PASSAGE 1

The economic importance of coral reefs

A lot of people around the world are dependent, or partly dependent, on coral reefs for their livelihoods. They often live adjacent to the reef, and their livelihood revolves around the direct extraction, processing and sale of reef resources such as shell fish and seaweeds. In addition, their homes are sheltered by the reef from wave action.

Reef flats and shallow reef lagoons are accessible on foot, without the need for a boat, and so allow women, children and the elderly to engage directly in manual harvesting, or 'reef-gleaning'. This is a significant factor distinguishing reef-based fisheries from near-shore sea fisheries. Near-shore fisheries are typically the domain of adult males, in particular where they involve the use of boats, with women and children restricted mainly to shore-based activities. However, in a coral-reef fishery the physical accessibility of the reef opens up opportunities for direct participation by women, and consequently increases their independence and the importance of their role in the community. It also provides a place for children to play, and to acquire important skills and knowledge for later in life. For example, in the South West Island of Tobi, in the Pacific Ocean, young boys use simple hand lines with a loop and bait at the end to develop the art of fishing on the reef. Similarly, in the Surin Islands of Thailand, young Moken boys spend much of their time playing, swimming and diving in shallow reef lagoons, and in doing so build crucial skills for their future daily subsistence.

Secondary occupations, such as fish processing and marketing activities, are often dominated by women, and offer an important survival strategy for households with access to few other physical assets (such as boats and gear), for elderly women, widows, or the wives of infirm men. On Ulithi Atoll in the western Pacific, women have a distinct role and rights in the distribution of fish catches. This is because the canoes, made from mahogany logs from nearby Yap Island, are obtained through the exchange of cloth made by the women of Ulithi. Small-scale reef fisheries support the involvement of local women traders and their involvement can give them greater control over the household income, and in negotiating for loans or credit. Thus their role is not only important in providing income for their families, it also underpins the economy of the local village.

Poor people with little access to land, labour and financial resources are particularly reliant on exploiting natural resources, and consequently they are vulnerable to seasonal changes in availability of those resources. The diversity of coral reef fisheries, combined with their physical accessibility and the protection they provide against bad weather, make them relatively stable compared with other fisheries, or land-based agricultural production.

In many places, the reef may even act as a resource bank, used as a means of saving food for future times of need. In Manus, Papua New Guinea, giant clams are collected and held in walled enclosures on the reef, until they are needed during periods of rough weather. In

Palau, sea cucumbers are seldom eaten during good weather in an effort to conserve their populations for months during which rough weather prohibits good fishing.

Coral reef resources also act as a buffer against seasonal lows in other sectors, particularly agriculture. For example, in coastal communities in northern Mozambique, reef harvests provide key sources of food and cash when agricultural production is low, with the peak in fisheries production coinciding with the period of lowest agricultural stocks. In Papua New Guinea, while agriculture is the primary means of food production, a large proportion of the coastal population engage in sporadic subsistence fishing.

In many coral-reef areas, tourism is one of the main industries bringing employment, and in many cases is promoted to provide alternatives to fisheries-based livelihoods, and to ensure that local reef resources are conserved. In the Caribbean alone, tours based on scuba-diving have attracted 20 million people in one year. The upgrading of roads and communications associated with the expansion of tourism may also bring benefits to local communities. However, plans for development must be considered carefully. The ability of the poorer members of the community to access the benefits of tourism is far from guaranteed, and requires development guided by social, cultural and environmental principles. There is growing recognition that sustainability is a key requirement, as encompassed in small-scale eco-tourism activities, for instance.

Where tourism development has not been carefully planned, and the needs and priorities of the local community have not been properly recognised, conflict has sometimes arisen between tourism and local, small-scale fishers.

Questions 1–7
Are the following statements TRUE, FALSE, or NOT GIVEN?

1 In most places, coral-reef gleaning is only carried out by men.
2 Involvement in coral-reef-based occupations raises the status of women.
3 Coral reefs provide valuable learning opportunities for young children.
4 The women of Ulithi Atoll have some control over how fish catches are shared out.
5 Boats for use by the inhabitants of Ulithi are constructed on Yap Island.
6 In coral reef fisheries, only male traders can apply for finance.
7 Coral reefs provide a less constant source of income than near-shore seas.

Questions 1–7

*Complete the notes below with **NO MORE THAN TWO WORDS** from the passage for each answer.*

How coral-reef-based resources protect people during difficult times

Coral reefs can provide

- a resource bank, e.g. for keeping clams and **8** …… .
- a seasonal back-up, when **9** …… products are insufficient e.g. in northern Mozambique.
- a tourist attraction, e.g. **10** …… tours in the Caribbean.

Benefits for local people include:

- The creation of jobs.
- Improvements to roads and **11** …… .

Important considerations:

- Development must be based on appropriate principles.
- Need for **12** …… .
- Poorly-planned development can create **13** …… with local fishers.

POST-TEST EXERCISES

1. Complete the keyword table

Keywords in questions	**Keywords in the passage**
Q2: raises the status	
Q3: provide valuable learning opportunities for young children	
Q4: how fish catches are shared out	
Q6: apply for finance	
Q9: agricultural **products** are insufficient	
Q13: **create** conflict	

PASSAGE 2

Acquiring the principles of mathematics and science

Question 14–19

*Choose the correct heading for paragraphs **A–F** from the list of headings below.*

List of Headings		List of Paragraphs
i	A suggested modification to a theory about learning.	**14** Paragraph **A**
ii	The problem of superficial understanding.	**15** Paragraph **B**
iii	The relationship between scientific understanding and age.	**16** Paragraph **C**
iv	The rejection of a widely held theory.	**17** Paragraph **D**
v	The need to develop new concepts in daily life.	**18** Paragraph **E**
vi	The claim that a perceived contradiction can assist mental development.	**19** Paragraph **F**
vii	Implications for the training of science teachers.	
viii	An experiment to assess the benefits of exchanging views with a partner.	
ix	Evidence for the delayed benefits of disagreement between pupils.	

