SCOTTISH SCHOOLS SCIENCE EQUIPMENT RESEARCH CENTRE

Bulletin No. 116. November, 1979.

Contents

Introduction

For the benefit of many teachers who have not been very long in the profession, we are detailing the processes involved in dealing with surplus or second-hand equipment, some of which is described in this bulletin. The material comes from many sources, some regular, like the Royal Bank of Scotland who over the years must have sent us hundreds of calculators, typewriters, adding machines and other hardware. Others come only once, as when industrial firms merge and close a research lab., or a university department moves house. The bulk of our material comes from Ministry of Defence auction sales, where we can arrange for material to be tendered before it goes to auction. Much of our electronic equipment comes from the U.K.A.E.A. at Dounreay.

We are always on the lookout for new sources, so that if the neighbouring factory offers you surplus which you cannot absorb, do not let the chance pass by. We have no desire to intervene in any arrangement between a school and a source of supply, but we can find homes for anything which the school does not want, or has plenty of, and in most cases we can arrange to have it uplifted. Sometimes we have material which is not surplus or second-hand, but which we sell because it is normally sold in bulk and there is no way in which the school could obtain the small amount which the school needs. Examples of this type of material are bimetallic strip, which we buy by the kg, I.C.I. perspex offcuts by 500kg pallet, and strain gauges which have a minimum order charge.

Whatever the source, material in the Centre is examined to see whether it can be sold as being in working order. If not, we see whether repairs are possible or desirable, or whether it has to be 'melted down' for its components. Our selling price bears little relationship to the intrinsic value of the material in the open market. We are not in this to make a profit, but to provide a service to our subscribers. As a result we are probably too cautious in our buying and wait until we are sure that there is a market before going for expensive items. Some years ago we sold about 30 Advance signal generators, new, at £30 but this was an exceptional case since the item was already in use in many schools. Generally the electronic equipment is far more complex than a school will need and unless it is apparently new, there will always be a doubt about the condition, or whether we can repair it.

The fact that the schools' needs are different from those of the services or industry can sometimes work to our advantage. An item which has no obvious use can be bought for peanuts. Some years ago we were able to sell 25mm diameter rubber balls, ideal for making ball and spoke atomic models for 1p each. But at the next auction someone had found a use for them and we dropped out when the price rose to 5p each, which was a lot of money in those days.

Buying at a Ministry of Defence auction may involve three journeys; firstly to view the goods, secondly at the sale itself which is centrally placed and may be miles away from the various sites where the goods are held, and lastly to recover any goods bought from the sites. The expense of these journeyings, and the expense of processing the material in the Centre, does not come into the sale price. We consider this an expense which has already been paid by our subscribers. This in turn means that any equipment sold must be for the subscriber's use, i.e. the school, and not for personal use by a teacher. There are few

occasions when this can happen but when they do, e.g. with typewriters, we restrict it to a credit sale, so that an invoice payable by the headmaster is involved.

Otherwise sales may be by credit or in cash. A receipted slip is given for cash sales, and for credit sales we send an advice note, which details the various items and their prices, with the goods. Too often the teacher regards this flimsy as a throw-away item, when it should be sent to the headmaster's secretary, and then there is trouble. Once a month we send out our invoices to the headmasters of the schools, and the invoice refers only to the advice note number without giving details of what was bought or who bought it. Hence you can see that the absence of an advice note can lead to a number of unnecessary phone calls.

Occasionally we are asked for surplus items by teachers who have no money. This does not worry us; we will keep any item until the money is forthcoming, and since much of our equipment may never come round again, no one should refrain from buying on this account.

