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SCIENCE COMMITTEE

SCIENTIFIC AND TECHNOLOGICAL TRAINING AND MANPOWER IN THE USSR

Note by the Secretary

Members of the Committee will recall that during their meeting on 22nd and 23rd April, 1959, they heard a presentation on the above subject by Dr. C.R.S. Manders. It was agreed that the text of this presentation would be published separately from the minutes. Dr. Manders has accordingly kindly supplied a text together with the appropriate charts and tables, and these are attached herewith for the consideration and use of the Committee.

(Signed) H. WEST-BURHAM

Palais de Chaillot,
Paris, XVIe.

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SCIENTIFIC AND TECHNOLOGICAL TRAINING AND MANPOWER IN THE USSR

I. Introduction.
II. Some factors contributing to rapid advances in training under the Soviet régime.
III. The educational ladder and modifications.
IV. The trained manpower reserves of the USSR and rates of production.
V. Difficulties and defects.
VI. Disciplines of defence interest.
VII. Conclusions.
VIII. Appendices.

I. INTRODUCTION

1. When the Soviet Union came into being just over 40 years ago the country had to face enormous difficulties. The South Russian harvest had been devastated by a locust plague so that food was scarce and morale low. For defence there was little more that could be offered other than an intelligent use of terrain and climate. In education and other social services the country was backward, illiteracy was widespread and no more than ten years since relevant figures were still quoted in Soviet journals and press. The supply forty years ago of trained personnel to lead the Soviet people out of their difficulties was apparently hopelessly inadequate, yet today the USSR challenges the USA for world supremacy. This achievement is one that bears comparison with any of modern times.

II. SOME FACTORS CONTRIBUTING TO RAPID ADVANCES IN TRAINING UNDER THE SOVIET REGIME

2. Naturally a whole host of factors has contributed to the Soviet advances of the past forty years, and those chosen for mention here represent but a small fraction that could be considered. Although this paper has been written with training in science and technology in mind, much of it could have been written equally well with respect to some other field of endeavour. In many ways, Soviet practice differs from that in Western countries, where conspicuously successful attention is drawn in this paper to those differences.

(i) Leaders qualified in science and technology

From the first it has been clearly realised by the Soviet leaders that science and technology are essential means of achieving communist military and economic aims. With this emphasis over forty years on science and technology, these disciplines are well represented in the background training of the present Soviet leaders. The President of the Academy of Sciences of the USSR

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is an ex-officio member of the Presidium, a body to be compared with the cabinet of the British Prime Minister or the cabinet of the French Président du Conseil. All told 39 out of the 67 members of this body are technically or scientifically qualified. Again, the first deputy-Chairman and 9 out of the remaining 13 deputy-chairmen of the Council of Ministers possess scientific or technological qualifications. At top administrative level in the USSR scientific and technological projects may be expected to receive an easier passage than in Western countries.

(ii) Central control and planning

These offer obvious advantages for achieving maximum efficiency in a training programme. Uniform standards can be set for the whole country, the system of training can be simplified and much of what is confusing in Western countries, where the system has grown piecemeal, can be eliminated. If planning and production keep in step, there should be no unemployed but people with the right qualifications should be available for all the jobs that the State needs doing. With a centralised system, of course, there exist the possibilities of being gloriously right or disastrously wrong. The essentials of the Soviet method are - Ministries forecast their requirements in materials and manpower for a 5 (now 7) -year plan in response to an overall directive from the Party executive. These stated requirements of Ministries, modified slightly each year in the light of experience, are collated and plans drawn up by the State Planning Commission. The scientific and technological parts of the Plan are vetted by the Academy of Sciences.

(iii) Newly trained manpower at the disposal of the State

Nearly all who train in the Soviet Union beyond the legal minimum stage receive public funds in order to do so. The State requires that such people, professionals and semi-professionals alike, shall serve in posts to which they are allotted for a period of three years after completing training. Some 750,000 professionals and 1,200,000 semi-professionals, in the main young folk without a load of other commitments, can be readily switched to the solution of the State's priority problems such as the great development chemes, teaching and the like. This group of nearly 2 million workers does not constitute a sweated labour force, individuals are paid the "rate for the job" and, moreover, military service is not required of them.

(iv) "Small" subjects

The USSR is a large country, thus it is able to produce a study group, and cater for it adequately, for such subjects as gyro engineering, boiler engineering where many Western countries could only arrange an occasional course, on account of small numbers, and that of an extremely compromise nature.

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(v) Combing of Western Sources

Western publications are available in translation in the main Soviet establishments within about 2 months of original publication. The Academy's Institute of Scientific Information provides the finest and most complete abstracting service in the world. When circumstances require it, the Soviets are ready to acquire information through espionage.

(vi) Ploughing back

Over the years a generous proportion of the personnel trained has been ploughed back into teaching in order to train more specialists. Pay and prestige in teaching are good. The net annual increase in the body of trained personnel is currently 7% in the USSR (cf. USA 3½%, UK 2½ - 3%).

(vii) Strong basic subjects

Of recent years at any rate, there has been undoubted insistence on strong basic subjects in all the courses offered in the Soviet Union. All 200 of the technology curricula followed in higher educational establishments devote approximately 10% of the time to advanced mathematics and a similar amount to physics. The large trained manpower reserve and the rapid technological progress have not been obtained by indulging in superficiality.

(viii) Teacher-training programmes a first priority

With each foreshadowed technological or scientific advance there is initiated an appropriate teacher-training programme. Teachers of programming have been trained since 1955 in Moscow State University (Appendix 1).

(ix) Efficient propaganda

In the West it is not unusual for Soviet propaganda and lies to be regarded as synonymous. Propaganda does succeed in keeping the national targets before the Soviet people so that they are pleased and excited as these are knocked off. Again there are posts in the USSR people might not be keen to fill, places where people might not be keen to go and work. Propaganda in the educational establishments presenting these posts and places as a challenge produces many of the young folk of (iii) eager to work for their country in the less favoured conditions.

III. THE SOVIET EDUCATIONAL LADDER

3. The diagram in Appendix 1 represents conditions under the last (abandoned) 5-year plan and, although changes are to come about in the primary and secondary stages of training, the diagram

indicates the system that will apply for much of the current 7-year plan.

4. Formal education in the Soviet Union begins at 7 years of age and the primary stage lasts seven years. By 1960 the last 5-year plan aimed to make 10-year school available overall. Where 10-year school could be provided such training was made compulsory by local regulation; in consequence of which the numbers graduating from 10-year school rose during the last 5-year plan from 440,000 to 1,500,000 per annum. Boys and girls alike follow the same course in the 7- and 10-year schools. In the secondary stage of academic training, i.e. the eighth, ninth, tenth grades of 10-year school, pupils spend 42% of their time on mathematics, physics and chemistry. The product obtained from the 10-year school is not so highly trained as the product of the Science Sixth of a British grammar school or the young man or woman with a Science 2nd bachot of a French lycée. A far higher average level in science is, however, attained by all who complete 10-year school training in the USSR, and by vastly larger numbers of pupils, than is the case in the West (Appendix 3).

