

**SCHEME OF IMPROVEMENT OF
SCIENCE EDUCATION IN
SCHOOLS**



सत्यमेव जयते

GOVERNMENT OF INDIA
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INTRODUCTION

Science has become an all-pervasive part of modern life. Knowledge of science relevant to life will, therefore, be required by every citizen and specific skills needed to operate and maintain various scientific and technological devices which are increasingly becoming part of every day usage will have to be acquired. The outcomes of science go beyond information and skills into the realm of attitudes. Science strengthens the commitment of man to free enquiry and to the quest for truth. Inculcation of scientific temper would facilitate the task of social transformation also.

2. The importance of science in the scheme of general education for school children can scarcely be over-emphasised. The Kothari Commission (1964—66), The Education Policy Resolution (1968) and the “Curriculum for the Ten-Years School—A Framework” prepared by the NCERT (1975) have all recommended that highest priority be given to the teaching of science, mathematics and languages at the school stage. The National Policy on Education, 1986 (NPE) has also emphasised the need to strengthen science education programmes “so as to develop in the child well defined abilities and values—enable the learner to acquire problem solving and decision making skills and to discover the relationship of science with health, agriculture, industry and other aspects of daily life.” Inculcation of scientific temper is one of the items constituting Core Curriculum in the NPE.

3. The Scheme has been formulated to improve quality of science education and promote scientific temper, as envisaged in the NPE and the Programme of Action (POA) prepared for the implementation of the Policy. It is proposed to use the resource and agency of the State Governments and non-governmental organisations for this purpose and work towards the achievement of these objectives by strengthening laboratory and library facilities in schools, improving teacher motivation and competencies and mobilising a vigorous campaign for science education through voluntary organisations.

4. The teaching of science should not merely emphasise explanation of abstract concepts but also draw upon the child’s experience of his environment. The students should also have the opportunity to handle scientific apparatus and perform experiments in order that the understanding

of theory is reinforced through demonstration and experimentation. It is, therefore, essential that adequate laboratory demonstration facilities should be available in all schools. A good library, having sufficient number of reference books and supplementary readers on various science subjects is necessary for all secondary and higher secondary schools. However, according to the available information, a large number of schools in the country do not have adequate laboratory facilities with the results that teaching of science in schools is unsatisfactory.

5. A programme for improvement of science education cannot be successful if the teachers are not properly motivated. Mere provision of books and laboratory apparatus is unlikely to improve the things if the teachers lack competencies and motivation. The science teachers should have strong foundation in science, familiarity with environment, competencies and skills to provide guidance to pupils, ability to mobilise resources, ability to use and maintain various types of equipment in addition to the skills of communication, planning and implementing curricula, evaluation, etc....For all these functions and requirements, they must be provided suitable training and resources.

6. The role of voluntary organisations in promotion of science education and for creating scientific temper is important. A number of such organisations are doing very good work in this field, who need encouragement and assistance from the Government. Their effort will strengthen science education in schools in the long term by increased involvement of the people including student/teacher population.

Type of the Scheme

7. This is a Centrally-sponsored scheme under which 100% assistance will be given to the State Governments/Union Territory Administrations for approved purposes. The assistance will be conditional on the States undertaking the responsibility for maintenance and refurbishing of laboratories and libraries after these are brought to the desired standard with Central assistance under this scheme. Financial assistance to voluntary agencies will also be provided on 100% basis for approved projects. Guidelines/rules for GIA to voluntary agencies are being formulated. Till that is done, assistance to them will be provided on an ad hoc basis.

Implementing Agency

8. The Education Department in the State/UT Administration shall be the implementing agency for this Scheme. Voluntary or other non-

government organisations will however, be also involved in the programme. Assistance to the latter will be provided by the Ministry of Human Resource Development (Department of Education) directly.

Scope

9. The Scheme will cover all Government and Government aided upper primary, secondary and higher secondary schools in a phased manner by the end of the VIII Plan.

Components of the Scheme

10. The Scheme has the following components:

- (i) Provision of science kits to upper primary schools;
- (ii) Upgradation and strengthening of Science laboratories in secondary and higher secondary schools.
- (iii) Library assistance to secondary and higher secondary schools;
- (iv) Setting up of District Resource Centres for Science Education for teacher's training, development of instructional materials, etc.
- (v) Training of Science and Mathematics teachers;
- (vi) Assistance to voluntary organisations for undertaking innovative projects and resource support activities in science education.

Provision of Science Kits to Upper Primary Schools

11. NCERT has developed integrated science kits for primary and upper primary schools. The kit for primary level is being supplied to primary schools under Operation Blackboard. Under this scheme assistance will be provided to States/UTs for providing NCERT designed/compatible science kits to all Government and Government-aided upper primary schools which do not have it. A composite science kit has also been developed in some states by local agencies and non-government organisations. Under this scheme, such kits can also be considered for supply to schools with prior approval of the Government of India. But, in such cases, it will have to be ensured that the overall costs do not change substantially. A list of items constituting an integrated science kit and a list of suggested activities and a guide for usage of kit items is at Annex. 1. States/UTs may plan for supply of science kits to one third of upper primary schools annually. The States/UTs will have to make arrangements for procurement of the kits or individual items which can be then assembled

as kits before supply to schools. The cost of kits will have to be broadly maintained at the level of NCERT kits. Proposals in departure from these guidelines may also be considered, provided that the State Governments/UT Administrations send due justification for it.

Upgradation of Science Laboratories in Secondary and Higher Secondary Schools

12. NCERT has prepared a list of science equipment/apparatus needed in laboratories at secondary and higher secondary stage. These have been sent to State Governments and more copies of this list can be obtained from the NCERT. State Boards of Secondary Education have also designed lists to conform to their syllabi. Assistance will be provided under the scheme for upgrading laboratories in all Government and Government-aided schools to the optimum level. Assistance to each school will be restricted to the extent it lacks such equipment with reference to the standard list developed by the NCERT or the State Board of Secondary Education. The State Government/UT Administration will have to conduct a survey of laboratories in the schools selected for assistance to determine the existing deficiencies and then formulate a phased programme for upgrading laboratories in Government and Government-aided schools. About one third of the higher secondary schools are proposed to be assisted annually under this programme to remove deficiency in laboratory equipment.

The recommended norms for Teacher-Student ratio for upper primary schools is 1:40 and for Secondary and Higher Secondary Schools 1:30. Assistance will be provided under the scheme for only those schools that have adequate laboratory space and the desired number of teachers. It will be the responsibility of the States/UTs to ensure availability of teachers and laboratory space before Central assistance under this scheme can be claimed for the schools. Since maintenance and repair of equipment is often the major constraint in utilisation of the equipment provided, the State Governments/UT Administration will also be expected to give an undertaking that adequate funds for repair/replacement will be provided on a continuing basis. Liberal norms would also be formulated by them enabling write-off of unserviceable equipment by the heads of the institutions. Average life of various laboratory items has been developed by the KVS for writing off unusable equipment. States/UTs would be expected to develop appropriate norms and make them applicable.

Upgradation of Libraries in Secondary and Higher Secondary Schools

13. In view of the importance of reference books and supplementary readers for upgrading standards of education, one time library grant of Rs. 15,000/- will be given to each school so as to enable them to purchase about 500 new volumes in different subject areas. A list of some suggested books is at Annex. II for consideration of the State Government/UT Administration. Since the medium of instruction is regional language in the States/UTs at secondary level, the State/UT may purchase some books in English and the rest in regional language. Books not in this list can also be purchased if they are found to be good. Since the purchase under this scheme would be large, the States/UTs should contact the publishers and work out arrangements for translation and printing of selected books in the regional language.

14. While claiming assistance for library grant from the Ministry the States/UTs would be expected to mention the process laid down by them for selection/purchase of books to ensure that sub-standard books do not get purchased.

Establishment of District Resource Centres of Science Education (DRECSE).

15. The thrust of District Institutes of Education and Training (DIET) will be on universalisation of elementary education in the coming years. The task of training teachers is so enormous that DIETs may not immediately be in a position to properly attend to the urgent need of improving science education for the upper primary, primary, secondary and senior secondary level. It is therefore, proposed to set up DRECSE to look after the job of training of science and mathematics teachers and also to take up other activities for promotion of science education. A College of Teachers Education selected for upgradation of facilities under the scheme "Reorganisation and Restructuring of Teacher Education", should be selected as the District Resource Centre for the district in which such a college is located. Where there is no such college, a good school/college/institution/NGO having adequate academic and physical resources may be identified to function as DRECSE. Such an institution must satisfy the following requirements/facilities :-

- (i) It should enjoy a good academic reputation of providing science education in the District concerned.
- (ii) It should be in a position to provide a room to accommodate about 50 persons at a time and adequate space for storing instructional materials and office equipments.

- (iii) It should have a good stock of science books, magazines.
- (iv) It should have facilities of regular supply of running water, electricity as well as laboratories for Physics, Chemistry, Biology required for performing school level science experiments/activities.
- (v) It should be preferably centrally located in the District.
- (vi) It should be able to provide hostel facilities to the trainees during training programmes.
- (vii) It should have sufficiently qualified and experienced staff.
- (viii) It should be able to enlist the co-operations of academics working in neighbouring institutions during training programmes.

16. The NGOs to be designated as DRECSE must be a registered society with 3 years standing in the field of promotion of science education in the country and should have an institutional base.

* In case it is allied to an institution, then the institution concerned will be given necessary assistance under this programme.

17. These Centres will be expected to work in close coordination with Colleges of Teachers Education and DIETs in the development of materials and conducting of teacher training programmes. These Centres will serve as a nucleus of the school network in the districts where teachers may come from time to time to sort out their problems and share ideas. These centres will have the following broad functions :-

- (i) Each Centre shall organise training programmes for science teachers as well as science teacher educators.
- (ii) Each Centre will organise seminars and workshops for science teachers and teacher educators on regular basis.
- (iii) Each Centre will serve as an institution to which science teachers would turn for advice, consultation and help.
- (iv) It will also provide self-study facilities.
- (v) It will provide technical workshop facilities for preparation of low-cost equipments, teaching aids as well as other instructional materials.
- (vi) It will also act as a nucleus for organising science exhibitions, students projects, etc., and other out-of-school science activities.

- (vii) It will organise competitions in innovations in science education for science teachers.
- (viii) The Centre may also publish science education bulletin/news for disseminating significant activities carried out in the schools of the district as well as outside the district.

18. The DRECSE will be assisted for creation of necessary facilities restricted to a maximum of Rs. 1 lakh. A list of equipment/other items which can be provided to the Resource Centre under this programme is at *Annex. III*.