Our ballot system causes a lot of confusion, yet we have evolved it over the years as the fairest way of allocating material where the demand may greatly exceed the supply. It is an almost inevitable response to the conflicting claims of those who can visit the centre regularly, and those who may seldom or never be in Edinburgh. Not all our material is ballotted. It may be too trivial in price, or there may be too little of it. So we have many resistors, transistors, capacitors etc. which are not detailed in a bulletin. We expect the teacher to write or phone us asking his wants. No one minds hunting through the stock looking for a 500Ω potentiometer or a 1% tolerance resistor. It is part of the service. Sometimes things do not reach the ballot because the local market has sold them all before the bulletin is ready, but if we think this is likely to happen, we 'freeze' it until the ballot has taken place. Occasionally items do not get ballotted because we don't know what they are and can't describe them! Hence there is usually something of benefit to the browser, and it is right that this should be so for those who take the trouble to visit us.

After a bulletin which details surplus equipment has gone out, we wait 10-14 days before taking the ballot. This should give enough time for those who want items in the ballot to write or phone us their wants. What we need from them is a list of items, the quantity of each, in order of priority. For example:

Inversnecky Academy

	Item 983		1
or	Item 947)	not	2
	Item 948)	both	1
	Item 970		4
	Item 953		1

When the ballot is made, the first time round we allocate the first two item numbers in the priority list that are still available. If Inversnecky Academy were first out of the ballot he/she would get one of Item 983 and two of Item 947. If, by the time his name came out all of items 983 and 948 had gone, he would get two of 947 and four of 970. This restriction means that the lucky first does not scoop the pool. When all the ballotteers have been allocated in this way we go through the list a second time in the same order, and now there is no restriction on the number of items that may be taken. Items which have

been through the ballot procedure and not sold can be sold without restriction at any time. Abbreviated details of such old stock are usually described in the bulletin, together with the bulletin number in which the item first appeared which will have all the details.

Perhaps by now the reader will realise that money spent on postal or freight charges to us is money wasted. Therefore we expect those who have been successful in a ballot to make their own arrangements for collection. As has been said before, we will keep any goods sold for as long as necessary, and hope that the teacher or a colleague can uplift during a visit to Edinburgh by car. But if you want goods to be freighted or posted you must say so, and such charges will be added to the cost. Every ballotteer who has been successful is given a letter detailing item numbers and the total price, and this is taken as an indication that the teacher himself will arrange for the collection. The science advisers or their resource centre technicians in one or two regions make the trip regularly and uplift items for all the regions' schools, and this is an economical and sensible way of arranging collection.

Very occasionally we get a dissatisfied customer, and then we simply take the goods back (at the customer's expense) and refund the money. We hope that customers realise that with second-hand equipment there can be no guarantee of satisfaction. A lot of the equipment we get is sold because it has out-lived its shelf life (e.g. dry batteries or photographic materials), because it is obsolete (which means there may be a problem getting spares), or because the cost of repairing it is uneconomic. Frequently we cannibalise equipment, taking items from several duds to make a working item, but for such we cannot guarantee how long the repair is going to last. Wear and tear already in the equipment may make the item unserviceable at any time, and the user hopefully accepts this when he buys and realises that this risk is reflected in the price he has paid.

Prices quoted for our equipment are net, exclusive of VAT. This is because most of our transactions come under category D, transactions between exempted bodies and therefore outside the scope of tax. It does not apply to private or fee-paying schools, and they are liable for tax at the standard rate.

As a supplier we have certain duties laid upon us by the Health and Safety at Work Act 1974 (Part I, Section 6). Because of the nature of the goods we sell, it is not always "reasonably practicable" for us to take full, direct responsibility for the safety of some items. Many of the things that we sell are passive components or items sold for spares. In these cases we have responsibility for the inherent safety of the component itself, but the use to which the item is put is outwith our control. The duty of care then devolves upon the purchaser under Part I, Section 6, paras. (3) and (10) of the Act. Occasionally we may invoke paragraph (8) of Section 6 and ask for a written undertaking from the purchaser that, before putting the article to use at work, he will take certain specified steps to ensure that it will be safe and without risks to health when properly used.

The statement above is not a disclaimer. We cannot avoid our responsibilities under the Act. We only wish to make it clear that there is a point where our responsibility ends and that of the purchaser begins.