5. Other possibilities at the 7-year stage are illustrated on the diagram of Appendix 1. It has been possible to go out into paid employment but the numbers doing so dropped sharply during the last 5-year plan. The labour reserve schools are run in association with industries and agriculture. The specialist secondary schools, mostly Tekhnikums provided by appropriate Ministries, give semi-professional training in some 2,000+ specialities, the courses being of strongly practical character.

6. Of recent years some 40% of the 10-year school output, together with a lesser percentage from the semi-professional schools, has been going on to some form of higher educational establishment (Appendix 2) and there has been talk of raising the percentage to 70. Universities provide only 10% of the trained manpower of the Soviet Union and instruction in them is given in the basic subjects only. Pedagogical institute courses last 4 years, basic subjects in universities (physics excepted) last 5 years. Most of the courses in technology (also physics) take 5½ years, whilst medicine is a 6-year course. For all courses but those in pedagogy the student has to carry out a 6-month diploma project, the account of the research being embodied in a dissertation that is defended in public. About 1 in 6 or 7 people from the higher educational establishments proceed to higher studies. Students, aspirants and doktorants are required to develop competence in one, two and three foreign languages respectively.

MODIFICATIONS NOW BEING INTRODUCED

7. The Khrushchev Memorandum of September, 1958 envisaged replacement of the 7-year period of primary education by one of 8 years. Following this there comes a 3 to 4 year course of secondary education in one of five types of school, viz.:

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(a) Academic type secondary school differing from the 8 - 9 - 10th grades of 10-year school in having four divisions and taking perhaps 20% of the 8-year stage output.

(b) Technical type secondary school.

(c) Specialised secondary schools for theatre, ballet, fine arts, military services, etc.

(d) Part-time secondary schools enabling people to work in factories and farms while studying.

(e) Evening class labour reserve schools.

Clearly the changes in the system imply no relaxation of standards. Furthermore, existing secondary school facilities can be readily adapted to serve the new purposes.

IV. MANPOWER RESERVES AND PRODUCTION RATES

8. Appendix 4 summarises the position under this heading. The first table demonstrates the heavy bias in the USSR in favour of science and technology. It will be seen also that in the USSR those trained in science and technology tend to remain in those fields. Prestige and rewards are high in these fields, particularly for teaching.

9. At higher degree level the USSR is not going to be starved of men qualified to direct the country's projects. At higher education and school level there is every indication that the outputs of trained personnel can be not only maintained without difficulty, but even stepped up.

10. Appendices 5 and 6 give breakdown figures, the latter also summarising achievements since the War. The notable contribution of women to the trained manpower figures of the USSR will also be seen from this table.

V. DEFECTS AND DIFFICULTIES

11. The Soviet training system with some 35 million people studying at its various levels is gigantic. One of its outstanding merits, stemming from central control and planning, is its relative simplicity. It may be of interest to note how the Soviet Union has fared in coping with problems that have dogged Western countries.

(i) Accommodation

At all levels in Soviet schools a 2-shift per day system is normal and a 3-shift system not unheard of. The provision of

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classroom, lecture-theatre and laboratory space is undoubtedly the most severe problem with which Soviet training has to cope. The shortfall in its building programme was one of the factors contributing to the abandonment of the last 5-year plan. It was almost certainly a factor precipitating the modifications in the educational system at secondary level. There is talk of requiring all candidates for higher education being required to put in two years of industrial service before going on - a two-year breathing space would enable the building programme to catch up. Appendix 1 shows accommodation problems are no new thing in the USSR.

(ii) Equipment

Western observers generally have been envious of the quantity and quality of equipment in Soviet training establishments.

((iii) Staff-student ratio

The Soviet Union, as mentioned earlier, has no teacher problem, whereas in most Western countries the position is far from happy.

	USSR	USA	UK
Higher educational establishments	1-12.6	1-14.1	1-9
Schools	1-17.6	1-21 (second.) 1-30 (prim.)	1-18.1 (sec.gramm.) 1-22.3 (sec.mod.) 1-30.5 (prim.)

(iv) Military Service

In the USSR, for reasons given earlier, this is no problem at all.

(v) Ratio of professionals to semi-professionals

Western experience seems to indicate that one professional should be supported by three semi-professionals and in the major Soviet establishments visited by Western observers this ratio appears to be commonly adopted. The 3 to 1 ratio is not the training ratio so it appears that somewhere in the USSR there must be a shortage of semi-professionals with presumably difficulties in consequence. The fact that difficulties are not obvious suggests that professionals may be being used in the USSR at levels that would be considered uneconomic in the West.

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VI. DISCIPLINES OF DEFENCE INTEREST

(i) Mathematics

12. This is the subject in the USSR which enjoys highest prestige. The country has a first-class mathematical tradition and the current level of mathematics in the Soviet Union is second to that of the United States alone. When examining a bunch of Soviet scientific papers, more especially in the physical sciences or engineering, it is very noticeable how satisfying it appears to be to the Soviet scientist to trail off into mathematics. British papers often consist of two parts, one part theory and the second part giving an account of experimented verification of the theory. Often a Soviet paper will give theory only.

Top-notch Soviet methematicians play a much bigger role than Western counterparts in engineering conferences of quite "oily rag" level. This scientific approach to engineering problems may possibly account for part of the rapid progress in this field. Soviet mathematicians appear somewhat ready to fit mathematical theory to quite small-scale experiments. They also appear unusually confident in extrapolating into regions where Western workers would regard supplementary experimental data as essential. When the Soviet method succeeds it does enable certain stages of a development to be dispensed with. Doubtless much of recent Soviet advance in aerodynamics and chemical engineering is due to taking mathematicians' advice.

Mathematics again is strongly encouraged in the schools. Olympiads, mathematical contests for the 8-9-10th grades of 10-year school, are held on town, regional, republican and national bases. The exceptionally able pupil is spotted at a very early stage and he/she can be appropriately nurtured thereafter.

In most countries there is an obvious vertical structure in scientific disciplines and a vertical hierarchy among the workers. This makes for weakness in transfer of ideas between disciplines. In the USSR mathematics is the active agent in cross-fertilisation between disciplines. A noteworthy example of this is provided by the Vibrations Laboratory of the Lebedev Physics Institute of the Academy of Sciences of the USSR. The laboratory is a research organization but, in addition, members, who it is presumed attend this Moscow laboratory for one or two months per annum, are to be found in institutions all over the Union. These members are leaders in a wide range of subjects - astronomy, radio astronomy, spectroscopy, acoustics, theoretical physics, machine tool engineering, marine hydrology, electric power engineering and many other fields - and the only common factor is their interest in wave motion. The possibilities in the way of carry-over of ideas in the Vibrations Laboratory are clearly enormous.