Training of Science & Mathematics Teachers

19. The programme of teacher training will be co-ordinated by the Department of Secondary Education and Higher Education in Science & Mathematics, in the NCERT. An advisory Committee in the NCERT will be constituted to approve the programmes and review the progress. The Committee will include distinguished scientists, science educationists and representatives of various government and non-government agencies from the Centre and the States. Similarly, at the State level each State will identify a nodal group which may be located in SCERT/SISE. An Advisory Committee may be set up at the State level with similar functions. It would be the nodal responsibility of the core group set up in the NCERT to coordinate; organise and liaise with various premier institutions, universities, colleges, boards, SCERTs, DIETs etc. NCERT will also organise workshops for orientation of officials of the State level and training of key persons and resource persons who will in turn organise the training of science and mathematics teachers working in upper primary, secondary and higher secondary schools. NCERT will organise workshops for preparation of guidelines/syllabi and instructional materials. The training programmes for science and mathematics teachers will be organised in the following manner :-

- (i) NCERT will co-ordinate for conducting training programmes of about 3 weeks duration for science and mathematics teachers of higher secondary schools in about 500 summer institutes to be organised in premier institutions of science and technology, university departments, reputed colleges, etc., during summer vacations. The aim would be that five teachers of Science and Mathematic from each Higher Secondary School may undergo these training programmes by 1990.

NCERT will identify such institutions and organise the training programmes for science teachers in different parts of the country. Necessary grants will be released to the NCERT by the Ministry to organise such training programmes.

- (ii) Training programmes will be organised by the State Governments (SCERT/Directorate of Education) for science and mathematics teachers of the secondary schools in upgraded Secondary Teacher's Training Institutes. Assistance of NGO/Voluntary organisation/DRECSE may also be enlisted for this purpose. About 3-4 batches of training programmes of two weeks duration may be organised during the year in summer vacations/autumn break/winter break. Aim should be that two teachers from each secondary school may undergo this training by 1990. Grants would be released to the State Governments/Union Territory Administration for conducting such programmes.
- (iii) Two teachers from each upper primary school will be given training/orientation in science teaching for a duration of about ten days in the DIETs and DRECSE envisaged under this scheme. Each of these institutions would be expected to organise at least 3 batches of training programmes for 40 teachers each during an year. Grants for these programmes would also be released to the State Governments.
- (iv) The expenditure on organisation of the programmes for training of teachers and development of instructional/training materials will be borne under this scheme. This will include expenditure on TA/DA of external resource persons, honorarium to local as well as external resource persons, training materials/material development and contingencies. It is envisaged that there will be four resource persons for each training programme/workshop--2 local and 2 external. The expenditure on TA/DA of the participant trainees would have to be met by the State Government. Norms for incurring expenditure on training programme are at *Annex. IV*.

Voluntary Organisations

20. Voluntary organisations suitable for taking up programmes in the field of science education will be assisted for taking up innovative programmes

for promoting scientific temper, increasing awareness, promotion of science education, teacher training programmes, development of instructional materials/textbooks, preparation of general informative books, brochures/ audio-visual materials, etc. Projects prepared by Voluntary Organisations will be examined by a Committee in the Department of Secondary Education and Higher Education, Ministry of Human Resource Development, which would include specialists and field workers including one from the Ministry of Science and Technology.

Procedure for Grants to State Governments/UT Administrations

21. The State Governments should first identify the schools which will be assisted under the scheme during the year. It would be advisable to take up whole districts as units for assistance so that district resource centres can also be proposed for being set up under the scheme. Then, it would be necessary to conduct a survey of identified schools to identify the deficiencies in science laboratories, libraries and prepare a proposal in respect of the programmes proposed to be taken up under this scheme. Grants will be released to the State Governments for the year by the Department of Secondary Education and Higher Education on the basis of proposals submitted by the State/UT Government. A format for sending proposals for financial assistance under this scheme is at *Annex. V*.

Evaluation and Monitoring

22. The Central Government would take steps for summative evaluation of implementation of the scheme at the end of the Plan period through NCERT (or other institutions). The State Governments/UT Administrations would also be expected to have a summative evaluation of the scheme to ensure that intended benefits are obtained.

23. Quarterly progress reports on implementation of this scheme may be furnished in the prescribed form by the State/UT Governments to the Ministry of Human Resource Development, Department of Education, at the end of June, September, December and March every year, in the format at *Annex. VI*. Since the programme to be conducted by voluntary agencies would differ from case to case, the items for monitoring in regard to them would be specified while sanctioning their cases.

INTEGRATED SCIENCE KIT**LIST OF ITEMS****A. Scientific & General**

1. Metre Scale (in two halves) cum lever.
2. 1 c.c. Spoon
High density polyethylene, white, 100 mm. overall length
3. Beam Balance
4. Multipurpose Base for Beam Balance
5. Weights for Beam Balance
 - (a) 50 mg—4 Nos.
 - (b) Steel Ball 4.69 mm weight 450 mg—2 Nos.
 - (c) Disk, 1 gm —10 Nos.
 - (d) Disk, 10 gm—4 Nos.
 - (e) Transparent Polystyrene container with screw cap, outside dia 40 mm × 30 mm height.
6. Laboratory Stand cum Vice Unit rod, clamp and two boss heads.
7. Kerosene Burner
 - (a) Empty container of M.S./tin. sheet outside dia 80 mm × 70 mm height, without lid.
 - (b) Chimney
 - (c) Wick holder
 - (d) Wicks—4
8. Tripod stand
Cast Iron triangular base each side 92 mm, M.S. 1 gs each 6mm dia, 155 mm height painted black.
9. Wire Gauze
Galvanised M.S. wire net, 22 swg, 100 × 100 mm, 25 meshes/Sq. cm, ends folded.
10. Sun Dial
11. Clock Pendulum
 - (a) Table Call bell complete with spring, sprocket, ratchet gang and M.S. Bell (Plated) 92 mm. dia 2 × 20 mm height 1.4 mm thick.
 - (b) Pendulum with bob

12. Steel ball, 20 mm dia, electroplated.
13. Spring Balance open type—2 Nos.
graduated in Gms and Newtons, in steps of 10gms. capacity 500 gms., Base-high density polyethylene white, 235 mm × 60 mm × 3.5 mm thick with hooks, spring with Pointer—spring steel.
14. Action & reaction Syringe.
 - (a) Syringe—polystyrene transparent outside dia 31 mm × 100 mm long with double action piston of low density polyethylene white and nozzle tapered 6 mm/4 mm.
 - (b) Aluminium wire— 18 Swg × 335 mm long.
 - (c) Sleeve—to fit in the nozzle. 4 mm outside dia × 415 mm long.
15. Trolley—2 No.
 - (a) Compression Spring
 - (b) rod with pulley, nylon thread
 - (c) bolt with flynut and washers.
16. 30 mm ruler cum lever (M)
Anodised Aluminium ruler 29 mm × 300 mm × 1.5 mm thick smallest division—1 mm, graduations printed black.
17. Pulley with frame
18. Wedge (pair)
19. Maxwell wheel
High density polyethylene 120 mm dia × 45 mm width with nylon thread 360 mm long.
20. Weights with hook—50 gm each
 - (a) Aluminium
 - (b) Mild Steel
 - (c) Lead
21. Calorimeter :
 - (a) Aluminium vessel outside dia 85 mm × 80 mm height 1.5 mm thick.
 - (b) Empty container of M.S. tin, sheet, outside dia 800 mm × 70 mm height without lid.
 - (c) Plastic triangular stand.
22. Aluminium wire and pointer for expansion of solid.
23. Decimetre cube vessel
Inside dimensions 100 × 100 × 100 mm, wall thickness—2 mm, Top open, polystyrene transparent, sunk and colour filled marking on two sides, 9 numbered lines on one side, 10 equal squares on the other side.

24. **Bimetallic strip**
25. **Rods with holder for conduction of heat**
26. **Hand operated Generator set with :**
 - (a) **Wooden base**
 - (b) **Magnet with one source coil, 6V/25W**
 - (c) **Three brackets for shafts**
 - (d) **Disk for holding coil**
 - (e) **Main Shaft**
 - (f) **Big Pulley—1, Small Pulley—2, Stepped Pulley—1.**
 - (g) **Governor with two weights**
 - (h) **Bicycle axle dia 8.84 mm × 165 mm long threaded on both ends with two pairs of cup and cone-nut, with 18 steel balls of 6 mm dia (standard set for one axle fitting).**
 - (i) **Leather belts—2**
 - (j) **Handle**
 - (k) **Terminals—2**
27. **Panel for connections**
 - (a) **Wooden base with terminals**
 - (b) **Ammeter 0.1 milliamp D.C. graduated in 0 to 500 m. A and 0—10V scales.**
 - (c) **Metal rectifier (bridge)**
 - (d) **Terminals 8 Nos.**
 - (e) **A pair of red and black leads each 800 mm. long with probe at each end, standard.**
28. **Connecting Wires with crocodile clips 50 mm long (M.S. plated) at both ends.**
 - (a) **500 mm length—4 Nos.**
 - (b) **300 mm length—6 Nos.**
29. **Demonstration Ammeter**
 - (a) **Ring magnet of barium ferrite, poles on periphery, outside dia 18 mm/hole dia, 6.2 mm × 6 mm thick.**
 - (b) **Coil with frame**
 - (c) **Rod and frame assembly**
 - (d) **Scale**
 - (e) **Pointer.**
30. **Electric motor**
Toy D.C Motor, 1.5 v.
31. (a) **Fuses—50 nos.** (b) **Model showing heating effect of electric current—Transparent Container 25 mm dia × 80 mm with lid and terminals, resistive wire.**

32. Set of four resistors (5 ohms 10 ohms—2 Nos., 20 ohms).
33. Magnetic Compass
Dia 56 mm 15 mm height
Polyethylene case, polystyrene transparent top, paper dial, magnetised indicator (magnet steel) painted red and blue at poles.
34. Ferrite bar magnet (pair)
12.5 mm × 9.5 mm × 54 mm lengthwise magnetized poles marked "N" & "S".
35. Electric Bell
 - (a) Base for electric bell
 - (b) Core for coil.
36. Ray streak apparatus
 - (a) Cover with slits.
 - (b) Screw type torch bulb 6.2 V × 0.3 Amp with holder fitted with two terminals.
 - (c) Plane, concave, convex mirrors of Aluminium Sheet.
 - (d) Double convex lens—Section 50 × 10 mm, height 15 mm. both faces ground, perspex.
 - (e) Plane Concave lens, counter part of the above double convex lens—2 Nos.
 - (f) Graduated disc, paper—1 No.
 - (g) Glass Slab, 10 mm × 30 mm × 50 mm, one face of 30 mm × 50 mm ground, edges chamfered.
 - (h) Glass triangular prism, each side and height 25 mm, edges chamfered.
37. Colour Disk
Seven colours on cardboard sheet having a hollow rivet at the centre.
38. Electroscope—2 Nos.
 - (a) Aluminium disk—2 Nos.
 - (b) Plastic lid dia 85 mm fitted with leaf assembly 65 mm long—2 Nos.
39. Aluminium wire with insulated (thermocole) handle
40. Plastic Strips
 - (a) Polythylene low density 25 mm × 3 mm thick × 240 mm long, edge chamfered.
 - (b) as above and half covered with woollen cloth (quality of woollen cloth as at 43)
41. Hook for suspension of plastics strips.
42. Silk Cloth 200 mm × 200 mm.
43. Woollen Cloth dark colour 200 mm × 200 mm.
44. Thermocole sheet, 300 × 200 × 25 thick.

