SCOTTISH SCHOOLS SCIENCE EQUIPMENT RESEARCH CENTRE

Bulletin No. 90. August, 1976.

Contents

Introduction

We have recently sent to chemists and a number of other subscribers in the U.K. a copy of our revised chemistry equipment list. We have tried to reduce our costs by restricting circulation to principal teachers of chemistry, regional education offices and manufacturers. However, anyone from abroad who wishes to have a copy of the list should send us 15p (or the equivalent in their own currency) with, please, a clearly printed address in BLOCK CAPITALS, and the list will be sent to them. The same charge, which includes postage, will apply to anyone who is not on our circulation list, or requires additional copies.

The list purports to cover the needs of a chemistry laboratory up to H grade. All prices were current in February, 1976 which is why the list carries that date. We have usually tried to quote two suppliers to give some idea of the price differences which are possible. When we multiply the pupil scale apparatus by 10 (i.e. assuming a class of 20 working in pairs), always taking the lower of the two costs for an item, and the smallest number of items where a choice is possible we find that an approximate minimum figure for equipping up to H grade is £1,900. This breaks down as follows.

Section	A	B	C	D	E	F				Total
Cost, £	30	451	39	90	21	92				£723
Section	G	H	I	J	K	L	M	N	O	Total
Cost, £	20	231	112	81	28	79	35	155	11	£754
Section	P	Q	R	S	Small Scale					Total
Cost, £	46	65	124	78	110					£423

The divisions represent the cost for Integrated Science in SI and SII, £723, for years SIII and SIV to O grade, £754, and for year V to H grade plus an extra £110 if one adopts fully our recommendation to small scale chemistry, of £423.

The total would be lower if the three science departments can co-operate fully in sharing arrangements. For example, section B includes the cost of O grade microscopes, and section H of power supply and demonstration meters. On the other hand, the cost of basic equipment has to be taken into account. We have excluded from the chemistry list items which are common to any laboratory whatever its function, such as burners, retort stands etc. A basic equipment list, which includes such expensive items as top-pan balances, was issued in May, 1975.

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We would remind secretaries of regional groups of science teachers and any others who may now or shortly be preparing their programme of meetings for session 1976/77 that the services of our staff, individually or severally, are freely available to stage exhibitions or lecture demonstrations on any aspect of science teaching which they feel might interest their members. We have at present no bookings for the session, and we would appreciate being contacted well in advance of a meeting, if only so that we may give it more publicity through the bulletin. This normally means having the arrangements made final two months before the meeting.

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How's this for precocity? We quote from the June issue of Electron, a circulation magazine we receive.

'Conceived three years ago in a bedroom - which makes a change from the perennial garage - automatic test equipment manufacturer ..... has now opened a new 2000 ft^2 test facility at ..... devoted almost entirely to handling customer test problems'.

At least we now know why so many car owners have cause for complaint at the service they get from their garage.

Opinion

I was pleased to read recently in my morning paper that the Associated Examinations Board are to introduce another certificate for the English school leaver, which will guarantee his prospective employer that he is fluent in written and spoken English. The course leading to the certificate will contain, inter alia, instruction in how to acquire an interview technique, and how to use the telephone in a business situation. It is in the nature of our job that we use the telephone to England more often that most of our readers. We frequently have to call up firms, most of them within 50 miles of Hemel Hempstead, for information on one or other of their products. A few observations on what this certificate course should contain may therefore not be amiss.

The first hurdle to be surmounted is S.T.D. I forget how many years ago this was introduced, nor could I quote statistics of what proportion of U.K. subscribers are now connected to S.T.D., but I believe the ratio of the haves to the have-nots must be 10:1 or greater. Yet consider the following table recently abstracted from the journals mentioned.

	S.T.D. Code	Exchange Name
School Science Review	22	9
Laboratory Equipment Digest	111	30
Wireless World	88	25

There is still a substantial minority of firms who when giving their telephone number in their advertisements give their exchange name, instead of their S.T.D. code. (Some give both, but they have been included amongst the 'goodies'). Why? It means I have to heft around a telephone directory in order to ring them. Why do we need exchange names at all? Is the code itself not identification enough?

The next obstacle brings us into the realms of big business. It is disconcerting and time-wasting to imagine one is ringing the Concrete Wire and Denture Co., and to be answered by 'Bottle Brush Bending Co.'. (This is not fantasy: if you ring Griffin and George at their East Kilbride number, the girl will answer 'Gallenkamp'.)

