ysFkkbjl] dstsul] esyhyksVl*** o ***Vªkbxksusyk***A***flt+yfiuksbMh***&***dsfl;k***] ***flt+yihfu;k***]

ekbekslkbMh & ***vdsf'k;k] izkslksfil] ekbekslk*** A

6- ***,fi;slh*** & ***dksjh;sUMªe] QksuhD;wye] ,usFke*** A

7- ***,LVsjslh*** & ***gsyh;sUFkl] ,stsjsVe] lksUdl*** o ***VªkbMsDl*** A

8- ***,sdsUFkslh*** & ***,MkVksMk*** o ***isjhLVªksQh*** A

9- ***,sikslkbuslh*** & ***foUdk] fFkosf'k;k] uhfj;e***A

10- ***,LDysih;sMslh*** & ***dsyksVªksfil***A

11- ***lksysuslh*** & ***lksysue] fo/kkfu;k*** o ***/krwjk***A

12- ***;wQksfcZ;slh*** & ***;wQksfcZ;k] fjflul*** o ***QkbysUFkl*** A

13- ***ysfe;slh*** & ***vkslhee*** o ***lsfYo;k*** A

14- vejsUFkZlh ***&vejsU;l] ,dkbjsUFkl*** A

15- ***fyfy;slh*** & ***,LQksMhyl*** o ***,Lisjsxl*** A

16- ***iks,slh*** & ***,sfouk***] ***fVªVhde***] ***gksfMZ;e*** A