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АНГЛИЙСКИЙ ЯЗЫК

ПРАКТИКУМ
по одноименному курсу для магистрантов, соискателей и аспирантов

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UNIT I. MY HIGHER DEGREE COURSE

1.1. Vocabulary

Postgraduate student – аспирант
Graduate student (Am) – аспирант
Undergraduate student – магистрант
Trainee probationer – стажер
Doctoral candidate – соискатель
Doctor of Philosophy – кандидат наук
Reader / Principal lecturer – доцент
Senior lecturer – доцент
Associate professor (Am) – доцент
Full professor (Am) – доцент
Supervisor / Adviser – руководитель
Assistant lecturer – ассистент, младший преподаватель
Instructor (Am) – ассистент, младший преподаватель
Master thesis – кандидатская диссертация
Academic / Teaching staff – преподавательский состав
Faculty (Am) – преподавательский состав
Lecturer / Senior instructor – старший преподаватель
Assistant professor (Am) – старший преподаватель
Professor – профессор
Full professor (Am) – профессор
Emeritus professor (Am) – почетный профессор
Vice rector / Chancellor / Prorector – проректор
Prorector for academic affairs – проректор по учебной работе
Prorector for research – проректор по научной работе
To prepare / Write a thesis – написать диссертацию
I'm planning to finish writing the thesis by the end of the next year.
To defend / prove / maintain a thesis – защитить диссертацию
If a thesis meets necessary requirements it will be proved at Academic Counsil.
To do smth with a high level of technical skill – делать что-либо профессионально
The research will be conducted with a high level of technical skill.
To employ most suitable techniques – использовать соответствующие методы
They employ most suitable techniques and procedures of investigation.

To take qualifying exams – сдавать кандидатские экзамены
Core subjects of the field – основные предметы данной области знаний
The postgraduate students will take qualifying exams in the core subjects.
To prepare research publications (articles and papers) – готовить научные публикации
Written reports – письменные доклады
Do you prepare research publications and written reports on the work carried out?
To prepare articles and papers on matters relevant to the investigation – готовить статьи и доклады по теме диссертации
To select a promising topic – выбрать перспективную тему
The supervisor helps them to select a promising topic.
To meet smb. at regular intervals – регулярно встречаться с кем-либо
To discuss the progress of work – обсуждать ход работы
You'll meet your supervisor at regular intervals to discuss the progress of your work.
To produce significant results – дать значительные результаты
Will you produce significant results in the appointed period of time?
To review the major sections of the thesis – просматривать (читать) основные разделы диссертации
To make critical comments – делать критические замечания.
The supervisor will review the major sections of your thesis and make critical comments on each draft of the thesis.

ECONOMICS

I'm a post-graduate (undergraduate student, doctoral candidate) of the Sukhoi Gomel State Technical University. I don't only study but also work as a teacher (instructor, assistant, trainee) at the Economics and Humanities Department of our University. I have not so many working hours, but I get great experience. I combine practical work with a scientific research. My post graduate course will last three years during which time I have to carry out an investigation and prepare a thesis on it. My higher degree thesis should show that the research has been conducted with a high level of technical skill. I should employ the most suitable techniques. The procedures should be of a high academic standard. I hope my work (thesis) to be an original contribution to knowledge and the results of it should be capable of practical application.

Now I attend seminars and colloquiums. At the end of the year I'm going to take qualifying exams in the core subjects of my field, philosophy

and foreign language. My core subject is Economics and industrial management.

I'm doing research in the field of economics. It's a great science. No wonder that people are interested in weather, health and economics. People have been interested in economics since earliest times. Economics is the social science concerned with the analysis of commercial activities and with how goods and services are produced. Every nation must organize the production and distribution of goods and services wanted by its citizens. To do this a nation's economic system must solve four basic problems:

1. What shall be produced?
2. How shall goods and services be produced?
3. Who shall get goods and services?
4. How fast shall the economy grow?

I'm greatly interested in economics and I got interested in it when a student. Economists use scientific methods to study economic problems. Even a mathematical statement was worked out by Leon Wolras to show how each part ot economy is related to all the other parts.

Research today generally centers on understanding the relationship between various parts of the economy. Economists base their findings on observation, on case studies. Many economists emphasise the use of mathematics and statistics in testing economic theories. Their method is known as econometrics. The methods of economic analysis have been applied to many problems such as education, family life, the organization of government. This method may be useful when resources available to achieve an objective are limited.

My work is primarily of practical importance. I work in close cooperation with my colleagues. We also closely collaborate with the researchers of other universities of our Republic and some universities of the CIS.

I work under the supervision of my adviser, Ph.D. associate professor Petrov P.P. I meet him at regular intervals to discuss the progress of my work and the obtained data and get his advice in solving problems. I consult him when I encounter difficulties in my research.

He helped me to select a promising topic likely to produce significant results in the appointed period of time. I hope he will review the major sections of my thesis when it is being written. Now I'm through with the introduction and some theoretical parts of my thesis.

It's with my supervisor's assistance that I prepare articles and papers. I prepare research publications and written reports on the work carried out

and publish my articles in special magazines and in the «Herald of the Sukhoi Technical University».

I take part in various scientific conferences and willingly participate in scientific discussions and debates. I'm planning to finish writing my thesis by the end of the next year and prove it in the Scientific Council of… I hope to get the scientific degree of a Ph.D. in the field of…

ENGINEERING

Let me introduce myself. My name is *Alex Mironov*. Last year I graduated *(with honours)* from the Gomel State Technical University named after Pavel Sukhoi. My major is Engineering. I specialized in *industrial electronics*. My university academic program included a great number of humanities, exact sciences and special courses. When studying at the University I did my best to acquire fundamental knowledge of my speciality and to become a highly professional engineer. Higher education has the task to ensure the training of specialists who should combine fundamental knowledge with high professional skills. I am sure that to have high professional skills is very important for all graduates. The course of study at the University is concluded by the presentation of a diploma project, which is normally a result of independent research.

Being a student I was really interested in doing research. That is why I made reports at the annual students' scientific conferences and was engaged in gathering and analyzing experimental data for my future research work.

After the graduation I chose an academic career. I think that to contribute to the improvement of training engineers is a very challenging and responsible job. I work at *the Industrial Electronics* Department and enjoy every minute of my work. Our department is headed by the associate professor *Bronislav Verigo*. The department I work at is *(not)* very large. It's *25* staff members deliver lectures, give lab works and practical classes in a number of special subjects for the full- and part-time students. The courses offered by our department are: *microprocessors*, *electronic circuits*, *semiconductor materials and others*. The main scientific trend of our department is *the development of methods and means of automation of production processes*. The results of scientific research are given in the monographs, published works and author certificates for inventions. The latest developments are regularly presented in the reports made at the University, national and international scientific gatherings.

I combine academic activity with doing research. Everybody knows that teaching demands life-long education. I believe that to be a highly qualified teacher is impossible without doing research and having a higher degree. After the graduation I applied for a post-graduate / *master* course, passed my entrance exams successfully and was admitted. The post-graduate / *master* course is intended to prepare persons with higher education for research and faculty posts in institutions. My post-graduate / *master* course will last three years / *one year*. It is necessary for my further professional development. Now I am a post-graduate *master / research* student and undertake a program of study and research under the supervision of a staff member who holds a senior doctorate. S/he assists me in many ways. I meet my scientific adviser at regular intervals to discuss the progress of my work. I often consult him / *her* when I encounter difficulties in my research. The theme of my research selected with my supervisor's help is very promising and may produce significant results in the appointed period of time.