Biology Notes

The examination of leaf litter and simple pupil scale investigations into the types and/or numbers of organisms found therein can be a most useful exercise. A number of points emerge which are directly helpful in meeting some of the objectives of Section 2 of ISC and Sections I(2) and (3) and III(2b) of the Biology Syllabus. The equipment and materials are relatively simple, yet pupils enjoy the exercise and are often amazed at the numbers and variety of organisms found.

However in a large school there can be organisational problems, if a number of classes carry out the practical at about the same time. The usual tools given out are seekers, for turning over and poking about in the litter, and forceps for picking up organisms and transferring them to a stereomicroscope stage, or a specimen tube, for examination. Some pupils inevitably see themselves as great white hunters in miniature, and use the seekers to stab to death anything that moves. It is also difficult for pupils to pick up organisms with metal forceps without squashing the life out of them. This leads to a high mortality rate. The collected leaf litter is quickly depleted of organisms. This in turn invloves technicians and teachers in collecting fresh supplies of litter for each successive class. Another minor problem lies in finding sufficient suitable trays so that each pupil or pair of pupils has their own tray of leaf litter, thus avoiding the possibility of large groups of pupils squabbling around an inadequate amount of material.

An Edinburgh school has recently shown us their own solution to these problems. They employ one gallon polythene containers, of the type used for bulk fruit juice or detergent, to provide them with both trays and tools.

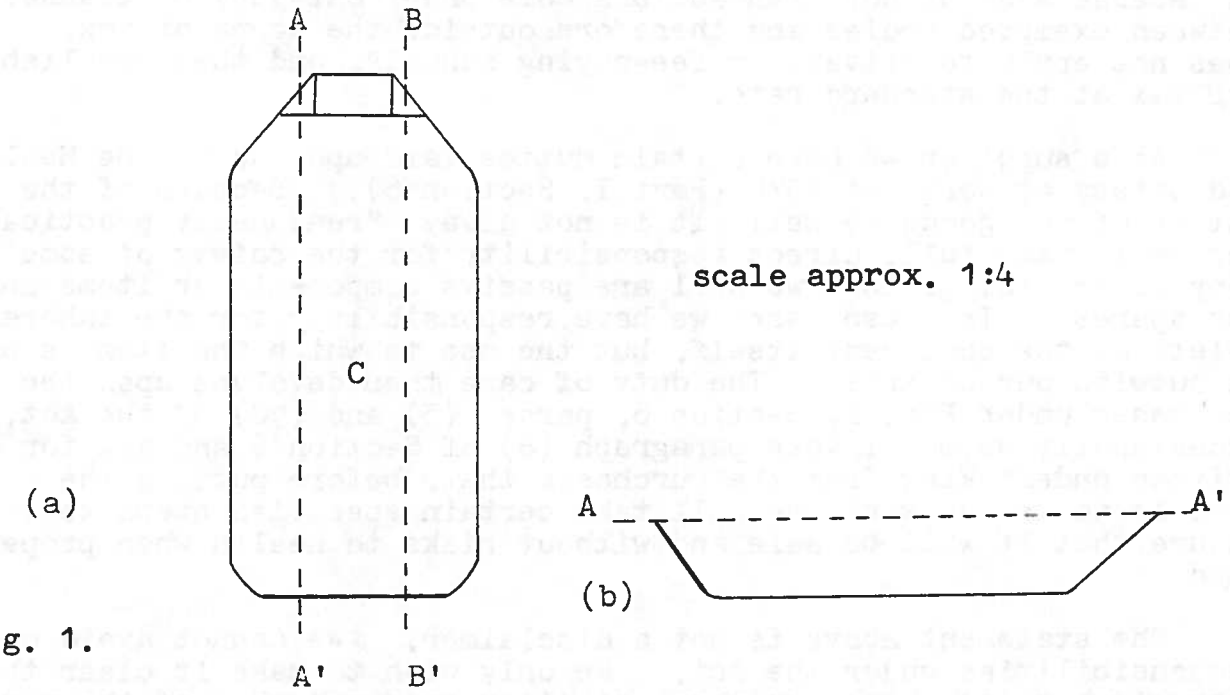

Fig. 1.

