

REQUIREMENTS FOR B.Sc. LIFE SCIENCES LABORATORY COURSES (LSE-04L, LSE-08 ,LSE-11L, &LSE14L)

EQUIPMENTS

- 1) Compound microscope (with low and high power objective lens)
- 2) Dissection microscope.
- 3) Centrifuge
- 4) Distillation plant.
- 5) Water bath
- 6) Ph meter and the electrodes
- 7) electronic balance
- 8) Electric shaker
- 9) stop watch
- 10) stop clock
- 11) Ocular micrometer.
- 12) Stage micrometer
- 13) Spirit lamp
- 14) Watch lamp
- 15) Dissection Kit.
- 16) Dissection needles
- 17) Scalpel/Blade
- 18) Forceps.
- 19) Razor blade
- 20) Spatula/ Toothpick
- 21) Test tube racks,
- 22) Bunsen burner.
- 23) Burette clamp stand
- 24) Magnetic stirrer
- 25) Oven
- 26) Scissors(small)
- 27) Magnifying glass
- 28) Wooden quadrant of definite size.
- 29) 15 cm transparent plastic ruler (with millimeter division)
- 30) mortal and pestle
- 31) ice bucket
- 32) table lamp- 60 watt bulb with internal reflector
- 33) razor blade
- 34) Haemometer (Haldene's haemoglobinometer),
- 35) Haemocytometer
- 36) Kymograph apparatus
- 37) 1.5 volt dry cell (stimulator) with electrodes attached to it
- 38) Muscle lever
- 39) Double hook
- 40) Femur clamp and stand
- 41) 5 gram weight

- 42) Recording stylus
- 43) Binocular stereoscopic dissection microscope is preferred)
- 44) Lamp
- 45) Sharp, pointed scissor
- 46) Strainer spoon
- 47) Insect Net
- 48) Aspirator
- 49) insect box
- 50) Spreading board
- 51)

52)

53)

GLASSWARES

- 54) Slides and coverslips
- 55) Pasteur pipettes
- 56) pipettes
- 57) 5 and 10 ml graduated pipettes
- 58) Pipette (4, each 1 ml)
- 59) Graduated pipette (100 μ l/digit)
- 60) Droppers.
- 61) Test tubes
- 62) boiling tube or a hard glass wide mouth test tube
- 63) Syringes(2 ml)
- 64) Measuring cylindresr-1-10ml, 1-25 ml, 10-50ml, 10-100ml.
- 65) Glass rod.
- 66) Beaker
- 67) Beaker (100 ml)
- 68) Plastic beakers(250 ml)
- 69) Conical flasks(100 ml)
- 70) Conical flasks (250 ml)
- 71) Conical flask (500 ml)
- 72) Thermometer
- 73) Burette
- 74) Glass stopped reagent bottles(300 ml)
- 75) Burette(50 ml)
- 76) Glass tube 30 cm in length and 2 cm in diameter
- 77) Corks of the size to fit in the glass tubes
- 78) Petri dishes
- 79) T- tube
- 80) Separating funnel (25 ml)
- 81) Capillary tube (used for finding M.P.) or fine painting brush
- 82) Specimen jars with lid or gas collecting jars with a cover
- 83) Pipette manometer
- 84) Wide mouth test tubes (15-20 ml) or 12 small beakers (50 ml)

- 85) Cavity slides
- 86) Pipette manometer
- 87) Desiccator
- 88) Razor blade cutter
- 89) Hand lens
- 90) Test tube holders
- 91) Porcelain tile
- 92) 4 oz. bottles
- 93) One holed rubber stopper
- 94) graduated pipette(2ml).
- 95) Filter paper
- 96) Small pieces of wire gauze (about 1" square)
- 97) Watch glass
- 98) Killing jar with lid
- 99) petridishes (10×5 1.5 cm)
- 100) Dissecting trays
- 101) Frog board made of balsa wood with a hole
- 102) Beakers(50ml)
- 103) Injection syringe and needle
- 104) Microslides
- 105) Finger bowl of 200 ml. capacity
- 106) Step block
- 107) killing bottle
- 108)