Are we all supposed to know these companies have coalesced? When a merger takes place, could the firms involved not think to keep their own telephone number, printed on their own glossy leaflets? Even at the expense of some of the gloss, or failing all else, of a party line, it would be worth while to the customer.

Another time-wasting technique is for the switchboard operator to demand a name and firm, before passing the call on to the appropriate department. If they will mean anything to the callee, I willingly give them, but if they will not, should the operator persist in asking for them? What usually transpires, after arguments about how I spell my name, is a complete impasse over SSSERC. Say it, and there is a stunned silence. Spell it, and one is in immediate trouble. Spell anything, and one is in trouble. How do you distinguish between P, D and T, or between G and C, on the telephone? How do you pronounce the figure 0; is it owe, ought, nought, nothing, or zero? If only the G.P.O. would put out a pamphlet setting out a recommended phonetics code; it would be more useful than the one I get at present, urging me to fit a Trimphone. I want nothing flashy, only something we can all agree on. There must surely be a phonetics code in use for international phone operators; I cannot believe that other nationals struggle with the double ee pronounciation which forms a third of the English alphabet. Would this not be a good thing to put in the A.E.B. course?

The initial courtesies over, I am switched to the appropriate department, and then - silence. I am incommunicado, in limbo. After what must be half a minute, but seems more like five, I wonder if I have been forgotten altogether. It would cost very little to plug in a tape-recorded message saying every ten seconds 'Still trying to connect you'. Of course the switchboard operator has often no means of knowing whether I'm phoning from across the road or from the other end of the country. But in the few moments between her picking up the phone and speaking into it, it should be possible for the G.P.O. to transmit a tone which would tell her it was a maximum charge rate (over 56 km) call, which her employer might then expect her to expedite without undue delay. If one were to write an overall objective for this A.E.B. course on telephone technique, should it not be 'To see the situation from the point of view of the caller'? On too many occasions I find the vision blurred or non-existent.

Biology Notes

It was interesting to note that the disquiet felt by a non-biologist (Opinion, Bulletin 89) about practical microbiology in schools, is shared by a professional microbiologist working in the Public Health Laboratory at Dulwich Hospital. Several of the points made in Bulletin 89 are amplified and developed in the latest number of 'Biologist', (23, 2 May '76) the journal of the Institute of Biology. In an article entitled 'Biological Hazards in Teaching Laboratories', C.H. Collins expresses very definite views about the inadvisability of some microbiological work carried out in schools. Whilst many biologists would not agree with several of the suggestions made in the article, it certainly contains much food for thought.

In the past many authors of school texts have been lax and have not stressed the safety aspects sufficiently. Not to put too fine a point on it, some authors of school microbiology books have

been sloppy in their approach and have produced poor books which may have led to poor technique and increased hazards in the schools. That is one extreme; C.H. Collins perhaps, on occasions, represents the other. Most biologists whilst having reservations about some aspects of school microbiology, probably would not agree that "Practical microbiology should begin in colleges" and that young pupils should only be shown films or videotapes of professional microbiologists conducting experiments. Admittedly this is only put forward as an interim measure whilst the hazards of school microbiology are examined in greater detail.