The trays are made by cutting slices from each side of the container. Using a sharp scalpel or 'Stanley' knife, on previously marked lines, cuts A-A' and B-B' on Fig 1(a) are carefully carried right round the container. Fig. 1(b) shows a section of the type of tray obtained.

Particular care should be taken when cutting through the base. This is frequently thicker than the walls and more difficult to cut. The operator should be careful as the blade enters the base so that he neither strays too much from the line or lets the knife slide off and thus cuts himself.

The moulded top and handle of the bottle are too small to use as a funnel and can be discarded. However the strips of polythene from the walls (C in Fig. 1(a)) can be used to make plastic seekers and forceps. The seekers are merely strips of polythene 3-5mm wide and up to 100mm long (Fig. 2.). If they are made much longer than 100mm the 'seekers' tend to be too flexible and it is difficult to turn the litter over. Stiffer seekers can be made by using the thicker material from the container base. Premeditated slaying of organisms is still possible with these instruments, but they are much less effective weapons compared with a metal needle or seeker.

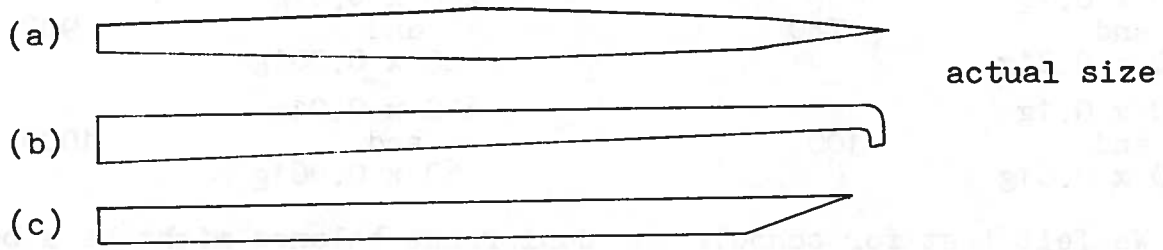

Fig. 2. Examples of effective shapes for plastic seekers; shape (b) was best made from the thicker base material.

The forceps were made by taking a strip of material 15mm wide and 160-200mm long. This was carefully folded in half and a staple placed just below the fold. The ordinary very small stapler will not be suitable for this job, the staples failing to penetrate the plastic. Our office stapler however proved perfectly satisfactory. It then only remains to shape the strips with the fingers to form them into a forceps shape and put some spring in the arms. These forceps take a little getting used to since their action is different from that of metal types. The plastic forceps are normally closed and are opened over the organism and then released so that they close once again and gently grip the specimen. It is much more difficult to squash organisms because the spring action is weak and there is a certain amount of 'give' in the structure.