Appendix 8 gives a detailed university curriculum in Applied Mathematics, whilst Appendix 7 gives one for Pure Mathematics. The provision for industrial practical work in both will be noted, also the farsighted arrangements for automation in items 19 and 20 of Appendix 7.

(ii) Physics

Soviet workers in this subject are up with the world leaders on practically every topic. Great strength is shown in theoretical physics whilst the last five years has seen spectacular advances in the USSR in semi-conductor research. Appendix 9 shows a physics curriculum, in it the good provision for higher mathematics and for industrial practical work will be observed.

(iii) Chemistry

Here is a subject where the USSR is described as being somewhat pre-war in outlook though too much should not be made of this point. In chemical engineering the Soviet Union is also backward, but this position is clearly recognised and there is currently a drive in this field. The chemistry curriculum of Appendix 10 again shows good provision for industrial practical work and for higher mathematics.

(iv) Engineering

Appendix 11 is typical enough in that it demonstrates the generous allotment of time for higher mathematics and physics menioned earlier. Again, time is allowed for industrial practical work. With an expanding economy based on growing industrialisation, engineering in the Soviet Union enjoys high priority. In 1958-9 it is planned to have an output of engineers three times that of the United States. It may well be that indications of a saturation state will soon become apparent.

VII. CONCLUSIONS

13. There is a considerable tendency in the West to adopt extreme views concerning the Soviet Union. Its peoples are, however, neither supermen nor inferior material, but are in fact people with the same range of abilities and emotions as any other. If 210 million people in the West will work together with the same priorities and the same intensity as their counterparts in the Soviet Union they will achieve similar results. Nations competing individually with the USSR fritter away their energies and resources in efforts foredoomed to failure. If methods superior to those of the USSR cannot be thought up continuously then serious thought may have to be given to the adoption and adaptation of Soviet methods. This could easily involve, among other things:

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(i) the abandonment of cherished, traditional ideas about women;

(ii) a demand for service to the State from those who have received aid from public funds for training beyond the legal minimum stage;

(iii) abolition of a "free market" in trained personnel and the acceptance of some, and probably increasing, measure of direction by the State.

14. Whatever happens, any country now experiencing a teacher supply problem must solve it as a first and urgent priority.

(Signed) C. R. S. MANDERS

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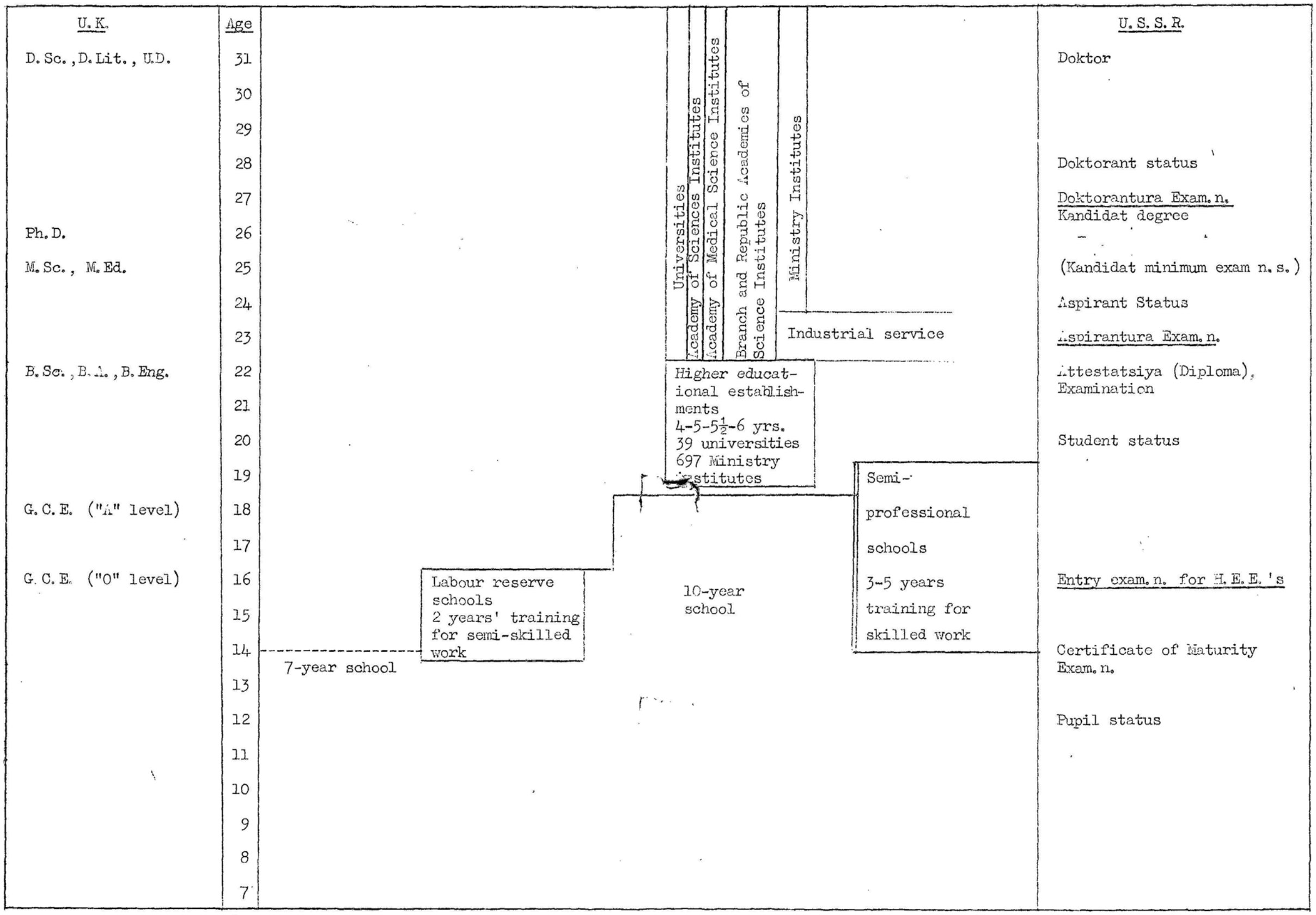
SOVIET EDUCATIONAL LADDER



N.B. - Double line implies proceed by qualifying or competitive examination

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Type of Soviet Higher Educational Establishment

		Number of estabs.
1.	Universities	39
2.	Polytechnics and industrial higher educational establishments	29
3.	Power engineering, electrotechnical, radiotechnical and physiocotechnical higher educational establishments	8
4.	Mechanical engineering, ship-building, aviation, printing and cine-engineering higher educational establishments	32
5.	Geological, mining, petroleum, peat and metallurgical higher educational establishments	27
6.	Chemico-technological higher educational establishments	9
7.	Higher educational establishments of the Food and Fish Industry	13
8.	Higher educational establishments of light industry	8
9.	Civil engineering, surveying and motor-highway higher educational establishments	29
10.	Hydro-meteorological institutes	2
11.	Higher educational establishments of transport and communications	30
12.	Agricultural and Forestry higher educational establishments	109
13.	Economics higher educational establishments	26
14.	Juridical higher educational establishments	4
15.	Higher educational establishments of the Arts	44
16.	Medical higher educational establishments	77