A

It has been pointed out that learning mathematics and science is not so much learning facts as learning ways of thinking. It has also been emphasised that in order to learn science, people often have to change the way they think in ordinary situations. For example, in order to understand even simple concepts such as heat and temperature, ways of thinking of temperature as a measure of heat must be abandoned and a distinction between 'temperature' and 'heat' must be learned. These changes in ways of thinking are often referred to as conceptual changes. But how do conceptual changes happen? How do young people change their ways of thinking as they develop and as they learn in school?

B

Traditional instruction based on telling students how modern scientists think does not seem to be very successful. Students may learn the definitions, the formulae, the terminology, and yet still maintain their previous conceptions. This difficulty has been illustrated many times, for example, when instructed students are interviewed about heat and temperature. It is often identified by teachers as a difficulty in applying the concepts learned in the classroom; students may be able to repeat a formula but fail to use the concept represented by the formula when they explain observed events.

C

The psychologist Piaget suggested an interesting hypothesis relating to the process of cognitive change in children. Cognitive change was expected to result from the pupils' own

intellectual activity. When confronted with a result that challenges their thinking – that is, when faced with conflict – pupils realise that they need to think again about their own ways of solving problems, regardless of whether the problem is one in mathematics or in science. He hypothesised that conflict brings about disequilibrium, and then triggers equilibration processes that ultimately produce cognitive change. For this reason, according to Piaget and his colleagues, in order for pupils to progress in their thinking they need to be actively engaged in solving problems that will challenge their current mode of reasoning. However, Piaget also pointed out that young children do not always discard their ideas in the face of contradictory evidence. They may actually discard the evidence and keep their theory.

D

Piaget's hypothesis about how cognitive change occurs was later translated into an educational approach which is now termed 'discovery learning'. Discovery learning initially took what is now considered the Tone learner' route. The role of the teacher was to select situations that challenged the pupils' reasoning; and the pupils' peers had no real role in this process. However, it was subsequently proposed that interpersonal conflict, especially with peers, might play an important role in promoting cognitive change. This hypothesis, originally advanced by Perret-Clermont (1980) and Doise and Mugny (1984), has been investigated in many recent studies of science teaching and learning.

E

Christine Howe and her colleagues, for example, have compared children's progress in understanding several types of science concepts when they are given the opportunity to observe relevant events. In one study, Howe compared the progress of 8 to 12-year-old children in understanding what influences motion down a slope. In order to ascertain the role of conflict in group work, they created two kinds of groups according to a pre-test: one in which the children had dissimilar views, and a second in which the children had similar views.

They found support for the idea that children in the groups with dissimilar views progressed more after their training sessions than those who had been placed in groups with similar views. However, they found no evidence to support the idea that the children worked out their new conceptions during their group discussions, because progress was not actually observed in a post-test immediately after the sessions of group work, but rather in a second test given around four weeks after the group work.

F

In another study, Howe set out to investigate whether the progress obtained through pair work could be a function of the exchange of ideas. They investigated the progress made by 12-15-year-old pupils in understanding the path of falling objects, a topic that usually involves conceptual difficulties. In order to create pairs of pupils with varying levels of dissimilarity in their initial conceptions, the pupils' predictions and explanations of the path of falling objects were assessed before they were engaged in pair work. The work sessions involved solving computer-presented problems, again about predicting and explaining the paths of falling objects. A post-test, given to individuals, assessed the progress made by pupils in their conceptions of what influenced the path of falling objects.

Question 20 and 21

*Choose **TWO** letters, **A–E**.*

The list below contains some possible statements about learning.

Which **TWO** of these statements are attributed to Piaget by the writer of the passage?

A Teachers can assist learning by explaining difficult concepts.

B Mental challenge is a stimulus to learning.

C Repetition and consistency of input aid cognitive development.

D Children sometimes reject evidence that conflicts with their preconceptions.

E Children can help each other make cognitive progress.

Question 22 and 23

*Choose **TWO** letters, **A–E**.*

Which **TWO** of these statements describe Howe's experiment with 8-12-year-olds?

A The children were assessed on their ability to understand a scientific problem.

B All the children were working in mixed-ability groups.

C The children who were the most talkative made the least progress.

D The teacher helped the children to understand a scientific problem.

E The children were given a total of three tests, at different times.

Question 24–26

*Complete the summary below with **NO MORE THAN TWO WORDS** from the passage for each answer.*

How children learn

Piaget proposed that learning takes place when children encounter ideas that do not correspond to their current beliefs. The application of this theory gave rise to a teaching method known as **24** …… . At first this approach only focused on the relationship between individual pupils and their **25** …… . Later, researchers such as Perret-Clermont became interested in the role that interaction with **26** …… might also play in a pupil's development.

POST-TEST EXERCISES

1. Complete the keyword table

Keywords in questions	Keywords in the passage
Q20 & 21: **mental challenge** is a stimulus to learning	
Q20 & 21: *reject* evidence that conflicts with **their preconceptions**	
Q22 & 23: understand a scientific problem	
Q24: teaching method	
Q26: the role that **interaction with PEERS** might play in a pupil's development	