

Theory of knowledge possible answers

Suggested answers or discussions to the Theory of knowledge questions.

Topic 1

1.01.01

- 1 Deep ecologists have extreme views; could you live your life by their EVS? There are no 'correct' answers here, but it is important to put forward your point of view and argue your case logically.
- 2 Think of examples where a paradigm shift in public opinion has occurred. Consider Rachel Carson as a starting point.

1.01.02

- 1 Argue the case for protecting whales (or another important environmental issue) from the point of view of a religious person.
- 2 The world summit is international, generally not exclusively a political event, and it receives wide publicity. It is therefore very important in influencing a person's opinion if they study media reports from the conference.

1.02.01

- 1 The systems approach looks at the environment as a set of components that work together as integrated units. Whereas an alternative approach studies plants, animals or the atmosphere separately, the systems approach considers them together as components of the complex environments in which they are found.
- 2 Reductionists view single objects that can be clearly recognised and identified by their properties, whereas the systems approach gives a holistic view. The reductionist view does not allow interconnections and interrelationships to be taken into account.

1.02.02

- 1 Think about the models used to forecast the weather. What are the important aspects of a weather system that must be included? Suggest some others that have the potential to be included, such as volcanic eruptions.
- 2 Models are built by people, so anyone constructing a model will have their own point of view. Think about some important models, such as the DNA molecule, which have helped advance knowledge, and others, such as the atom, which may have been too simple to do so.

1.03.01

- 1 Try to decide which aspect of the experimental process is essential to further knowledge. Are any items listed that could be left out?
- 2 Reason can be defined as the action of thinking about something in a logical, sensible way. Discuss how this is important in environmental systems and societies or economics.

1.04.01

- 1 Consider the factors that influence your appreciation of the natural world; are they scientific or artistic, and does this matter?
- 2 Think about some difficult ideas such as climate change or why species become extinct. How would you present these concepts to others?

1.05.01

- 1 Suggest other areas of study where definitions are important, for example naming



- species in biology or similar.
- 2 Identify areas of confusion that might arise without clear names and terminology.

Topic 2

2.01.01

- 1 Consider how scientific progress is made. It is important that scientists working in different parts of the world discuss their ideas using agreed definitions.
- 2 We now know more about relationships from DNA analysis. Think about how difficult it used to be to distinguish different species in the past.

2.02.01

- 1 Is it better to have general measurements rather than none at all?
- 2 Are living things likely to behave in their natural way in a laboratory?

2.03.01

- 1 As we have seen, different people have different EVSs, and some will modify their behaviour while others will not.
- 2 Developed countries could reduce their use of fossil fuels to allow more development elsewhere, or international treaties could impose restrictions on all. Many different scenarios are possible.

2.04.01

- 1 Should conservation efforts be made at the international level or by local action? Can small local groups have knowledge of the bigger picture?
- 2 If international organisations have knowledge of a problem should they make efforts to solve it in all areas rather than only in the forest?

2.04.02

- 1 You must formulate your own response to this question, but consider the complex interactions between the people you meet every day and look for examples of similar interactions in an ecosystem.
- 2 Think about predictions that have already been made about climate change. Have they been correct? What about predictions about severe weather events?

2.05.01

- 1 Consider the type of study being undertaken. Is it a large scale overview or a precise calculation?
- 2 Think about the response to question 1. If we are considering whether a population is increasing or decreasing, a general trend may be acceptable.

2.05.02

- 1 How are areas for study selected? Why do we collect samples in some places but not others? Are we entirely objective?
- 2 We can study microorganisms using microscopes and lenses that were not available long ago. This has increased our knowledge and our understanding.

Topic 3

3.01.01

- 1 Refer to some older texts that use the term 'nature'. Is their approach to diversity and conservation very different? Is the approach sufficiently different to qualify as a paradigm shift in the same way that acceptance of plate tectonics was?
- 2 As the definitions above suggest, there are three main ways to study diversity: through genetics, species and habitat.
- 3 Suggest an area of technology where advances have occurred, for example communications – it is no longer normal to 'dial' a phone call, digital technology has resulted in changes such as 'streaming', 'downloading' and so on in vocabulary.

3.01.02

- 1 Consider how numbers are used and why. A diversity index has a specific importance in ecology; discuss what this is and why simple numbers would not be helpful.
- 2 Think about how useful it is to know how many individuals of a species are present in an area and when it is more useful to know about their relative abundance. Why is quantitative data needed in experimental situations such as measuring the rate of photosynthesis? Discuss why qualitative data has limited importance here.