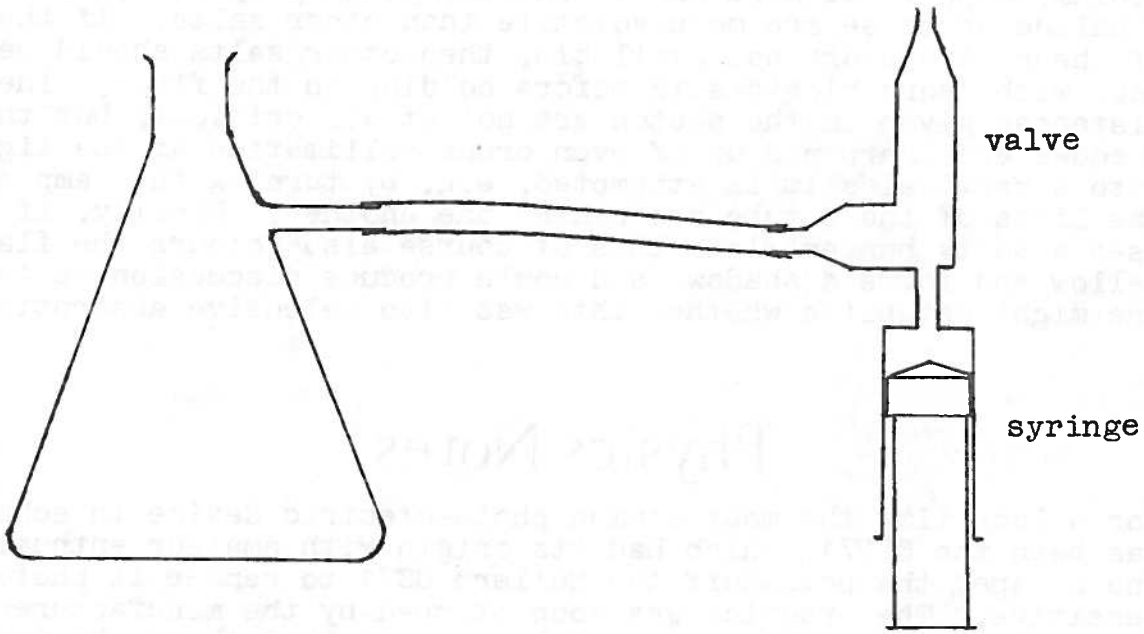
One wonders if an increased risk of infection accompanies the growing practice of setting aside a corner of a Home Economics room for scientific work, if this includes use for microbiological practicals. Mr. Collins is at pains to point out that culturing relatively harmless organisms can also concentrate pathogens that occur naturally in the environment in small numbers, so that they reach infective levels. He gives as his example the salmonellas that occur in small numbers in many foodstuffs! One can only speculate on the possible chances of some home economics class culturing these up into infective doses. One also wonders if any Anatomy, Physiology and Health classes are carrying out similar work under the supervision of a non-specialist. Whilst we might not advocate a full scale microbiological closed-shop, with attendant restrictive practices, this could be an area which requires some attention.

In the current controversy on school microbiology, as in any controversy, the extreme views tend to attract most attention with each side claiming to have the balanced view and that the other represents the extremists. Recently we have had Professor Kelly ("Accentuate the positive", Journal of Biological Education, 10, 2) proclaiming that things are basically very satisfactory and that the noisiest critics aren't teachers anyway. At the same time we have Mr. Collins asking that experiments with bacteria be abandoned in schools where there are young children, pending further investigation of the hazards. Perhaps the more 'disinterested' view, put forward in Bulletin 89 represents the sensible middle way. Qualifying courses for those who wish to use certain types of organisms, possibly with exceptions made for those already having adequate university or other training, and a great deal more thought about who teaches what to whom, may provide some of the answers.

Whilst we all wish to see safe practice, efforts must be made to find positive solutions. Micro-organisms have many advantages for use in school practical work. They are reliable, usually producing results which can be interpreted by the pupils (notice we do not say the right results!). They do not necessarily have to be maintained over long periods, don't have to be fed at weekends and can be killed without risk of emotional outcries. Unnecessary restrictions on the use of living organisms inevitably lead to the unnecessary abandonment of a number of important educational aims. Together with the recurring evil of the overcrowded syllabus they could turn the clock back to the days when any practical work was mere 'shadow boxing', and the only living things to come through the door were the pupils and (sometimes) the teacher. Improved training and a critical appraisal of current practice form much more attractive alternatives.

Chemistry Notes

The sketch below illustrates yet another use for the plastic syringe valve, type GK SVC, which costs £1.75 from Gordon Keeble. Vacuum filtration with a Buchner flask is usually achieved by attaching the flask to a filter pump. Where such a pump is not available, or where it is thought politic to conserve water, the same suction can be obtained by a plastic syringe and the syringe valve. Pumping the syringe slowly and continuously will produce adequate suction.