45. Toothed Disk
46. Chalk Holder—3 Nos.
47. Pith/Plastic ball, 12 mm dia with 1 mm hole
48. Transparent stiff plastic tube outside dia 20 mm, 2 mm thick × 500 mm long, with rubber stoppers at both ends.
49. Tuning Fork
Steel Section 6 × 3.4 mm, prongs 110 mm long, frequency, 2.50 Hz
50. Sitar String
Steel wire used in stringed instruments 24 SWG, length one metre, with beads at both ends.
51. Shaving blade, ordinary
52. Aluminium Tray cum Solar Still
53. (a) Dissecting Microscope
(b) Glass Slides—6 Nos.
54. Bed Microscope
55. Laboratory Thermometer with case, Glass and red liquid 0 to 100°C, graduation 1°C, plastic case having cotton wool at both ends.
56. Mounting needle—2 Nos.
Plated steel needle fixed in plastic handle of 6 mm dia, overall length—110 mm.
57. Insect mounting board, made of corrugated cardboard sheet.
58. Petri dish
Coloured H.D. Polyethylene Dia 115 mm × 30 mm × 2.5 mm thick.
59. Garden Trowel
Dia 25 mm × 235 long
M.S. sheet, painted.
60. Graduated syringe with needle—5ml.
Plastic—standard
61. Deflagrating spoon with a rubber stopper
Straight M.S. Wire 2 mm dia 165 mm, M.S. cup dia 15 mm rubber stopper to fit glass belljar SI No. 125
62. Pair of tongs—one pc.
MS plated 160 mm standard
63. Cork borer—Metallic, plated, for 6 mm dia. tubing.
64. Funnel.
Transparent/Semi-transparent
Plastic—70 mm dia. at top, 15 mm dia stem overall length 150 mm

65. Test Tube Brush
M.S. plated, nylon bristles, size dia 35 × 20 mm, standard.
66. Spatula
with micro spoon H.D. Polyethylene, dark colour, over all size 5 × 10 × 120 mm.
67. Test tube holder
(to hold test tubes upto 25 mm dia)
M.S. plated with wooden handle, overall length—190 mm.
68. Pinch cock
(a) Screw type—2 Nos.
M.S. Plated, 25 mm between bars, with hinged bottom standard.
(b) Spring type—4 Nos.
55 mm, plated.
69. Plastic tray
H.D. Polyethylene 250 mm × 225 mm × 50 mm deep. thickness 3mm.
70. Dropper,
L.D. Polyethylene, overall length, 100 mm.
71. Forceps 100 mm. long straight, pointed and plated.
72. Knife
with wooden/plastic handle, hardened steel, plated blade 100 mm × 1.5 mm thick
73. Scissors surgical 125 mm one prong blunt, other pointed, standard.
74. Screw driver
with plastic/wooden handle, ordinary, 100 mm long (thin quality) plated and point hardened.
75. (a) Bottle opener with cork screw & Screw driver tip M.S. Plated, overall length 140 mm.
(b) Rubber stopper and screw.
76. Wash Bottle 150 ml.
L.D. Polyethylene with screw cap, plastic tube and nozzle.
77. Copper wire enamelled 24 swg—1 metre.
78. Iron Nails, 18 swg. 25 mm—50 gms.
79. Rubber bands (assorted size)—20 Nos.
80. Filter paper (fullscape size)—2 Sheets.
81. Plasticine —50 gms.
82. Wax —100 gms.

83. Paper clips —20 Nos.
84. Office Pins —20 Nos.
85. Rubber balloons assorted size —15 Nos.
86. Cotton thread —1 (18 gms) roll
87. Candles
(15 mm × 200 mm approx 2 Nos.)
88. Kit Box with packing materials
- Sheet Metal box with lock arm cum vernier caliper and five tray frames.
 - Top big tray 540 mm × 335 mm × 100 mm deep Corrugated sheet.
 - Middle big tray 540 mm × 335 mm × 170 mm deep Corrugated board.
 - Middle small tray (No. 1) 250 mm × 225 mm × 75 mm deep Corrugated board, middle small tray (No. 2), 180 mm × 180 mm × 75 mm corrugated board.
 - Bottom small tray, 200 mm × 170 mm × 125 mm deep corrugated sheet.
89. Padlock with keys, 35 mm.
90. Packing materials
- Polyethylene bags 550 mm × 100 mm (for Metre Scale)
 - Polyethylene bags 150 mm × 150 mm (for Clock Pendulum)
 - Polyethylene bags 70 mm × 40 mm (for ferrite magnet)
 - Polyethylene bags 100 mm × 100 mm (for magnetic compass and others)—10 Nos.
 - Polyfab bag 330 mm × 500 mm with nine pockets as per sample.
 - Thermocole sheet 300 mm × 250 mm × 50 mm.
 - Paper cutting, polyethylene sheet etc.

B. Chemicals (Solid) in Plastic Labelled Containers with Lids and Screw Caps

- | | |
|---|---------|
| 91. Sodium Hydroxide | 150 gms |
| 92. Sodium chloride | 150 gms |
| 93. Copper sulphate | 100 gms |
| 94. Calcium Hydroxide | 30 gms |
| 95. Copper Oxide | 50 gms |
| 96. Calcium Oxide | 10 gms |
| 97. Calcium Carbonate | 350 gms |
| 98. Potassium Permanganate (KMnO ₄) | 100 gms |
| 99. Washing Soda | 100 gms |

100.	Sulphur	20 gms
101.	Glycerine	20 gms
102.	Alum	100 gms
103.	Sugar	100 gms
104.	Hydrochloric Acid	150 ml (container only)
105.	Sulphuric Acid	150 ml (container only)
106.	Nitric Acid	150 ml (container only)
107.	Zinc Pieces	150 gms
108.	Aluminium strips	10 gms (without container)
109.	Magnesium Ribbon	20 gms (without container)
110.	Copper turnings	25 gms (without container)
111.	Iron Powder	25 gms.
112.	Napthalene Balls	50 gms (in polythene bag)
113.	Litmus paper red & blue	2 booklets each (without container)
114.	Phenolphthalein	1 gm.

C. Glassware & Others

115.	Measuring cylinder with detachable base High density polyethylene white-semi-transparent with 1 ml graduation	100 ml
116.	Insect killing bottles: glass 70 mm dia × 120 mm long, ground neck with rubber stopper holding glass test tube without rim dia 10 × 80 mm long.	
117.	Beaker 250 ml. Corning/Borosil Glass	
118.	Beaker 150 ml. Polyethylene H.D.	
119.	Test tube with rim dia 15 × 125 mm	12 Nos. Neutral glass, thick quality
120.	Test tube with rim dia 15 mm × 150 mm Neutral glass, thick quality.	—8 Nos.
121.	Boiling test tubes dia 25 mm × 150 mm hard glass Corning/Borosil.	—4 Nos.
122.	Test tube stand—aluminium sheet.	
123.	Round Bottom Flask 500 ml. Corning/Borosil.	
124.	Deleted.	
125.	Glass bell jar	
	(a) Outside dia 105 mm × 125 mm height, 3 mm wall thickness inside dia of neck—20 mm approx.	

- (b) Rubber stopper to fit the neck.
- (c) 2 Electrodes and plastic sleeves to partly cover the electrodes (W)
126. Glass Rod with rubber tube at one end glass dia 6 mm × 150 mm ground edges, rubber tube 15 mm long.
127. Glass tube 6 mm outside dia Bore dia—5 mm.
Neutral glass
- | | | |
|-----|----------------------|----------|
| (a) | 45°—30×40 mm | — 3 Nos. |
| (b) | 90°—30×40 mm | — 3 Nos. |
| (c) | 120°—30×40 mm | — 3 Nos. |
| (d) | Jet—50 mm long | — 3 Nos. |
| (e) | Straight 140 mm long | — 3 Nos. |
128. Plastic Rubber tubing (for 6 mm glass tubes), durable quality.
- | | | |
|-----|--------------------------------------|---------|
| (a) | Rubber tubing | 1 metre |
| (b) | Plastic tubing | 1 metre |
| (c) | Plastic test tubes dia 8 mm × 75 mm. | 2 Nos. |
129. Rubber stoppers
for test tubes, boiling test tubes and round bottom flask—2 each
(Sr. Nos. 119, 120, 121, 123).
130. Kipp's Apparatus Improvised (To be supplied assembled)
- | | |
|-----|---|
| (a) | Reagent bottle (Glass wide mouth 125 ml.)—1 No. |
| (b) | Rubber stopper to fit above—1 No. |
| (c) | Test tube with hole—15 mm dia × 135 mm neutral glass, thick quality—1 No. |
| (d) | Rubber stopper for test tube—1 No. |
| (e) | Bent tube polyethylene 6 mm dia.
90°—30×40 mm—1 No. |
| (f) | Plastic tubing durable quality 250 mm long to fit 6 mm tube. |
| (g) | Polyethylene jet, 6 mm dia × 50 mm long—1 No. durable quality |
131. Reaction tube (to be supplied assembled).
- | | |
|-----|---|
| (a) | Hard glass tube with rim having both ends open 25 mm dia × 130 mm long—
1 No. |
| (b) | Rubber stopper with 6 mm hole to fit at open ends—2 Nos. |
| (c) | Glass tube dia 6 mm/3.5 mm bore × 60 mm long (to fit in the hole of rubber
stopper)—2 Nos. |
132. Apparatus for exhaled and inhaled air (To be supplied assembled)
- | | |
|-----|---|
| (a) | Test tube dia 25 × 150 mm (Neutral glass, thick quality)—2 Nos. |
|-----|---|

- (b) Rubber stopper for above—2 Nos.
- (c) Clamp (MS Painted)—1 No.
- (d) Transparent plastic L=tube (90°), outside dia 6 × 150 × 20 mm —2 Nos.
- (e) Transparent plastic L-tube (90°), outside dia 6 × 50 × 40 mm —2 Nos.
- (f) Transparent plastic T=tube, outside dia 6 × 40 top × 50 mm ht.—2 Nos.
- (g) Screw (M 2.5 × 10) with nut & washer, M.S.—2 Nos.
- (h) Rubber/Plastic tube to fit Tubings, 350 mm —1 No.