17.	Higher educational establishments of physical culture	15
18.	Pedagogical, historical-archive and librarianship higher educational establishments	213
19.	Correspondence institutes	22
	Total	736

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Curriculum of 7- and 10-year Schools

Year / Subject	I	II	III	IV	V	VI	VII	VIII	IX	X
Russian language and literature	13	13	13	9	9	8	6	6(5)	4	4
Mathematics	6	6	6	6	6	6	6	6	6	6
History				2	2	2	2	4	4	4
Constitution of the USSR										1
Geography				2	3	2	2(3)	2(3)	3	
Biology				2	2	2	3	2	1	
Physics						2	3	3	4	5(4)
Astronomy										1
Chemistry							2	2	3	3(4)
Psychology										1
Foreign language					4	4	3	3	3	3
Physical education	2	2	2	2	2	2	2	2	2	2
Drawing	1	1	1	1	1	1				
Advanced drawing							1	1	1	1
Singing	1	1	1	1	1	1				
Handwork	1	1	1	1	2	2	2			
Practicals (factory visits, etc.)								2	2	2

In number of hours per week.

(Where a different number of hours is given to the subject in the second semester this is indicated in brackets.)

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SCIENTIFIC-TECHNOLOGICAL MANPOWER RESERVES

Table 1

	USSR	United States	United Kingdom
Living "graduates" in all fields	3,125,000 (1956)	6,400,000 (1956)	(500,000) (estimated)
Living "graduates" in scientific/technological fields	1,690,000 (1956)	1,970,000 (1956)	(200,000) (estimated)
"Graduates" employed in scientific/technological fields	1,360,000 (1956)	1,240,000 (1956)	134,000 (1955)
Populations	210 M.	162 M.	52 M.

Table 2 - Higher Degree Level

Kandidat and Doktor (USSR)/ Ph.D. and higher doctorate (United States and United Kingdom)	USSR	United States	United Kingdom
Number of higher degrees awarded per annum (1954)	8,000+	4,300	960

USSR aspirant enrolment 33,000 (1956) of whom 1,500 were from countries abroad

Table 3 - Higher Education

	USSR	United States	United Kingdom
Total enrolment	2,000,000 (September 1957) includes (738,000 correspondence) (122,000 part-time) (12,000 foreign)	3,068,000 (1957)	84,000 (1956)
Number of new enrolments (1955)	461,400	675,000	22,000
Number of "graduations" (1956-57 estimated)	260,000 includes (78,000 engineering) (62,000 science)	311,298 includes (53,000 engineering) (47,000 science)	20,000 includes (9,829 science & engineering

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Table 4 - Ten-Year School

	1950	1952	1953	1954	1956
Numbers completing ten-year school	220,000	315,000	440,000	750,000	1,300,000

Table 5 - Semi-Professional Education

	USSR	United States	United Kingdom
Total semi-professional man-power reserve	3,680,000 (1956)	Wide variety of sources, no figures available	Wide variety of sources no figures available
Total enrolment	1,961,000 (1957)		

Table 6 - Labour Reserve Schools

	USSR	United States	United Kingdom
Annual Output	650,000 (1956)	See above	See above

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DISTRIBUTION BY SUBJECT OF OUTPUT OF PROFESSION AND SEMI-PROFESSIONAL MANPOWER, 1955

Subject		H.E.E.'s		Teckhnikums	
			Per cent		Per cent
Geology and mineral prospecting		3,976	1.6	5,626	1.35
Development of mineral deposits		5,290	2.1	12,953	3.35
Power engineering		4,957	2.0	12,712	3.2
Metallurgy		2,656	1.1	4,538	1.2
Mechanical engineering and mechanical equipment		15,736	6.35	34,904	9.0
Electrical engineering and electrical equipment		2,981	1.2	4,784	1.2
Radio and communications		2,950	1.2	11,847	3.1
Chemical technology		4,954	2.0	7,203	1.85
Timber, wood technology, cellulose and paper		1.885	0.76	5,079	1.3
Technology of food products		1,878	0.76	5,737	1.5
Technology of consumer goods		1,669	0.68	5,944	1.5
Building		9,440	3.8	32,367	8.3
Geodesy and cartography		540	0.22	1,400	0,35
Hydrology and meteorology		628	0,25	1,081	0,28
Agriculture and forestry		24,563	10,0	50,436	13.0
Transport		4,236	1.7	12,605	3.25
Economics		16,138	6.5	41,607	10.8
Law		8,126	3.3	1,291	0.33
Public health, physical culture/sport		16,943	6.85	599,573	15.2
Educational		113,809	46.0	70,187	18.0
Universities	15,560				
History, Philology, Philosophy	4,030				
Physics-Mathematics	3,750				
Chemistry	1,260				

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Subject			H.E.E's		Tekhnikums	
				Per cent		Per cent
Biology	1,440					
Geology-Geography	2,320					
Economics	665					
Law	980					
Others	1,045					
Pedagogics and Library		98,249				
Institute, Etc.,						
The arts			24 2,491	1.1	4,197	1.1
Totals			245,846	100	387,770	100

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POST-WAR OUTPUTS

Field	HIGHER EDUCATIONAL ESTABLISHMENTS					SEMI-PROFESSIONAL TRAINING ESTABLISHMENTS				
	Enrolment 1955-56	Women	New entrants 1955-56	Output 1955-1956	Output 1946-55	Enrolment 1955-1956	Women	New entrants 1955-56	Output 1955-56	Output 1946-1955
		Per cent					Per cent			
Industries and constructions	550,600	35	144,812	56,446	331,900	843,100	42	245,527	140,799	826,800
Transport and communications	99,000	35	29,775	9,465	60,900	150,300	42	48,498	23,920	165,900
Agriculture	195,900	39	51,065	24,136	136,800	337,800	43	98,208	57,769	408,400
Economics and law	106,700	67	28,537	15,645	109,000	134,600	82	51,711	30,479	238,700
Educational (University, Pedagogical and Librarianship Institutes) (Universities)	741,600 (166,256)	72	172,056 (36,690)	120,836 (22,866)	915,500	247,200	85	51,682	73,541	655,500
Arts and cinema	14,400	42	2,901	2,493	21,400	31,500	51	10,682	4,951	38,200
Public health, physical culture, sport	158,800	69	32,298	16,825	196,900	215,900	89	81,246	56,311	501,400
Total (No. of correspondence students)	1,867,000 (639,100)	52	461,444	245,846 (62,014)	1,773,000	1,960,400 (286,500)	55	587,554	387,770	2,837,900
No. of establishments	765 (1955-56)					3,753 (1955-56)				
No. of correspondence establishments	22 (1955-56)					41 (1955-56)				

