
UNIT 19

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19.0 OBJECTIVES

In this unit we shall give you further practice in reading comprehension by

- (i) giving you an expository passage : 'Science and Human Life' by Bertrand Russell, and
- (ii) giving a glossary of difficult words and questions on comprehension.

We shall also set an exercise on selected items of vocabulary.

In the section on grammar and usage we shall discuss the passive constructions. We shall also ask you to write short compositions based on the passage read by you.

After completing the unit you should be able to

- read and understand expository passages,
- use the passive constructions correctly, and
- write short expository compositions.

19.1 READING COMPREHENSION

19.1.1 Passage for Reading

'Science and Human Life'

by Bertrand Russell

1. Science and the techniques to which it has given rise have changed human life during the last hundred and fifty years more than it had been changed since men took to agriculture, and the changes that are being wrought by science continue at an increasing speed. There is no sign of any new stability to be attained on some scientific plateau. On the contrary, there is every reason to think that the revolutionary possibilities of science extend immeasurably beyond what has so far been realised. Can the human race adjust itself quickly enough to these vertiginous transformations, or will it, as innumerable former species have done, perish from lack of adaptability? The dinosaurs were, in their day, the lords of creation, and if there had been philosophers among them, not one would have foreseen that the whole race might perish. But they became extinct because they could not adapt themselves to a world without swamps. In the case of man and science there is a wholly new factor, namely that man himself is creating the changes of environment to which he will have to adjust himself with unprecedented rapidity. But, although man through his scientific skill is the cause of the changes of environment, most of these changes are not willed by human beings. Although they come about through human agencies, they have, or at any rate have had so far, something of the inexorable inevitability of natural forces. Whether Nature dried up the swamps or man deliberately drained them, makes little difference as regards the ultimate result. Whether men will be able to survive the changes of environment that their own skill has brought about is an open question. If the answer is in the affirmative, it will be known some day; if not, not. If the answer is to be in the affirmative, men will have to apply scientific ways of thinking to themselves and their institutions.
2. One of the most obvious, problems raised by a scientific technique is that of the exhaustion of the soil and of raw materials. This subject has been much discussed and some governments have actually taken some steps to prevent the denudation of the soil. But I doubt whether, as yet, the good done by these measures is outweighing the harm done in less careful regions. Food, however, is such an obvious necessity that the problem is bound to receive increasing attention as population pressure makes it more urgent. Whether this increased attention will do good or harm in the long run is, I fear, questionable. By a spendthrift use of

fertilisers, food production in the present can be increased at the cost of food production in the future.

3. The question of raw materials is more difficult and complex than the question of food. The raw materials required at one stage of technique are different from those required at another. It may be that by the time the world's supply of oil is exhausted, atomic power will have taken its place. But to this sort of process there is a limit, though not an easily assignable one. At present there is a race for uranium, and it would seem likely that before very long there will be no easily accessible source of uranium. If, when that happens, the world has come to depend upon nuclear energy as its main source of power, the result may be devastating. All such speculations are of course very questionable, since new techniques may always make it possible to dispense with formerly necessary raw materials. But we cannot get away from the broad fact that we are living upon the world's capital of stored energy and are transforming the energy at a continually increasing rate into forms in which it cannot be utilised. Such a manner of life can hardly be stable, but must sooner or later bring the penalty that lies in wait for those who live on capital.
4. In primitive times, when the human population of the globe was small, such problems did not arise. Agriculture, it is true, was practised in ways that exhausted the soil for a time, but there were usually new vacant lands available; and if there were not, the corpses of enemies sufficed as fertilisers. The system was 'conservative' in the physicists' sense. That is to say, energy on the whole accumulated as fast as it was used. Now, this is not the case; and, so far as one can see, it will never be the case while scientific technique continues.
5. The problem which most preoccupies the public mind at the present moment is that of scientific warfare. It has become evident that, if scientific skill is allowed free scope, the human race will be exterminated, if not in the next war, then in the next but one or the next but two—at any rate at no very distant date. To this problem there are two possible reactions: there are those who say, 'Let us create social institutions which will make large-scale war impossible': there are others who say, 'Let us not allow war to become too scientific. We cannot perhaps go back to bows and arrows, but let us at any rate agree with our enemies that, if we fight them, both sides will fight inefficiently.' For my part, I favour the former answer, since I cannot see that either side could be expected to observe an agreement not to use modern weapons if once war had broken out. It is on this ground that I do not think that there will long continue to be human beings unless methods are found of permanently preventing large-scale wars. I shall return to it presently.