List of Activities Suggested

UNIT	—	1	<i>Measurement</i>
	—		To measure regular and irregular objects
	—		To measure volume
	—		To measure temperature
	—		To prepare a pan balance
	—		To measure time
UNIT	—	2	<i>Materials Around Us</i>
	—		To group objects
	—		To prepare models by plasticine/clay
	—		To test for hardness
	—		To show that no two objects can occupy same space
	—		To observe differences in the ways objects float
	—		To examine density of different materials
	—		To test for solubility
	—		Experiments to show that some substances are magnetic.
UNIT	—	3	<i>Separation of Substances</i>
	—		To separate a mixture
	—		To demonstrate different methods of separation
	—		Decantation
	—		Loading
	—		Filtration
	—		Sieving
	—		Winnowing
	—		Distillation
	—		Evaporation
	—		Crystallisation

	---		Sublimation
	---		Centrifugation
	---		Chromatography
	---		Separation by a magnet
UNIT	---	4	<i>Changes Around Us</i>
	---		To observe growing seedlings
	---		To examine changes in the mixture of sulphur and iron, filings on heating.
	---		Observation of changes in wax due to heating and cooling
	---		Observation of rusting
UNIT	---	5	<i>Motion, Force and Pressure</i>
	---		Observation of a few moving objects and measurement of average speed
	---		Measurement of average speed of a body in circular motion
	---		To prepare and calibrate a spring balance
	---		To observe effect of the point of application and magnitude of force.
	---		To compare the force of friction on different objects using spring balance.
	---		To observe the effect of force on objects of different areas
	---		To measure the time period of a pendulum
	---		To observe effect of streamlining.
UNIT	---	6	<i>Simple Machines</i>
	---		To observe and use simple machines
	---		To construct a beam balance to make the model of a screw
UNIT	---	7	<i>The Universe</i>
	---		To observe constellations
	---		To prepare a scale model of the solar system
	---		To observe the shadow of a stick
	---		To observe the timings of sunrise and sunset
	---		To observe a sundial.
UNIT	---	8	<i>The Living World</i>
	---		To observe a variety of living objects and classify them
	---		To study the growth in living and non-living objects.
	---		Set up and maintenance of an aquarium.

	---		To collect animals and plants from the locality, draw and label each.
UNIT	---	9	<i>Structure and Function of Plants and Animals</i>
	---		To collect plants and study their preservation
	---		To examine internal structures of animals
	---		To examine external and internal structures of animals listing their functions.
	---		To examine modifications in plant parts and list their functions.
	---		To collect flowers and study of pollen grains.
	---		To study vegetative propagation in some plants.
	---		To identify and group different plants and animals.
UNIT	---	10	<i>Food and Health</i>
	---		To examine food items of man and their major grouping
	---		To list food habits in different animals.
UNIT	---	11	<i>Man's dependence on plants and Animals</i>
	---		To study man's dependence on plants and animals.
	---		To study food chain and balance in nature
	---		To demonstrate soil erosion
	---		To demonstrate plant's role in preventing the soil erosion
UNIT	---	12	<i>Adaptability of the Environment</i>
	---		To feel hot water
	---		To study adaptation in different plants and animals.
UNIT	---	13	<i>Water</i>
	---		To collect water from various sources and examine the residue.
	---		To examine water-content in plants.
	---		To taste water from different sources of drinking water.
	---		To study different processes of purifying water (decantation, loading, filtration, distillation etc.)
	---		To test hardness in water from different sources.
	---		To study water as a solvent.
UNIT	---	14	<i>Energy</i>
	---		To examine different sources of energy.
	---		To experiment to understand that light is a form of energy.
	---		To study the conversion of energy.
	---		To study heat energy.

	—		To examine the relationship of energy with the movement
	—		To observe conservation of energies
	—		To show that moving water has energy.
UNIT	—	15	<i>Motion, Mass & Friction</i>
	—		Experiment to demonstrate 'inertia'
	—		To study mass
	—		To find out the force of sliding and rolling friction
	—		To examine ball and roller bearings
	—		To study action and reaction
	—		To determine relative density of kerosene.
UNIT	—	16	<i>Pressure and Buoyancy</i>
	—		To demonstrate thrust and pressure
	—		To demonstrate that water tends to remain at the same level
	—		To demonstrate that water exerts lateral pressure
	—		To study the pressure of water at different heights
	—		To demonstrate that water exerts equal pressure on all sides
	—		To explain the principle of a hydraulic press
	—		To demonstrate the method of measuring buoyant force
	—		To determine relative density.
UNIT	—	17	<i>Heat and its Effects</i>
	—		To demonstrate conversion of mechanical energy into heat
	—		To demonstrate that quantity of heat required to heat a substance is proportional to the rise in temperature.
	—		To study the effect of heating on naphthalene and to plot temperature—time graph.
	—		To study the effect of heating two substances of same mass to same range of temperature.
	—		To determine the melting point of ghee
	—		To determine the boiling point of water
	—		To show the thermal expansion of solids
	—		To show the expansion of a liquid
	—		To show the expansion of a gas.
UNIT	—	18	<i>Transfer of Heat</i>
	—		To demonstrate the conduction of heat through a solid
	—		To demonstrate the convection of heat in liquid

—		To demonstrate the convection of heat in gas
—		To show that water and glass are bad conductor of heat
—		To study some radiations.
UNIT	19	<i>Light and Optical Instruments</i>
—		To perform experiments with light
—		To study reflection of light on different surfaces
—		To study the focal length of a convex lens and a concave mirror
—		To study image formation by a convex lens and a concave mirror
—		To study refraction through glass slab and prism
—		To make a model of human eye
—		To prepare a model of a pin hole camera
UNIT	20	<i>Vibrating Bodies and Sound</i>
—		To study vibration
—		To study the passage of sound through water
—		To study the propagation of sound through solids
—		To study the high and low sound
—		To study resonance
—		To observe reflection of sound
—		To show that sound may be absorbed.
UNIT	21	<i>Effects of Electricity</i>
—		To study the parts of an electric cable
—		To study electrical circuits conductors and insulators
—		To study the heating, effects of electric current
—		To observe the effect of electric current on a magnetic compass
—		To study A.C. and D.C.
UNIT	22	<i>Electric Charges at Rest</i>
—		To find the presence of electrical charges in a comb
—		To observe the repulsion in and electrically charged balloon
—		To demonstrate that there are two kinds of charges like charges repel and unlike charges attract
—		To study the charging mechanism of simple electroscope
—		To test for charges in conductors and insulators
UNIT	23	<i>Magnetism</i>
—		To test for magnetism

	—		To identify magnetic north and south
	—		To demonstrate that like poles repel and unlike poles attracts
	—		To demonstrate the use of magnetic compass to determine direction.
	—		To magnetise and demagnetise a piece of iron.
	—		Use magnetise needle or razor blade to locate north and south
	—		To observe the effect of distance on magnetic force.
UNIT	—	24	<i>Nature and Composition of Substances-I</i>
	—		To show the difference of intermolecular space in a gas and in a liquid.
	—		To study elasticity of some materials
	—		To study plasticity of some substances
	—		To show decomposition of copper carbonate
	—		To show the electrolysis of water
	—		To demonstrate some chemical reactions
	—		To demonstrate some combination reactions.
UNIT	—	25	<i>Nature & Composition of Substances-II</i>
	—		To demonstrate the addition of masses in a chemical reaction
	—		To demonstrate conservation of mass during mixing
	—		To determine the composition of a compound.
UNIT	—	26	<i>Air and Oxygen</i>
	—		To show that $\frac{1}{5}$ of air is oxygen
	—		To observe the effect of blowing exhaled air into lime water
	—		To observe that oxygen is released by green aquatic plants
	—		To prepare oxygen and study its properties.
UNIT	—	27	<i>Water</i>
	—		To study water-content in some substances
	—		To study the solubility of liquids and gases in water
	—		To prepare hydrogen gas and study some of its properties
	—		To prepare a saturated solution of sugar, salt and alum
	—		To study some oxidation and reduction processes.
UNIT	—	28	<i>Acids, Bases & Salts</i>
	—		To demonstrate some properties of Sulphuric, Nitric and

			Hydrochloric acid
		---	To test for acidity
		---	To demonstrate some properties of bases
		---	To demonstrate neutralization
		---	To demonstrate the preparation of soap.
UNIT	29		<i>Preservation of Self-I</i>
		---	To observe how food gets spoiled and study some causative organisms
		---	To list the common parasites present in a locality
		---	To study the food-chain in a pond
		---	To study respiration in germinating seeds and to test for carbon dioxide evolved in this process.
		---	To examine the heart beat of a frog
		---	To observe the veins of the lower arm
		---	To determine the pulse rate
		---	To observe the vascular bundles in the transverse section of stem
		---	To observe the feeding activity of ants.
UNIT	30		<i>Preservation of Self-II</i>
		---	To observe locomotion and movements in some animals
		---	To observe movements in plants.
UNIT	31		<i>Population</i>
		---	To list different types of habitats in the surroundings
		---	To list characteristics of habitats like those of river, school garden etc.
		---	To draw an outline map of a locality showing different habitats
		---	To study the organism and their habits in the locality.
UNIT	32		<i>Pollution</i>
		---	To observe the effect of washing soda on fish
		---	To observe the ingredients of smoke
		---	To list the sources of noise in the environment
		---	To list various environmental changes during various seasons and list the advantages and disadvantages of these changes.
		---	To list the common pollutants in the surroundings.
UNIT	33		<i>Light</i>
		---	To observe the effect of temperature on the colour of a body

	---		To observe that light alone is necessary to make objects visible
	---		To observe reflection of sunlight
	---		To verify that light travels in a straight line
	---		To study formation of umbra and penumbra
	---		To observe the reflection of light from a mirror and find the relationship between the angles of incidence and reflection..
	---		To study the passage of light through a glass slab and compare the angles of incidence and refraction.
UNIT	---	34	<i>Light & Colour</i>
	---		To observe absorption of light by different coloured sheets
	---		To split sunlight into component colours
	---		To make Newton's disc and to study mixing of colours
	---		To study the effect of moving objects on our eye (Perception of eye.)
	---		To observe parallax between two objects (fingers).
UNIT	---	35	<i>More about Electricity</i>
	---		To study the flow of water from higher to lower level.
	---		To study the parallel and series combination of cells
	---		To study resistances in series
	---		To study the factors on which the resistance of wires depend.
	---		To demonstrate magnetic effects of electric current.
UNIT	---	36	<i>Electrical Energy</i>
	---		To observe the working of a fuse wire
	---		To observe a fuse socket and grip (kit-kat)
	---		To study the generation of electricity in dynamo.
UNIT	---	37	<i>Electrical Magnetism</i>
	---		To make an electromagnet
	---		To demonstrate the working of an electric bell
	---		To show a simple transformer
	---		To demonstrate the working of a simple model of an electronic motor.
UNIT	---	38	<i>Structure of Atom</i>
	---		To prepare simple models of atoms of helium, oxygen and sulphur.
	---		To draw models of nitrogen, magnesium and chlorine atoms.
UNIT	---	39	<i>Nuclear Energy</i>
	---		To prepare chart of showing chain reactions
	---		To prepare a chart showing some common uses of radioactive isotopes using illustrations, newspapers and magazine cuttings.