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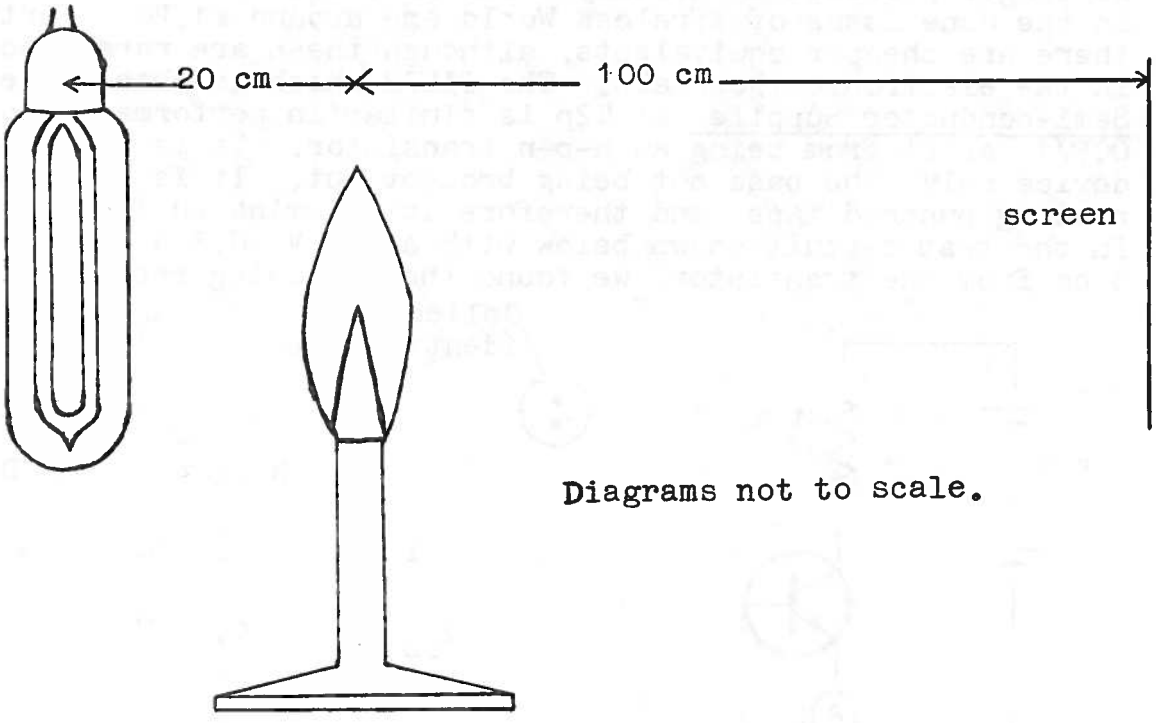
The demonstration of an absorption spectrum described below may recall for some the same effect being shown with mercury vapour in a demonstration at a long-distant A.S.E. meeting.



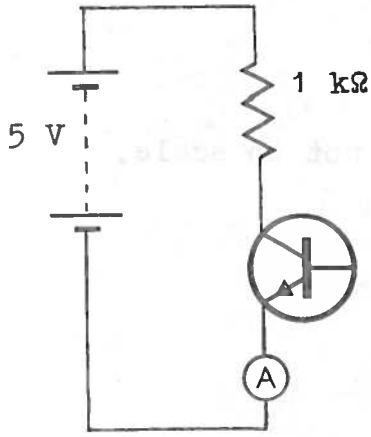
Diagrams not to scale.

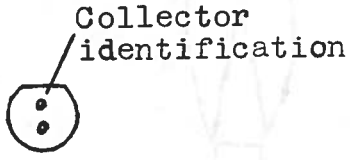
The sodium lamp which we mentioned in Bulletin 79 makes it possible to demonstrate the effect in daylight; other lamps may require dim- or black-out of the room. A screen, not shown in the sketch should be placed to shield pupils from direct light from the lamp. The bunsen flame by itself will give no shadow on the screen, nor will it if it is coloured by flame test elements other than sodium. But a sodium flame pencil, or a platinum or nichrome wire loop dipped into sodium chloride solution and held in the flame will give a definite shadow. The other elements which can be tried are potassium, copper, lithium and strontium, preferably in the form of a halide as these are more volatile than other salts. If the halides of these metals are not available, then other salts should be moistened with hydrochloric acid before holding in the flame. The distances given in the sketch are not at all critical, but the shadows are sharpened up if even crude collimation of the light into a vertical slit is attempted, e.g. by turning the lamp so that the limbs of the U-tube are behind one another. Finally, if one uses a sooty bunsen flame this of course also colours the flame yellow and forms a shadow, and could produce discussion as to how one might establish whether this was also selective absorption.

Physics Notes

For a long time the most common photo-electric device in schools has been the OCP71, which had its origin with amateur enthusiasts who scraped the paint off the Mullard OC71 to render it photo-sensitive. The practice was soon stopped by the manufacturer, who sealed their OC71s into metal cans, so that those who wanted a photo-transistor had to buy the uncanned, unpainted version from Mullard themselves.