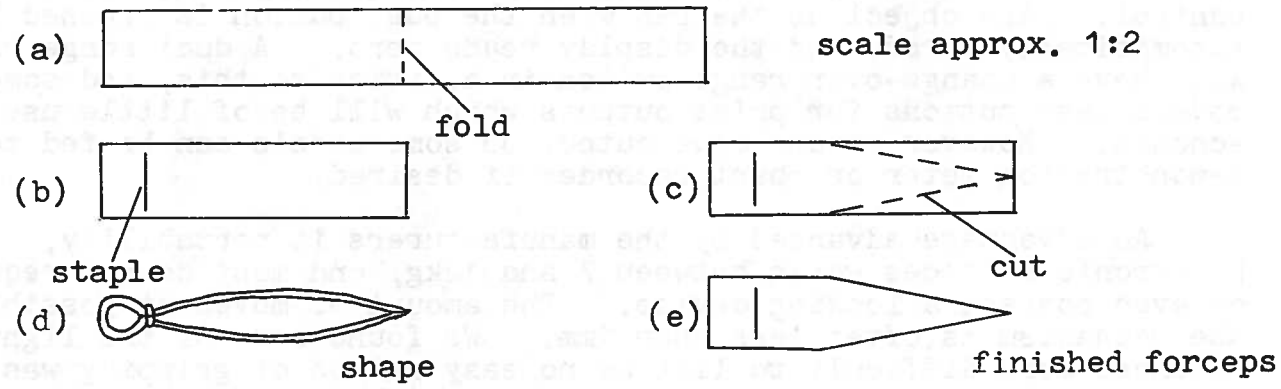

Fig. 3. (a) - (e) stages in making forceps.

Chemistry Notes

Electronic balances, introduced some years ago have gradually fallen in price as a result of the growth of micro-electronics, whereas mechanical balances have continued to rise due to increased labour costs of making precision components. The present position with approximate figures is as follows:

Mechanical		Electronic	
200 x 0.01g	£400 - 500	300/400 x 0.01g	£650 - 850
1000 x 0.01g	700 - 900	2/4kg x 0.01g	850 - 1000
200 x 0.001g	670 - 900	200 x 0.001g	1000
1/2kg x 0.01g	400 - 500	1½/4kg x 0.1g	800
Dual Range Electronic			
2000 x 0.1g and 200 x 0.01g	730	200 x 0.01g and 20 x 0.001g	900
4000 x 0.1g and 400 x 0.01g	1000	600 x 0.01g and 60 x 0.001g	1000

We felt that for schools the dual range balance might be a better buy, and to date we have tested five of these and are awaiting a further three. Some of these models can be visited in the Centre. While test reports and summaries will appear in due course, we thought it would be useful to point out how the electronic balance differs from its mechanical counterpart.

Electronic balances measures force, although the purist who believes that they should therefore be scaled in newtons is championing a lost cause. It does mean that balances manufactured abroad have to be recalibrated to account for the different value of g, but this is done by the manufacturer's agent before the balance is sold. A coil in the balance can sense when the pan shaft has moved away from a reference position, and supplies enough current to bring the mechanism back to the reference position. The amount of current required is proportional to the weight of the object in the pan, and is scaled so that the display gives the weight in grammes!

Electronic balances are easier and faster for pupils to use. Once switched on, there is usually only one combined zero/tare control. Any object on the pan when the push button is pressed is automatically tared, and the display reads zero. A dual range balance will have a change-over range switch in addition to this, and some models have buttons for print outputs which will be of little use to schools. However an analogue output on some models can be fed to a demonstration meter or chart recorder if desired.

An advantage advanced by the manufacturers is portability. Electronic balances weigh between 7 and 12kg, and most do not require or even possess a locking device. The amount of movement possible in the mechanism is often less than 1mm. We found some of the lighter balances more difficult to lift as no easy method of gripping was possible. Some heavier models have feet which lift the balance off the floor far enough for fingers to get underneath. One of the most likely ways in which a balance could suffer damage is by being dropped and we feel that manufacturers who stress the advantage of portability should

provide a means of carrying expensive instruments more safely.

Many balances do not have facilities for levelling and we found that a tilt of more than 1½-2° was required to affect the sensitivity significantly. Others with adjustable feet and level indicator did not have their readout significantly altered until half the bubble was outside the reference circle. In other words the performance of the balance is not affected by the small differences in slope found in laboratory benches.

The digital displays used are mostly of the seven segment type and can be easily read at a distance from the balance and from a wide angle. (One make could be read at a distance of five metres and would be suitable for demonstration purposes). The steeper the slope of the display the further the observer could move back before the decimal point and lower part of the digit segment 'dipped below the horizon'. Up to seven or eight pupils situated at a distance in front and to the sides of the balance could easily read it.