REAGENTS AND STAINS

- 109) Methylene blue Stain/ 0.02% Methylene blue solution
- 110) Glycerin
- 111) Absolute alcohol/ ethanol
- 112) Conc. NH_4OH ,
- 113) Cone HCl
- 114) Conc. Sulphuric acid
- 115) Conc. nitric acid
- 116) Giemsa stain
- 117) Wright's stain
- 118) Acetic acid
- 119) Aceto-carmin
- 120) or Aceto-orcein /1% aceto-orcein
- 121) Xylene
- 122) Crystals of KMNO_4
- 123) Nail polish or DPX mountant, and

- 124) Sodium chloride
- 125) Potassium bromide (KBr)
- 126) Potassium ferricyanide [$K_3 Fe (CN)_6$]
- 127) Silver nitrate ($AgNO_3$)/ 0.05 N silver nitrate solution ($AgNO_3$)
- 128) Sucrose.
- 129) Glucose
- 130) Fructose
- 131) Egg. Albumen
- 132) Sample of blood
- 133) Unpasteurised milk
- 134) Formaldehyde solution
- 135) 0.4% Paraffin
- 136) 1% catechol solution
- 137) 1% alpha naphthal reagent,
- 138) solution of starch/starch powder
- 139) Iodine solution
- 140) Alkaline-iodide solution
- 141) Hydrogen peroxide
- 142) Buffer solution Ph 6.8
- 143) Concentrated HNO_3 .
- 144) Phenyl hydrazine hydrochloride
- 145) NaOH
- 146) Sodium acetate
- 147) $MnSO_4$ solution
- 148) Potassium chromate.
- 149) Buiuret reagent.
- 150) Seliwanoff's reagent
- 151) Benedict's reagent
- 152) Sodium hydroxide
- 153) Millon's reagent.
- 154) Gingili or groundnut oil
- 155) Standard buffer solutions of pH 4 and Ph 8.2
- 156) Lime water
- 157) Sodium bicarbonate solution (baking soda)
- 158) Cholesterol,
- 159) Ether,
- 160) Chloroform.
- 161) potassium bisulphate
- 162) Sudan III solution
- 163) Acetic anhydride.
- 164) Sodium thiosulphate ($Na_2S_2O_3 \cdot 5H_2O$ per)
- 165) anti A serum, anti B serum(blood)
- 166) 2, 3, 5- triphenyl tetrazolium chloride
- 167) KOH pellets
- 168) Phenolphthalein
- 169) Petroleum ether,

- 170) Solid sodium sulphate
- 171) phosphate buffer (Ph 6.5)
- 172) phosphate
- 173) 0.1%, 2, 6 – dichlorophenol indophenol (DCPIP)
- 174) sodium bicarbonate
- 175) KNO_3
- 176) Propanol
- 177) Sulphanilamide
- 178) N- (1naphthyl) ethylene diamine hydrochloride
- 179) KCl
- 180) Detergent
- 181) Lactophenol
- 182) 1% Boric acid solution
- 183) Iodine solution
- 184) 1.5% saffranin
- 185) Antigen A and B serums
- 186) Detergent
- 187) 2,4-dichloro acetic acid(2,4-D)
- 188) Boric acid solution(1%)
- 189) Bromothymol blue
- 190) Aceto-carmin stain
- 191) Clove oil/Xylol
- 192) Canada-Balsam
- 193) Chloroform
- 194) Albumen
- 195) Ethanol
- 196) Starch(Cracker)
- 197) Antiseptic solution(betadine)
- 198) Adrenalin solution
- 199) Hayem's solution
- 200) Thomas fluid
- 201) Nessler's reagent
- 202) Urease enzyme or freshly made housegram powder
- 203) sodium carbonate
- 204) Ammonium hydroxide
- 205) urethane,
- 206) Neutral Red or Nile blue (0.1% solution)
- 207) Ethyl acetate
- 208) Naphthalene powder
- 209)
- 210) **Prepared slides of the various animal tissues—**

I) epithelial tissues: squamous, cuboidal, columnar, ciliated, glandular.