While pursuing my programme I attend lectures, practical classes and seminars to prepare for qualifying exams in the core subjects of my field, philosophy and English. The knowledge of English will certainly help me in my scientific research since I need worldwide experience in my special field of science.

I am at the very beginning of my investigation. I have been working at the chosen problem for *two years*. The main stages of my investigation are: problem formulation, collecting, assessment and analyzing data and relevant information. The techniques I use in my research are as follows: comparison, analysis, synthesis, analogy and simulation. My higher degree thesis should demonstrate that the research has been conducted with a high level of technical skill and that I have employed the most suitable procedures and techniques. Being rather an experimentator than a theoretician I make use *of various measuring and registering devices*. The facilities I need for doing my research include PC with a data base analyzing system.

I regularly prepare research publications on matters relevant to my investigation and written reports on the work carried out. I also take part in various scientific conferences and do my best to submit the major sections of my thesis in time. I hope the thesis will meet necessary requirements and will be accepted by the Academic Council which will take the decision to award me the higher degree.

Questions

1. What are you?
2. Where do you work?
3. What is your special subject?
4. What field of knowledge are you doing research in?
5. Have you been working at the problem long?
6. Are you a theoretician or experimentalist?
7. Who do you collaborate with?
8. Who is the team you work in headed by?
9. Who is your personal supervisor?
10. When do you consult your scientific adviser?
11. What are the methods used in your work?
12. What do you investigate?
13. How many scientific papers have you published?
14. Do you take part in the work of scientific conferences?
15. Where and when are you going to get your higher degree?

NOTES

staff member: one of those working in an establishment, institution, organization;

to hold a senior doctorate: to hold a scientific degree which corresponds to the degree of Doctor of Science. NB! *doctorate* corresponds to the degree of Candidate of Science;

technical skill: practical knowledge and ability to conduct an investigation;

the most suitable techniques: methods which are best for some particular investigation;

procedure: scientifically tested order of doing things while carrying out an experiment;

to conduct research: to investigate something systematically in order to discover and interpret new knowledge;

written report: a written account of one's achievements;

to prepare a paper: to prepare a scientific contribution to be read to a learned society or to be published;

1.2. Exercises

1.2.1. What parts of speech are the words given in brackets?

VERBS

undertake
hold
carry out
prepare (preparation)
conduct
employ (employment)
pursue (pursuit)
assist (assistance)
discuss (discussion)
select (selection)
produce (production)
review
appoint
complete (completion)
submit
accept
award (award)

NOUNS

supervision (supervisor, supervise)
staff
course
investigation (investigate)
skill (skilful)
technique
procedure
contribution (contribute)
qualification
core
subject
advice (advise)
comment (comment)
draft
requirement
paper

ADJECTIVES

suitable (suit)
academic
applied (apply, application)
theoretical (theory)
regular
promising (promise)
significant
major
critical
technical

1.2.2. For each of the vocabulary items listed above give the phrases from the text. Group them according to the following patterns and give their Russian equivalents:

V+N – prepare a thesis
N+N – postgraduate student
N+prp+N – a contribution to knowledge
Adj+N – theoretical research

Ved+N – written report
Ving+N – promising topic

1.2.3. Give English equivalents of the following phrases with reference to the text:

аспирантура; написать диссертацию; делать что-либо профессионально; проводить исследование; использовать соответствующие методы; научные методики; личный вклад в науку; сдавать кандидатские экзамены; основные предметы (дисциплины) данной области знаний; готовить научные публикации; готовить письменные отчеты; регулярно встречаться с кем-либо; обсуждать ход работы; дать значительные результаты; просматривать (читать) основные разделы диссертации; делать краткие замечания; готовить доклады и статьи по теме диссертации; выбрать перспективную тему.

1.2.4. Fill in the blanks:

A postgraduate student undertakes a programme of ... and research under the supervision of a … member who holds a ... doctorate. The ... course lasts three years during which ... the student has to carry out an … and prepare a thesis on it. The ... degree thesis should show that the ... has been conducted with a high ... of technical skill. The investigation should be an ... contribution to knowledge. The supervisor ... his student in many ways. The student meets him to ... the progress of his work and ... his advice in solving … . With his help the student ... a promising topic likely to … significant results. The supervisor reviews the … sections of the thesis and makes critical ... on each draft of it before the … thesis is submitted. If the thesis ... the necessary requirements it is … by the Academic Council which takes the ... to award the student the… degree.

1.2.5. Which of the following sentences has the same meaning as the sentence taken from the text:

1. You will undertake a programme of study and research.

a) You will study and carry out research according to a programme.

b) You will have to carry out research.

c) You will pursue your studies in accordance with a programme.

2. The investigation has been conducted with a high level of technical skill.

a) The researcher should conduct the investigation with a high level of technical skill.

b) The investigation must be carried out with appropriate skill.

c) The investigation has been done very skillfully.

3. While pursuing your programme you will attend seminars and colloquiums.

a) After carrying out his programme the postgraduate student will attend seminars and colloquiums.

b) Before the postgraduate course the student will have to attend seminars and colloquiums.

c) While carrying out your programme you will attend seminars and colloquiums.

4. You will get your supervisor's advice in solving problems.

a) Your supervisor will give you advice on how to solve problems.

b) Your supervisor may advise you on how to solve problems.

c) You will take his advice on how to solve problems.

1.2.6. Rephrase the sentences with reference to the text:

A higher degree thesis should provide a substantial contribution to learning.

Your research may involve further development of some theory, or it may deal with practical application of some experimental results.

You are to take exams in the major subjects of your field. These exams should prove that you have deep and wide knowledge gained through reading and study.

The postgraduate student is to submit a yearly report outlining the progress of his work to date.

1.2.7. Which sentence best illustrates the word in italics as it is used in the text:

1. ... you prepare *papers* on matters relevant to your investigation

a) The plan looks O.K. on paper.

b) Have you read today's papers?

c) He read a paper at the seminar.

d) The biology paper was difficult.

2. ... the investigation has been *conducted* with a high level of technical skill

a) The visitors were conducted over the institute.

b) He has conducted a lot of experiments.

c) Who is conducting the orchestra?

d) Plastic doesn't conduct electricity.

3. He will also make *critical* comments on each draft of the thesis.

a) The patient's condition is critical.

b) His critical articles are always stimulating to read.

c) At colloquiums you expect critical remarks on your report.

d) Try not to be so critical of people.

1.2.8. Transform the following phrases:

a) +N – N+prp+N

PATTERN: to prepare a thesis – preparation of a thesis

to employ suitable techniques; to prepare research publications; to pursue a programme; to attend seminars; to assist students; to select a topic; to review the major sections; to award a degree;

b) +N – N+prp+N

PATTERN: a research programme – a programme of research

a staff member; a thesis draft; a study programme;

c) dj+N – N+which/that+Adj

PATTERN: suitable techniques – techniques that are suitable

theoretical research; regular interval; promising topic; significant results; critical comments; relevant matters; necessary requirements;

d) art. II+N – N+which/that+V (pass)

PATTERN: prepared publications – the publications which are prepared (by ...)

written report; appointed period of time; completed thesis; employed techniques; selected topic

1.2.9. Give the sentence that corresponds to each of the following phrases:

PATTERN: the student's preparation of a thesis – The student (has) prepared a thesis.