Recently the price of the OCP71 has risen until it is now no longer possible to justify their purchase for school use. Prices in the June issue of Wireless World are around £1.20. Fortunately there are cheaper equivalents, although these are rarely advertised in the electronics journals. The TIL78 which is obtainable from Semi-conductor Supplies at 42p is similar in performance to the OCP71, apart from being an n-p-n transistor. It is a two terminal device only, the base not being brought out. It is designed for reading punched tape, and therefore is illuminated from above. In the test circuit shown below with a 6.5 V, 0.3 A m.e.s. lamp 3 cm from the transistor, we found the following results.





	Bright	Dark
i =	4.6 mA	<10 μA
V_{CE} =	0.55 V	4.95 V

When the illumination was made intermittent by using a motor strobe, the rise and fall times of V_{CE} for a light pulse of 1 ms duration were both of the order of 0.2 ms. The absolute maximum collector-emitter voltage is 50 V, and maximum continuous dissipation 50 mW.

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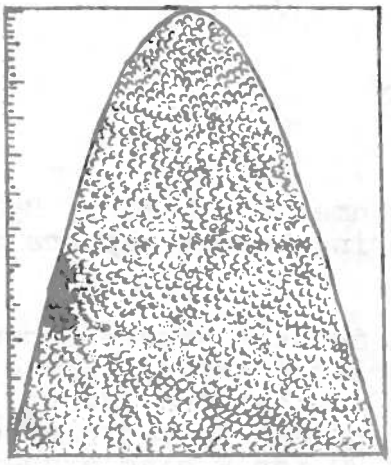
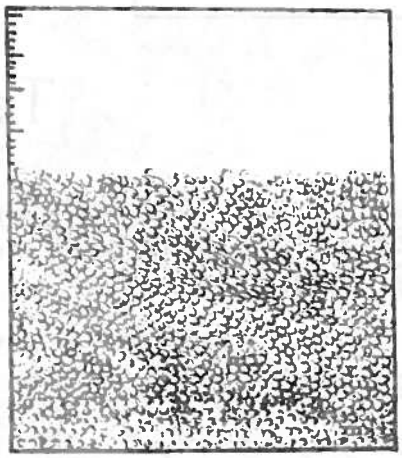
The following suggestion for an o.h.p. demonstration of average and r.m.s. values of alternating current came to us from an H.M.I. A shallow tray with inside dimensions 20 x 18 cm is made by tacking or cementing 3 mm thick perspex to wooden or perspex sides. The inside height of the tray need be no more than 5 mm. On the base along the 20 cm side is fixed a length of Scalafix tape to act as a y-axis scale. The graphs of $y = 20 \sin x$ and $y = 20 \sin^2 x$ are drawn for $0 < x < \pi$ to scales of 1 = 1 cm on y and π = 18 cm on x.

A 10 mm wide strip of aluminium cut from 18 s.w.g. sheet is carefully bent into the shape of the graph, and likewise a second similar strip for the other graph. To illustrate the average value of sin x, the appropriate strip is fitted into the tray which is on the platform of the overhead projector. It should fit the tray, touching the sides at three points as in the diagram below. Lead shot is poured in carefully, adding just enough to make a close-packed monolayer covering the area under the graph. This can be helped by shaking the tray while having it tilted slightly to one side.

When the shape is full, the strip is removed and the lead shot is now shaken down, still in a monolayer so that it forms a rectangle in the lower part of the tray, i.e. with the x-axis as the base. The height of the rectangle read off the scale will then be the average value of sin x. When the $\sin^2 x$ strip is used it is fairly obvious to pupils that the area is half that of the tray.