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Curriculum - (Pure) Mathematics for (Pure) Mathematician Teacher in Secondary Schools

(Moscow State University)
1955

Duration of training 5 years

	In semesters			Hours				Hours per week in semesters									
								I		II		III		IV		V	
	Exams	Tests	Projs.	Total	Lecture	Lab. Wk.	Pract. Wk.	1	2	3	4	5	6	7	8	9	10
1. Principles of Marxism - Leninism	2,4	1,3	-	224	144	-	80	3	3	4	4	-	-	-	-	-	-
2. Political economy	6,8	5,7	-	140	100	-	40	-	-	-	-	2	2	2	3	-	-
3. Dialectical and historical materialism	8,9	-	-	140	80	-	60	-	-	-	-	-	-	2	3	5	D
4. Pedagogy	6	-	-	64	64	-	-	-	-	-	-	-	4	-	-	-	I
5. Methodology of teaching mathematics	-	7	-	70	40	-	30	-	-	-	-	-	-	4	-	-	P
6. Foreign language	4	1,2,3,6,8	-	204	-	-	20	4	4	2	2	-	-	-	-	-	L
7. Mathematical analysis	1,2,3,6	1,2,3,4	4	560	340	-	220	8	8	7	4	2	4	-	-	-	O
8. Higher algebra	1,2,3	2,3	4	190	104	-	86	4	4	3	-	-	-	-	-	-	M
9. Analytical geometry	1,2	1	-	188	102	-	86	6	5	-	-	-	-	-	-	-	A
10. Differential equations	4	3	4	136	68	-	68	-	-	4	4	-	-	-	-	-	
11. Differential geometry	4	-	-	100	68	-	32	-	-	3	3	-	-	-	-	-	
12. Astronomy	1	-	-	70	54	-	16	4	-	-	-	-	-	-	-	-	P
13. Theoretical mechanics	3,5	4,6	4	288	180	-	108	-	-	4	6	4	3	-	-	-	A
14. Physics	3,5,8	2,4,7	-	328	200	68	60	-	5	3	5	3	-	2	2	-	P
15. Theory of functions of a complex variable	5	5	-	108	72	-	36	-	-	-	-	6	-	-	-	-	E
16. Variational calculus	5	-	-	36	36	-	-	-	-	-	-	2	-	-	-	-	R
17. Equations of mathematical physics	7	-	8	100	100	-	-	-	-	-	-	-	3	3	-	-	-
18. Theory of probability	6	-	8	48	32	-	16	-	-	-	-	-	3	-	-	-	-
19. Modern calculating machines and programming	-	8	-	60	60	-	-	-	-	-	-	-	-	2	2	-	-
20. Maths. pract. classes with introduct. lectures on computational methods	-	5,6,7,8	-	208	34	-	174	-	-	-	-	3	4	3	3	-	-
21. History of mathematics	-	8	8	60	60	-	-	-	-	-	-	-	-	2	2	-	-
22. Selected courses and seminars	7,8,9	8,10	6,8	420	260	-	160	-	-	-	-	4	4	6	6	6	2
23. Physical education and sport	-	1,2,3,4	-	136	-	-	136	2	2	2	2						-
Totals	32	35	9	3878	2198	68	[180] 1432	31	31	32	30	26	27	26	21	11	2

Theoretical instruction 146 wks.
Exam. sessions 31 wks.

Practical instruction - wks.
Industrial Inst. etc. 8 wks.

Diploma project & State Exams 20 wks.
Vacations 46 wks.

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Moscow State University

Speciality : Applied Mathematics
Specialist qualification : Applied Mathematician
Duration of training : 5 years

COURSE	1956						1957						
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	
I	0	0	0	0	: :	=	0	0	0	0	: :	=	=
II	0	0	0	0	: :	=	0	0	0	0	: :	=	=
III	0	0	0	0	: :	=	0	0	0	0	: :	=	=
IV	0	0	0	0	: :	=	0	0	0	: :	X X X X		=
V	0	0	0	0	: :	=	//	//	//	//	//		
Wks	17				3	2	17			4	9		

0 Theoretical instruction
: : Examinations
= Vacations
X Industrial practical work
// Diploma project and State examinations

COURSE	Theoret. Instructn.	Exams	Industr. Pr. Wk.	Diploma project	State exams	Vacations
I	34	7	-	-	-	11
II	34	7	-	-	-	11
III	34	7	-	-	-	11
IV	30	7	8	-	-	7
V	14	3	-	16	4	2
	146	31	8	16	4	42

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APPENDIX 8 to
ANNEX to
AC/13-D/40

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Curriculum in Applied Mathematics

No	In semesters...			Hours				Hours per wk. in semesters...										
								I		II		III		IV		V		
	Exams.	Tests	"Task"	Total	Lecture	Lab. Wk.	Pr. Wk.	1	2	3	4	5	6	7	8	9	10	
1. Marxism-Leninism	2,4	1,3	-	224	144	-	80	3	3	4	4	-	-	-	-	-	-	
2. Political economy	6,8	5,7	-	140	100	-	40	-	-	-	-	2	2	2	5	-	-	
3. Dialectics, historical materialism.	8,9	-	-	140	80	-	60	-	-	-	-	-	-	2	3	5	-	
4. Foreign language	4	1,2,3,6,8	-	204	-	-	204	4	4	2	2	-	-	-	-	-	-	D
5. Analytical geometry	1,2	1	-	188	102	-	86	6	5	-	-	-	-	-	-	-	-	I
6. Mathematical analysis	1,2,3,4,	1,2,3	4	460	240	-	220	8	8	7	4	-	-	-	-	-	-	P
7. General astromony	-	1	-	70	70	-	-	4	-	-	-	-	-	-	-	-	-	L
8. Higher algebra	1,2	2	-	136	68	-	68	4	4	-	-	-	-	-	-	-	-	O
9. Differential equations	4	3	4	136	68	-	68	-	-	4	4	-	-	-	-	-	-	M
10. Theoretical mechanics	3,5,6	2,4,3,4	4	334	216	-	118	-	6	4	4	3	3	-	-	-	-	A
11. Physics	5,7	5,6	6	310	170	104	36	-	-	5	4	5	2	2	-	-	-	
12. Differential geometry	3	-	-	70	54	-	16	-	-	4	-	-	-	-	-	-	-	
13. Functions of a complex variable	5	5	-	108	72	-	36	-	-	-	-	6	-	-	-	-	-	
14. Equations of mathematical physics	7	7	-	136	100	-	36	-	-	-	-	-	4	4	-	-		
15. Theory of probability	-	9	-	56	42	-	14	-	-	-	-	-	-	-	-	4		
16. Calculus of variations	-	5	-	36	36	-	-	-	-	-	-	2	-	-	-	-		
17. Hydro-aero-mechanics	6	4	6	134	134	-	-	-	-	-	2	3	3	-	-	-		
18. Elasticity and plasticity	6	-	6	100	100	-	-	-	-	-	-	3	3	-	-	-	P	
19. Gas dynamics	8	-	-	60	60	-	-	-	-	-	-	-	-	2	2	-	A	
20. Theory of oscillations	7	-	-	36	36	-	-	-	-	-	-	-	-	2	-	-	P	
21. Strength of materials	-	4	-	64	32	32	-	-	-	-	4	-	-	-	-	-	E	
22. History of mechanics	-	9	-	56	56	-	-	-	-	-	-	-	-	-	-	4	R	
23. Selected courses and seminars	7,8,9	8,10	8	356	180	-	176	-	-	-	-	2	4	6	6	4	2	
24. Laboratory work	-	5,6,7,8	-	436	-	436	-	-	-	-	-	4	6	8	8	2	-	
25. P.E. and sport	-	1,2,3,4	-	136	-	-	136	2	2	2	2	-	-	-	-	-	-	
		Total hours		4126		572	1807											
					2,160		1,214											