1) the researcher's employment of up-to-date techniques
2) the student's pursuit of a programme
3) the supervisor's assistance to the student
4) the researcher's selection of a topic
5) the supervisor's review of the thesis draft
6) the scientist's contribution to knowledge
7) the researcher's investigation of the phenomenon
8) the student's preparation of research publications

1.2.10. Give the corresponding Adj+N phrases with reference to the vocabulary:

1) research which deals with developing a theory
2) results of significance
3) comments of criticism
4) matters of relevance
5) contribution showing originality
6) topic which is likely to give good results
7) research which can be put to practical use

1.2.11. See if you can recall the prepositions:

1) a programme … study and research
2) a contribution … knowledge
3) progress … the work
4) a thesis ... an investigation
5) period … time
6) study and research … the supervision
7) examination ... a core subject
8) a report ... work
9) comments ... a draft of the thesis

1.2.12. Complete the following definitions using N+N phrases:

1) A student who undertakes a postgraduate course of study and research is ...

2) An institute where research in some areas of knowledge is conducted is …

3) A course which is taken by a postgraduate student is ...
4) A thesis which is submitted for the award of a higher degree is ...
5) The most important subjects in some field of science are ...
6) Publications that are relevant to one's research are ...
7) A meeting for discussing some problem at a laboratory is ...

1.2.13. Give words corresponding to the following definitions:

1) a body of persons employed in an institute, laboratory, etc.
2) an ability to do something expertly and well
3) a method of doing something expertly
4) the regular order of doing things
5) a careful examination of a subject in order to find out new facts about it, or a new way of describing, understanding, using it

6) an account or description of events, experiences, achievements
7) a scientific contribution to be read to a learned society
8) a complete piece of scientific writing published in a periodical

1.2.14. Complete each of the following sentences with what you remember from the text:

1) Postgraduates and researchers undertake ...
2) A higher degree thesis should show …
3) While pursuing your programme you will ...
4) Your research may be ...
5) The supervisor will help you to select ...
6) He will also make critical comments ...
7) With his assistance you prepare ...
8) Your thesis should meet ...
9) You will meet your supervisor at regular intervals to ...
10) You submit your thesis to ...

1.2.15. Rephrase the following:

1) You will do your research under the supervision of a staff member who holds a senior doctorate.

2) Your thesis should show that you have employed the most suitable techniques and the procedures are of a high academic standard.

3) ... you will take qualifying exams in the core subjects of your field.

4) He will help you to select a promising topic likely to produce significant results in the appointed period of time.

5) ... you prepare articles and papers on matters relevant to your investigation.

1.2.16. Answer the following questions:

1) What is a research student supposed to do during his postgraduate course?
2) What requirements should a higher degree thesis meet?
3) What does supervision involve?
4) How do postgraduates report the progress of their work?
5) What should the examinations taken by postgraduates prove?
6) What body has the authority to award a candidate's degree in this country?

1.3. Guided conversation. Step I.

1.3.1. How do you express your opinion about something? Here are some ways in which you might do so:

I think / believe / feel that ...
In my opinion ...
In my view ...

Answer the following questions giving your opinion:

1) What do you think about the problem of air pollution? (important)
2) What do you think about the theories pf the origin of life? (stimulating)
3) What do you think about the theory of relativity? (fundamental)
4) What do you think about the problem of the origin of the Moon? (challenging)
5) What is your opinion about the theories in your field?
6) What is your opinion about the problems in your field?
7) What is your opinion about the experimental techniques in your field?
8) What is your opinion about the procedures you are to use in your work?

1.3.2. If during a talk or a discussion you want to illustrate what you say you might use:

for example
for instance
namely

a) Study the following pattern sentences and learn to distinguish between «for example» and «namely»:

There are *quite a few problems* which are referred to as global: *for example,* food, population, energy, etc.

We discussed *two* problems: *namely,* food and population.

b) Complete each of the following with «for example» or «namely»:

1) There are several techniques which I use in my experiments: ...
2) There are two foreign languages that I'd like to master: ...
3) My supervisor assists me in many ways: ...
4) I have to take three exams: ...

1.3.3. Answer the following questions giving your opinion, examples, details. You may use the following:

In my view ...
In my opinion ...
I think that ...
I suppose that ...
to give you an example ...
for example ...
that is to say ...

1) What in your view is the purpose of a postgraduate course?

2) At the end of the postgraduate course many young people become self-reliant scientists, don't they?

3) I suppose there are some significant developments in your branch of science, what are they?

4) Would you agree that the language of mathematics is universal, and no science can develop fruitfully without using mathematics?

5) I suppose your thesis is developing successfully?

1.3.4. (A) Complete the following sentences:

1. My field of research is ...
2. The problem I am studying concerns …

I	study …
	investigate …
	do research …
	carry out an investigation of …
	undertake a study of …

		the activity	
		the function	
		the nature	
	studying	the structure	
I am engaged in	investigating	the effects	of
	researching into	the action	
		the causes	
		the influence	
		the properties	

3. The main aim of my investigation / The chief purpose of my work / The primary objective of my research | is | to find out … / to discover … / to obtain … / to assess … / to demonstrate … / to show … / to test … / to check … / to verify …

4. The problem I am trying to solve / The problem I am studying | is | …

The investigation I am carrying out | is | interesting / fascinating / important / of practical importance / of fundamental value / involves certain difficulties / presents some difficulties

5. In my work I | turn for help to / turn for advice to / consult with / discuss things with | my supervisor / my colleagues / my fellow workers / co-workers / consult standard reference books

6. I | carry out / make / perform | experiments | to determine the parameters of / to examine facts about / questions concerning … / to measure the rate of / the amount of … / to obtain data on … / to test the validity of … / to confirm the idea / the theory / the hypothesis | that | to provide evidence for … / to reveal the causes of … / to find out whether …

7. I managed	to give to present to provide to obtain	good strong sufficient convincing interesting important promising reliable	evidence data	showing suggesting indicating which show(s) suggest(s) indicate(s)	that

8. This evidence These data	is seem(s) to be are	of	certain some great	theoretical importance practical interest experimental value

9. The techniques I use / apply are as follows: ...
10. The procedure I follow in my experiments is like this: …
11. The facilities I need for my work include: ...

(B) Restate the following questions:

PATTERN: What education did you get?

Could you tell me Would you tell us I'd like to know I wonder	what education you got?

1) What is your branch of science?
2) What is your field of research?
3) What are your scientific interests?
4) What activities does your programme of study and research include?
5) What are the basic requirements for a higher degree thesis?
6) How does your supervisor assist you?
7) What techniques do you use in carrying out your experiments?
8) How is your thesis developing?

(C) Answer the restated questions using «for example» and «namely» to give details.

(D) You are having a talk with your fellow-students. Ask them about their research and tell them about the research you are doing.

1.3.5. Prepare interviews with your fellow-students on the following topics. Use the key words in brackets to guide your conversation. You may introduce your questions using:

First of all I'd like to know ...
Then, I'm interested in ...
I also wonder ...
And finally, could you please tell me ...

1. A postgraduate programme of study and research:

(study, reading, seminar, colloquium, examination, investigation, publication, thesis).

2. A higher degree thesis:

(topic, draft, originality, application, submission, acceptance, defence, award, degree).

3. Research publications:

(article, paper, report, abstract, contribution, co-author, joint publication).

4. Research:

(theoretical background, investigation, skills, techniques, procedures, hypothesis, data, correlation, computation, facilities, equipment).

5. Supervision:

(assistance, advice, discussion, criticism, problem, review, comment, publication).

1.3.6. Present the following as a naturally connected sequence of sentences. Suggest a suitable headline for the text.

1) Then experiments are carried out to prove the hypothesis.
2) To start with, a problem is formulated.
3) And finally, if the hypothesis is confirmed, a theory is suggested to explain other phenomena.
4) After that the accepted hypothesis is either confirmed or rejected.
5) Next a hypothesis is put forward.