Drift is a slight problem, although only the zero, and not the sensitivity is significantly affected. Hence if one zeroes the balance before taking a reading there is no need to allow a period for stabilisation. Stabilisation times recommended by the manufacturers varied between 20 and 30 minutes but the readout of most of the balances steadied when they had been switched on for 10 to 15 minutes from 'cold'. When a balance which has been stabilised in one room is moved to another at a different temperature it will drift until it has stabilised at the new temperature. Drift might only be something of a nuisance where a series of weighings of the same object is being made over a period of time, e.g. comparing rates of reaction by following the rate of loss of weight of an open reaction vessel and contents.

Electronic balances feature a 'sample and hold' device, i.e. the information is sampled, held steady while it is displayed, and then the process repeats. Hence if a weight is varying, perhaps due to draughts or floor vibrations, or if a small animal is being weighed the readout may be erratic. The balances have an integration time which averages out these fluctuations. In some models this is fixed in the factory, but others allow the user to alter this integration period. One balance also has the facility for altering the 'automatic stability detect band', which when switched in allows only readings within a chosen band of accuracy to be displayed. This facility must be used in conjunction with the integration time. In a school we would expect the integration time to be the minimum possible, unless the users were unduly worried by the tendency of the least significant digit to wander over a digit or two. This might have to be increased when weighing live animals, or when using in a site subject to floor vibrations or draughts.

Because of the mode of operation, one should be wary of using the balance in the neighbourhood of strong magnetic fields. A Magnadur (ferrite) magnet from the Westminster kit may appear to be 0.3g heavier, depending on which way up it rests on the scale pan, and neither reading may be the true mass. Magnets near the balance but not resting on the pan will have a lesser effect, altering the zero rather than the sensitivity. Some balances have a facility for suspended weighing, and this would be useful when carrying out the Gouy balance experiment, or others which require a strong magnetic field.

It is difficult to predict the long term reliability of the balance; it has not been in being long enough. But the moving parts are fewer, and the amount of movement is less than the mechanical balance so that it would seem to be a reasonable assumption that they are at least as reliable. Service contracts are not thought to be necessary since the only 'repairs' would consist of removing an electronic panel and substituting another.

The electrical safety aspects of some of the balances could have been improved. Some models were far from splashproof if the plastic cover was omitted and users of one model might have been tempted to remove it as it tended to ride up and touch the bottom of the scale pan. As a general principle we feel it would be good to remove the transformer, mains on/off switch and fuse to the rear leaving only low voltage parts at the front. In any case since these balances have to be left on there would seem to be little advantage in having the switch at the front.

The balance pan of course is the part most frequently touched by the user, and should be electrically safe. This means passing a current of 10A through the pan, to check the conductivity of the earthing with an electrical test set. Reactions from manufacturers to this suggestion were mixed. Some did not mind, having already carried out the test themselves; others had stories about twenty balances in one department being ruined by it. The sensor in the balance is often connected to the remainder by torsion strips, and some manufacturers believe that mechanical damage to them could result from a 10A current. The problem is not confined to electronic balances, as the safety of mechanical top-pan balances can also be damaged by an electrical test sending too much current through the pan supports. Our advice would be for the school to adhere to the manufacturer's recommendation, and where a test of earthing is not advised, to insulate the scale pan from its support with a piece of insulating material such as polythene. Some models are already so insulated.

The question of whether a school should buy an electronic balance depends on the organisation in the school, and the existing balance facility. The question of whether a single balance will serve the needs of the science department is the organisational one of solving the bottleneck produced by having the weighing facility only in one place at a time. Most of any hold-up will be caused while users write down the balance reading, because until this is done the object must remain on the pan. On a purely financial argument one has to choose between an electronic dual range, and two mechanical balances covering the same range, say 1kg x 0.1g and 400 x 0.01g which can be purchased for little more than the price of the electronic balance. Speed and ease of use by pupils has to be set against the convenience of having two balances in two separate sites, and that in the event of a break-down one still possesses 50% of the normal weighing facility.