3.02.01

- 1 Are biochemistry and genetics more objective than measures used in the past?
- 2 What are the essential features of a dogma such as creationism; how are they different from the methods of science?

3.02.02

- 1 Theories are testable hypotheses. Could the theory ever be proved? Theories can be disproved if any evidence is found to refute them.
- 2 Think about how difficult it is to get a new theory accepted if all the important people of the time refuse to consider it.

3.03.01

- 1 Think about the legacy this generation will leave to the next.
- 2 Can we know everything about a species and its importance in a living system?
- 3 Hints/responses Theory of knowledge 3.04.01
- 4 Think about the way indigenous peoples 'know' their ecosystems.
- 5 Consider the EVS (see Topic 1) of the Yanomami.

3.04.02

- 1 Think about the importance of different species to ecological, aesthetic and other aspects of conservation. Is it ever wrong to conserve a species?
- 2 Consider who makes these decisions and why.

Topic 4

4.01.01

- 1 There is often considerable debate about how local and regional work should be funded. In the example of a new development upstream causing problems for communities further downstream, it may not be surprising if some downstream residents think that upstream residents should pay for any engineering works required to cope with higher river discharge. But all such developments will feature a complicated consideration of costs and benefits: the immediate versus the long term; the local versus the geographically distant; the rights of one community over another. Sometimes information about future impact is simply not available or hard to predict.
- 2 The hard engineering answer would be engineering works, but more and more local governments are looking towards soft engineering to solve or reduce such problems. Planting new wooded areas downstream of a new urban area would undoubtedly be one possibility that would be considered.

4.02.01

- 1 The right to water is arguably more important than any other right, as water is fundamental to life itself. However, many people might say, for example, that the right to freedom is more important. The debate here is about what prevents access to water, freedom and other aspects of a reasonable quality of life – factors might include oppression by inhumane governments and other hostile human actions, lack of funding in the poorest countries, low rainfall conditions, or a combination of factors. The obstacles to a reasonable water supply have to be clearly understood if solutions to the problem are to be found.
- 2 In many countries there is a direct charge for water for every household. It may be a standard charge for every household, or where water meters are mandatory the charge will be based on how much water an individual household uses. In some countries, the cost of water supply and sanitation comes out of general government funds where people are paying for these services indirectly through income tax and other general taxes. Recently, the Republic of Ireland introduced household water charges after a history of general government funding. Understandably, this was unpopular with most people. The government argued that a large amount of money was required to modernise much of the water supply system and the government could not afford to do this without introducing the household charge.

4.03.01

- 1 Think about some of the environmental campaigns that are described in this book. How would they influence you and how might they influence someone of your age whose family had a long tradition of, for example, whaling?
- 2 Think about laws that could protect both indigenous people and wildlife.

4.04.01

- 1 Consider some examples of cause-effect relationships that are valid, for example flu vaccination leads to a reduction in cases of flu, and some which are not, for example many trees are cut down in rainforests and many more people now have mobile phones.
- 2 Using the points discussed in 1, consider which correlations between parameters are likely to be valid and which not.

Topic 5

5.01.01

- 1 A body of knowledge will not be recognised as a distinct academic discipline until a comprehensive literature on the subject has been developed. This will include models, theories and detailed case studies. Such developments will usually span a wide range of countries and academic institutions.
- 2 Clearly there are real concerns about the sustainability of soils that are put under too much pressure. Modern soil science can do much to improve productivity, but scientists and farmers must always keep a sharp eye on the long-term viability of soils.

5.02.01

- 1 There is always a balance to be had in wanting to increase resource supply in order to satisfy increasing demand, while at the same time being aware that the Earth-atmosphere system has limitations. Exceeding such limitations can be much more serious in some cases than others. Improving agricultural production is vital to further development in many poor countries. Trying to balance the reality of present needs but at the same time ensure the sustainability of soils can be very difficult indeed.
- 2 Critics of the green revolution have raised a number of issues, which include: the poor mineral content of many higher-yielding varieties; some higher-yielding varieties have an inferior taste; the costs of high inputs of fertiliser and pesticide have resulted in rural indebtedness in some areas; higher-yielding varieties require more weed control and are often more susceptible to pests and disease; mechanisation has increased rural unemployment.

