

Part 6

You are going to read a magazine article about techno-solutions to global warming. Seven paragraphs have been removed from the extract. Choose from the paragraphs **A–H** the one which fits each gap (37–43). There is one extra paragraph which you do not need to use. Mark your answers **on the separate answer sheet**.

## Cooling the Earth

*As a last resort to combat global warming, researchers are investigating two possible ways of applying 'sunscreen' to the planet.*

Even with the best will in the world, reducing our carbon emissions is not going to prevent global warming. It has become clear that even if we take the most drastic measures to curb emissions, the uncertainties in our climate models still leave open the possibility of extreme warming and rises in sea level. At the same time, resistance by governments and special interest groups makes it quite possible that the actions advocated by climate scientists might not be implemented soon enough. Is the game up in that case?

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Quite recently a growing number of researchers have been taking a fresh look at large-scale 'geo-engineering' projects that might be used to counteract global warming. Basically the idea is to apply 'sunscreen' to the whole planet. It's controversial, but recent studies suggest there are ways to deflect just enough of the sunlight reaching the Earth's surface to counteract global warming. Climate models show that blocking just 1.8 per cent of the incident energy in the sun's rays would cancel out the warming effects produced by a doubling of carbon dioxide and other gases in the atmosphere. That could be crucial, because even the most stringent emissions-control measures being suggested would leave us with a doubling of carbon dioxide by the end of this century, and that would last for at least a century more.

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There are two distinct proposals: reflecting away sunlight within the Earth's atmosphere, or blocking it in outer space. Each approach has its supporters and detractors. While tinkering with the atmosphere is likely to be much cheaper and simpler, space-based approaches may be longer-lasting and less likely to cause unwanted side effects – though they are much more technically challenging.

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In addition, since it is naturally present at great heights above the earth, some researchers think an increase might not present as many unforeseen risks as some other suggested remedies for global warming, such as seeding the ocean with iron filings or other nutrients to encourage the growth of carbon-consuming organisms.

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These drawbacks have driven others to look seriously at larger-scale, more expensive alternatives that might carry fewer risks. One that might do the trick is a space-based sunshade system. It may sound wildly implausible but some scientists are convinced that it is feasible.

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These simple devices would be packed into metal containers in stacks of a million and propelled into space using electromagnetic rail guns – a method that has been tested in labs but never actually used. The acceleration is far too rapid for people or delicate equipment, but the method has long been proposed for shooting bulk material into space, such as water, rocket fuel or building materials. It could be cheaper and more reliable than traditional rockets.

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Independent computer simulations show that the space sunshade could almost cancel out the temperature changes expected from global warming, except for a small area around each pole. That's because while greenhouse warming is uniform, the poles receive less sunlight than the tropics, so the effect of changes in sunlight is weakest at the poles. This regional difference

in cooling might cause unpredictable changes in weather patterns. And since the poles would see less of an effect from the dimming, they might still experience a significant loss of ice cover.

rise, we might want to have this as an option. We're not going to implement it, but you certainly have to know what's possible. It's like emergency back-up surgery; you never want to do it, but you still have to practise it.

43

Nobody wants to have to do this but if you get to the point where the alternative is six metres of sea-level

- A** The idea is to manufacture discs of silicon about 60 centimetres across. Each disc would be studded with holes of precisely calculated sizes, close to the wavelengths of visible light, which would scatter incoming light like a lens. The effect would be to produce a slight but imperceptible dimming of sunlight.
- B** So, is the concept of a technological fix new? Not at all; but while most remedies have focused on combating greenhouse gases themselves – finding ways to remove them from the air or scrub them from power-plant emissions – only recently have more radical ideas been taken seriously.
- C** Well, fortunately, if the worst comes to the worst, scientists still have a few tricks up their sleeves. For the most part they have strongly resisted discussing these options for fear of inviting a sense of complacency that might thwart efforts to tackle the root of the problem. Until now, that is.
- D** What's more, geo-engineering in general has major drawbacks. It does nothing about the carbon dioxide in the atmosphere, which would still produce effects such as ocean acidification. When carbonic acid runs into the oceans from rocks, they get more acidic. Nobody disputes that this will happen on an increasing scale. The only question is how much it matters to basic ecosystems.
- E** The simplest method put forward has been known for decades. That is to inject sulphur dioxide into the stratosphere, mimicking the cooling effects of volcanoes. Sulphur is cheap, and the means of releasing it could be as simple as pumping it up through a vertical pipe as much as ten kilometres long. Sulphur dioxide forms sulphate particles that are big enough to block part of the incoming sunlight, but small enough to allow infrared wavelengths – the heat radiation from the Earth – to escape back into space.
- F** So, which approach has the edge? It comes down to costs and feasibility. If we were suddenly faced with a climate catastrophe, the sulphur-particle approach is cheap enough to be essentially free. The engineering is simple enough that it could be put up in a couple of years. The space sunshade, though attractive, seems unlikely to be implemented. If cost were no object, one would want to use something like this latter scheme, because it's very clean and controllable, and would likely minimise any secondary effects. But it's very expensive. If you want to go to that much effort, it would be simpler just to change our energy systems.
- G** The approach is not without side-effects, however. Anything we do within the Earth's atmosphere might have unpredictable results that turn out to be worse than the cure, such as dramatic changes in regional rainfall or drought patterns, or chemical reactions that might disrupt ecosystems.
- H** Once launched, the receptacles would travel to the place between the Earth and sun where their gravitational fields cancel out, allowing objects to remain stationary relative to the two bodies. This is where the contents would be released. Scientists think they could be kept in place for 50 years or more.

