

Biosystems Technology

List of Equipment and Specifications

Agriculture and Environmental studies Branch, Ministry of Education

No	Name of Item	Specification	Quantity per school
1	Digital memory Thermo hygrometer	<ul style="list-style-type: none"> • Small diameter (1.08) probe for measuring inside air ducts • Relative humidity accuracy of +/-0.5 provides reliable readings • Measure dew point and wet bulb temperature • Data record function stores minimum & maximum humidity and temperature measurements • Hard wire probe • Protective rubber boot • Measuring range - 10°C - 60°C • R/H - 10% - 98% 	2
2	Maximum and Minimum Thermometer	<ul style="list-style-type: none"> • Should indicate both highest and the lowest temperature reached since the instrument was last reset, as well as the temperature at the time of reading. • As the thermometer is not divided on its stem, but is mounted on a separate printed scale made of weather resistant plastic • The highest & lowest temperature to reach must be indicated by means of a clearly visible metal pointer / needle which could be readjusted / reset using a magnet provided with a groove to enable smooth movement along the thermometer glass tube to shift the pointer / needle due to magnetic effect. • scale: - (-45°C to +55°C) • Graduations: - 1°C • Dimensions: - 210 x 60 x30 mm • Accuracy :- ±1°C 	2
3	Wet & dry bulb thermometer	<ul style="list-style-type: none"> • It should consist of two thermometers mounted on a plastic/wooden/ non-corrosive metal case; complete with a graduated scale. • Accuracy ± 1°C, measuring range -10°C to 50°C • Thermometers – scale length approximately 150 mm divided at 0.50C increments. • Thermometer colored liquid. Dimension approximately 300 x 140 x 50mm accessories spares – muslin wicks (pack 50) for replacement water bottle should be provided below the wet bulb. The wick tied to the wet bulb should go in to the water bottle right up to the bottom. • RH table should be mounted or provided. 	3

4	General purpose Thermometer	<ul style="list-style-type: none"> • Thermometer with liquid alcohol • Temperature range of - 10°C to 110°C supplied in protective case. • The graduation interval should be 1 °C. • Length approximately 300mm. Length of scale approx. 200mm. 7.5mm Immersion length. • Yellow background preferred. • Should have a hanger 	5
5	Electrical Conductivity meter with a calibration standard	<ul style="list-style-type: none"> • Should be designed to be hand – held • The measurement range shall be at least from 0 – 1999 micro Siemens/cm • Accuracy of $\pm 1\%$ full scale, and an operating temperature of 0-50 °C. • Resolution 1 micro Siemens/cm • ATC Yes • Power 3V *2 Lithium Battery CR2032 • Weight with battery 85 g approximately • Standardized solution should be provided 	4
6	Soil Hydrometer	<p>Measures in grams per liter(g/L), with a range of -5 to +60 g/L (at 68°F or 20°C).</p> <p>Meets ASTM D7928 and AASHTO T 88 standards</p> <p>Range -5 — +60 g/L</p> <p>Division 1g/L at 68°F (20°C)</p> <p>Length 11inches (280mm)</p> <ul style="list-style-type: none"> • Two year warranty 	2
7	Sedimentation Cylinder for Soil Hydrometer	<ul style="list-style-type: none"> • required for testing Soil Hydrometer Analysis. • stable base • made of heavy-wall clear glass scribed at the 1,000ml mark. • Volume 1,000ml <p>Product Dimensions</p> <ul style="list-style-type: none"> • 2.5 x 18in (64 x 47mm), Dia. x H • No. 12 Neoprene Stopper 	2
8	Set of sieves	<p>size 2 mm, 0.02 mm, 0.002 mm</p> <ul style="list-style-type: none"> • Outside Dia.8 inches 	1
9	Soil moisture can	<ul style="list-style-type: none"> • Round sample tins <p>A metal container</p> <p>Size – Diameter 7cm & height 5cm with a removable lid</p>	4
10	Soil pH Meter with Buffers (Desktop type)	<ul style="list-style-type: none"> • Bench Top • Digital pH meter with LED / LCD display • Range 0-14 pH with 0.01 resolution, auto/ manual calibration. • Temperature range 0°C –100 °C electrically operated with electrode and electrode holder. • Accuracy ± 0.02 	1