UNIT	—	40	<i>Carbon in Nature</i>
	—		To produce carbon and carbon dioxide by burning some materials
	—		To observe different forms of carbon
	—		To study the electrical conductivity of different forms of carbon.
	—		To demonstrate combustion
	—		To study conditions for burning
	—		To observe different types of combustions
	—		To demonstrate different parts of a flame and their heating effects.
UNIT	—	41	<i>Compounds of Carbon</i>
	—		To demonstrate preparation and properties of carbon dioxide
	—		To test for carbonate and bicarbonate
	—		To demonstrate distillation of crude oil
	—		To study the presence of carbohydrates in food items
	—		To test for fats in some common substances
	—		To test for proteins in some common substances.
UNIT	—	42	<i>Outliving World</i>
	—		To observe detailed structures of some micro-organisms
UNIT	—	43	<i>Cells & Tissues</i>
	—		To observe the growth in some plants
	—		To examine some plants & animal tissues.
UNIT	—	44	<i>Reproduction</i>
	—		To demonstrate the reproductive parts of the animals
	—		To show reproductive parts of plants.
UNIT	—	45	<i>Growth and Development</i>
	—		Germination of seeds.
UNIT	—	46	<i>Heredity & Variation</i>
	—		To observe survival of plants
	—		To study the variation in human beings.
UNIT	—	47	<i>Organic Evolution</i>
	—		To study different evidences in support of organic evolution.
UNIT	—	48	<i>Materials-I</i>
	—		To study physical properties of some metals
	—		To study the use of some metals
	—		To observe the phenomenon of corrosion and its prevention
	—		To observe the oxidation process

UNIT	—	49	<i>Materials-II</i>
	—		To demonstrate the physical properties of some materials by their burning odours.
UNIT	—	50	<i>Agriculture practices & implements</i>
	—		To observe the effect of depth on seed germination
	—		To collect and study some crop plants and weeds
	—		To collect and examine soils from different places.
UNIT	—	51	<i>Our Crops</i>
	—		To select healthy seeds
	—		To observe some common crops and classify them into different groups based on their use and seasons.
	—		To observe the stages of growth of some forms of common crops.
	—		To observe the nodules in some legumes.
UNIT	—	52	<i>Improvement of Crop Production</i>
	—		To examine some samples of soil
	—		To study the various components of soil
	—		To study the water holding capacity of different soils
	—		To test the acidity and alkalinity of soils
	—		To demonstrate the process of emasculation
	—		To collect and study different types of fertilizers used in the locality.
UNIT	—	53	<i>Useful Plants and Animals</i>
	—		To test for adulteration of honey with sugar or gur
	—		To separate larva and unhatched eggs of silk worm
	—		To test the quality of an egg
	—		To study the medicinal plants and plants which provide food.
UNIT	—	54	<i>Animal Husbandry</i>
	—		To test the amount of water in milk
	—		To observe different types of fibres.
UNIT	—	55	<i>Conservation of Natural Resources</i>
	—		To study the soil-erosion
	—		To examine samples of water from different sources

ANNEX. I

LIST OF BOOKS ON SCIENCE RECOMMENDED FOR SCHOOL LIBRARIES

It is envisaged that school libraries in Secondary/Higher Secondary schools should have at least 500 books on science related subjects for the use of students and teachers. An illustrative list of such books is given below. State Governments/Directorate of School Education may purchase books out of this list and some other books considered suitable by them. School libraries should have some books covering the following subjects:--

- (1) One science based encyclopaedia.
- (2) Ocean and Ocean life.
- (3) Deserts and Desert life.
- (4) Himalayan environment; plant & animal life.
- (5) 4-5 sets of science text books of all classes (for teachers and poor students).

It would be desirable that at least half of the books procured should be in the language which is the medium of instruction in the State/UT concerned.

<i>Title of the Book</i>	<i>Author/Publisher</i>
1. Tell me Why	Leokum Arkady London : Hamlyn 1976
2. Lots More Tell Me Why	Leokum Arkady London : Odhams Books, 1972.
3. More Tell Me Why	Leokum Arkady London : Odhams Books, 1974.
4. The Children's Book of Question Answers	Addision Authomy (Ed) London : 9 Warwick Court WCI, 1977
5. Discovering Nature	Macdonald educational Ltd., London, 1977
6. Frontiers of Technology, 1983	Marshall Cavendish Books Ltd., 58, Old Compton Street, London W1V 5 PA.
7. Basic Science	Marshall Cavendish
8. Family Encyclopaedia of Science	Marshall Cavendish

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| 9. | Junior Science Encyclopaedia | Pustak Mahal, Delhi |
| 10. | Time-Life International | (Nederland) N.V.
(Ten volumes). |
| | —Animal Behaviour | |
| | —Evolution | |
| | —The Earth | |
| | —The Mammals | |
| | —Fishes | |
| | —The Birds | |
| | —The Deserts | |
| | —The Sea | |
| | —The Reptile | |
| | —The Earlyman | |
| 11. | Popular Science | (Ten volumes) |
| 12. | Founders of Sciences in Ancient India | Satya Prakash Saraswati
Govindram Hasanand. |
| 13. | Science and Indian Culture | J.B.S. Haldane, New Age
Publishers. |
| 14. | Science and Man | Ed. A.K. Jalaluddin,
U. Malik, NCERT |
| 15. | Science and Scientific Method | P.J. Dubash et al.
Himalaya Pub. |
| 16. | Science and Scientists in India | N.K. Jain, Indian Book
Gallery. |
| 17. | Science and the Conquest of Hunger | M.S. Swaminathan.
Concept. |
| 18. | Studies in the history of science in
India Vol. I & II. | Editorial Enterpriser (N.D.) |
| 19. | Experiments are fun | RG. Lagu, Oxford |
| 20. | Wonders of the Sky | G.R. Narayanan Rao,
IBH Prakashan |
| 21. | Rocks and Minerals | K.S Nisar Ahmed,
IBH Prakashan. |
| 22. | Science Learning through Enquiry. | Vikram Sarabhai
Community Science Centre. |

23.	Jeevan aur Vigyan (Hindi)	NCERT
24.	Our Tree Neighbours	NCERT
25.	Vigyan aur Manushya (Hindi)	
26.	Meghnad Saha Ka Jeevan aur Karya (Hindi)	
27.	Foundation of Physics	H.O. Joshi, Deshmukh Prakashan
28.	Indian Wildlife	APA Productions Ltd., Bombay.
29.	The state of India's environment.	Centre for Science and Environment.
30.	The book of Indian reptiles	Bombay Natural History Society.
31.	Insects	M.S. Mani, NBT.
32.	Common Trees	H. Santapar, NBT
33.	Children's library of Knowledge.	Pustak Mahal
34.	Computers for Children	K.S. Galgotia
35.	Watching Birds (Hindi, English)	Jamal Ara
36.	The Cat Family (Hindi, English)	M.D. Chaturvedi.
37.	Inventions that changed the World (Hindi, English) (In two parts).	Mir Najabat Ali
38.	The World of Trees (English)	Ruskin Bond
39.	Who's Who at the Zoo	Kamala Nair
40.	Our Useful Plants	K.S. Sekharan
41.	The Summer Tree Contest (Hindi, English)	Radha Khambadkone
42.	Adventures of a Wildlife Warden (Hindi, English).	R.C. Davidar
43.	Wild Woodnotes (English, Hindi)	P.J. Roy
44.	The Rainbow (Hindi, English)	Usha Joshi
45.	Pollution (Hindi, English)	N. Seshagiri
46.	Bullock Carts and Satellites, (Hindi, English)	Monisha Bobb
47.	The Story of Blood (Hindi English)	Rescha & Yatish Agarwal.

48.	Flowers and I (Hindi, English)	Monorama Jafa
49.	A Journey through the Universe (English)	By Jayant Narliker.
50.	The Snakes Around Us (Hindi, English)	Zia and Rom Whitaker.
51.	Our Body—A Wonderful Machine (Hindi, English)	Ramesh Bijlani
52.	Water	Rama
53.	Our Tree	Parnab and Sunita Chakkravarti.
54.	A Vice in the Jungle (Hindi, English)	Jagdish Joshi
55.	Animal World (Hindi, English)	Aurobindo Kundu.
56.	51 Mahan Abiskar (Hindi)	Pustak Mahal
57.	Vishwa—Prasidh Khojen (Hindi)	-do-
58.	Think Series (Vol. 1-4) (English)	-do-
59.	101 Science Games (Hindi, English)	-do-
60.	101 Science Experiments (Hindi, English)	-do-
61.	O-level Physics Pupils' guide ; Astronomy.	Rogers, E.M. Nuffield. Longman Penguin
62.	The invasion on the Moon	Ryan P., Penguin.
63.	Nature of the Universe	Hoyle F., New York, Herper & Row Publications.
64.	Our Universe	P.L. Bhatnagar, NCERT, New Delhi.
65.	Your Book of Astronomy	P. Moore, Faber & Faber Ltd., London.
66.	Space Flights	M.L. Rajan, NCERT, New Delhi.
67.	The Science of Biology	P.B. Weizz, McGraw Hill Inc., New York.