### Part 7

You are going to read a magazine article about six young people who have been successful in various artistic fields. For questions **44–53**, choose from the people (**A–F**). The people may be chosen more than once. Mark your answers **on the separate answer sheet**.

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#### Which of the successful young people

is inspired to investigate motivation? 

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is undaunted by the prospect of future demands? 

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makes a link between background and character? 

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appears to have thrived on negative feedback? 

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seems strangely unassuming given levels of success? 

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concentrates more on the medium than the message? 

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was prepared to make a leap into the unknown? 

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owes success to taking a step on impulse? 

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has a healthy disregard for adverse comment? 

52	
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shows an understanding way beyond experience? 

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## Six to watch

*Sarah Carter chooses six young people to watch in various artistic fields.*

### **A Yasmin Shahmir – singer**

'I was so excited. I felt euphoric,' says Yasmin having heard her first single being played. After five years spent DJing, this is one milestone the 22 year-old will never forget. The feline-eyed singer cuts a striking figure and you sense she was not destined to stay behind the decks forever. 'The song is about a time in my life when I was really going out on a limb – I'd quit my university course and moved to London where I was up for whatever life threw at me. At school I'd never been like the others – I'm half-Iranian, half-English and have a weird name. So I stood out a bit – maybe that's where my determined attitude comes from.'

### **B Emma Hart – video artist**

Emma Hart is tipped as 'one-to-watch'. Her output consists of video works, lectures and performances that challenge the way photographs and film are received. They make witty observations about everyday situations and ask the viewer to be active and questioning. 'The focus,' she says, 'is on how I use the camera, not on what I'm filming.' Recognition has been hard won. She worked first as a 'frustrated' office clerk. Bitten by the photography bug, she began a degree course but, constantly getting marked down on technical issues, dropped out. However, the criticism received was probably the making of her – it helped consolidate her artistic ideas, and made her more determined. It paid off in the end.

### **C Danielle Hope – actor**

'I'm 18, I'm a leading lady and a singer. I mean, who'd have thought it?' Danielle's life has undergone a considerable change – last year she was working as a waitress and thinking about applying to drama school. Instead, she auditioned on a whim and beat 9,000 hopefuls to win the lead role in a forthcoming musical. She seems remarkably unfazed by the task ahead. 'I don't want to let anyone down. It's self-pressure more than anything. Of course some will like my performance, some will hate it. Everyone's entitled to their opinion. I won't take it to heart – they won't be criticising me the person, but me the actress. It's all been so exciting – I've no idea what's going to be next.'

### **D Eudon Choi – fashion designer**

Eudon Choi trained as a menswear designer in South Korea and has always enjoyed the support of his family. After moving to London he won a prestigious award and his collection is soon to be stocked in 'Brown's Focus', an influential fashion boutique. For all the accolades, Eudon is surprisingly diffident. Is it a strain living up to all the hype? 'You can say that again!' For a relatively new designer, it's a great start. His inspiration comes from eclectic sources – he trawls vintage shops for military jackets and has, in the past, taken the aesthetic of the industrial revolution as his model. Now his clothes are acclaimed by fashion editors and worn by celebrities.

### **E Andrew Sheridan – playwright**

Andrew Sheridan's debut play is soon to open in Manchester. It has already been described as 'the best first play' by one of a group of leading young playwrights, the friends who initially pushed him into writing. It will be judged by the actors too, well known to Sheridan after a decade performing on stage and screen, and by his family. His family's reaction concerns him – none of them has ever had anything to do with the theatre and they haven't read his play. A desire to delve into 'what it is to be human' primarily drives his writing – 'what ultimately makes us tick.' Will his family find it all a bit weird?

### **F Sunjeev Sahota – novelist**

Sunjeev studied maths at university and didn't catch the reading bug until relatively late – he didn't read a novel until he was 18. Now, after eleven years spent 'catching-up', with his own first novel just published, he talks with the air of someone with a lifetime's reading behind him. It took him four years to write, working in the evenings and at weekends, but he didn't really expect to get it published – 'It was just maybe, maybe.' Now that it's out, he feels good. 'My friends aren't readers. They're just normal lads. But they've all bought the book. I'm anxious, slightly, and proud.'