II)connective tissues :(i)**skeletal connective tissue :** hyaline, yellow elastic cartilage, white fibrous cartilage)(ii) **binding connective tissues---**a)loose connective tissues, b)dense fibrous connective tissues-- white fibrous connective tissues, yellow connective tissues

- 111) **Muscular tissues:** striated muscle, cardiac muscle.
- 1V) **Nerve tissues:** unipolar and bipolar neurons
- V) **Vascular tissues:** red blood cells, white blood cells--eosinophils, basophils,
- 211) Prepared slides of mammalian -ovary, testis, pituitary, thyroid, parathyroid, pancreas and adrenal
- 212) Prepared slides of whole mounts and sections of different stages of chick embryos
- 213)
- 214) Protozoan *Paramecium* and *Euglena*, aphid.
Blood smear preparations of frog and man, sections of tissues showing cells and their nuclei distinctly.
- 215) Wood Eating termites(e.g.- *Trichonympha* or *Pyrsonympha*)
- 216) *Entamoeba gingivalis*
- 217) *Taenia solium*. scolex and mature gravid proglottids
- 218) Prepared microscope slides of frog development:unfertilized eggblastula entire and its vertical section,gastrula entire and its vertical section,neurula entire and its vertical section,whole mount of tadpole larva of frog,T.S. through ear of tadpole,T.S. Through eyes of tadpole, T.S. through the head and gills of tadpole.
- 219) Protozoan slides:- *Amoeba*, *Radiolarians*, *Euglena*, *Trypanosoma*, *Giardia*, *Paramecium*, *Vorticella*.
- 220) Porifera Specimens- cross Section of *Sycon*
- 221) Cnidaria Slides: T.S. of Hydra through Testis, T.S. of Hydra through Ovary.
- 222) Mollusca Slides- Glochidium and Veliger larvae.
- 223) Platyhelminthes Slides: *Dugesia tigrina*, *Fasciola hepatica*, *Taenia solium*.T.S. of *Dugesia tigrina* through pharynx and Intestinal region. T.S. of *Fasciola hepatica* through Testes, Cirrus sac and Uterus, Mature and gravid Segment of Proglottids and T.S. of Mature proglottid of *Taenia solium*. Larval stages of *Fasciola hepatica* – miracidium, sporocyst, redia, cercaria, Larval stage of *Taenia solium*- Cysticercus.
- 224) Nematoda: T.S. of body of *Ascaris lumbricoides*(Male and Female)
- 225) Arthropoda: *Daphnia* Slide, Nauplius Larva., Mount of *Drosophila*
- 226) Echinodermata – Bipinnaria larva
- 227) Hemichordata: Tornaria larva of *Balanoglossus*
- 228) Cyclostomata: Larva of *Petromyzon* (Ammocoete larva)
- 229)

PERMANENT SLIDES : PLANTS

Permanent slides of various types of plant tissues- i) simple:

parenchyma, collenchyma, and sclerenchyma. ii) **Complex:** xylem, phloem.

- 230) T.S. of lichen thallus
- 231) T.S. of the association of dodder plant and its host
- 232) **Hydrophytes plants:** T.S. root of *Potamogeton pectinatus* (submerged hydrophytes). T.S. stem of *Hydrilla* (submerged hydrophytes). T.S. leaf (only lateral wing portion shown) of *Potamogeton pusillus* (submerged). T.S. leaf of *Nymphaea* (floating-leaves). T.S. petiole of *Nymphaea* (floating-leaved).
- 233) **Xerophytes plant sections:** T.S. stem (a part) of *Casuarina*, T.S. leaf (lateral wing portion only) of *Peperomia* showing epidermal water storage tissue, T.S. leaf of *Nerium* (non-succulent perennial).
- 234) **For Studies on Male Gametophyte**
T.S. young (developing) anther
T.S. anther showing tetrad
T.S. mature anther showing pollens.
- 235) **For Studies on female gametophyte**
L.S. ovaries showing various types of ovules.
Early stage in ovule development.
Two celled stage of megaspore mother cell.
Linear tetrad of a megaspore.
Ovule with binucleate embryo sac.
Ovule with 4- nucleate embryo sac.
L.S. of ovule through mature embryo sac.
Globular stage of embryo.
Horse-shoe shape stage of embryo.
Mature embryo showing two dicotyledons
- 235) lichen types-crustose, foliose, fruticose
- 236) Study of sub-cellular organization of prokaryotic and eukaryotic cells
- 237) Comparative study of prokaryotic and eukaryotic organisms
- 238)