What are the possible stages of conducting research?

1.4. Guided conversation. Step II.

1.4.1. Opinion. Respond to the following. You may use:

I think
I suppose
I believe
in my view
if you want my opinion

1. One lover of statistics estimated the number of scholars that lived on earth from the days of Romulus till our time. He found out that 90 per cent of them are our contemporaries.

2. A century ago the number of research workers was in the thousands; today there are millions. It seems likely that in the third millenium every tenth inhabitant of the globe will be engaged in science.

3. Do you know how many scientific journals are published today? Fifty thousand! If their publication was spread out evenly you would be receiving a new journal every ten minutes.

1.4.2. Agreement, disagreement, comment. Respond to the following. You may use:

I'm afraid you are wrong
I can't agree with you
I'm of a different opinion
You are quite right
It's absolutely correct
I quite agree with you
Moreover
In addition
It should also be mentioned

1. High-speed electronic data machines are the researcher's dream.

2. It is believed that science is an attitude, not a set of facts.

3. Scientific research has meaning only if it is done to reveal something unknown or vague.

1.4.3. Explanation, comment. Respond to the following. You may use:

I mean to say
It seems to me
It means
That is to say
In other words

1. One must, obviously, reject the idea of knowing everything about all sciences: specialization has become inevitable.

2. When the natural sciences are highly developed the applied sciences – engineering, medicine, agronomy, etc., – are in advantageous conditions.

3. It is not easy to evaluate the work of a researcher in the sphere of natural sciences. It is much simpler to assess the work of an engineer.

1.4.4. Interpret the following. You may find the following phrases useful:

it is essential to note
it must be mentioned

1. A researcher is interested not only in the subject he is doing but in his science as a whole.

Vocabulary: to get pleasure from explaining any of one's problems; to give a clear and full answer to questions; to be of help with one's knowledge and experience; to get satisfaction from merely speaking of one's work; to see one's place in science; to know the history of one's science; to be enthusiastic about one's work; to enjoy teaching one's science to others; to devote most of one's time to science; to have other interests outside one's field; to keep abreast of the achievements in one's science and other related disciplines.

2. A sceptic may erroneously conclude that practitioners of natural science have managed to cope with their problems without the help of theoretical science.

Vocabulary: to advance along its own road; to use traditional techniques; many spheres of technology; to be perfected without the help of science; to develop at a faster rate; to put forward new ideas; to translate ideas into practice; to propose new methods; to facilitate the production; to find answers to practical questions; to move ideas and experiments from laboratories; to benefit from theory; applied sciences; practical utilization of a scientific discovery; to have influence on practical affairs; to have effect on the applied sciences.

1.4.5. Read the text:

How can one expect to keep abreast of the achievements in science? Various digests, abstracts and synopses, reviews and compendiums are a must. There are yearbooks in which highly qualified researchers offer reviews of developments in large domains of science over the past twelve months. Many young researchers content themselves with studying journals covering only the last five or ten years. A result of this is the appearance of articles making old «discoveries», so the researcher wastes his energy.

Answer the following questions:

1. What literature should a researcher follow to keep abreast of the new developments in his field?

How should a young researcher go about his reading?

Why is a knowledge of English so important for a scientist?

How is the knowledge of Russian spreading in the world?

2. Which scientific journals are there in your line?

In what way do you choose articles to read – by the name of the author, by the name of the scientific centre where the author does research, by the title of the article, by the abstract at the beginning of it, by scanning it?

How regularly do you turn to literature: once a week, once a month, when you encounter difficulties, when you feel you've come to a blind alley, when you are to prepare a review on the latest developments in your field?

3. How important is English for you: is it a means to keep abreast of new ideas; are you learning it only in order to be able to take your qualifying exam; are you learning it to be able to communicate with foreign visitors to your Institute, to translate articles of interest for your colleagues, to contribute articles to foreign journals, to read your papers at international scientific meetings; are you learning it to be able to read fiction, poetry, watch films?

1.5. Additional material

1.5.1. Dialogue

Q: What do you do after receiving your bachelor's degree?

A: With a bachelor's degree you can apply to a graduate school and start working towards a master's degree. If you have a bachelor's degree you can also go to a professional school.

Q: What is a professional school?

A: Law and medical school are considered professional schools. If you go to a medical school it's a four year program, basic program, and then you usually have internship. In the end you get a M.D., doctor of Medicine degree. Medical schools are run by the American Medical Association, A.M.A. and law schools by the American Bar Association, A.B.A. It's a three yeas program and you get a J.D., Juris Doctor degree.

Q: And if you go to a graduate school, how many years does it take to get a master's and a doctorate?

A: I think it depends on the program and every program is different. Usually a master's is a couple of years and a doctorate is another two or three years. Usually Ph.D. and master's (degree) program are in the same place and you simply continue. The master's degree is not very important, it's a step on the way to get a Ph.D. You simply stay on the same program

and continue. But you can change. You can get a master's degree in one place and then change schools and get a Ph.D. degree in another one.

Q: What do you know about honorary degrees?

A: I don't know much about that. But I do know that my college gives honorary degrees. For example at the graduation ceremony when I got my bachelor's degree they awarded some very accomplished elderly man a Doctor of letters degree. It's an honorary degree and it means that the institution recognizes that person.

Q: What is the most important division at an American university?

A: It's a department. But you don't belong to a department, you're a student and have a major. Your major is in one department and usually your advisor is also in that department. So the department requires certain courses. In order to major you have to do these certain courses. Perhaps a quarter or a half of your courses are in the direction of your major department.

Q: Could you name the positions which are occupied by the university teachers?

A: O.K. I'll start with the bottom. A private institution can hire anyone. The lowest rank is instructor. Actually he teaches anything they need. I think the assistant professor is the next highest. Usually when you hire an assistant professor that's someone who is likely to be on a tenure track.

That's a lower rank and it's assumed you eventually would achieve a higher rank. They do anything, they do whatever the department decides. An assistant professor usually has a master's degree. Now when there are so few university jobs they are usually people who have almost a Ph.D., people who are writing their dissertations or are close to a Ph.D. and it's assumed they will finish their Ph.D. They couldn't move up until you get your Ph.D. You really have to have it before you get an associate professor or full professor.

Q: What is a tenure position?

A: Each department has some tenure positions which are life-time positions. It's an academic protection. You can't fire that person. An associate professor who after a number of years has done his Ph.D. is considered for tenure. Say, there are four tenure positions and someone is retired and if you're considered qualified enough you get tenure. It is a very long and difficult process because the college or university is committing itself to you, to that person. And if you don't get tenure, and you're turned down, you usually quit and go to another university.

Q: It is important not only what position you have but also where you work?

A: That's right. Each organization, basically, runs its own show. A major university, Berkeley, for example has its own research organizations connected with the university. If you're associated with the university you may have an academic title or simply be a part of the research organization at Berkeley. I think in a lot of areas you're considered important and accomplished if you're a senior associate at Berkeley research institute. Because Berkeley is very important. Because Berkeley is a big name. Every field has its big names.

1.5.2. Text

Science is not a licensed profession, and to be counted as a scientist one need not be a Doctor of Philosophy ... But a scientist without a Ph.D. (or a medical degree) is like a lay brother in a Cistercian monastery. Generally he has to labor in the fields while others sing in the choir. If he goes into academic life, he can hope to become a professor only at the kind of college or university where faculty members are given neither time nor facilities for research … A young scientist with a bachelor's or a master's degree will probably have to spend his time working on problems, or prices of problems, that are assigned to him by other people and that are of more practical than scientific interest. Wherever he works, the prospects are slight that he will be given much autonomy and freedom. Having a Ph.D. or its equivalent – a medical degree plus post – graduate training in research – has become in fact, if not in law, a requirement for full citizen ship in the American scientific community.