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| 58. | The Science of Zoology | P.B. Weizz,
McGraw Hill Inc.,
New York. |
| 69. | Foundations of Physics | Lehrman and Swart
(Holt Rinehart). |
| 70. | Mechanics | J.P. Den Hartog
(Dover Publications Inc.
New York). |
| 71. | Physics ; Foundations and Frontiers | G. Gamow and Cleveland,
Prentice Hall of India
Pvt. Ltd., New Delhi. |
| 72. | Physics for Everyone,
Moscow | L. Landon and Kitaigrodsky
Mir Publishers, Moscow |
| 73. | An introduction to Molecular
Kinetic Theory | J.H. Hildebrand.
Reinhold Publishing Co.
New York. |
| 74. | Physics for Entertainment | Perelman, Ya.,
Mir Publishers. |
| 75. | Fun with Mechanics | Harbarat Mckey,
Oxford University Press. |
| 76. | Inside the Atom | I. Asimov, Ableard Schuman. |
| 77. | Explaining the Atom | S. Hecht, Viking. |
| 78. | The discovery of the Electron | D.L. Anderson, Van
Mostrand. |
| 79. | Atomic Physics | Dull, Met Calfe and —
Williams Holt, Rinchart, and
Winston. |
| 80. | Physics and Experimental
Science | White and White, Van
Morstand. |
| 81. | Understanding Science | Sampson Low Mortston and
Co. Ltd., 2, Fortman
Street, London. |
| 82. | Source Book for Science Teaching | UNESCO. |
| 83. | Electricity and Modern Physics | Beanat, G.A.C.,
Edward Arnold Ltd., 1965. |
| 84. | Physics for Life Science Students | Hons Brewer (Prentice Hall) |
| 85. | A textbook on Health Education
for Secondary School. | Frank Bros., Delhi under the
authority of KVS, New Delhi. |

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| 86. | Dietary Allowances Rocommended to Different Age Groups, Sexes and Professionals. | ICMR, New Delhi. |
| 87. | Teaching Guide for Nutrition Education in Primary Schools. | NCERT, New Delhi. |
| 88. | Physics Resource Materials, Volume I and II for Secondary School Teachers. | RCE, Mysore. |
| 89. | Treatise on Heat. | M.N. Saha and B.N. Srivastava, The Indian Press Ltd., Allahabad. |
| 90. | Textbook of Physics. | J.B. Rajan, S. Chand and Co., Delhi. |
| 91. | A textbook of Heat (Part II). | N.S. Allen and R.S. Maxwell, Macmillan & Co. Ltd., New York. |
| 92. | Albert Einstein. | Leopold Infeld Charles Scribery & Sons, New York, 1950. |
| 93. | Optics. | Jenkins and White. |
| 94. | Nuffield Physics, Question Book I to V. | Longmans/Penguin Books. |
| 95. | NAS Physics, Students Book Unit 1 to 7. | Penguin Books. |
| 96. | NAS Physics : Teachers' Guide Unit 1 to 7. | Penguin Books. |
| 97. | NAS Physics Student Book and Teachers' Guide Unit 8 to 10. | Penguin Books. |
| 98. | Nuffield, Physics, Teacher' Guide (Book I to V). | Longmans/Penguin Books. |
| 99. | Nuffield, Physics, "Guide to Experiments" (Book I to V). | Longmans/Penguin Books. |

NCERT PUBLICATIONS

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| 100. | Environmental Studies for Class III Part II (Gen. Sc.). |
| 101. | Paryavaran Adhyayan for Class III. Bhag II (Samanya Vigyan). |
| 102. | Environmental Studies for Class IV Part II (Gen. Sc.) |

103. **Paryavaran Adhyayan for Class IV, Bhag II (Samanya Vigyan).**
104. **Learning Science Through Environment, Part III for Class V.**
105. **Paryavaran Se Vigyan Seekhna, Bhag-III for Class V.**
106. **Learning Science Part-I, II & III.**
107. **Aao Vigyan Seekhain, Bhag-I, II and III.**
108. **Physics Part I and Part II for Classes IX, X.**
109. **Bhautik Bhag-I and Bhag II for Classes IX, X.**
110. **Bhautik Vigyan Bhag-I & Bhag-II for Classes XI, XII.**
111. **Physics for classes XI-XII.**
112. **PSSC Physics Teachers' Resource Book and Guide Part I to IV.**
113. **Samanya Vigyan Vol. I, II and III.**
114. **Environmental Studies Part-II Teachers' Guide for class III, IV and V.**
115. **Teachers Guide Learning Science, Part I, II & III.**
116. **The Romance of Tansport.**
117. **Everest—Where the snow never melts.**
118. **Story of Glass.**
119. **Physics is Fun Book I to IV.** Jim Jardine, Heinemann Educational Books Ltd.
120. **Physics through Experiments.** B. Saraf and D.P. Khandelwal, Vikas Publishing House Private Limited.
121. **Physics Experiments and Projects.** W-Boiton, Pergammon Press.
122. **Practical Physics for Pre-University and Pre-Engineering Studies.** U.S. Kushwaha and S.S. Datta, Punjab University, Chandigarh.

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| 123. | Enjoy Physics. | Dr. Vinay B. Kamble
Vikram Sarabhai Community
Centre. |
| 124. | How Time is measured | Peter Hood (Oxford
University Press, London). |
| 125. | Elementary Physics | A.F. Abbott. & M. Nelkon,
William Heinemann Ltd.
London. |
| 126. | Wheel of Timer | Harry Zarehy (Thomas
Y. Crowell Co., New York). |
| 127. | Understanding Physics
Vol. I to III. | Isacc Asimov (George Allen
& Unwin Ltd., London.) |
| 128. | Modern Technical Physics. | Arthur Beiser (Mc. Graw-Hill
Book Inc., New York). |
| 129. | Introduction to Physics & Chemistry | Arthur Beiser (Mc. Graw-Hill
Book Co., New York). |
| 130. | Physics A Discovery Approach. | Steve Adwards (John Willey
& Sons Inc., New York). |
| 131. | General Physics and Sound. | D.H. Fender (The English
University Press Ltd.,
London). |
| 132. | The Evolution of Physics. | Albert Einstein & Leopold
Infeld (University Press,
Cambridge). |
| 133. | Physics for the Modern Mind. | Walter R. Fuchs
(Mac Millan Co., New York). |
| 134. | Physics : A modern approach | L. Paul Elliotte William
F. Wilcor (The Macmillan Co.,
New York) |
| 135. | A Contemporary View of Elementary
Physics. | Borowitz & Bornstein.
Mc Graw Hill Book Co.,
New York. |
| 136. | New Perspectives in Physics. | Louis De Broglie, Oliver &
Boyd, London. |
| 137. | Physical Science, Man's Conquest
of Matter and Space. | Odhams Press Ltd., London. |
| 138. | Physics. | W. Balton, Thomas Nelson
& Sons Ltd., London. |
| 139. | The Physical Science. | Caple, Getchil & Kedesch,
Printice Hall Inc.
New York. |

140. A Journey Through Space and the Atom. S. T. Butler, The Macmillan Co., New York.
141. General Physics. Blackwood, Kelly & Bell. Johns Wiley and Sons, Inc., New York, London.
142. Projects in Physics. N.D.N. Bellamy, B.T. Batsford Ltd., London.
143. Discovering Physics. Harold P. Knauss, Addison-Wesley Press, Inc. Cambridge 42 MASS.
144. From Galileo to the Nuclear Age. Harvey Brace Lemon The University of Chicago Press.
145. Mastering Physics. H.J.P. Kieghley & Others. The Macmillan Press Ltd., London.
146. Physics with Chemistry. J.V. Partch & O.J. Simpson Edward Arnold (Publishers) Ltd., London.
147. The Law of Nature. R. E. Peierls, Chartles Scribner's Sons, New York.
148. Dynamic Physics. Ernest O. Bower and Edward P. Robinson Rand Mc. Nally & Co., New York.
149. Vibrations, Waves and Diffraction. H.J.J. Braddick, Mc. Graw Hill Publications Co., Ltd. London.
150. Physics : Its Marvels and Mysteries. Dr. Daniel & Rosin. Whitman Publishing Co., Wisconsin.
151. Chemistry in Action. G.M. Rawlines, A.H. Struble and C.W. Gatewood (D.C. Health and Company, Boston).
152. Using Chemistry. Oscar E. Lanford (Mc. Graw-Hill Book Co., Inc., New York).
153. Chemistry : Principle and Properties Michell J. Sienro and Robert A. Plance (Mc. Graw-Hill Book Co., New York).

154. Contemporary Organic Chemistry. Andrew L. Ternay, J.R. (W.B. Saunders Co.), London.
155. Chemistry—A Modern Introduction Frank Brescia, Stanley Mehlman F.C. Pellegrill and Stembler (W.B. Saunders Co., Philadelphia) London.
156. Chemistry, Man and Environmental Change—An Integrated Approach. J. Calvin Giddings (Canfield Press, San Francisco, New York.
157. An Introduction to Chemical Thermodynamics R.P. Rastogi and R.R. Mishra (Vikas Publishing House Pvt. Ltd.) New Delhi.
158. Modern Chemistry. Metcalfe Williams and Castra (Holtine : chart Winston).
159. Thermodynamics. Samuel Glasstone (Van Nostrand Reinhold) East West Press.
160. General Chemistry. W.E. Miller and Joseph A. Babor (Scientific Book Agency) 22, Raja Woodmunt Street, Calcutta.
161. Chemistry—Structure and reaction. Milton K. Snyder Holt, Rinehart and Winston. (Inc.) New York.
162. Thermodynamics. Kenneth S. Pitzer and Leo Brewer (Mc Graw-Hill Book Company).
163. The Chemistry of Matter. Janes B. Pierce (Houghton Mifflin Co.) Boston.
164. Inorganic Chemistry an Intermediate Text. C. W. Wood & A.K. Holiday (Butter Worths) London.
165. Kinetics of Inorganic Reactions. A.G. Sykes (Pergamon Press) Oxford.
166. Basic Physical and Inorganic Chemistry. G.D. Parkes & J.M. Harrison (Longmans).
167. A Text-book of Inorganic Chemistry. J.R. Partington (Macmillan & Co. Ltd.), London.

168. Text-book of Inorganic Chemistry. Panchanan De.
169. An Introduction to Physical Chemistry. S.N. Srivastava & H.C. Saraswat (Shiv Lal Agarwala & Co.) Agra.
170. Physical Chemistry for Advance Knowledge. G.G. Silcocks (Macdonald & Evans) London.
171. A History of Chemistry. J.R. Partington (Macmillan & Co.), New York.
172. History of Chemistry—Ancient and Medieval India. P. Ray, Indian Chemical Society, Calcutta.
173. Organic Chemistry. I.L. Finar (ELBS.)
174. Organic Chemistry. Morrison & Boyd (Prentice-Hall).
175. Guidelines for Investigatory Projects in Chemistry. NCERT Publication.
176. Petroleum and Petrochemicals. R.D. Patel (Thomson Press).
177. Physical Chemistry. Puri & Sharma (S. Nagin & Co.)
178. Inorganic Chemistry. Puri and Sharma (S. Nagin & Co.)
179. Systematic Numerical Chemistry. S.K. Kundra (Neelam Publishers)
180. Chemistry & Our World. Mundiayath Venogopalan (Harker & Row).
181. Chemistry through Models. Collin J. Suckling (Cambridge Univ. Press).
182. The Ideas of Chemistry. Martha Orico Visschor (Narcourt Brace Novanovich INC).
183. Chemistry for the space age. Posin & Shampo (J.B. Lippincott Co.)
184. Karbanic Rasayan Ke Adharbhoot Siddhanta. Dr. M.M. Vokadia, M.P. Hindi Granth Academy, Bhopal.
185. Prarambhik Rasayan Part 1 & 2. Dey Ewam Bhargava, (Upper India Publishing House. Pvt. Ltd.), Lucknow.