11	Digital Balance	<ul style="list-style-type: none"> • Should be able to weigh to 0.01g anywhere within the 1000g capacity of the scale. • Standard features include a 15.6cm stainless steel pan, chemical resistant powder coating and multiple units of measure. • Equipped with a circular 10.8- 15.6cm diameter platform to hold just about any specimen weighing. • Requiring ± 0.01 g accuracy. • Voltage 220 – 230 v 50 Hz • Warranty min. 2 years 	3
12	Pallet Knife / Spatula	<ul style="list-style-type: none"> • 100mm long x 20 mm blade width stainless steel with wooden Handle 	6
13	Automatic level with tripod and 2 Leveling staff	<ul style="list-style-type: none"> • Leveling accuracy +/- 2mm • Telescopic magnification .24 x • Minimum focus distance - 0.2m from end of telescope, 0.3m from instrument center Dust tight and water tight protection • Horizontal angle measurement • Objective aperture - 32mm • Resolving power - 4 inches • Field of view - 10 25' at 100m • Image - Frect • Stadia constant - 0 • Stadia ratio - 100 • Focusing knob - 1- speed • Sighting aid - Gun sight • Circular level - Sensitivity - 10ft/2mm • Horizontal circle - Diameter - 103mm • Operating temperature - 40 F to 1220 F Gig umbrella - yes • Aluminum tripod - yes • Plumb bob - yes • Tool kit - yes Casing -yes 	1
14	Compass	<ul style="list-style-type: none"> • Palm top compass. Covered with stainless-steel • Main directions and degrees should have marked. • Orientation arrow should be there. • Indicator motion lock should be available • Diameter - 4 cm - 6 cm 	4
15	Measuring tape (50m)	<ul style="list-style-type: none"> • Measuring Length up to 50m • Measuring Unit- mm, cm, m • Accuracy- up to a millimeter • Material- Fabric, Fibre Coated • Rewind- Hand Crank • Water/Chemical resist graduation needed 	2

16	Measuring tape (20m)	<ul style="list-style-type: none"> • Measuring Length up to 20m • Measuring Unit- mm, cm, m • Accuracy- up to a millimeter (mm) • Material- Linen 	2
17	Surveying pole	<ul style="list-style-type: none"> • Made of Aluminum • Light weight • Full closed length - 1.20m • Extended length - 2.00m • Telescopic quick stopper system 	2
18	Spirit lamp	Stainless steel with screw caps and metal wick holder fitted with wick capacity - 100 ml	1
19	Test tube Stand	<ul style="list-style-type: none"> • Made of hardwood with heavy base 10 holes of 20mm. diameter and 2 holes of 30mm diameter. Internal height – 100mm 	2
20	Forceps Specimen Holder	• 10" Stainless steel with blunt ends & serrated tips of 10" length	10
21	Microscope (MONOCULAR)	<ul style="list-style-type: none"> • Microscope Monocular: Straight with 3 eyepieces 5/6x, 10x, 15 x. • Three objectives 10x, 40/45x & 100x. • (Oil immersion) Condenser with Irish diaphragm and mirror, graduated mechanical stage, rack, pinion focusing arrangement in wooden box with keys. 	2
22	Microscope Slide Box (plastic)	• Made up of polystyrene base slotted to hold 50 (76 X 22mm) slides with close fitting lid and index	2
23	Lens- Hand	<ul style="list-style-type: none"> • Biconvex lens. Magnification $\times 3$ lens minimum dia. 70mm. • Mounted in circular metal frame with plastic or metal handle • Handle painted black and other metal parts electroplated 	5
24	Tissue Culture Micro Dissecting Kit (stainless steel)	<ul style="list-style-type: none"> • Durable Vinyl Case • Dissecting Scissors 115mm • Watchmakers Forceps 112mm • Straight • Watchmakers Forceps 112mm Curved • Teasing Needle Straight • Teasing Needle Curved 	4
25	Budding knives	<ul style="list-style-type: none"> • Should be constructed with quality stainless steel blades and brass lined nylon handles. • Folding 2-inch blades • 3 ½ - Inch brass lined handle • 1 ¼ -Inch solid brass bark lifter • Dimension (closed) : 4" * 1" * 0.5" 	10