6. The new dangers resulting from our more organic society call for certain changes in the kind of character that is admired. The bold buccaneer, or the great conqueror such as Alexander or Napoleon, has been admired and is still admired although the world can no longer afford this type of character. We come here upon a difficulty. It is a good thing that people should be adventurous and that there should be scope for individual enterprise ; but the adventure and enterprise, if they are not to bring total disaster, must streer clear of certain fields in which they were formerly possible. You may still, without harm to your fellow men, wish to be the first man to reach the moon. You may wish to be a great poet or a great composer or a man who advances the boundaries of scientific knowledge. Such adventure injures no one. But if Napoleon is your ideal, you must be restrained. Certain kinds of anarchic self-assertion, which are splendid in the literature of tragedy, have come to involve too much risk. A motorist alone on an empty road may drive as he pleases, but in crowded traffic he must obey the rules. More and more the lives of individuals come to resemble the motorist in traffic rather than the lonely driver in an empty desert.
7. I come at last to a question which is causing considerable concern and perplexity to many men of science, namely : which is their social duty towards this new world that they have been creating? I do not think this question is easy or simple. The pure man of science, as such is concerned with the advancement of knowledge, and in his professional moments he takes it for granted that the advancement of knowledge is desirable. But inevitably he finds himself casting his pearls before swine. Men who do not understand his scientific work can utilise the knowledge that he provides. The new techniques to which it gives rise often have totally unexpected effects. The men who decide what use shall be made of the new techniques are not necessarily possessed of any exceptional degree of wisdom. They are mainly politicians whose professional skill consists in knowing how to play upon the emotions of masses of men. The emotions which easily sway masses are very seldom the best of which the undividuals composing the masses are capable. And so the scientist finds that he has inintentionally placed new powers in the hands of reckless men. He may easily come to doubt, in moments of depression or overwork, whether the world would not be a happier place if science did not exist. He knows that science given power and that the power which it gives could be used to increase human welfare; but he knows also that very often it is used, not so, but in the very opposite direction.
8. We must retain the belief that scientific knowledge is one of the glories of man. I will not maintain that knowledge can never do harm. I think such general propositions can almost always be refuted by well-chosen examples. What I will maintain—and maintain vigorously—is that knowledge is very much more often

useful than harmful and that fear of knowledge is very much more often harmful than useful. Suppose you are a scientific pioneer and you make some discovery of great scientific importance, and suppose you say to yourself, 'I am afraid that discovery will do harm' : you know that other people are likely to make the same discovery if they are allowed suitable opportunities for research; you must therefore, if you do not wish the discovery to become public, either discourage your sort of research or control publication by a board of censors. Nine times out of ten, the board of censors will object to knowledge that is in fact useful—e.g. knowledge concerning birth control—rather than to knowledge that would in fact be harmful. It is very difficult to foresee the social effects of new knowledge, and it is very easy from the sheer force of habit to shrink from new knowledge such as might promote new kinds of behaviour.

9. Apart from the more general duties of scientists towards society, they have a quite special and exceptional duty in the present critical condition of the world. All men of science who have studied thermonuclear warfare are aware of two superlatively important facts : first, that whatever agreements may have been reached to the contrary, thermonuclear weapons will certainly be employed by both sides in a world war; second, that if such weapons are employed there can be no hope of victory for either side, but only of universal destruction involving, quite possibly, the end of all human and animal life and almost certainly, failing that, a complete reversion to barbarism.