To be successful as a scientist, it is important not only to have earned it at the right place. From the standpoint of rightness, American universities may be divided into three groups. The first is made up of those institutions to which the term «leading» may appropriately be applied. They include Chicago, Cal Tech, the University of California at Berkeley, Columbia, Harvard, Illinois, M.I.T. (Massachusetts Institute of Technology), Michigan, Princeton, Stanford, Wisconsin, Yale, and perhaps two or three others. These are the universities whose professors get the biggest research grants, publish most scientific papers, serve in the most important government committees, win most of the scientific prizes, and are most likely to be acknowledge as leaders in their fields ... Ranking just below these twelve are universities like Minnesota and Indiana and U.C.L.A. (University of California at Los Angelos), where scientists and scholars of interna-

tional renown are also to be found, but not in such dense clusters as at Harvard or Berkeley ... This is not to say that first – rate scientists are to be found only at first-rate universities – or that there are no second-rate people at Berkeley and M.I.T. But the brightest students, like the brightest professors, tend to be found at the leading universities.

Although possession of Ph.D. is supposed to signify that a scientist has learned his trade as a researcher, it is now very common for young scientists to continue in a quasi-student statue for a year or two after they get their doctorates ...

Older scientists as a rule are very happy to take on postdoctoral students. The postdoctoral, as he is sometimes called, is like an advanced graduate student in that he does research under the general direction of on older man. But he usually needs much less direction, and he can therefore be much more helpful to an experienced scientist who is eager to see his work pushed forward as rapidly as possible ... Postdoctoral trainees can have the further advantage of serving a professor as a middleman in his dealings with his graduate students. For young scientists themselves, a year two of postdoctoral study and research has many attractions. For some it's a chance to make up for what they didn't learn in graduate school. For scientists whose graduate training has been good, the chief advantage of doing postdoctoral research is that it gives them a couple of years in which they can put all their effort into research. A postdoctoral fellowship can also be a relatively tranquil interlude between the pressures and intellectual restrictions of life as a graduate student, and the competition and distractions of life as an assistant professor. Many scientists go abroad, not because the training they get will necessarily be better than they would get in the United States, but because a postdoctoral fellowship gives them a chance to travel – often for the firat time in their lives.

UNIT II. TEXTS

SCIENCE IN THE MODERN WORLD

Look at the questions below and then read the passage to find the answers. Read as quickly as you can and do not worry about anything except the answers you need to find.

1) How did modern science influence our life?
2) What did modern electronics lead to?
3) What examples of the acceleration of scientific ideas are given in the text?

4) What new disciplines have appeared as a result of the integration of different disciplines?

5) What disciplines does materials science integrate?

6) What possibilities has the integration of science opened?

The modern advancement of scientific thought has given the world a new conception of nature, of man, and of man in nature and society. It has enlarged our perspectives in time and space, altered the habits of our daily life, and given us new possibilities for speculation and wonder.

In our century the marriage of science and technology has become one of its general features. We can see how science and technology interact in electronics which led to radar, television, computers, modern biochemistry and biology. This interaction brought into our lives nuclear energy, jet engines, rockets and space exploration.

Another striking thing about science today is the acceleration in the development of scientific ideas. The quantum theory of Planck is succeeded by the theories of electrons and the electrical structure of matter, Einstein's theory of relativity is followed by theories of wave mechanics and by atom smashing, and the end is not yet.

One more feature of modern science should be mentioned – scientific research has gone far toward integrating different disciplines. Hence we have in recent decades seen the development of biophysics and biochemistry, microbiology and molecular biology, as well as geophysics, geochemistry, and paleobotany. Materials science is a typical example of this process in the domain of applied disciplines. It integrates metallurgy, ceramics, physics, solid state chemistry, electrical and electronic engineering, etc. This integration of sciences is likely to continue and will surely result in giving scientists new possibilities of solving the global problems facing mankind at present.

NOTES

a new conception of nature: a new way of understanding nature;

to enlarge perspectives: to give better possibilities to understand, to see, to judge;

to alter the habits of daily life: to change the conditions in which people live, i.e. their housing, clothing, food;

to give new possibilities for speculation and wonder: to enable (scientists) to advance new theories concerning nature and to feel amazed at what one comes to see, understand;

the marriage of science and technology: the close union between the two;

a general feature: a universal, common characteristic;

a striking thing: smth. that attention, of great interest;

to be succeeded by smth.: to be followed by smth.;

atom smashing: the splitting into parts of certain atoms to free their powerful forces;

to integrate different disciplines: to join two or more different branches of science so as to form a whole;

the domain of applied disciplines: the sphere of those branches of science which bring about new technology;

the problems facing mankind: the problems which need consideration and action by all the peoples of the world.

RESEARCH INSTITUTE

Look at the questions below and then read the passage to find the answers. Read as quickly as you can and do not worry about anything except the answers you need to find.

If you happen to receive foreign guests on the premises of your Institute, what are the words to address them? You may say the following:

It is a great honour for this institution to receive here scientists who have made such a great contribution to scientific knowledge in their field. I have no doubt that the interchange of ideas during your visit will prove to be profitable to us all.

You are at this Institute for the first time, so I would like to say a few words about it.

Our academic traditions could be traced back to 1956, when this Institute was founded with Academician N. at its head. Today, with more than 2000 research scientists, technicians and supporting personnel utilizing our laboratory and pilot plant facilities in search of scientific truth as well as new techniques, it is accurate to describe this Institution as a powerful organization.

The various objectives of the Institute include practical application of the Institute's scientific discoveries, research and development schemes, professional training. There are plans for further construction of scientific facilities. The Institute maintains a research library and publishes a journal.

Our Institute has made numerous discoveries, of which not a few are certainly important. The really noteworthy ones are well-known and have made their authors famous. Among our scientists are eminent men with

remarkable achievements to their name. They have won the Lenin and State Prizes for their work.

Our international links ensure active participation in the progress of science worldwide. This is a desirable situation for it is the universal language of science and technology that knows no international barriers and leads to the good, plentiful, and peaceful life.

NOTES

technician: a highly qualified specialist not doing research;

supporting personnel: staff members who assist researchers in their investigations;

to utilize laboratory facilities: to make good use of the laboratory equipment;

pilot plant facilities: machinery used at an experimental plant;

scientific facilities: all the equipment which is necessary for successful research;

a research and development scheme: a plan or project for research and its implementation;

a research library: a library housing scientific and technical literature in the field;

a noteworthy discovery: a discovery which deserves to be noted;

a well-known discovery: a discovery known to many;

a famous scientist: a scientist who is well-known;

an eminent scientist: a distinguished scientist;

remarkable achievements: important achievements;

the universal language of science and technology: the language which is understood by all scientists.

Questions to the text:

1. How do you address foreign guests if you happen to receive them at your institution?
2. Is it advisable to speak about academic traditions?
3. What do international scientific links ensure?

SCIENTIFIC GATHERINGS

Look at the questions below and then read the passage to find the answers. Read as quickly as you can and do not worry about anything except the answers you need to find.

1) How do scientists coordinate research?

2) When do scientists usually get an opportunity to share and exchange opinions and information?