26	Egg Candler	<ul style="list-style-type: none"> • Weight: 150 Grams • Length: 18 cm • Diameter: 34 mm • Light source: 1 X 3W High Power LED • Input voltage: 220 Volt • Reflector efficiency: 90% • Color temperature: 3500K (Warm White) • Source life: 50,000 hours, On/off Switch • Sponge Ring for egg protection 	3
27	Lactometer	<ul style="list-style-type: none"> • TWMM01 Mercury • Measuring Range: 1020-1035g/ml / 0-4°C • Product Size: 330 mm • Packing: Plastic tube • MOQ: 1000pcs • Length: 300 mm 	6
28	Refractometer (0- 32%) (For vegetable & Fruit Juice)	<ul style="list-style-type: none"> • Scale Range - Brix 0 -32% (Automatic Temperature Compensation & water resistant) • Minimum Scale - Brix 0.2% • Measurement Accuracy - Brix +/- 0.2% (10-300C) • Repeatability - 0.1% • Size & Weight - 3.2 X3.4 x20.3 cm, 105g 	4
29	Refractometer (28% -62%)	<ul style="list-style-type: none"> • Scale Range - Brix 28% -62% (Automatic Temperature Compensation, water& water & heat resistant) • Minimum Scale - Brix 0.2% • Measurement Accuracy - Brix +/- 0.2% (10- 400C) • Repeatability - 0.1% • Size & Weight - 3.2 X3.4 x20.3 cm, 105g 	4
30	Refractometer (58%- 92%) (For High sugar content)	<ul style="list-style-type: none"> • Scale Range - Brix58% -92% (Automatic Temperature Compensation, water& heat resistant) • Minimum Scale - Brix 0.5% • Measurement Accuracy - Brix +/- 0.5% • Repeatability - 0.25% • Size & Weight - 3.2 X3.4 x16.8 cm, 130g 	4

31	Firmness meter with different probes (Fruit Hardness Tester)	<ul style="list-style-type: none"> • Scale Value - 0.5-4kg/cm² (×105Pa) Measuring head size - Φ3.5mm Φ8mm Φ11mm Accuracy - ±0.02 Inserting depth of pressure head - 10mm / • Range - Tip 1: 0.5-12 Kg/ cm² □ Tip 2: 1.0-23 Kg/cm² • Resolution: Tip 1: 0.1 Tip: 2: 0.2 • Accuracy: Tip 1: +0.3 Tip: 2: +0.6 • Tip Diameter: • 11 mm for range 0.5 - 12 kg/cm² • 8mm for range 1 - 23 kg/cm² • Weight: 300 g 	2
32	Hand operated polythene sealer	<ul style="list-style-type: none"> • Max. seal length: 8" • Max. seal thickness: 2x0.15mm • Seal width : 5 mm • Voltage : 220v – 230v • Watt : 600W • Weight : 4.2kg 	1
33	Portable non glass hand held pH meter	<ul style="list-style-type: none"> • Application - Measuring of pH of food products such as syrups, sauces, meat etc. • Type - Non glass (Ion sensitive field effect transistor, water proof, hand held) • Range - 0-14 • Resolution - 0.01 • Accuracy - +/- 0.01 • Measuring temperature range - (0°C – 100°C) • Display - LCD display • Calibration - 2 point calibration • Buffer recognition - 4, 7 & 10 • Power supply - Battery • Accessories - Piercing probe, One set of pH 4, 7 & 10 buffer bottles 	4
34	Pocket Digital Thermometer	<ul style="list-style-type: none"> • Temperature Range : -20°C to 200°C • Resolution : 0.1°C • Waterproof • Auto Power Off • Field Calibrate • Battery Type : 1.5V LR44 	4
35	Crucible with lid (Large Size)	<ul style="list-style-type: none"> • Porcelain, Dia. 40mm x Height 25mm, Capacity 30ml • Porcelain, Diameter 59mm x Height 28mm, Capacity 50ml 	4
36	Dropping bottles with pipettes	<ul style="list-style-type: none"> • Made of clear glass • Conical shoulder with clear glass pipette, rubber teat and standard ground joint polypropylene stopper • Capacity – 100 ml 	4