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In Bulletin 110 there was described a method of separating and regenerating mixed bed exchange resins in the commercially available cartridge. We have since found that some resins e.g. that for the Elga C114 cartridge do not separate very well on fluidising the mixture with a slow stream of water, presumably owing to the closeness of the densities of the two exhausted resins. We found that for such cases the stirring of the mixture with a strong brine solution affected immediately a complete separation and if the brine was saturated the anion exchange resin tended to float on the water whereas the cation

exchange resin still sinks. Thus the two layers of resin were completely separated by one of water. (This might make an interesting demonstration of density and flotation). The upper layer was easily removed by syphoning and the separated resins washed with water and regenerated as previously described in Bulletin 110.

Physics Notes

Having achieved our 1000th line in surplus equipment, we decided it would be easier to start again from scratch, so that the new stock in this list has small item numbers, and is subject to the ballot procedure detailed in the introduction to this bulletin. High numbers on the list, up to No. 987, are stock from previous lists, (bulletin number in brackets) and are not subject to the ballot.

Item 1. Photographic film, b/w 35mm, 50 ASA, approx. 3m length, 25p.

Item 2. Film, Ilford HP4 120 size, 400 ASA, 15p.

Item 3. Film, Kodak tri-x-pan, TXP 120, 400 ASA, 15p.

Item 4. Film, Kodak Ektachrome EH120, 160 ASA, for colour transparencies, 25p.

Item 5. Film, Kodak Ektachrome EX120, 160 ASA for colour slides, 25p.

Item 6. Polaroid film type 57, 3000 ASA, 25p.

Item 7. Photographic paper, Ilfospeed 3.1M glossy, resin coated, medium weight, hard, 8 x 10in, 100 sheets, £3.50.

Item 8. As above, but 6½ x 8½in, 100 sheets, £2.50.

Item 9. As above, Kodak WSG2S, 8 x 10in, 100 sheets, £3.

Item 10. As above, WSG2S, 12 x 15in, 100 sheets, £6.

Item 11. As above, WSG4S, 12 x 15in, 100 sheets, £6.

Item 12. Universal developer type PRNQ, to make 25-100l of working solution. In two separate bottles for mixing and dilution before use. Processing details on the bottle, £1.

Item 13. Rapid developer Exprol A; make up and quantity as in Item 12, £1.

Item 14. Electronic four-function calculators, desk type with l.c. display, £3.

Item 15. Typewriters, various makes, £3.

Item 16. Typewriter with extra long (70cm) carriage, £5.

(Items 14-16 will be sold only against an invoice).

Item 17. Orienteering compass type 15T by Silva ranger, £2.

Item 18. Exposure meter, Weston Master V, with diffusing cone, £4.

Item 19. Portable signalling lamp with two polarising filters, in leather case, £1.

Item 20. Silicon grease, 225g tube, £1.

Item 21. Silica gel, 500g tin, 50p.

Item 22. Castors ex-equipment, set of 4, £1.

Item 23. Alkaline cells, 80 x 80 x 100mm, probably 40Ah capacity, £1.50.

Item 24. Photomultiplier tube, type 6097F by E.M.I. Electronics in massive lead case, weighing 32kg, single coaxial outlet, £12. (which is less than the scrap price of lead).

Item 25. Photomultiplier tube, type 9530H by E.M.I. Electronics, £1.

Item 26. Photomultiplier tube and associated components, no power supply, £1.

Item 27. Scintillation counter type N559E by Nuclear Enterprises and associated components; no power supply, £1.

Item 28. Frequency standard type G415 by Furzehill Labs. Provides spot frequencies of 1,10,100 and 1000kHz. Each output is rich in harmonics so that calibration points up to 80 MHz are possible. Output impedance 500Ω. With circuit diagram and instruction manual, £5.

Items 29 - 35 Moving coil panel meters. These have screw terminals, and would be better stood on a bracket with 4mm sockets, as they will tend to fall over. But with the virtual disappearance of cheap single range meters from Japan and Russia, they may be the best value available for '0' grade and below where high accuracy is not necessary.

Item 29. Centre-zero voltmeter, 30-0-30 x 2V, £2.