Selected Courses in Applied Mathematics

1. Theory of elasticity

1. Envelopes and sheets
2. Statics and dynamics of structures
3. Propagation of waves in an elastic medium
4. The plane problem in the theory of elasticity
5. The contact problem in the theory of elasticity
6. Variational methods of the theory of elasticity — total hours 356; Lectures 180; Pr. Wk., Seminars 176
7. Optical methods of investigating stress
8. Stability of elastic systems
9. Oscillation of elastic systems
10. Propagation of non-linear waves
11. Methods of measurement of mechanical waves
12. Supplementary chapters of strength of materials
13. Theory of the elasticity of anisotropic materials
14. Theory of rigidity

2. Aeromechanics and hydromechanics

1. Theory of a thin wing — ditto
2. Hydrodynamic methods of the theory of functions
3. Theory of the wing and screw
4. Supplementary chapters of gas dynamics
5. The spherical dynamics of the stability of projectiles in flight
6. Kinetic theory of gases
7. Dynamics of flight
8. Theory of turbulence

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9. Experimental aeromechanics
10. Aeromechanics of bodies of changing mass
11. Theory of jet engines
12. Near-sonic motion
13. Applied gas dynamics
14. Unstable motion of a gas
15. Oscillations of a body in an air-stream
16. Theory of turbines
17. Theory of cavitional flow
18. The plane problem in hydromechanics
19. Theory of the motion of mixtures (liquid, solid particles)
20. Theory of sound waves
21. Application of hydromechanics to meteorology
22. Theory of motion of a viscous liquid
23. Hydraulics
24. Theory of flow
25. Composite problems
26. Filtration of a liquid and gases
27. Theory of wave motion

3. Applied mechanics

1. Theory of oscillations
2. Theory of control
3. Dynamics of machines
4. Synthesis of mechanisms
5. Applied theory of gyroscopes
6. Gyroscopic stabilisation

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7. Electromechanics and electrotechnics — Total hours 356; Lectures 180; Pr. Wk., Seminars 176
8. Digital computing mechanisms
9. Operational and metrical calculation in the theory of oscillations
10. The measurement of mechanical quantities
11. Oscillations of shafts
12. Non-linear oscillations
13. Statistical methods in the theory of oscillations and control.
14. Dynamics of controlled flight
15. Theory of mechanisms
16. Theory of models and model construction
17. Tracking systems

4. Theoretical mechanics

1. Stability of motion — ditto
2. Integration of dynamical equations
3. Periodic solution of problems in mechanics
4. Mechanics of bodies of varying mass
5. Motion of bodies about a fixed point
6. Dynamics of non-holonomic systems
7. Fundamentals of the mechanics of a filament
8. Methodology of the teaching of theoretical mechanics
9. Mechanics of the theory of relativity
10. Geometrical theories of the motion of bodies
11. Integral invariants
12. History of mechanics in Russia and USSR
13. Philosophical basis of mechanics
14. History of hydroaeromechanics
15. History of elasticity

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5. Wave dynamics

1.	Propa gation of elastic-plastic waves	Total hours	356
		Lectures	180
2.	Theory of ultrasonic waves	Pr. Wk., Seminars	176
3.	Theory of surface waves in a liquid		
4.	Theory of collision of elastic bodies		
5.	Thermodynamics		
6.	Shock waves in detonations		

6. Department of the theory of plasticity

1.	Plane problem of the theory of plasticity	ditto
2.	Information on metals	
3.	Metal physics	
4.	Theory of plasticity, Parts I and II	
5.	Creep of metals	
6.	Viscous-plastic flow	
7.	Stability beyond the elastic limit	

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APPENDIX 9 to
ANNEX to
AC/137-D/40

Curriculum: Physics — Moscow State University

Duration of training: 5½ years. Qualification: Physicist

No.	Subject	In semesters: Exams	Tests	Projs.	Hours: Total	Lecture	Lab. Wk.	Pract. Wk.	Hours per wk. in semesters: I 1	2	II 3	4	III 5	6	IV 7	8	V 9	10	VI 11	
1.	Principles of Marxism - Leninism	2,4	1,3	-	234	144	-	[80]	3	3	4	4	-	-	-	-	-	-		DIPLOMA PROJECT
2.	Political economy	6,8	5,7	-	140	100	-	[40]	-	-	-	-	2	3	2	2	-	-		
3.	Dialectical and historical materialism	8,9	-	-	140	80	-	[60]	-	-	-	-	-	-	2	3	5	-		
4.	History of physics	9	-	-	52	52	-	-	-	-	-	-	-	-	-	-	4	-		
5.	Foreign language	4	1,2,3,6,8	-	270	-	-	270	4	4	4	4	-	-	-	-	-	-		
6.	Chemistry	1	2	-	102	68	34	-	4	2	-	-	-	-	-	-	-	-		
7.	Drawing	-	2	-	68	-	68	-	2	2	-	-	-	-	-	-	-	-		
8.	Workshop instruction	-	2	-	68	-	68	-	2	2	-	-	-	-	-	-	-	-		
9.	Higher mathematics	1,2,3,4	1,2,3,4	-	616	360	-	236	10	10	10	6	-	-	-	-	-	-		
10.	Methods of mathematical physics	5,6	5,6	-	256	170	-	86	-	-	-	-	8	7	-	-	-	-		
11.	Practical mathematics	-	6	-	34	-	34	-	-	-	-	-	1	1	-	-	-	-		
12.	General physics	1,2,3,4	1,2,3,4	-	372	236	-	186	4	6	6	6	-	-	-	-	-	-		
13.	Atomic physics	6	5	-	86	68	-	18	-	-	-	-	3	2	-	-	-	-		
14.	Nuclear physics	7	6	-	102	68	-	34	-	-	-	-	-	3	3	-	-	-		
15.	Theoretical mechanics and mechanics of continuous media	5	4	-	154	102	-	52	-	-	-	4	5	-	-	-	-	-		
16.	Thermodynamics and statistical physics	7	6	-	104	68	-	36	-	-	-	-	-	2	4	-	-	-		
17.	Electrodynamics	6	5	-	136	102	-	34	-	-	-	-	4	4	-	-	-	-		
18.	Quantum mechanics	8	7	-	124	93	-	31	-	-	-	-	-	-	4	4	-	-		
19.	Principles of radio	5	-	-	54	54	-	-	-	-	-	-	3	-	-	-	-	-		
20.	Practical course in general physics	-	1,2,3,4	-	374	-	374	-	5	5	6	6	-	-	-	-	-	-		
21.	Practical course in atomic, nuclear, radio physics, special subjects	-	5,6,7,8	-	483	-	483	-	-	-	-	-	6	6	9	9	-	-		
22.	Specialization subjects with seminars (1)	7,8,9,10	6,7,8,9,10	-	424	345	-	79	-	-	-	-	-	4	6	6	6	6		
23.	Laboratory work in specialization subjects	-	-	8,9,10	625	-	625	-	-	-	-	-	-	-	-	7	14	22		
24.	Physical education and sport	-	1,2,3,4	-	136	-	-	136	2	2	2	2	-	-	-	-	-	-		
	Totals	37	47	3	5,144	2,110	1,688	[180] 1,168	36	36	32	32	32	32	30	31	29	28		