5.03.01

- 1 Attempting to change peoples' attitudes and values can be difficult in all fields of life. There are reasons why common attitudes and values have developed over time. Some of these reasons will be positive, while others would now be perceived as negative. Education is clearly of vital importance here. In this case, farmers need to be convinced that the changes advocated are indeed the right path to take. How change is funded will be a major issue. Will farmers be asked to shoulder most of the burden, or will national or local government play a major role? If people feel they are partners in a process, they are likely to be much more positive in their outlook.
- 2 Strict legislation is generally considered a last resort in most countries, because it can engender a hostile reaction. For most issues that need addressing, education and persuasion are the usual starting points.

Topic 6

6.01.01

- 1 The accuracy of weather forecasting has improved significantly in recent decades. The UK's Meteorological Office says its four-day forecast is now as accurate as its one-day forecast was 30 years ago. Other major countries in the field of meteorology have made similar claims. However, such improvement has only come about after considerable investment in better satellites, weather stations and supercomputers. However, the atmosphere is immensely complex and constantly in flux. An accuracy of 100 per cent is viewed by meteorologists as impossible, but the trend of increasing reliability and accuracy will undoubtedly continue.
- 2 With more than a third of the world's total economic output affected by weather, investment in improving weather forecasting is generally viewed as an essential investment. Extreme weather can cause great devastation in a short period. The ability to take remedial action in time can save both lives and economic assets.

6.02.01

- 1 While it is often the most powerful countries who have led the way in seeking international agreement on a range of important issues, many smaller nations constantly complain that more often than not the powerful nations dominate the outcome of negotiations. While the rate of international participation tends to be high in international discussions, there are genuine concerns about how democratic such processes are. It seems that much negotiation goes on behind closed doors, when larger countries often try to call in favours from smaller countries. There can be no doubt that the objective of seeking international agreement is honourable in itself, but important questions remain about how the process operates.
- 2 It is natural that individual countries want to benefit as much as possible from an international agreement but contribute as little as possible to the costs of implementation. LEDCs argue that MEDCs should pay more because, firstly, they have a much greater ability to do so than LEDCs, and, secondly, the causes of many present-day problems are a result of economic actions by MEDCs in the past.

6.03.01

- 1 It is understandable that environmental organisations want to stop adverse influences in the atmosphere before the situation deteriorates too much. It is equally understandable that big business may argue that environmentalists have insufficient proof to make categorical statements. Such debate can sometimes be a long process, and both sides can change positions over time. For example, some environmental groups were initially in favour of nuclear energy and the production of biofuels, because they were keen to reduce the burning of fossil fuels. However, when they realised the extent of the potential negative impact of these newer sources of energy, they changed their minds and came out against them. There are varying degrees of risk with every large-scale economic activity, and this is clearly an important factor in whether something should go ahead or not. Technological advance can reduce the level of risk, but it can rarely eliminate it entirely.
- 2 Sometimes environmental organisations have to backtrack. A report about the retreat of glaciers in the Qinghai–Tibet plateau was proved to be deeply flawed, because the evidence was based on only a small number of glaciers and it was regarded as unsound to scale up these results for the entire region.



6.04.01

- 1** While the origins of much acid rain can be traced, it is not always easy to be precise in separating locally sourced pollution from that originating further away. Importantly, at the moment at least no system is in place to compensate countries and regions which, on balance, are adversely affected. Studies in China have found that, on average, a 10 per cent decrease in pollution coming into a region from neighbouring regions results in a 1 per cent increase in house prices.
- 2** The adverse impact of acid rain can be much quicker on some surfaces, such as lakes and forests, than on others, such as prominent buildings. It is also important to be aware of other pollutants that have contributed to the demise of surfaces. It would be particularly difficult to precisely trace the origin of pollution in countries that are downwind of many neighbouring countries that have similar sources of pollution. Reaching agreement on compensation for acid rain and other forms of cross-border pollution would seem at the moment to be impractical.

Topic 7

7.01.01

- 1 From the text preceding Theory of knowledge you will know that there are considerable differences in predictions of when peak oil and gas will occur. This means that national governments have to plan as best they can for a high degree of uncertainty. It is not surprising that an increasing number of countries have become concerned about their energy security. A popular strategy has been to build up strategic petroleum reserves, while many countries are investing more and more money in domestically produced renewable energy. A major objective has been to become less reliant on imported energy. In turn, energy experts continually strive to improve their monitoring and prediction capabilities.
- 2 It can be difficult to compare the validity of different scientific claims about the same issue. There is no doubt that some organisations are more generously funded than others. This, at least in theory, gives such organisations access to greater scientific expertise and the most sophisticated technology available. However, sometimes relatively small scientific units 'hit the nail on the head'. Predicting peak oil and gas is difficult for a number of reasons. One is that some governments are very wary about the information they give out to the international community. They may feel that it is their national interest to overestimate or underestimate figures.