Item 30. Centre-zero ammeter, 50-0-50 x 2μA, £2.

Item 31. Centre-zero ammeter, 25-0-25 x 1μA, £3.

Item 32. Centre-zero ammeter, 5-0-5 x 0.2mA, £3.

Item 33 - 35. These have been re-scaled in the Centre with easy-to-read scales of 10 or 20 divisions which may be easier for junior pupils to understand.

Item 33. Ammeter, 0-1 x 0.1mA, large size, £3.

Item 34. Ammeter, right hand zero, edge scale, 0-1 x 0.05mA, £2.

Item 35. Ammeter, 0-5 x 0.5mA, £2.

Item 36. Heavy duty rheostats. These have two coils and a single moveable shorting handle. State the resistance required. 2.4Ω, 10A; 25.4Ω, 10A: 58Ω, 6.5A; 64Ω, 5A; 152Ω, 2A; £3.

Item 37. Heavy duty rheostat, single coil and slider; state the resistance required. 4.06Ω, 6.5A; 5Ω, 10A; 8.4Ω, 10A; 12Ω, 6.5A; 22.6Ω, 6.5A; 45Ω, 2A; 46.3Ω, 6.5A; £2.

Item 38. As above, 60Ω, 1.5A; 254Ω, 2A; £1.

Item 39. Helical (10 turn) potentiometers with multi-turn dial mechanism. Values 1kΩ, 5kΩ or 20kΩ. State the resistance required. £1.

Item 40. Constant voltage transformer; input 190-260V, 50Hz output 110V, 250W; £2.

Item 41. Constant voltage transformer; input 190-260V, 50Hz: output 230V, 500W, £5.

Item 42. Low voltage transformer; standard primary; secondary 25V, 1kW, £2.

Item 43. Pyrometer testing furnace. Consists of a ceramic surround enclosing a 8cm dia x 24cm deep central furnace hole. The wire element is rated at 250V, 2kW, and is open to the hole, £2.

Item 44. Head and breast set, comprising earmuff type earphones and microphone, £1.50.

Item 45. Electrolytic capacitor, 3mF 50V, 30p.

Item 46. As above, 1250µF, 40V, 10p.

Item 47. As above, 500µF, 50V, 10p.

Item 48. High voltage capacitor, 1nF, 20kV, 10p.

Item 49. Toggle switch DPDT biassed type, 5p.

Item 50. Bottle brushes, 3p.

The remaining items have already been advertised in the bulletin, and are not subject to the ballot.

Item 789. (Bulletin 100). Low voltage variac, £1.

Item 800. (" "). Sodium lamp, 20p.

Item 811. (" "). Hypam fixer, 35p.

Item 872. (Bulletin 105). 115V motor, 50p.

Item 876. (" "). Photographic paper, 50p.

Item 899. (" ")). Furnace, £20.

Item 890. (" "). Sodium hydroxide, 30p.

Item 911. (Bulletin 107). Dual range ammeter, £3.

Item 912. (" "). Ammeter, £3.

Item 917. (" "). Interference suppressor, 20p.

Item 934. (Bulletin 110). Transformer, £1.50.

Item 940. (" "). Head and breast set, 60p.

Item 956. (Bulletin 113). A.C. range box, £4.

Item 969. (" "). Standard cell, £2.

Item 972. (" "). Recording paper, 3p.

Item 973. (" "). 4.5V battery, 15p.

Item 975. (" "). Dry cell, 5p.

Item 987. (" "). Plastic carboy, 40p.

Safety Tips

We have had a report of a fire caused when the sun's rays were focussed by the optical head of an overhead projector onto the dust cover on top of the platform which is a cover for the Frensel lens. One remedy is always to place a hood over the optical head.

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Centrifuges with open rotating heads should be boxed in so that moving parts cannot be touched. Hardboard on a light frame would suffice and a cut-out switch should be fitted on the lid of the box. Suitable micro-switches are usually in stock in our surplus equipment.

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