Theoretical instruction 162 wks. Practical instruction - wks. Diploma project 21 wks.
Exam sessions 35 wks. Industrial pract. work 8 wks Vacations 55 wks.

(1) Specializations: Topics within the fields of Theoretical and Mathematical Physics, Solid State Physics, Optics and Spectroscopy, Molecular Physics, Low Temperature Physics, Radio Physics, Geophysics, Nuclear Physics.

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Moscow State University

Curriculum: Chemistry

Duration of training: 5 years. Qualification: Chemist

No.	Subject	In semesters: Exams	Tests	Projs.	Total	Lecture	Lab. Wk.	Pract. Wk.	Hours per wk. in semesters: I 1	I 2	II 3	II 4	III 5	III 6	IV 7	IV 8	V 9	V 10
1.	Principles of Marxism - Leninism	2,4	1,3	-	224	144	-	[80]	3	3	4	4	-	-	-	-	-	
2.	Political economy	6,8	5,7	-	140	100	-	[40]	-	-	-	-	3	2	2	3	-	D
3.	Dialectical and historical materialism	8,9	-	-	140	80	-	[60]	-	-	-	-	-	-	2	4	4	I
4.	Foreign language	3,5	1,2,4,6,8	-	270	-	-	270	4	4	4	2	2	-	-	-	-	P
5.	History of chemistry	-	9	-	36	36	-	-	-	-	-	-	-	-	-	-	2	L
6.	Higher mathematics	1,1,2,3,4	5	-	446	258	-	188	9	7	4	4	2	-	-	-	-	O
7.	Physics	2,3,4,5	2,3,4	-	406	204	136	66	-	6	6	7	5	-	-	-	-	M
8.	Inorganic chemistry	1,2	1,2,7	2	480	172	308	-	14	12	-	-	-	-	2	-	-	A
9.	Analytical chemistry	4	3,4,7	4	412	32	380	-	-	-	12	10	-	-	2	-	-	
10.	Organic chemistry	6	4,5,6	6	492	126	366	-	-	-	-	3	14	12	-	-	-	
11.	Physical chemistry	7	6,7	-	384	132	252	-	-	-	-	-	-	6	16	-	-	P
12.	Chemical technology	7	8	-	202	102	100	-	-	-	-	-	-	3	3	10	-	R
13.	Technical drawing	-	6	-	32	-	32	-	-	-	-	-	-	2	-	-	-	O
14.	Structure of matter	6	-	-	64	64	-	-	-	-	-	-	-	4	-	-	-	J
15.	Crystallochemistry	7	-	-	54	36	18	-	-	-	-	-	-	-	3	-	-	E
16.	Colloid chemistry	8	8	-	116	46	70	-	-	-	-	-	-	-	2	8	-	C
17.	Radiometric methods	-	5	-	72	36	36	-	-	-	-	-	4	-	-	-	-	T
18.	Workshop instruction	-	1,2	-	86	-	86	-	3	2	-	-	-	-	-	-	-	
19.	Practicals and courses in specialisations (1)	9	8,9	-	384	100	284	-	-	-	-	-	-	-	-	6	18	
20.	Physical education and sport	-	1,2,3,4	-	136	-	-	136	2	2	2	2	-	-	-	-	-	
	Totals	27	37	3	4,576	1,670	2,066	[180] 660	35	36	32	32	30	30	32	31	24	

Theoretical instruction	148 wks.	Practical instruction	wks.	Diploma project	20 wks.
Exam sessions	30 wks.	Industrial practical work	7 wks.	Vacations	46 wks.

(1) Specialisations:
- Inorganic chemy. - Rare elements, complex compounds, physico-chemical analysis, metallography, inorg.chem.technology.
- Organic chemy. - Synthesis, organo-metallic cpds., proteins, heterocyclic cpds., Petroleum, fuels, lubricants, biol. activo substs.etc.
- Physical chemy. - Thermodynamics, thermochemy., spectroscopy, chemical kinetics, adsorption, electrochemy., crystal chemy.etc.
- Analytical chemy. - Chromatography, luminescent anal., gas anal., spectranalysis.
- Radio-chemy. - Genl., wkg. with radio elements, extraction and separation, tagged atoms etc.

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Curriculum - Design and Production Technology of Radio Equipment