3) What are the benefits of informal contacts?
4) What are the aims of laboratory and institute colloquiums?
5) What opportunities does a laboratory colloquium provide?

Scientific gatherings play an important part in coordinating research. National and international conferences and symposia in all fields of science and the humanities are held regularly all over the world. Plenary sessions and section meetings, seminars and workshops give scientists an opportunity to share and exchange opinions and information, to verify their scientific ideas, and to advocate their views. The participants present their papers and listen to papers and reports read by others on the latest developments and the state of the art in their field. They can take part in the discussions that follow and express their point of view.

No less important for the participants are informal contacts with their colleagues from other research centres, when a scientist can unhurriedly discuss a given problem with an expert in his field, argue with his scientific opponent, find out the details of some experimental procedure. The best opportunity for personal contacts is provided by social events.

Another type of a scientific meeting is the laboratory or institute colloquium where members of the staff and guest speakers make reviews of the developments in the field and report the progress of their research. Their successes and failures are thoroughly discussed. The speakers expect criticism or approval, advice and help. The colloquium gives an opportunity to evaluate the place and importance of one's effort in science, it improves the capacity to criticize one's own work, admit error and respect the point of view of others. It provides a personal exchange of views which is essential for any science student.

NOTES

to hold a conference: to hold a meeting for interchanging views;

symposium: a conference at which a particular topic is discussed by various speakers;

seminar: a discussion group on any particular subject;

workshop: a seminar emphasizing exchange of ideas and practical methods;

colloquium: a meeting for discussion;

event: an item in a programme of a scientific gathering; a scientific programme includes such events as plenary sessions, section meetings, seminars, workshops, round-table talks, etc.;

a social programme includes such events as dinners, receptions, excursions, tours, etc.;

the state of the art: the level or position at a given time, especially at present, of generally accepted and available knowledge, technical achievement in a particular field;

the humanities: the branches of learning concerned with literature, history, philosophy, etc.

PROTECTION OF THE ENVIRONMENT

Look at the questions below and then read the passage to find the answers. Read as quickly as you can and do not worry about anything except the answers you need to find.

1) What problems have been recognized as global?

2) Are these global problems connected with environmental protection?

3) Does the increasing population make new demands on the environment?

4) What possibilities did technology give people?

5) What happened to air, watercourses and natural resources as a result of industrialization?

6) Why is it necessary to stop environmental damage?

7) What does environmental protection mean?

Over the last decades, a whole set of problems has been recognized as global: the environment, energy, resources, food, population, and last but not least the arms race. One can easily see that environmental protection is closely connected with all of the above mentioned problems. It really means steps to improve people's quality of life.

People have always exploited the resources of nature. As time went on an increasing population with greater requirements made new demands on the resources of the Earth. Following industrialization changes occurred in the environment at a greater rate than ever before. With the aid of technology people found new ways to exploit the forces of nature and command its resources. In the industrial countries people's material conditions were improved, but, at the same time, the forces which they had harnessed began to affect the environment. Watercourses were damaged, air was polluted. and natural resources were destroyed.

Today, we know more than ever before about the forces that affect the environment. This increases our responsibility for controlling these forces in such a way that we can achieve continual material progress at the same time as we maintain environmental values. We must stop environmental damage in different areas. Otherwise it will threaten continual progress and the improvement of our standards of living.

Once mankind was able to see the Earth from space, it began to be thought of as a whole, as a large common home for four and a half thousand million people. Environmental protection is protection of our Earth itself. This is a common cause of all nations, irrespective of the differences in their social system. And all scientific and technological achievements must be usel to protect the land, water and air, which means man's life, too. The global problem of environmental protection can only be solved by joint national and international efforts.

NOTES

to protect the environment: to preserve it by keeping it safe from danger, damage, change or loss;

to recognize a problem as global: to acknowledge that the problem affects the whole world and all peoples;

to improve people's quality of life: to achieve a high standard of living;

to command the resources of nature: to have the resources of nature at one's service, to be able to use them;

to achieve continual material progress: to provide all people with more material comforts;

to maintain environmental values: to keep the environment safe, healthy, in good condition;

to make new demands on the resources of the Earth: to exploit them more and more extensively;

to harness forces: to get control over them;

to pollute air, water, soil: to make them dangerously impure or unhealthy for use;

last but not least: coming at the end, but not least in importance;

irrespective of the differences in their social systems: not taking into account, not paying consideration to the differences in their social systems.

UNIT III. SUPPLEMENT TO UNIT II (PROTECTION OF THE ENVIRONMENT)

RECYCLING

The term «recycling» can imply various methods of reprocessing secondary materials and reusing all sorts of products: household, waste packaging materials, even industrial waste. Either the government or local trade associations may organize such schemes. The aim, however, is one and the same – to create a survivable society. In Japan recycling is no whim or fad, but generally accepted part of everyday life.

A poll in 1994 showed that more than 82 % of housewives living in the capital agreed that some nature conservation measures should be taken now, i. e. before, it is too late, which demonstrates people's real concern at an impending crisis. However, as to what action to take 60 % of those asked agreed to cooperate only «if this does not call for financial expenditure» and 65 % said they would cooperate provided «this would not cause them extra inconvenience». These figures could by no means be called encouraging but they do shed some light on one of the reasons hindering the introduction of a recycling programme, namely lack of information.

Information is necessary for people to become aware of the urgency of establishing a community capable of reprocessing its waste. To find out what needs to be done and what challenges the community faces, more information is required. Even if numerous groups of residents are organized to collect empty cans, tins or milk cartoons, this may prove very ineffective if they act on their own. To pool the efforts of individuals and local bodies, it is necessary to provide an information network. A veritable «recycling community» will not come into being unless the efforts of people, businesses and government are coordinated.

WASTE AS A RAW MATERIAL SOURCE

There is a general rule which states that the amount of a country's waste is proportional to its gross product, implying that a larger amount of rubbish is proof of a higher standard of living. The world wide drive for saving resources calls for new ways to be found of curbing the rate at which the amount of waste increases. At present the average Japanese citizen produces about 920 g of waste per day, i. e. more than 330 kg a year. Local recycling programs will be of little significance, if the collected waste materials are not removed. The bulk of waste is therefore burnt and the resultant debris used for infill. But as fewer sites need filling the cost of reprocessing waste increases and the problem becomes more acute. The only solution is to cut the amount of rubbish produced whilst increasing the proportion which can be recycled. This can only be achieved by implicating every member of society – a task for government institutions, jobs schools and residents groups. New manufacturing techniques are needed which will permit the waste to be re-used. In some districts it has been possible to cut rents as a reward for collecting waste materials. There have also been experiments to use untreated waste for making organic fertilizers and of incinerating rubbish to power the air-conditioning systems in public buildings.

The individual consumer must have a way of life that is based on an awareness of the need to recycle. The modest efforts of individuals will, on a national scale, produce a massive combined force. And yet it won't really matter how much less rubbish is produced by the individual because, as long as manufacturers pursue a policy of mass production and bulk sales of consumer goods the role of recycling will be insignificant. For recycling to take root as a social system, individuals, employers and government must recognize the importance of conserving the environment of our planet Earth.

THE PROBLEM OF THE ENVIRONMENT

The last three decades in the world's development have been characterized by the increasingly pressing nature of global problems that are of concern to the whole of mankind. The accelerated growth of the productive forces, the increasing physical and economic internationalization of the modem world combined with the global scale of world political processes have generated a whole set of organically intertwined global factors which are increasingly affecting the shaping of mankind's future.

A place of prominence among these global problems belongs to preservation of the natural environment on our planet and ensuring the rational use of its resources, which has for the first time in history come to be an objective reality.