37	Evaporation Dish	<ul style="list-style-type: none"> • Made of Ceramic /Porcelain, Diameter 70mm, Height 30mm, • Capacity 62ml Glazed inside, with spout. 	4
38	Measuring Cylinder Graduated ·1000ml - plastic	<ul style="list-style-type: none"> • Plastic with spout and graduated with hexagonal base 	4
39	Milk Pipettes Petri Dishes with lid	<ul style="list-style-type: none"> • Volume -10. 94 ml accuracy - 0.03 	4
40	Petridish 80mm vents, 80 x 15mm	80mm vent, 80 x 15mm Borosilicate glass Free of cadmium and led	40
41	Specific gravity bottle - 25 ml bottles	<ul style="list-style-type: none"> • Spherical pattern, adjusted, borosilicate Flat bottom and perforated stopper. 	6
42	Specific gravity bottle - 50 ml bottles	<ul style="list-style-type: none"> • Spherical pattern, adjusted, borosilicate Flat bottom and perforated stopper. 	6
43	Watch glass	<ul style="list-style-type: none"> • Made of soda lime glass • Free of contain cadmium and lead • Fire polished edges • Diameter – 40mm, 60 mm 	10
44	Burette holder with clamp	<ul style="list-style-type: none"> • To be assembled by a base plate made of powder coated steel with rubber feet and a zinc coated rod with thread M 10 • Plate (LxW) – 180x 100 mm • Rod – (LxD) – 750x12 mm • clamp- • Nickle plated Zinc die – casting • Clamps and jaw dies are plastic coated • Span width 0 to 40 mm • For 1 burette 	4
45	Crucible tongs	<ul style="list-style-type: none"> • Crucible tongs are 9.5" long, have two prongs, and feature serrated tips for a firm grip. • Should provide with gripping surface. • Made of Stainless Steel corrosion resistant. Double Bent • Total length 200mm 	4
46	Pipette rack	<ul style="list-style-type: none"> • Made of polypropylene • Rotary rack with solid base for safe standing • Rotary base unit protects the pipette tips • Openings with different diameters for graduated pipettes and volumetric pipettes 	1