SPECIMENS/MODELS ANIMALS

- 239) 3rd instar of *Drosophila* larvae.
- 240) *Taenia solium* (Tape worm)
- 241) Carp (*Labeo rohita*)
- 242) Angler fish (*Lophius*)
- 243) Acorn barnacle (*Balanus*)
- 244) Sand mole crab (*Hippa*)
- 245) Horned toad (*Phrynosoma*)
- 246) *Pediculus humanus* (human head louse)

- 247) Suckerfish (*Echeneis*)
- 248) Porifera Specimens- *Sycon*, *Hyalonema*, *Euplectella*, *Spongilla*.
- 249) Cnidaria Specimens- *Obelia Colony*, *Medusa of Obelia*, *Physalia*, *Aurelia*, *Metridium*, *Acropora*.
- 250) Annelida Specimens: *Nereis*, *Aphrodite*, *Chaetopterus*, *Pheretima*, *Hirudinaria*.
- 251) Mollusca Specimens: *Chiton*, *Dentalium*, *Pila*, *Octopus*, *Nautilus*.
- 252) Nematoda Specimens: Male and Female of *Ascaris lumbricoides*.
- 253) Arthropoda Specimens: *Palamnaeus*, *Aranea*, *Sarcoptes scabiei*, *Limulus*, *Balanus*, *Sacculina*, *Palaemon*, *Eupagurus*, *Scolopendra*, *Julus*, *Peripatus*, *Lepisma*, Dragon fly, *Schistocerca gregaria*, *Mantis religiosa*, *Gryllus*, Specimens of Honey bee (*Apis indica*/*Apis dorsata*)- Worker, Queen, Drone, Termite- Alates, Soldier, Worker, Queen, King, Specimens/Mounts of eggs, larva, pupa and adults of *Anopheles*, *Culex*, *Aedes*.
- 254) Echinodermata Specimens: *Antedon*, *Ophiura*, *Echinus*, *Holothuria*, *Asterias*
- 255) Hemichordata Specimens: *Balanoglossus*.
- 256) Protochordata: Specimens *Herdmania*, *Doliolum*, *Branchiostoma*.
- 257) Cyclostomata Specimens: *Petromyzon*, *Myxime*
- 258) Chondrichthyes Specimens: *Scoliodon*, *Pritis*, *Torpedo*, *Trygon*.
- 259) Bony fishes Specimens: *Notopterus*, *Labeo rohita*, *Clarias*, *Wallago*, *Anguilla*, *Amphipnous*, *Anabas*, *Exocoetus*, *Hippocampus*, *Synapta*, *Synaptura*, *Antennarias*.
- 260) *Amphibia* Specimens: *Ambystoma*, *Axolotl larva of Ambystoma*, *Necturus*, *Ichthyophis*, *Hyla*, *Bufo*, *Rana*
- 261) *Reptilia* Specimens: *Kachuga*, *Trionyx*, *Hemidactylus*, *Chamaeleo*, *Draco*, *Mabuya/Mabuia*, *Eryx johni*, *Xenochrophis piscator*, *Ptyas mucosus*, *Bungarus caeruleus*, *Naja naja*, *Vipera russelli*, *Hydrophis cyanocinctus*.
- 262) *Aves* Specimens: *Milvus migrans*, *Bubo bubo*, *Corvus splendens*, *Dicrurus adsimilis*, *Columbia livia*, *Demdrocopus mehrattensis*, *Psittacula eupatria*, *Gallus domesticus*, *Eudynamys scolopacea*, *Struthio camelus*, Adaptive Beaks (Sparrow/Finch, Parrot, Fly catcher/Hoopoe, Duck/Teal, Kingfisher) and Feet (Sparrow, Parakeet/Woodpecker, Kite/Owl, Fowl, Lapwing, Duck/Teal, Humming bird) of birds.
- 263) *Mammals*: *Ornithorhynchus*, *Talpa*, *erinaceus*, *Sunchus*, *murinus*, *Pteropus*, *Funambulus*, *Herpestes*, *Loris*.
- 264)