Scientific and technological progress has equipped mankind with a previously unheard-of powerful means of harnessing and utilizing the forces of nature. The increasing scale of society's impact on the environment has, however, created a danger of polluting and destroying it.

The present ecological conflict threatens to deplete the non-renewable resources of nature and to pollute the biosphere. This is why the further development of the productive forces will make it increasingly imperative to work out special measures to reduce the rapid build-up of the pressure on the environment on the part of economic system.

The global industrialization of economic activity, the growing population of the globe, the unprecedented concentration of the means of production and people in the major cities, etc. carry the threat of increasing pressure on the environment and on the totality of the natural resources. The resulting ecological conflict is now becoming a recognized factor in the economic and social development of society. Its consequences are literally being felt in all the links and levels of national economies.

BUSINESS CIRCLES JOIN IN

Nowadays the greatest obstacle to industrial recycling is the excess of expenditure over income. In addition to certain obligatory recycling, an economic system must be provided which would make it financially advantageous to re-use materials. Industries are gradually introducing methods of evaluating «total use» of an article. This involves the manufacturer assessing the overall impact of his product on the environment, taking all factors into account from the selection of raw materials to the moment when all consumer value has been exhausted.

Industry has also manifested an interest in the call made by the University of the United Nations Organization for «zero emission», i.e. total elimination of the discharge of noxious substances during the manufacturing process. A new law came into force in the spring of 1997 requiring manufacturers and retailers to ensure that packaging materials are recyclable. Other measures being examined by the government are a system for resale of the rights to emit noxious substances and the introduction of a tax on the burning of oil, coal, natural gas and other fuels which produce carbon dioxide during combustion.

Looking at basics, it is easy to see that the whole of our eco-system functions on the principle of constant recycling. Sea water evaporates to form clouds which fall to earth in the form of rain. Grass and trees convert carbon dioxides, taken in from air and water, into the oxygen so essential to animal life. Plants are a vital link in the food chain, supporting animal life and contributing to the constant enrichment of the soil. However, the earth's recycling system is ruined by petroleum hydrocarbons and other pollutants, which harm the environment and which do not revert to soil. In other words it is extremely important that all efforts be directed at restoring the natural balance of the planet's ecological system.

THE WORLD CAN ONLY SAVE ITSELF BY POOLING EFFORTS

In 1997, a document was adopted in the Japanese city of Kyoto, which came to be known as the Kyoto Protocol. It reflected the desire of states, aware of the global threat of climate warming, to reduce the amount of greenhouse gases in the atmosphere. The Protocol sets countries individual emission targets.

By now the Kyoto Protocol has been signed by more than 80 states (all developed countries and nearly all CIS countries) while nearly 40 have ratified it.

Under the protocol, developed countries and transitional economies are to reduce greenhouse emissions at least 5 percent by 2008-2012, to return to the 1990 level, assumed as basic. The cuts are not equal. Say, the United States, Japan, and EU member states must cut back emissions 7 percent, 6 percent, and 8 percent below the 1990 level. Russia's commitments are relatively mild: It does not have to reduce emissions, but during five years (from 2008 to 2012) it has no right to exceed their current level. Within the protocol framework, Russia has to monitor and control emissions and emission targets as well as regulate emission targets. To this end, a national emission control system is to be put in place and a special registration center is to be set up.

The Kyoto Protocol is the first international document to use a market mechanism in addressing global environmental problems. Its international cooperation tools are based on the premise that climatic effects do not depend on the place of greenhouse gas emission while greenhouse gases in existing concentrations are not harmful to human health. These are known as Kyoto flexibility mechanisms.

In Russia, up to 98 percent of all emissions of the main greenhouse gas, CO, result from the burning of fossil fuel coal, natural gas, and oil products. This means that the problem of reducing emissions is a problem of energy efficiency and energy saving. Russia's technological potential for energy efficiency and energy saving has been tapped only fractionally whereas EU countries or Japan have virtually exhausted theirs. So it is far cheaper to implement a particular project and reduce emissions in Russia than in the majority of developed countries.

KINDS OF POLLUTION

There are several kinds of environmental pollution. They include air pollution, water pollution, soil pollution, and pollution caused by solid wastes, noise, and radiation.

All parts of the environment are closely related to one another. The study of the relationships among living things, and between living things and other parts of the environment, is called ecology. Because of the close relationships, a kind of pollution that chiefly harms one part of the environment may also affect others. For example, air pollution harms the air. But rain washes pollutants out of the air and deposits them on the land and in bodies of water. Wind, on the other hand, blows pollutants off the land and put them into the air.

Air pollution turns clear, odorless air into hazy, smelly air that harms health, kills plants, and damages property. People cause air pollution both

outdoors and indoors. Outdoor air pollution results from pouring hundreds of millions of tons of gases and particulates (tiny particles of liquid or solid matter) into the atmosphere each year. Indoor air pollution results from many of the same substances found outdoors. But indoor pollutants can present a more serious problem because they tend to build up in a small area from which they cannot easily escape. Cigarette smoke is a familiar indoor air pollutant.

Most air pollution results from combustion (burning) processes. The burning of gasoline to power motor vehicles and the burning of coal to heat buildings and help manufacture products are examples of such processes. The pollutants range from small amounts of colorless poison gas to clouds of thick black smoke.

Weather conditions can help reduce the amount of pollutants in outdoor air. Wind scatters pollutants, and rain and snow wash them into the ground. But in many areas, pollutants are put into the air faster than weather conditions can dispose of them. In crowded cities, for example, thousands of automobiles, factories, and furnaces may add tons of pollutants to a small area of the atmosphere each day.

One serious result of air pollution is its harmful effect on human health. In cities throughout the world, long periods of heavy air pollution have caused illness and death rates to increase dramatically.

ENERGY FOR THE FUTURE

During recent generations, the world depended mostly on hydroelectric power. Governments built dams across rivers, forming large lakes and putting thousands of acres of land under water. More and more people object to hydroelectric power because it seriously changes the balance of nature.

Thermonuclear power, or nuclear power, comes from the splitting of atoms. It is a widely used and inexpensive form of energy. However, it is possibly the most dangerous because there are health risks from radiation.

Coal, one type of fossil fuel, is one of the dirtiest kinds of energy used. Other fossil fuels that come from the earth are petroleum products: gasoline, which is used for most vehicles, and natural gas, which is used for some vehicles, but mostly for heating and cooking.

Alcohol, quite commonly used as fuel in Brazil, comes from one of Brazil's main crops, sugar cane, which is easily processed into alcohol. Methane gas, another source of fuel, comes from garbage, but it is not widely used. Geothermal energy provides most of heat and hot water in Iceland. Other sources of energy include the wind and the sun. In many

parts of the world the sun fulfills many energy needs. Solar panels heated by the sun produce electricity. Solar energy already provides many homes with heat and hot water.

What about future sources of energy? NASA proposed a plan to use solar-powered satellites to capture the power of the sun in space, where the sun shines 24 hours a day, 365 days a year. The plan would provide low-cost, nonpolluting energy for the entire world. An additional energy source to be developed is fusion energy, the process that powers the sun and the stars. Nuclear fusion, or fusion, represents an unlimited source of energy. Although these sources of energy seem easily available, their high cost is a problem. They are expensive to develop. As a result, they are not as widely used as cheaper forms of fuel.

If the world population increases as expected, resources for those kinds of energy we use today may be insufficient. We will have to look closer at different energy sources, such as fusion and solar power.