19.1.2 Note on the Author

Bertrand (Arthur William) Russell (1872-1970) was an English philosopher and mathematician. He was awarded the Nobel Prize for Literature in 1950.

19.1.3 Glossary

1. **tech'niques** : methods
wrought : made
sta'bility : the state of being steady
'plateau : a period of time during which the active development of something is not continued
Ver'tiginous : causing a feeling of great unsteadiness
tr₁nsfor'mation : complete change
'species : a group of plants or animals that are of the same kind, which are alike in all important ways.
adapta'bility : ability to change so as to be suitable for different conditions
'dinosaurs : types of very large long-tailed creatures that lived in very ancient times

cre'ation : the universe, the world, and all living things

ex'tinct : no longer existing

swamp/swamp/ : soft, wet land

en'vironment : the surrounding conditions

un'precedented : which has never happened before

willed : made by power of the mind

'agency : the power which causes a result

in'exorable : whose actions or effects cannot be prevented

i,nevita'bility : something that cannot be prevented from happening

'natural : what happens ordinarily in the world, not caused by people

de'liberately : intentionally

'ultimate : happening in the end

af'firmative : declaring 'yes'

insti'tutions : habits and customs which have been in existence for a long time; organisations

2. **ex'haustion**/ɪg'zɔ: stʃən/ : the state of being used up completely

raw : in the natural state, not yet treated for use

'denu'dation : removal of the covering

out'weighing : being more important than

'obvious : easy to understand; clear

bound : certain

'urgent : very important; which must be dealt with quickly

'questionable : not certain

'spend,thrift : spending wastefully

'fertilisers : chemical or natural substances that are put on the land to make crops grow better

3. **'complex** : difficult to understand

ex'hausted : used up completely

'process : a continued set of actions to reach some result

as'signable : which can be fixed

u'ranium : a heavy white metal this is an element (= a simple substance), is radioactive, and is used in the production of atomic power

ac'cessible : easy to get at

- 'devastating** : completely destructive
- 'specu'lation** : reasoning without all the facts
- 'questionable** : about which doubts may be raised
- di'spense with** : do without
4. **'primitive** : of the earliest stage of the development of man
- globe** : an object in the shape of a round ball : the earth
- 'corpses** : dead bodies
- con'servative** : preserving : using carefully
- 'physicist** : a person who makes a special study of physics, the science concerned with matter and natural forces.
- ac'cumulated** : collected
5. **pre'occupies** : fills the thoughts of
- 'evident** : plain; clear
- ex'terminated** : killed
- re'action** : action in reply
6. **or'ganic** : made of parts with specialized purposes
- bucca'neer**, bL k 'nie/ : sea-robber
- ad'venturous** : eager for exciting and dangerous experience; ready to take risks
- 'enterprise** : the way of arranging and carrying on business
- di'saster** : sudden great misfortune
- 'steer'clear of** : keep away from
- re'strained** : controlled
- a'narchic**/æ'nd : kɪk/ : without control
7. **'casting 'pearls before 'swine** : offering something valuable to someone who cannot understand how valuable it is
- sway** : influence
- 'reckless** : too hasty; not caring about danger
8. **'propo'sition** : an unproved statement in which an opinion is expressed
- re'futed** : proved to be untrue
- 'vigorously** : forcefully
- 'pio'neer** : a person who does something first and so prepares the way for others
- 'censor** : an official who examines printed matter, etc. with the power to remove anything offensive

9. **'thermo 'nuclear** : using the very high temperatures that result from atomic fusion as in a hydrogen bomb
re'version (n) : return to a former condition
'barbarism : the state of being uncivilized

19.1.4 Comprehension Questions

Exercise 1

(Find the answers to these questions in the sections marked with the corresponding numbers.)