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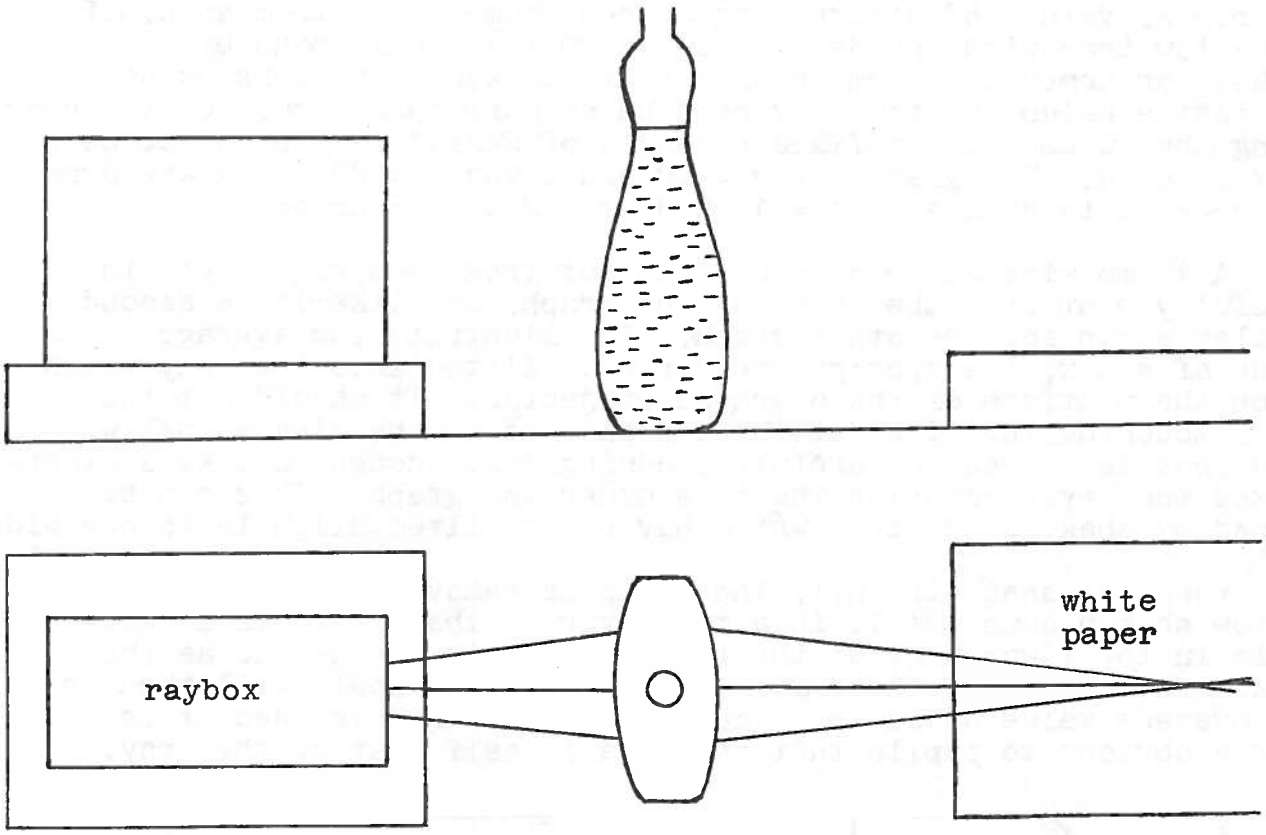
This illustration of a variable focus lens comes from Dundee Science Adviser, who showed it at the A.S.E. meeting there. Essentially it consists of a transparent plastic bottle whose sides can be squeezed to increase or reduce their curvature. With the bottle partially full of water, this produces a variable focus lens. The bottle should have an oval shape; we found that Palmolive washing-up liquid, with the labels washed off was suitable.

The 'stands' on which raybox and paper screen rest are used to raise the light path out of possible distortions caused by the base of the bottle, and in a pupil situation books could be used for this purpose. When the bottle is squeezed, using both hands, at either side of the light path, this increases the curvature. Similar squeezing in the middle above and below the light path reduces it.



Trade News

Philip Harris are now marketing an environmental chamber, B5027 at £36.00 which is very suitable for rearing locust hoppers and other insect larvae.

In Bulletin 83 we gave details of a deposit scheme arranged by British Oxygen for the supply of compressed gases. Since that time there have been two price increases so that the charge to enter the scheme, if the school has no cylinder to contribute is now £34.50. The refill charge is now £2.20 for F size oxygen cylinder; the handling charge remains at £2.65 per transaction. Because of this last charge there would seem to be merit in the region organising a once-per-year collection of all its cylinders for refilling.