47	Wire gauzes	<ul style="list-style-type: none"> • Wire gauze is saved from corrosion by zinc coating with ceramic centre Asbestos free • Dimension 12 X 12 cm / 16 X 16 cm 	6
48	Vernier caliper	<ul style="list-style-type: none"> • Accuracy: 0.001inch,12 inch long 	6
49	Breadboard	<ul style="list-style-type: none"> • Breadboard extension with additional Power Bus ideal for board expansion. Plastic Body for reduced static, suitable for CMOS devices. • Quick circuit testing and mock • 740 Contact Points • Suitable for most IC's, Standard 0.1" Spacing • Positive and Negative Power Rails Run the Length of the board • Breadboard Size: 174mm (6.9") x 55mm (2.2") 	15
50	Digital multi meter	<ul style="list-style-type: none"> • DC Voltage Ranges: 200mV,2V,20V,200V,1000V $\pm(0.05\%+3\text{dpts})$ • AC Voltage Ranges: 200mV,2V,20V,200V,750V,(True RMS), $\pm(1\sim2\%+20\text{dpts})$ • DC Curent Ranges: 200uA,2mA,20mA,200mA, 20A,$\pm(0.5\sim2\%+10\text{dpts})$, AC Curent Ranges: 200uA,2mA,20mA,200mA, 20A,(True RMS),$\pm(0.8\sim2.5\%+10\text{dpts})$, • Resistance Ranges: 200Ω,2kΩ,20 kΩ,200 kΩ,2MΩ,20MΩ, $\pm(0.15\sim1\%+10\text{dpts})$ Frequency Range: 2KHz,20KHz,200KHz • *Diode Test * Transistor test (hFE) * Logic Test • Power Requirement: One 9V battery • Dimensions: 7.5"x3.4"x1.5" (190x86x38mm) • Weight: 17 oz.(482g) • Accessories: Test leads, holster, battery, and owner's manual 	6
51	Analog multi meter	<p>AC/DCV, DCA, Resistance, Diode Check, Continuity, dB & Transistor leak current. 20 kOhm/VDC sensitivity. Mirrored scale. 1-Year Warranty. DCV: 0 – 0.1V $\pm 1\%$ 0.25V/2.5/10V/50V/250/1000 $\pm 3\%$. ACV :0-10/50/250/1000V$\pm 4\%$ *DCA:0-50μA/2.5mA/25mA/250mA$\pm 3\%$. Resistance: 0 – 2K/20K/200K/2M/20Mohm $\pm 3\%$ *dB: -10 dB – 22 dB. Diode check (including LED). Continuity: Both Buzzer & flash. Transistor leak current.</p>	2

52	Hand sprayer (Compression type)	<ul style="list-style-type: none"> • Materials - PP HEAD/PE BOTTLE/BRASS NOZZLE (Made of PE,PP and Copper) • Dimension -72 « 61.5 « 35 CM • Weight - 445g • Capacity - 2L , Nozzle - Adjustable • Power Source - Air Pressure • Plastic Hand 	2
53	Piston type knapsack sprayer	<ul style="list-style-type: none"> • Capacity - 16 L • Material - plastic • Working pressure - 0.2-0.4MPA • Max. pressure of air chamber:1MPA Four compatible Spray heads (brass) : Double/Fan style/Adjustable/four hole nozzles	2
54	Beaker - 100ml	<ul style="list-style-type: none"> * Borosilicate glass 100 ml * Parallel size with rim and spout. * Griffin, low form beaker, manufactured with uniform wall thickness, offers optimum balance between thermal shock resistance and mechanical strength * Polypropylene, autoclavable, graduated 	3
55	Beaker - 250ml	<ul style="list-style-type: none"> * Borosilicate glass 250 ml * Parallel size with rim and spout. * Griffin, low form beaker, manufactured with uniform wall thickness, offers optimum balance between thermal shock resistance and mechanical strength 	3
56	Beaker - 500ml	<ul style="list-style-type: none"> * Borosilicate glass 500 ml * Parallel size with rim and spout. * Griffin, low form beaker, manufactured with uniform wall thickness, offers optimum balance between thermal shock resistance and mechanical strength 	3
57	Beaker - 1000ml	<ul style="list-style-type: none"> * Borosilicate glass 1000 ml * Parallel size with rim and spout. * Griffin, low form beaker, manufactured with uniform wall thickness, offers optimum balance between thermal shock resistance and mechanical strength 	3
58	Bottle Wash 250ml	<ul style="list-style-type: none"> * Flexible walled polythene squeeze bottle. * Round section with swan-neck and jet through screw cap. * Capacity 250ml. 	5
59	Boiling tubes	<ul style="list-style-type: none"> * 150mm x 25mm. Dia. * Borosilicate glass 	5
60	Burette 50ml	<ul style="list-style-type: none"> * Borosilicate glass. Rota flow type. PTFE. Resistant to chemical attack. * Interchangeable stop cock, giving excellent flow control. * Permanent graduation. Capacity 50 ml. Graduation 0.1 ml 	4
61	Cover slips (Pack of 50pcs)	<ul style="list-style-type: none"> Made of special optical glass 22 mm x 22 mm 	1
62	Funnel Glass 75mm Dia	<ul style="list-style-type: none"> * glass, 7.2cm x 9.6cm outside top dia * Stem length 70mm 	3