1. Science has brought a rapid change in human life. What questions does it give rise to?
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.....
2. (a) The author refers to one of the problems raised by scientific techniques? What is it?
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(b) How can food production be increased? What effect will it have in the future? Why do you think so?
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.....
3. (a) What will be a possible substitute if the world's supply of oil is exhausted?
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(b) Man will be punished for living on 'capital'. What capital is the author talking about?
.....
4. In olden days the problem relating to the exhaustion of the sources of energy did not arise. Why?
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.....
5. Man dreads the next war. What are the two possible reactions to this? Why is the second alternative not a practical one?
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6. (a) Name two people who are greatly admired. Why is it dangerous to admire them?

- (b) What type of aspiration injures no one?

7. (a) What is the ambition of a pure man of science?

- (b) What do the non-scientists who utilize new scientific knowledge lack?

- (c) What does science give?

 How do the scientists want it to be used?

 Is it always used in that way?

8. Why is a scientist sometimes afraid of making a great scientific discovery?

9. What is the greatest danger of thermonuclear warfare?

19.2 VOCABULARY

Exercise 2

- (a) Match words of List A with words of similar meaning given in List B.

A	B
perish	surroundings
environment	apparent
obvious	use
spendthrift	extravagant
utilize	store
accumulate	die

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- (b) Now use suitable words from List A in the blanks below :
1. It is so hot that the green vegetables in the shop will _____ by evening.
 2. The patient is looking active. It is _____ he has got rid of his stomach infection.
 3. The young boy spent money recklessly, so his father reprimanded him on his being a _____ .
 4. To overcome drought conditions, Government will _____ all water resources.
 5. Even if you _____ a lot of money, it is not necessary that will be happy.
 6. Pollution of the _____ is hazardous for health.

19.3 GRAMMAR AND USAGE

The Passive Voice

Look at the following examples of the 'passive voice' taken from the reading passage (Section 19.1.1).

1. with the simple present and the simple past tenses
(*am/is/are/was/were* + past participle)
Energy accumulated as fast as it *was used*.
If scientific skill is *allowed* free scope,
2. with the present continuous tense
(*is/are* + *being* + past participle)
change that *are being wrought*
3. with the present perfect tense
(*has* + *been* + past participle)
..... beyond what *has* so far *been realised*.
This subject *has been* much *discussed*.
The great conqueror *has been admired*.
4. with the future
(*will* + *be* + past participle)
The answer *will be known* some day.
The human race *will be exterminated*.

5. with modal verbs

(*can/must + be + past participle*)

Food production *can be increased*.

You *must be restrained*.

Notice that in all passive constructions we have the past participle form of the main verb preceded by the appropriate tense form of the verb *be*.

The passive voice is used when we are more interested in the action than in the 'doer' of the action.

Example :

He *was killed* in a fight.

(We have not said who killed him.)

When the 'doer' is to be mentioned, we use a phrase beginning with *by*.

Example :

The meeting *was addressed* by the Prime Minister.

The passive voice is used very often to describe scientific experiments, because there the doer is not important. Similarly, we use the passive in the description of processes, and the narration of historical events.

Examples :

Glass *is made* from sand, which *is melted* under great heat.

The First Battle of Panipat *was fought* in 1526.

Exercise 3

Fill in the blank with passive forms of the verbs given in brackets :

- (a) Great quantities of animal oil come from whales. To protect the whale from the cold of the Arctic seas, nature has provided it with a thick covering of fat called blubber. When the whale _____ (kill), the blubber _____ (strip) off and boiled down. It produces a great quantity of oil which _____ (can make) into food. Vegetable oil _____ (know) from very old times. No household can get on without it, for it _____ (use) in cooking. Perfumes _____ (may make) from the oils of certain flowers. Soaps _____ (make) from vegetable and animal oil. Scientists think that the oil under the surface of the earth originated from living things in the seas. For these creatures to become oil, it was necessary that they _____ (should imprison) between layers of rock for an enormous length of time. The statement that oil originated in the sea _____ (confirm) by a glance at the map showing the chief oil fields of the world; very few of them are far distant from the oceans of today. The rocks in which oil _____ (find) are of sea origin too. Almost always the remains of shells and other proofs of sea life _____ (find) close to the oil.