Since we published details of the T.H.D. Halight 300 projector in Bulletin 89 we have been asked by Philip Harris to state that they also market the projector under cat. no. B4548/60 at £44, and the microscope attachment, B4548/65 at £18.90. The latest Griffin and George broadsheet to reach us also lists the projector under S34-900, and the microscope attachment S34-902/070, prices as above. Both firms have shown commendable promptitude in getting a very versatile instrument, shown for the first time at the Oxford A.S.E.

in January, into their catalogues. They have been less keen to include three-way taps (Bulletin 48) and the plastic syringe valve (Bulletin 78) which we have been urging them to do since we first described uses for them in the bulletins mentioned, which is a much longer time. If their reluctance to do so is at all linked with a belief that their own items of apparatus will be less saleable if they offer the schools the wherewithal to do-it-themselves, this seems a very short-sighted view, but we challenge the firms to convince us to the contrary.

Elesco-Fraser will undertake the repair of most items of electrical or electronic equipment found in schools. They prefer not to be asked to make an estimate, which in itself costs money, but to have an understanding that the repair will be proceeded with unless they believe that it will cost more than 50% of a new instrument. In these cases they will get in touch with the client for instructions and if the repair is not approved they make a nominal handling charge. In the central belt of Scotland items for repair will almost always be uplifted from, and returned to the school by their representative.

In our biology equipment list issued recently, we omitted to give the address of Adam Rouilly who are listed as a supplier of Item 150, human tooth model. The firm's address will be found in the address list of this bulletin.

The disposable petri dishes, 90 x 15 mm, mentioned in Bulletin 81 are now available from the Scottish agents of Nunc, who are Vestric. Cases of 500, which is the minimum quantity supplied, cost £12.40, including delivery. Two Vestric addresses, serving the east and west of Scotland, are given in the address list of this bulletin.

The latest catalogue from Humex Ltd. contains a number of new products which extend their range of propagators and greenhouse accessories. There is a basic 'Propatray' at £20.25 which can have an aluminium framed glass top added at later date, or the tray which has a built in electric heater and thermostat can be made the basis of a home-made propagator. Also new are models of a compact gas fired greenhouse heater which will run on bottled or natural gas. Model GH/1 has a manual control switching from 'low' to 'high' heat and costs £41.70; GH/2 is thermostatically controlled and runs on bottled propane. GH/3 is natural gas version of GH/2 and both cost £43.90. 10% discount is allowed on official educational orders.

Following our note on Oxoid materials on Bulletin 89, Philip Harris Biological have asked us to point out that their 'Spring Supplement 1976' catalogue contains the most commonly used Oxoid items. Although prices are higher than Oxoid list prices, the items do accrue for discount and customers may find it worth while to check the discount structure granted to their particular authority before deciding where to place their order.

Macfarlane Robson Ltd. have recently been appointed by Oxoid to distribute their range of Oxoid Laboratory Animal Diets. The diets are supplied in a minimum of 56 lb bags and prices for most of the 14 different diets available are around £4 per bag. A handling charge of 25p is added to each order regardless of its size or value. A full price list and technical details of the diet are available on request.

S.S.S.E.R.C., 103 Broughton Street, Edinburgh, EH1 3RZ.
Tel. 031 556 2184

British Oxygen Co. Ltd., P.O. Box 39, Great West House,
Great West Road, Brentford, Middlesex.

Elesco-Fraser Ltd., 36 St. Vincent Crescent, Glasgow, C.3.

Gordon Keeble Laboratory Products, 8a Chapel Street, Duxford,
Cambridge, CB2 4RJ.

Griffin and George Ltd., Braeview Place, Nerston, East Kilbride,
Glasgow, G74 3XJ.

Philip Harris Ltd., 30 Carron Place, Kelvin Industrial Estate,
East Kilbride, Glasgow, G75 OTL.

Philip Harris Biological, Oldmixon, Weston-super-Mare, Avon.

Humex Ltd., Humex House, 5 High Road, Byfleet, Weybridge,
Surrey, KT14 7QF.

Macfarlane Robson Ltd., Burnfield Avenue, Thornliebank,
Glasgow, G46 7TP.

Nunc U.K. Ltd., 16 Salter Street, Stafford, ST16 2JU.

Oxoid Ltd., Southwark Bridge Road, London, S.E.1.

Adam Rouilly Ltd., 10 Winchester Road, Swiss Cottage, London, N.W.3.

Semiconductor Supplies Ltd., Orchard Works, Church Lane,
Wallington, Surrey, SM6 7NF.

T.H.D. Ltd., T.H.D. House, Peacehaven, Sussex.

Vestric Ltd., Hatrick Branch, Alma Street, Glasgow, G40 2UX.

Vestric Ltd., 4b Milton Street, Abbeyhill, Edinburgh, EH8 8HF.

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