186. Prisht Rasayan. Vijendra Ramkrishna Shastri, Madhya Pradesh Granth Academy, Bhopal.
187. Bhoutik Rasayan. V.S. Bahal, G.D. Tuli, S. Chand and Co. Delhi.
188. Rasayan Vigyan Part 1 & 2. NCERT, New Delhi.
189. Chemistry Test Items Part-I. NCERT, New Delhi.
190. Chemistry I & II (For classes XI-XII). NCERT, New Delhi.
191. Keys to Chemistry Book I & Book 2. Grahm Hill, Hodder and Stoughton Sydney London, 1978.
192. Keys to Chemistry Book I & Book 2 Teacher' guide. Grahm Hill Hodder & Stoughton, London, Sydney.
193. New Calculations in Chemistry Student Problems at 16 +. D.G. Davies, T.C.G. Kelley Bell & Hyman, 1985.
194. Modern Chemistry Series, Inorganic Chemistry Through Experiment. Mills & Bonn, London, 1980.
195. Chemistry in Today's World. D. Ainley, J.N. Lazonby A.J. Masson (Bell & Hyman Ltd., London, 1985).
196. Modern Chemistry Series Organic Chemistry Through Experiment. D.J. Waddington, H.S. Finlay (Bell & Hyman, Ltd. Lndon 1985).
197. The Language of Life. Beadle G. and M. Beadle, Garden City, N.Y. Doubleday 1996.
198. Heredity. Bonner, D.M. and S. Mills. Englewood Cliffis, N.J., Prantice Hall, 1964.
199. The Meiotic Mechanism. John, B. and K.R. Lewis. Oxford Biology Reader, 65, Boulder, Colorado, P.O. Box, 3406, 1972.
200. Somatic Cell Division (Mitosis). John, B. and K.R. Lewis. Oxford Biology Reader. London : Oxford University Press, 1972.

201. Heredity and Development. Morre, J.A. Fair Lawn, N.J. Oxford University Press. 1972.
202. An Introduction to Modern Genetics. Patt. D.I. and G.R. Patt Reading, Mass Addison Wesley, 1975.
203. The Mechanism of Inheritance. Stahl, F.W., Englewood Cliffs, N.J., Prentics Hall, 1969.
204. Know Your Genes. Milunsky, A., Boston : Houghton-Mifflin Co., 1977.
205. Genetics of Man. Mood, P.A. Morton, New York 1975.
206. The Double Helix. Watson, J. New York Anthenum, 1969.
207. Embryos and How they Develop. Jenkins, M.M., New York, Holiday House, 1975.
208. Animal Growth and Development. Moog, F. ABSCS Laboratory Block, Lexington, Mass : D.C. Health, 1968.
209. Understanding Evolution. Volpe, E.P. New York : Golden Western. 1974.
210. Fossil Man. Day, M.H. Grosset and Deulap, New York 1970.
211. Early Man. Howell, F.C. New York : Time-Life, 1965
212. Heredity, Evolution and Society. Lener, I.N., San Francisco : Freeman, 1968.
213. Animal Diversity. Hanson. E.D. Englewood Cliffs, N.J., Prentics. Hall, 1964.
214. The Control of Water Balance by the Kidney Noffat D.B., Oxford University Press, 1971.
215. Ecology. Farl. Peter, Time-Life Books, Latin Editor. New York.
216. Growth. Tanner, I.N. and G.R. Taylor. Time Life Books. New York 1971

217. *Worlds within Worlds, an Introduction to Biology.* Emmel, T.C. Harcourt Bruce Jovanovitch Inc. 1977.
218. *Readings from Scientific.* American, San Francisco, Freeman, 1974.
219. *Man Eaters of Kumaon.* Corbett. Jim, Bombay, OUP 1948.
220. *The Wild Life of India.* Lee, E.P. London, Corlling, 1964.
221. *About Flying.* NCERT
222. *Akash Darshan Atlas.* NCERT
223. *Meghnad Saha.* NCERT
224. *The Body.* A.E. Nourse, Time-Life Books, New York. 1971.

LIST OF ITEMS REQUIRED FOR RESOURCE CENTRES

(Resource Centre which already possess some of these items may use the fund for other items required for classroom teaching by the teachers).

1. Colour Television.
2. Video Cassette Player.
3. Radio with powerful shortwave reception.
4. Tape-recorders.
5. Video Cassettes educational.
6. Over-head projector with transparencies.
7. Microcomputer.
8. Indigenous software.
9. Microtome-Rotary type.
10. Paraffin Bath—40 C to 100 C.
11. Incubator—Bacteriological—10 C to 40 C.
12. Incubator— Hatching—25 C to 40 C.
13. Hot Plate.
14. Refrigerator.
15. LPG. Gas Cylinder with gas.
16. Barometer.
17. Thermometer—various ranges and types.
18. Centrifuge—Electrical—12 ml & 50 ml. tubes.
19. Ph. meter.
20. Single pan balance—electrical.
21. Car Battery.
22. Torch light batteries—assorted size.
23. Stereoscopic Binocular Compound Microscope with measuring appliances (1200 × mag.)
24. Stereoscopic Dissecting Binocular Microscope (20 × 100).
25. Telescope—3 dia.
26. Automatic 35 mm slide projector.
27. Magnets—assorted.
28. Galvanometer.
29. Lenses—assorted.
30. Glass wares as required in Science Lab. of Higher Secondary level.

31. Chemicals as required in Science Lab. for Higher Secondary level.
32. Glass distillation apparatus.
33. Assorted items required for Science teaching in Sr. Secondary level.
34. NCERT Kit for Classes upto VIII.
35. Hand tool kit developed by NCERT.

ANNEX.—IV

TRAINING OF SCIENCE TEACHERS AND DEVELOPMENT OF INSTRUCTIONAL PACKAGES—FINANCIAL IMPLICATION.

I. *Workshop for briefing the State-level officials. 64 Participants—2 from each State—3 days duration.*

	Rs.
(i) TA @ Rs. 1000/- per head	64,000.00
(ii) DA @ Rs. 50/- per head per day (64×50×3)	9,600.00
(iii) Books & other materials @ Rs. 50/- per head (64×50)	3,200.00
(iv) Contingencies	1,000.00
	<hr/>
	77,800.00
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II. *Orientation Programmes for Key Persons*

50 Participants—3 days duration Resource Persons—4
(2 local and 2 external).

(i) T.A. to 2 external participants @ Rs. 500/- per head	1,000.00
(ii) D.A. to 2 external participants @ Rs. 50/- per head per day (50×2×3)	300.00
(iii) Honorarium to 4 Resource Persons @ Rs. 75/- per day (75×4×3)	900.00
(iv) Material Development	2,500.00
(v) Contingencies	1,000.00
	<hr/>
	5,700.00
	<hr/>

III. *Programmes for Resource Persons*

50 Participants each, duration 3 days, Key Persons—4 (2 locals and 2 external).

(i) T.A. to 2 external Key Persons @ Rs. 200/- per head	400.00
(ii) D.A. to 2 external Key Persons @ Rs. 50/- (50×2×3)	300.00
(iii) Honorarium to 4 Key Persons @ Rs. 40/- per head per day (40×4×3)	480.00
(iv) Material @ Rs. 50/- per head	2,500.00
(v) Contingencies	1,000.00
	<hr/>
	4,680.00
	<hr/>

IV. *Training Programmes for Secondary Teachers*

	Participants 40 each-15 days duration-Resource Persons-4 (2 local and 2 external)	
(i)	TA to 2 external Resource Persons	200.00
(ii)	DA to 2 external Resource Persons @ Rs. 40/- per head per day (40×2×15) :	1,200.00
(iii)	Honorarium to 4 Resource Persons @ Rs. 40/- per head per day (40×4×15)	2,400.00
(iv)	Materials @ Rs. 25 per head (25×40)	1,000.00
(v)	Contingencies	1,500.00
		<hr/> 6,300.00

V. *Training Programmes for Upper Primary Teachers*

	Participants 40 each-10 days duration-Resource Persons-4 (2 local and 2 external)	
(i)	TA to 2 external participants @ Rs. 50/- per head	100.00
(ii)	DA to 2 external participants @ Rs. 25/- per head per day (25×2×10)	500.00
(iii)	Honorarium to 4 Participants @ Rs. 25/- per head per day (25×4×10)	1000.00
(iv)	Materials @ Rs. 25 per head	1,000.00
(v)	Contingencies	1,000.00
		<hr/> 3,600.00

VI. *Workshops for preparation of guidelines & syllabi, instructional materials*

	(20 Participants-7 days duration-Resource Persons-4 (2 local + 2 external)	
(i)	TA to external Resource persons @ Rs. 200/- per head	400.00
(ii)	DA to external participants @ Rs. 50/- per head per day (50×2×7)	700.00
(iii)	Honorarium to 4 Resource Persons @ Rs. 40/- per head per day (40×4×7)	1,120.00
(iv)	Material Development	20,000.00
(v)	Contingencies	2,000.00
		<hr/> 24,220.00

VII.	<i>Summer Institute for Higher Secondary Teachers</i>	
	Participants—40 each-20 days duration—Resource Persons-4 (2 local and 2 external)	
(i)	TA to 2 external Resource persons @ Rs. 100/- per head.	200.00
(ii)	DA to 2 external Resource persons @ Rs. 50/- per head per day (50×2×20)	2,000.00
(iii)	Honorarium to 4 Resource Persons @ Rs. 40/- per head per day (40×4×20)	3,200.00
(iv)	Materials @ Rs. 25/- per head.	1,000.00
(v)	Contingencies	2,000.00
		<hr/>
		8,400.00
		<hr/>

IMPROVEMENT OF SCIENCE EDUCATION IN SCHOOLS

Format of proposals for the year

A. Provision of Science Kits to Upper Primary Schools.

	GOVT.	GOVT.	TOTAL.
		AIDED	
	Sec.	HSS	Sec. HSS
1. No. of schools to be covered (Attach district and blockwise list of upper primary schools to be covered).			
(i) No. of Upper primary schools in the State/UT			
(ii) Out of (i), No. proposed to be provided the kit during the year.			
2. Unit cost of the integrated Science Kit.			
3. Total Estimated cost of Science Kits.			
4. Source and mode of procurement.			