[from G. C. Thornley : *Easier Scientific English Practice*, Longman]

(b) The sense of doom in use today is not a fear of science; it is a fear of war. And the causes of war _____ not _____ (create) by science.

Science has obviously multiplied the power of the warmakers. The weapons of today can kill more people more secretly and more unpleasantly than those of the past and for some time it _____ (say) of each new weapon that it is so destructive that it will force nations to give up war for lack of cannot fodder. This hope _____ never _____ (fulfil). The acts of men and women _____ not _____ (dictate) by such simple compulsions.

Exercise 4

Select suitable verbs from those given below and use their 'passive' forms in the following advertisement.

quote, print, invite, open, complete

Tender Notice
Printing of Annual Report

Sealed tenders _____ from reputed printing houses for the printing of the Annual Report of the Corporation.

The Annual Report _____ to be _____ in about 100 pages. The rates of printing should _____ .

The tender papers _____ by a committee in the presence of the tenderers on 16.5.87. The printing work _____ to be _____ within 15 days of our handing over the materials.

Managing Director

19.4 WRITING

Exercise 5

1. Make a list of the things that you wear, that you eat, and that are around you which have been affected to some extent by scientific technique.

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2. Imagine you are living in the pre-scientific age. Describe a typical day in your life. Describe your houses, your food, your clothes, your mode of travelling, your occupation, and your means of entertainment.

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19.5 LET US SUM UP

In this unit we have given you practice in

- reading and understanding an expository passage by Bertrand Russell;
- using some of the words occurring in the story;
- using the passive voice correctly; and
- writing a descriptive composition based on life in the pre-scientific age.

19.6 KEY WORDS

No’ble ’Prize : any of several prizes given in Sweden each year for important work in science and literature and work towards world peace.

’passive ’voice : expressing an action which is done to the subject of the sentence. e.g., the verb phrase ‘was admitted’ in the sentence.

He was admitted to the course

is in the passive voice.

19.7 SUGGESTED READING

1. *What is Science ?* Victor Gollancz.
2. G. C. Thornley : *Easier Scientific English Practice*, Longman.

19.8 ANSWERS TO EXERCISES

Exercise 1

1. The question is whether human beings will be able to adjust themselves to these rapid changes.
2. (a) the exhaustion of the soil and of raw materials.
(b) by the use of fertilizers. There will be less food production in the future. The fertility of the soil will be reduced.
3. (a) Atomic power
(b) stored energy in the form of raw materials
4. (a) The population was small, so there were very few farmers.
(b) There was plenty of land.
(c) The soil did not get exhausted because the dead bodies of enemies served as fertilizers.
5. One is that social institutions should be created which will make large-scale war impossible, and the other, that war should not be allowed to become too scientific. The second alternative is not practical because, if there is a war, each side will try to win by using deadly weapons.
6. (a) Alexander and Napoleon. It is dangerous to admire them because such people can bring about a disaster in the modern world.
(b) The aspiration to be a great poet or a great composer or a great scientist.
7. (a) the advancement of knowledge
(b) wisdom
(c) power ; to increase human welfare
No.
8. It might harm the human race.
9. that it will destroy all human and animal life, or at least bring about a complete reversion to barbarism.

Exercise 2

- (a) perish : die
environment : surroundings
obvious : apparent
spendthrift : extravagant
utilize : use
accumulate : store

- (b) 1. perish
2. obvious
3. spendthrift
4. utilize
5. accumulate
6. environment

Exercise 3

1. (a) is killed, is stripped off, can be made, has been known, is used, may be made, are made, should be imprisoned, is confirmed, is found, are found.
(b) are (not) created, has been said, has (never) been fulfilled, are (not) dictated.

Exercise 4

are invited, in (to be) printed, (should) be quoted, will be opened, is (to be) completed.