SPECIMENS/MODELS PLANTS

- 265) Dodder plant, (*Cuscutta*) parasitic on plant stem
- 266) Plants of *Raphanus* or *Brassica* or *Heliant*
- 267) **Hydrophytes plant**
- i) **Free-Floating Hydrophytes:** *Trapa bispinosa*, *Azolla*, *Eichhornia crassipes*, *Salvinia*, *Wolffia*, *Pistia*, *Lemna*.

- ii) **Rooted Hydrophytes with Floating Leaves:** *Nelumbo nucifera*, *Nymphaea stellate* (water lily), *Trapa Marsilea*.
 - iii) **Submerged Floating Hydrophytes:** *Ceratophyllum*, *Utricularia*.
 - iv) **Rooted submerged Hydrophytes:** *Vallisneria*, *Chara*, *Hydrilla*, *Potamogeton*.
 - v) **Rooted emergent Hydrophytes:** *Sagittaria*, *Ranunculus*, *Cyperus*
- 177) **Xerophytes plants:** *Aloe*, *Euphorbia*, *Opuntia*, *Agave* *Bryophyllum*, *Yucca*, *Tradescantia*, *Acaia*.

268) *Drosera* (Sun dew plant).

Plants for study of families

- 269) *Ocimum basilicum* (Labiatae)
- 270) *Tridax procumbens* (Composiatae)
- 271) *Pisum sativum* (Papilionaceae)
- 272) *Argemone mexicana* (Papaveraceae)
- 273) *Ranunculus sceleratus* (Ranunculaceae)
- 274) *Brassica campestris* (Cruciferae)
- 275) *Malva sylvestris* (Malvaceae)
- 276) *Allium cepa* (Liliaceae)
- 277) *Triticum vulgare* (Gramineae)
- 278) Comparative study of morphology of some representative genera of unicellular filamentous and colonial algae
- 279) Comparative study of characteristic features of cyanobacteria, Algae, Fungi, Bryophytes and pteridophytes
- 277. Comparative study of morphology of some representative genera of advanced algae
- 278. Comparative study of reproductive features of some representative genera of algae
- 279. Comparative study of habit, external features and asexual reproduction in some representative genera of fungi
- 280. Study of sexual reproductive structures in fungi
- 281. Study of common fungal diseases of crop plants
- 282. Study of morphological, anatomical and reproductive features in lichens
- 283. Comparative study of morphological features of some representative genera of bryophytes
- 284. Comparative study of anatomical features of some representative genera of bryophytes.
- 285. Comparative study of asexual and sexual reproductive structures of some representative genera of bryophytes
- 286. Comparative study of morphological features of some representative genera of pteridophytes
- 287. Comparative study of anatomical features of some representative genera of pteridophytes
- 288. Comparative study of reproductive structures of some representative genera of pteridophytes

Higher Plants

- 289. Tools and techniques for the course
- 290. Differentiated tissues
- 291. *Cyca*

292. *Pinus*
293. *Ephedra*
294. *Gnetum*
295. Comparative study of xylem elements of *Pinus*, *Ephedra*, and *Gnetum*;
296. Anatomy of roots
297. Anatomy of stems
298. Anatomy of leaves
299. Cereals and millets
300. Spices and condiments
301. Legumes
302. Fruits and nuts
303. Vegetables
304. Medicinal plants
305. Essential oil producing plants
306. Fumitory, and masticatory materials giving plants
307. Fat and oil-source plants
308. Sugar-yielding plants
309. Starch-producing plants
310. Revision, and extension of earlier studied families
311. Dicot families
312. Monocot families
313. Plant-products from forests
314. Non-alcoholic beverages
315. Fibre-yielding plants
316. Project work