B. Upgradation of Science Laboratories in Secondary and Higher Secondary Schools.

1. No. of schools to be covered (Attach district and blockwise list of Sec. & Hr. Sec. Schools to be covered).
 Certify for each School availability of space for laboratories, full complement of Science Teachers, water and electricity.
 - (i) No. of Schools in the State/UT offering Science subjects.
 - (ii) Out of (i), No. proposed to be covered during the year
 - (a) deficient labs
 - (b) no labs.
 (Please attach districtwise list of Schools of both kinds)
2. (i) Average unit cost of equipment for Schools having deficient labs.
- (ii) Average unit cost of equipment for Schools having no labs.
 (Please attach details of deficient equipment and estimated cost for each School to be covered under this scheme)

GOVT.	GOVT.	TOTAL
<u>Sec.HSS</u>	<u>AIDED</u>	<u>Sec. HSS</u>

3. Total Estimated cost.
 4. Source and mode of procurement
 5. Arrangements made by the State Govt. to allow Schools to repair and replace unusable equipment.
- C. Supply of Library Books to Secondary & Higher Secondary Schools.
1. No. of Schools to be covered
 - (i) No. of Schools in the State/UT having Science subjects.
 - (ii) Out of (i), No. having inadequate libraries.
 - (iii) No. proposed to be provided library assistance during the year (Attach District wise and blockwise list of schools to be covered).
 2. No. of schools to be supplied to each School. (Please attach the list of selected books).
 3. Total estimated cost of books.
- D. District Resources Centres for Science Education.
1. Total No. of Districts in the State.
 2. Names of districts where DRCs are proposed to be established during the year.
 3. Equipment to be supplied to each Centre (mention for every district). (Please also attach list of institutions identified).
 4. Total cost.
- E. Training of Science Teachers.
1. No. of teachers to be trained and No. of training programmes to be organised during the year.

No. of Teachers to be covered	Average No. of participants per programme	No. of Programmes to be organised
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- (i) For Upper Primary Teachers
- (ii) For Secondary Teachers.
- (iii) For Higher Secondary Teachers.

	No. of Teachers to be covered	Average No. of participants per programme	No. of Programmes to be organised
2. Arrangements for training.			
3. Unit costs for various types of training programmes			
(i) For Upper Primary Teachers.			
(ii) For Secondary Teachers.			
(iii) For Higher Secondary Teachers. (TA/DA of participants to be borne by State Govt).			
4. Total estimated expenditure.			

QUARTERLY PROGRESS REPORT FOR THE SCHEME OF IMPROVEMENT OF SCIENCE EDUCATION IN SCHOOLS

Name of the State/UT

Quarter ending

PART-I—PROVISION OF PHYSICAL FACILITIES

1. *Provision of Science Kits to Upper Primary Schools*

1. Total No. of Schools in the State/UT
2. Schools covered till the previous year under this scheme
3. Number of blocks—district-wise covered during the year
(All the Schools in a selected block must be covered during
the same year).
4. List of Schools covered in each block.
5. Number of Schools to be covered.

												No. of Schools covered			
During the year				During the Quarter				Upto the end of the last Quarter							
Govt.	Govt. aided	Local body	Total	Govt.	Govt. aided	Local body	Total	Govt.	Govt. aided	Local body	Total				

2. *Upgradation of Science Laboratories in Secondary Schools and Higher Secondary Schools.*

1. Total No. of Schools in the State/UT Secondary Hr. Sec.
2. Schools covered till the previous year Secondary Hr. Sec.
under this scheme.
3. Number of blocks, district-wise covered
during the year.

(All the Schools in a selected block
must be covered during the same year).
4. List of Schools covered in each block
certifying for each School availability
of requisite number of laboratory rooms
Science teachers water and electricity.
5. Number of Schools to be covered

No. of Schools covered											
During the year				During the Quarter				Upto the end of the last Quarter			
Govt.	Govt. aided	Local body	Total	Govt.	Govt. aided	Local body	Total	Govt.	Govt. aided	Local body	Total

- (i) Secondary
- (ii) Higher Secondary.

3. *Upgradation of Libraries in Secondary Schools and Higher Secondary Schools.*

1. Total No. of Schools in the State/UT Secondary Hr. Sec.
2. Schools covered till the previous year Secondary Hr. Sec.
under this scheme.
3. Number of blocks, district-wise covered
during the year.

(All the Schools in a selected block
must be covered during the same year)
4. List of Schools covered in each block
certifying for each School availability
of adequate library space.
5. Number of Schools to be covered

No. of Schools covered											
During the year				During the Quarter				Upto the end of the last Quarter			
Govt.	Govt. aided	Local body	Total	Govt.	Govt. aided	Local body	Total	Govt.	Govt. aided	Local body	Total

(i) Secondary

(ii) Higher Secondary.

PART-II TRAINING OF SCIENCE TEACHERS

Category of Teachers	No. of Training Courses Organised			No. of Teachers Trained	
	During the Quarter	Upto the end of last quarter	Target for the year	During the quarter	Upto the end of last quarter
(i) Upper Primary Teachers					
(ii) Secondary Teachers					
(a) Physics					
(b) Chemistry					
(c) Biology					
(d) Maths.					
(iii) Higher Secondary Teachers					
(a) Physics					
(b) Chemistry					
(c) Biology					
(d) Maths.					

PART-III DISTRICT RESOURCE CENTRES FOR SCIENCE EDUCATION

1. No. of Districts covered till previous year
.....
 2. No. of Districts to be covered during the year
.....
 3. Names of Districts covered during the year
.....
- (Please attach a list of institutions selected and equipment supplied to them).

No. F. 20-30/92-Desk (SCE)
Government of India
Ministry of Human Resource Development
Department of Education

New Delhi, 8th June, 1993

Subject : Continuance of the Centrally Sponsored Sceme, "Improvement of Science Education in Schools" during the 8th Plan—regarding.

The undersigned is directed to say that the Union Cabinet has approved the proposal regarding continuance of the Centrally Sponsored Scheme, "Improvement of Science Education in Schools" during the 8th Plan subject to the following modifications therein with the stipulation that the phasing of implementation of the scheme should be common to both Government and Government aided schools.

- Financial assistance for setting up of District Resource Centres will be discontinued. District Resource Centres will be wound up in those districts where DIETs have become operational. District Resource Centres will, however, be still required where DIETs have not become fully operational.
- While NCERT designed/compatible science kits, will, in general, be provided to eligible upper primary schools; the State Governments/ UT Administrations in exceptional cases will permit the schools to buy equipment in lieu of science kits subject to fulfilment of following conditions.
 - (a) the concerned State/UT is convicted of the difficulties in procuring the science kits;
 - (b) the relevant officials satisfy themselves about availability of laboratory/science corner/appropriate space in the schools where the equipment can be used for demonstration purposes; and
 - (c) appropriate modification in the teacher training programme is carried out so as to enable the teachers to use the apparatus to perform more or less the same set of experiments which could have been carried out with the science kit.

A list of equipment proposed to be procured in lieu of science kits will be prepared in consultation with NCERT and sent to the State Governments/ UT Administration shortly, who, in turn, will design the list of equipment conforming to their syllabi.

- Science kits/equipment in lieu thereof will be provided to secondary/ senior secondary schools for their upper primary sections, if any, only after all the eligible Government and Government aided upper primary schools in a State/UT have been covered.
- The State Government/UT Administrations will themselves decide as to involve NCERT or any other agency of the Central or the State Government/UT Administration including non-Government organisation for conduct of various training/orientation programmes for science and mathematics teachers. The States/UTs will, however, continue to bear the expenditure on TA/DA of the participant trainees. The duration of training programmes for senior secondary teachers will normally be 15 days while for secondary and upper primary schools the duration will be 10 days and 6 days respectively.
- In exceptional cases, non-recurring financial assistance will be given to voluntary agencies for acquisition of assets, wherever necessary.
- Under the Scheme, voluntary agencies are provided assistance for undertaking various programmes on project basis. The project activities may include taking up well-designed fielded projects, development of teaching-learning material and aids, preparation of books, brochures, posters, audio-visual materials and their dissemination, training or orientation of teachers, organisation of seminars, co-curricular activities in schools in collaboration with education department authorities etc. While the aforesaid list of activities is purely suggestive; the following activities will be added thereto:
 - (a) publication of journals/magazines exclusively aimed at science and mathematics teachers of schools,
 - (b) undertaking action research projects like improving the teaching-learning process in rural areas,
 - (c) designing specific remedial measures to boost the performance of scheduled caste/tribe student etc. and
 - (d) setting up of centralised laboratory facilities.

- It shall not be open to the States/UTs to seek assistance for implementation of the scheme in a part of district. All the components of the scheme shall have to be implemented in all eligible Government and Government aided schools in districts selected under the scheme. The States/UTs will be required to select the districts in the following order of preference:
 - (a) Atleast one district having lowest percentage of literacy ;
 - (b) Disripts partly covered during the previoures years ; and
 - (c) Other districts subject to constraints of the budget during a particular year.
 - In so far as training of science and mathematics teachers is concerned, the deserving proposals in this behalf, if any, submitted by the States/UTs for implementation in such districts as are yet to be taken up for implementation of the other components of the scheme will also be considered.
2. In order to utilise the effect of the inflation, existing unit cost for various items has been increased by 20%. The revised unit costs for various items are given in the Annexure.
 3. The details of the modified scheme may be brought to the notice of all concerned.

Yours faithfully,

(NAVED MASOOD)
DIRECTOR (ET)

To
Education Secretaries of all States/UTs.
Copy submitted for information/necessary action to :

1. Shri G. S. Chatterjee, Officer on Special Duty, Cabinet Secretariat, New Delhi—with reference to their O. M. No. 25/CM/93(i) dated 21st May, 1993.
2. The Director, NCERT, New Delhi.
3. Prof. K. V. Rao, Head, DESM, NCERT, New Delhi.

(NAVED MASOOD)
DIRECTOR (ET)

ANNEXURE

<i>Sl. No.</i>	<i>Item</i>	<i>Amount (in Rs.)</i>
1.	Laboratory equipment/schools for new laboratories	90,000/-
2.	Laboratory equipment/schools for inadequate laboratories	30,000/-
3.	Science kits/upper primary	2,400/-
4.	Library assistance/schools	18,000/-
5.	Summer Institute programme for Higher secondary teachers	<p>Taking note of the fact that the States/UTs will themselves decide as to involve NCERT or any other agency of the Central or the State Government/UT Admn. including non-Govt. organization for conduct of the various training/orientation programmes, it is not possible to indicate the unit cost per programme. The States/UTs will, however, ensure that the unit cost per teacher (including the funds required for training of key persons, resource persons and development of training materials etc.) will not exceed:</p> <p>--Rs. 1000/- per senior secondary teacher</p> <p>--Rs. 750/- per secondary teacher</p> <p>--Rs. 500/- per upper primary teacher</p>
6.	Secondary teacher training programme	
7.	Upper primary teacher training programme	
8.	Orientation programmes for resource persons	
9.	Workshops for development of instructional materials.	