7.01.02

- 1 Although the Stern Review is probably the largest and most widely known publication about the economics of climate change, it has not been without its critics. One analysis of the Stern Review described it as 'deeply flawed'. Others have criticised aspects of the report but argued that some of its conclusions might still be justified based on other grounds. It would seem that the weight of opinion agrees with the claim that climate change is the greatest challenge facing humanity.
- 2 There are scientists and people working in other fields who have always been sceptical about human-induced climate change. They have focused on the sections of the Stern Review for which there are the best counter-arguments. They have also challenged the most contentious scientific evidence.

7.03.01

- 1 Agreements on complex and difficult issues such as climate change can be extremely long and detailed. There may be many caveats included in order to gain the acceptance of individual countries or groups of countries. There might, for example, be different timelines for implementation for MEDCs and LEDCs. Some countries will invariably be very keen signatories to an agreement, while other countries may be much more reluctant but on balance feel that they do not want to be left out of an international agreement for various reasons.
- 2 The value of an agreement is very much based on the extent to which the individual parties to the agreement do what they promised to do. It is also important that the original basis of the agreement was sound, so that with good implementation the agreement fulfils its objectives and brings recognisable gains. Individual governments need to prove to their electorates that signing the agreement was in the national interest.

Topic 8

8.01.01

- 1 Many factors can influence the attitudes and values people develop during their lifetime. These factors include family background, employment/vocation, gender, and the period of time in which people live. For example, Thomas Malthus (1766–1834) was an English cleric and scholar. He was influential in the fields of demography and political economy. There seems to be general agreement among those who have studied his writing that his vocation as a cleric influenced his perceptions on human reproduction. In the field of political economy, he was very much against the attitude of those who put short-term gain ahead of longer-term stability. Ester Boserup (1910–99) was born almost 150 years after Malthus. She was a Danish economist. Her work challenged assumptions about population which dated back to the time of Malthus. She took what most experts would describe as a more 'liberal' view of the subject. A major point in her writing was that 'necessity is the mother of invention'. She also influenced the debate about women in the workforce.
- 2 The example you choose may depend on the country in which you live. It could refer to national or local politics, or to a completely different sphere. However, your choice of example could also be influenced by the international media. There can be little doubt, for example, that a number of the leaders of socialist political parties around the world have been heavily influenced in their thinking by their relatively poor backgrounds. Likewise, there are examples where right-wing politicians have been strongly influenced by their more privileged backgrounds. It is, of course, possible that for some people it is hard to see any link between what is known of their background and the views they currently hold. Also, of course, an individual's views can change considerably over time.

8.02.01

- 1 Writers and artists approach the environment from a different angle to the scientific community. Their objectives are very different, as are the outcomes of their work. It can be argued that good literature and art can do more to raise public awareness than the work of scientists, because of the power of the former to influence emotions. Literature and art can lay the foundations of a movement and engender powerful feelings. Science and the evidence it produces can then often provide firm justifications and conclusions. However, an important point is that the two forces combined can be very powerful. In many situations, literature and art have influenced people's perceptions long before scientists have said we should be concerned about something.
- 2 This will be very much a personal issue. The key influence might be a book you read at some stage in your life that really opened up an issue or topic to you for the first time. It could also be a painting you viewed in an art gallery which you found particularly fascinating. What in this key influencing factor stimulated your interest and awareness?

8.03.01

- 1 With increasing concern over many aspects of the environment, recycling has come to be seen as a vitally important part of the effort to create a more sustainable society. Because it is viewed as so important, many local authorities have invested significant funds in recycling schemes. While most local authorities still seem to use the educational/encouragement approach, some have felt the necessity to become

more draconian. In general, the tougher the stance adopted by political bodies, the greater the degree of opposition it draws.

- 2 Other such local authority rules might refer to parking, speed limits, litter, spitting in public and making changes to your home.

8.04.01

- 1 The large events you consider might include major sports events, New Year and other national celebrations, international conferences and military exercises. Is it possible to conduct such events well and reduce the amount of energy used at the same time? Is there an issue of national or local pride at stake? Would those responsible for organising such events be seen as penny-pinching?
- 2 Research has shown that most people are more likely voluntarily to take part in a campaign if they are convinced it is for the public good and that the majority of people are prepared to do their fair share. If a section of society, such as large organisations, appears to opt out, many people may feel that the burden is not being shared fairly, and this may result in a lessening of their own efforts.