WORK MATERIAL ANIMAL

- 317) Live Grasshoppers
- 318) Live/Preserved Cockroaches
- 319) Live/Preserved Mosquitoes (Male and Female)- *Anopheles* and *Culex*.
- 320) Live frog
- 321) Live frog eggs
- 322) Live Protozoan for culture:- *Amoeba*, , *Euglena*, *Paramecium*, *Vorticella*
- 323) Sponge like Sycon for spicules, bath sponge for sponging fibres and fresh water sponge (*Spongilla*) for gemmules, preserved in 10% formalin.
- 324) Preserved earthworm (*Pheretima posthuma*)
- 325) Preserved *Pila*.
- 326) Preserved *Scoliodon*
- 327) Bones of Frog: Skull, Vertibral column, Sternun, Pectoral girdle, Pelvic girdle, Forelimb bones, Hindlimbs bones
- 328) Bones of Fowl: Skull, Vertibral column, Sternun, Pectoral girdle, Pelvic girdle, Forelimb bones, Hindlimbs bones
- 329) Live mature rats (Male and Female)
- 330) Female rats/mice
- 331) Water from a fish aquarium
- 332) Water from the aquarium in which have been kept for a few days

- 333) Cow's urine
334) Bird guano Chick fertilized eggs incubated for a period of 30 to 38 hrs. at
38°C

WORK MATERIAL PLANT

- 335) Red onion bulb.
336) Onion root tips
337) Onion flower buds
338) Firm potato or apple
339) 3 ml of salivary
340) Water samples such as well water and river water
341) Animals tissue (liver, or muscle)
342) germinating mung bean or rose flower buds or roots of a herb
343) fresh lawn grass (*Cyanodon*)
344) 30 g leaves of any of the following plants: amaranthus, mursa, green
cabbage, cauliflower leave or spinach
345) any young fresh green leaves
346) wheat seedlings (7 days old)
347) *Hydrilla* plant with apical bud
348) Leaves of *Rhoeo discolor*
349) barley seeds (50)
350) soyabean seedlings (4 days old)
351) *portulaca* flowers
352) Pollen grains from *Tradescantia* and *Impatiens*
353) *Cucumis sativus* seeds at various stage of development
354) Barley seeds
355) onion juice
356) potato extract
357) Chick peas seeds
358)

OTHER MATERIALS

- 359) Filter paper (Whatman 5 MM or Whatman 1)
360) Brush (No.6)
361) Litmus papers.
362)
363) frog thigh muscle extract
364) 2% solution, grapes.
365) Cotton
366) Pins,
367) Johnson cotton swabs
368) Tissue paper
369) Cheese cloth
370) Four clean rubber stoppers
371) red beads 50
372) 50 yellow beads

- 373) 48 Green beads
- 374) 48 Yellow beads
- 375) 48 Black beads
- 376) 48 White beads
- 377) Packet of modelling clay
- 378) needle
- 379) Human chromosome photographs
- 380) Human karyotype forms
- 381) Tape or Glue
- 382) pH indicator papers (narrow and wide range)
- 383) PTC paper
- 384) Quadrats,
- 385) pegs,
- 386) 1 meter scale
- 387) gloves
- 388) string 50 m,
- 389) bags for plant collection
- 390) rubber bung
- 391) Absorbent towel
- 392) rubber tubing
- 393) pinch clip
- 394) nylon or fine muslin
- 395) cotton wad
- 396) Napkins
- 397) large sheet of black paper
- 398) cork borer (1 cm)
- 399) 4 or 5 mm cork borer
- 400) Ruler
- 401) Developed photographic film(several pieces
- 402) Vermiculite
- 403) Fresh milk
- 404) Graph paper
- 405) String
- 406) Thread
- 407) Bone cutter
- 408) white card-board squares of side 2 cm – 260 pieces.
- 409) Plastic bowls
- 410) plastic beads (big sized ones) of green, red, blue and black colours-500
- 411) each two plastic bowls.
- 412) Plastic beads (bigger sized ones) of red, black, blue and green colour-500
- 413) of each colour.
- 414) White cloth towel with rough texture