Duration of training - 5 years. Qualification: Radio-Engineer

		In semesters			Hours					Hours per wk. in semesters										
		Exams	Tests	Projs. Papers	Total	Lecture	Lab. Wk.	Pract. Wk.	Projs. Papers	I 1	I 2	II 3	II 4	III 5	III 6	IV 7	IV 8	V 9	V 10	
1.	Principles of Marxism - Leninism	2,4	1,3	-	256	156	-	100	-	4	3	4	4	-	-	-	-	-		
2.	Political economy	6,8	5,7	-	140	100	-	40	-	-	-	-	-	3	2	2	3	-		
3.	Foreign language	4,8	1,2,3,6	-	256	-	-	256	-	2	2	2	2	2	2	2	2	-		D
4.	Higher mathematics	1,2,3	2,4	-	408	220	16	172	-	8	8	4	4	-	-	-	-	-		I
5.	Physics	1,2,3	1,2,3	-	274	170	70	34	-	4	7	5	-	-	-	-	-	-		P
6.	Applied chemistry	1	1	-	90	54	36	-	-	5	-	-	-	-	-	-	-	-		L
7.	Descriptive geometry and drawing	1	1,2,3	-	210	36	-	174	-	7	3	2	-	-	-	-	-	-		O
8.	Technology of metals and materials	2	1,2	-	184	52	132	-	-	4	7	-	-	-	-	-	-	-		M
9.	Theoretical mechanics	2,3	3	-	136	102	-	34	-	-	4	4	-	-	-	-	-	-		A
10.	Technical mechanics	4,5	4,5,6	6	260	172	34	34	20	-	-	5	6	3	2	-	-	-		
11.	Electrotechnics	3,4	3,4	-	258	172	52	34	-	-	-	9	6	-	-	-	-	-		
12.	Principles of radiotechnics	5,6	4,5,6	-	226	122	70	34	-	-	-	-	5	7	2	-	-	-		
13.	Electronic and ionic instruments	5	5	-	108	72	36	-	-	-	-	-	-	6	-	-	-	-		
14.	Electro-radio materials	-	5	-	72	36	36	-	-	-	-	-	-	4	-	-	-	-		
15.	Calculation, design and production or radio components	5,6	5,6	6	188	94	28	56	10	-	-	-	-	6	8	-	-	-		P
16.	Calculation and design or radio transmitters	7	6,7	7	148	74	20	18	36	-	-	-	-	-	4	6	-	-		R
17.	Calculation and design of receiver amplifiers	6,7	6,7,8	8	188	112	56	-	20	-	-	-	-	-	6	6	2	-		O
18.	Calculation and design of aerials and feeders	7	8	8	74	54	10	-	10	-	-	-	-	-	-	3	2	-		J
19.	Radio measurements	-	6	-	60	40	20	-	-	-	-	-	-	-	6	-	-	-		E
20.	Radio equipment production technology	7,8	7,8,9	9	206	122	56	14	14	-	-	-	-	-	-	5	6	4		C
21.	Automatic devices for radio installations	7	7	-	54	36	18	-	-	-	-	-	-	-	-	3	-	-		T
22.	Radio systems and their design	8,9	8	-	120	86	10	24	-	-	-	-	-	-	-	-	5	5		
23.	Tuning and power supplies of a radio equipment	-	8,9	-	72	24	48	-	-	-	-	-	-	-	-	-	3	3		
24.	Economics of radio industry, organization and planning of plant	9	9	9	100	86	-	-	14	-	-	-	-	-	-	-	3	5		W
25.	Safety precautions and fire-fighting	9	-	-	42	32	10	-	-	-	-	-	-	-	-	-	-	3		O
26.	Physical education and sport	-	1,2,3,4	-	136	-	-	136	-	2	2	2	2	-	-	-	-	-		R
27.	Pro-diploma courses	9	9	-	84	70	14	-	-	-	-	-	-	-	-	-	-	6		K
	Totals	38	52	7	4,350	2,294	772	140 1,020	124	36	36	32	29	34	30	25	24	26		

Theoretical instruction 138 wks. Practical instruction 29 wks. Diploma project 16 wks.
Exam sessions 29 wks. Industrial pract. wk. 22 wks. Vacations 46 wks.

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DISTRIBUTION OF ASPIRANTS BY SUBJECT, JANUARY, 1956

	Number of aspirants	Per cent.
Technical	9,358	31.9
Physics-mathematics	2,855	9.7
Agriculture and veterinary medicine	2,564	8.7
Philology	2,164	7.4
Medicine and pharmacy	2,164	7.4
History and philosophy	2,064	7.0
Economics	1,810	6.2
Biology	1,426	4.8
Chemistry	1,318	4.5
Geology-mineralogy	1,260	4.3
Pedagogy	1,037	3.5
Fine arts	430	1.5
Law	367	1.3
Geography	359	1.2
Architecture	186	0.6
Total	29,362	100
Women	9,102	31

DISTRIBUTION OF SCIENTIFIC RESEARCH AND POST-TERTIARY LEVEL WORKERS BY SUBJECT
1ST OCTOBER, 1955

	Numbers	Per cent.	Doktors	Kandidats
Technical	61,107	27.3	1,855	20,653
Medicine and pharmacy	25,326	11.3	2,775	12,436
Physics-Mathematics	20,077	9.0	825	5,364
Philology	17,743	7.9	248	4,962
Chemistry	16,435	7.4	626	4,639
History and philosophy	15,305	6.8	325	6,987
Agriculture and veterinary medicine	15,135	6.8	736	6,981
Pedagogy	11,478	5.1	74	1,923
Biology	11,009	4.9	946	5,544
Economics	8,247	3.7	203	3,762
Geology-mineralogy	5,653	2.5	480	2,262
Fine arts	4,000	1.8	81	617
Geography	3,381	1.5	144	1,347
Law	1,607	0.7	91	1,027
Architecture	876	0.4	31	376
Others	6,514	2.9	20	941
Totals	223,893	100	9,460	77,963

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Scientific Research and Work at Post-tertiary Level

TYPES OF RESEARCH ESTABLISHMENTS - 1ST JANUARY, 1956

	Number of establishments	Number of qualified scientific workers
Scientific research institutes	1,064	73,500
Branches and departments of scientific research institutes	146	3,800
Scientific stations	574	6,200
Laboratories	142	2,600
Observatories	38	700
Others	833	11,000
Totals	2,797	97,800

ORGANISATIONS CONTROLLING SCIENTIFIC RESEARCH ESTABLISHMENTS, 1ST JANUARY, 1956

	Scientific research institutes		Branches, departments of scientific research institutes		Scientific stations	
	Number of establishments	Number of qualified workers	Number of establishments	Number of qualified workers	Number of establishments	Number of qualified workers
Academy of Sciences, USSR	87	10,963	6	484	19	197
Academies of Sciences, Union Republics	222	7,126	7	87	33	273
Ministries	755	55,452	133	3,237	522	5,712
Totals	1,064	73,541	146	3,808	574	6,182

STATUS/QUALIFICATION/DISTRIBUTION OF SCIENTIFIC RESEARCH AND POST-TERTIARY LEVEL WORKERS

	Totals	Academy Science, USSR	Republic Academies Science	Other scientific establish-ments	Higher education establish-ments	Control organisa-tions
Doctors	9,640	1,317	484	1,727	5,547	385
(Professors)	7,589	753	375	1,169	5,070	222
(Senior scientific workers)	1,010	510	76	365	37	22
Kandidats	77,961	4,975	3,826	18,797	43,450	6,913
Professors)	503	18	11	88	342	44
(Senior scientific workers)	12,928	1,996	1,477	8,279	647	529
(Dotsents)	25,018	154	245	1,054	22,500	1,065
(Junior scientific workers)	2,198	255	429	1,399	73	42
(Assistants)	2,045	10	3	54	1,791	187
(Not possessing scientific degree but having status)	17,490	529	854	7,551	7,531	1,025
Totals	223,893	13,009	7,993	75,509	119,059	8,323

Women: 36 per cent. of total; 6 per cent. of professors; 17 per cent. of dotsents; 30 per cent. of senior scientific workers; 52 per cent. of junior scientific workers.

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