POLLUTION BY INDUSTRY

Pollution by industry is of several kinds, pollution of the air by harmful or unpleasant gases, and pollution of water, whether salt or fresh, and whether by land-based industry or by ships, pollution of the land, whether by the products of industry or by dereliction. These three: pollution of air, water and land, are perhaps the types of pollution most commonly associated with industry.

Pollution is today out of all proportion a more serious problem that it was in the nineteenth century. There are three fundamental reasons: scale of operation, complexity of the processes involved, and pace of change.

National boundaries rarely look more out of date than in the context of atmospheric pollution. The Swedes complain convincingly that their atmosphere is polluted by both the Norwegians and the Germans. The only answer at present is international agreement on control at source.

Water pollution illustrates the linked factors of complexity of industrial process and rate of technological change.

The field of marine pollution presents an even more worrying example. People think of the oceans as limitless, and assume that what lives in it is somehow inexhaustible. The truth is, marine biologists tell us, that some 90 per cent of that richness is concentrated in something like 1 per cent of ocean areas those nearest the coast. The Mediterranean coastal strip, once so rich in marine life, is already dying. A similar situation exists in the Pacific and Atlantic Oceans and their seas.

According to some estimates, about 6 million tons of oil are dumped into the world oceans, mostly as the result of the cleaning of oil tankers. Thus the pollution of the world ocean has become a global problem.

The only really safe solution to the problem of oil pollution is not to ship oil on or under the sea.

The right «long-term», ecological answer is, of course recycling of waste products – liquid, solid and gaseous – to create new products or useful energy. What is needed is a fiscal policy, which will make it worthwhile for industry to search out every opportunity for recycling.

PRESSING PROBLEMS

Atmospheric pollution raises problems of several types. First, there are local problems due to the production of smoke and offensive gases by factories. Secondly, there are regional problems created by industrial agglomerations which may spread title same harmful effects over whole areas. Thirdly, there are some types of pollution, such as those arising from nuclear explosives, which cover a considerable portion of the globe. And lastly, there appeared one more type of pollution which is threatening the globe as a whole.

Recent scientific research suggests that the protective layer of ozone around our planet is under severe attack. Alarm bells were sounded in 1982 when researchers in the Antarctic first identified a yawning hole over the Antarctic where the ozone layer is thinnest. This was the first sign of a hole. Five years later it was reported that the hole had grown to an area the size of the United States.

The appearance of the Antarctic hole has intensified the search for a cause. Strong evidence now suggests that it is the growing industrial use of chlorine compounds called chlorofluorocarbons (CFCs) which is responsible.

According to measurements recorded by the US Environmental Protection Agency one chlorine atom has enough kinetic energy to destroy 100,000 molecules of ozone. In its «worst prediction scenario» NASA claims that air ever-thinning ozone layer could eventually allow a more harmful form of radiation, known as Ultra Violet C, to hit the earth. Laboratory experiments have shown that Ultra Violet C can penetrate cells in the body and irreparably damage the nucleic acids and proteins which are the building blocks of life.

There is the need for an international agreement that would completely stop CFC production.

IS GLOBAL WARMING A BLESSING?

Although the talk about global warming has been going on for a very long time, the World Meteorological Organization withheld opinion until recently. It was not until 2000 that, having analyzed a vast amount of data, the WMO recognized not only the fact itself but also that human activity was one of the reasons.

To be more accurate, we should be talking not about warming but about a global climate change since rising temperature in near-earth layers of the atmosphere is just one of the aspects.

Most of the time the growing greenhouse effect is blamed solely on an increase in the concentration of greenhouse gases in the atmosphere. This concentration builds up, as is commonly believed, because of the burning of vast amounts of fossil fuel (oil, natural gas, coal, wood, peat, etc.). This, however, is not the only cause of climate changes, nor even the only factor in the growing greenhouse effect.

The full truth is that humans have not only considerably stepped up the emission of greenhouse gases into the atmosphere but also destroyed much of the natural ecosystems that regulate concentration of these gases.

Thus, over the past millennium, man has destroyed at least 40 percent of the world's forests. In addition, virtually all steppes have been plowed up and meadows ruined. All of this taken together brought about a change in moisture circulation and the reflecting capacity of the surface. Also, there is no doubt that the number of impacting factors is far greater; we are simply unaware of them as yet.

Let us start with global warming. By the end of the century, the mean near-earth temperature is expected to rise two to six degrees. Many think that if somewhere in central Russia temperatures range from 35 below zero to 35 above zero, a two-degree rise in the mean near-earth temperature will neatly bring up both the upper and the lower limits by the same amount.

No way. The warming effect will certainly not be even. Unbalanced, the climate system will see temperature disparity in various places. This means that, should average temperatures rise by two degrees, the fluctuation span will expand, say, from 40 degrees below zero to 45 degrees above.

PROTECTION OF WATER

The water and the air are the most important elements in physical and chemical processes on the surface of the earth. Resources of river, lake and underground fresh waters are distributed very unevenly on the continents.

Shortage of water in different areas of the world is due not only to uneven distribution of water resources but also to its more varied and intensive use.

The Law on Conservation of Nature of the Republic of Belarus states that all rivers, lakes and underground waters are to be protected from depletion and pollution as water supply resources, a source of energy and means of treatment. Rivers and lakes are also used as transport routes, fisheries, hunting areas and recreation sites.

It is obvious that the exploitation of water resources is extremely varied at the present time. It should be added that the scope of water resource exploitation is growing rapidly due to population growth, fast development of industry and expansion of irrigated land area.

An enormous amount of water is used in industry. It has been estimated that industry consumes about 85 percent of the water in cities. This leaves about 15 percent for the daily needs of the people.

There are two ways to redistribute river water by means of reservoirs and through canals.

Reservoirs help irrigate agricultural land, improve water transport, supply large enterprises, cities and other populated areas with water fisheries and form the basis for recreation and tourist zones.

Canals are important not only for redistributing water but also as transport routes. As such they are artificial rivers built by mighty excavating machines.

Supplies of underground waters are considerable, and, therefore, their rational use helps to compensate for moisture shortages.

ENVIRONMENTAL PROTECTION

The poisoning of the world's land, air, and water is the fastest-spreading disease of civilization. It probably produces fewer headlines than wars, earthquakes and floods, but it is potentially one of history's greatest dangers to human life on earth. If present trends continue for the next several decades, our planet will become uninhabitable.

Overpopulation pollution and energy consumption have created such planet-wide problems as massive deforestation, ozone depletion, acid rains and the global warming that is believed to be caused by the greenhouse effect.

The seas are in danger. They are filled with poison: industrial and nuclear waste, chemical fertilizers and pesticides. The Mediterranean is already nearly dead; the North Sea is following. The Aral Sea is on the brink

of extinction. If nothing is done about it, one day nothing will be able to live in the seas.

Every ten minutes one kind of animal, plant or insect dies out forever. If nothing is done about it, one million species that are alive today will have become extinct twenty years from now.

Air pollution is a very serious problem. In Cairo just breathing the air is life threatening – equivalent to smoking two packs of cigarettes a day. The same holds true for Mexico City and 600 cities of the former Soviet Union.

Industrial enterprises emit tons of harmful substances. These emissions have disastrous consequences for our planet. They are the main reason for the greenhouse effect and acid rains.

An even greater environmental threat are nuclear power stations. We all know how tragic the consequences of the Chernobyl disaster are.

People are beginning to realize that environmental problems are not somebody else's. They join and support various international organizations and green parties. If governments wake up to what is happening – perhaps we'll be able to avoid the disaster that threatens the natural world and all of us with it.

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