63	Glass rods (pack of 30pcs)	* Outer diameter 6 mm Length 50cm	1
64	Glass slide (Pack of 50pcs)	* Made out of glass, Standard	1
		* Size ; 25 x 75mm	
		* Thickness : 0.8-1.00mm	
65	Graduated Cylinder 50ml	* Borosilicate glass with sprout and graduated with hexagonal base	2
66	Graduated Cylinder 100ml	* Borosilicate glass with sprout and graduated with hexagonal base	2
67	Graduated Cylinder 500ml	* Borosilicate glass with sprout and graduated with hexagonal base	2
68	Graduated Cylinder 1000ml	* Borosilicate glass with sprout and graduated with hexagonal base	2
69	Graduated Pipette 25ml	* Borosilicate glass	2
		* Graduated to tip zero mark at top or outlet, permanent amber marketings	
		* Graduation interval 0.1 ml	
70	Graduated Pipette 5ml	* Borosilicate glass	2
71	Reagent bottle with glass stopper	* Clear glass reagent bottle 100ml	2
		* narrow neck with hexagonal stopper	
72	Round Bottomed Flask	* Borosilicate glass.	3
		* Other specification as above (2.041).	
		* 250 ml.capacity	
73	Test tubes	* Borosilicate glass, medium wall (extra strong)	10
		* Size (O.D. X length) in mm	
		* 12 X 100mm	
74	Titration Flask	* Borosilicate glass with rim.	5
		* Volume 250ml.	
75	Desiccator	* Glass with knob type cover ground to fit and perforated zinc disc	1
		* Internal diameter of ground flange 200 mm	
76	Dissecting tray	* Standard pan size: 27.6cm x 18cm	2
77	Simple Rain gauge	* Funnel – 127 mm diameter, 250 mm overall length.	1
		* A copper rim should be fitted in the edge of the funnel. Copper Rim should be sharp edge right around.	
		* Diameter of the outer receiving cylinder 130 mm x 300 mm overall length.	
		* Diameter of the inner receiving cylinder 110 mm x 260 mm height	
		* Should be made of stainless steel or alloy.	
		* Flat Fiber Glass measuring jar graduated in 10mm x 0.1mm	
		(Should be made proportionately to the outer receiving cylinder to measure the rainfall correctly.	
78	Secchi disk	Limnological Secchi Disk 200m with line and float	1
79	Turbidity tube	<ul style="list-style-type: none"> • Clear plastic tube • Approximately 1.2m long & 4.5cm diameter white cap that fits securely on the tube • The end cap must display a pattern consisting of alternating black & white quadrants on the side that is viewed by looking the tube. 	1

80	Arduino starter kit and Arduino Uno R3 board	<ul style="list-style-type: none"> • Arduino Uno R3 board x 01 pcs. • USB cable x 01 pcs. • Red led x 10 pcs. • Resistors x 10 pcs. (for led). • Potentiometer x 1 pcs (10k) • Connecting cables x 10 pcs • Switch x 02 pcs • Mini Bread Board x 01 pcs 	5
81	Barometer	<ul style="list-style-type: none"> • With 100mm dial graduated 28 to 31 inch of mercury • Ranges: 960 to 1070 millibars 720-800mm mercury. • -50° to 70°C. 20/100% RH. Min-Max w/Memory Recall. • With plated bezel, cover glass and index plastic base approx. 16cm diameter. • Enclosed in a transparent synthetic case • Air tight sealed all round, a pressure bulb is provided to force the movements for educative demonstration. 	1