**Reading Test- 4\_22**

**READING PASSAGE 1**

You should spend about 20 minutes on **Questions 1-13**, which are based on Reading Passage 1 on the following pages.

**DRIVING ON AIR**

No matter how costly, hazardous, or polluting they are, nor how tedious it is to be stuck in traffic jams, cars are here to stay. In fact, the global car industry is worth a massive two trillion dollars a year.

Recently, Guy Negre, a French engineer on Renault’s Formula One engines, designed and produced the Airpod - a vehicle which runs on air, is lightweight and compact and capable of reaching moderate speeds.

Since the transport sector constitutes one seventh of all air pollution, Negre spent 15 years developing the Airpod, hoping to significantly reduce greenhouse-gas emissions. Petrol-electric hybrids, already on the market, are touted as being environmentally friendly, yet he says they are barely less polluting than combustion-engine vehicles. The Airpod, on the other hand, produces just 10% of the carbon monoxide of other cars.

Major manufacturers are now considering hydrogen as a power source for vehicles, but this technology may be decades away. Meantime, according to Negre, electric vehicles remain impractical; batteries are expensive, and need replacement within five years; recharging takes several hours.

Negre’s secondary aim in creating the Airpod was to bring cars within reach of consumers in the developing world. To date, his most impressive deal has been with an Indian car manufacturer which predicts the Airpod will retail for the price of an average motorcycle.

Currently, only three-wheeled Airpods are available, but Negre has a four-wheeled, five-door family saloon, plus vans, buses, taxis, boats, and aircraft on the drawing board.

So what is an Airpod? This small vehicle resembles an ordinary ear except that it is made mostly from fiberglass - ten times as strong as steel but very light - meaning an Airpod weighs just 220 kilograms (484 lb). It has glass windows and an aluminium engine. However, it uses a joystick instead of a steering wheel, and it has backward-facing passenger seats and a front- opening door.

The 180cc engine of an Airpod allows it to reach a speed of around 70 kilometres per hour (kph) (43 mph), and it can drive for about 220 kilometres (137 miles) before refilling is necessary. It takes as little as 90 seconds to pump air into an Airpod from a high-speed compressor at a gas station, with air costing a mere 50 cents for a 220-kilometre journey. An on-board pump can refill the tank at home overnight.

How does an Airpod work? Quite simply: air is released through pistons in the engine. Which drive the wheels. Compressed air tanks store up to 175 litres (46 gallons) of air at about 180 times the pressure of an average car tyre. Passengers and passers-by might have concerns about explosions with such pressure, but, in the rare event of one, the thermoplastic tanks split to release air, rather than shattering and exploding. In fact, the same tanks are already installed on natural-gas buses.

For longer journeys, there is a battery-assisted hybrid Airpod, which Negre maintains is capable of reaching 80 kph (50 mph) and travelling around 1500 kilometres (930 miles) on four litres of petrol, although this version has yet to be manufactured or tested.

Still in its infancy, the Airpod has both supporters and critics. Marcus Waardenberg, the organiser of an Airpod trial at a major Dutch airport, was impressed. ‘The Airpods went over 40 kph (25 mph), were quiet and manoeuverable. Refilling was fast and straightforward.’ As a result, his company is replacing its fleet of electric service vehicles with Airpods.

Perhaps more significantly, AK Jagadeesh, from the Indian conglomerate. Tata, signed a $60-million deal. ‘We're going to use Airpod technology in Tata's Nano car,’ he said.

Ulf Bossel, a sustainable energy consultant, commented that the Airpod easily reaches speeds of over 50 kph (31 mph). ‘Initially, it could capture the second-car market. Then, there are those older people who can no longer afford conventional cars.’ Both Europe and North America have ageing populations.

Bill Robertson, a motoring journalist, noted that the Airpod would suit large numbers of people who make two or three trips a day of fewer than ten kilometers, or who live in distant suburbs of big cities where public transport is poor. If the Airpod looked a little sexier, there would be the potential for it to make inroads into the golf buggy sector, which currently uses electric vehicles.

Among the detractors of the Airpod is the former champion racer, Martella Valentina, who would prefer a vehicle with a more robust engine. ‘There are so many aggressive drivers out there,‘ she said. ‘As a woman, I don't feel safe in an Airpod.’ She added. ‘Refilling overnight is a drag.‘

The automotive engineer, Hamid Khan, concurs, expressing skepticism about sufficient energy storage under reasonable pressure to drive the car any distance, let alone the alleged 220 kilometres (135 miles) before refill. He insists this is unconfirmed by independent tests. Stopping and starting in typical city conditions would also lower the range even further, and more distressingly, safety data is lacking for crash testing. ‘Negre claims fibreglass is stronger than steel, but the Airpod looks as though it would crumple under the wheels of a normal saloon,’ commented Khan.

Nevertheless, Negre has signed deals to manufacture his car in the US, Latin America, India, and several European countries. Compressed air may no longer take a back seat to other power sources, and it is even conceivable that one day we may be flying in aircraft that fly on air.

**Questions 1-8**

Complete the summary toting the list of words, **A-O**, below:

Write the comet letter; **A-O**, in boxes 1-8 on your answer sheet.

The **1**\_\_\_\_\_\_\_\_\_\_\_\_\_ of combustion-engine cars continues **2**\_\_\_\_\_\_\_\_\_\_\_\_\_ there being problems with them. According to Negre, an automotive engineer and inventor, a(n) **3**\_\_\_\_\_\_\_\_\_\_\_\_\_a petrol-electric car, is really not much less **4**\_\_\_\_\_\_\_\_\_\_\_\_\_\_,Negre believes his Airpod is far cleaner and cheaper, and will **5**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ drivers in the developing world in particular.

An Airpod is lighter than other cars at only **6**\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kilograms. The highest continued speed it can reach is around **7**\_\_\_\_\_\_\_\_\_\_\_\_\_ kph. It can be refilled fast at a service station or more slowly at home. Some people may be worried about the high-pressure gas stored on board an Airpod, but its tanks are safe and already in **8**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on public buses.

**A** exist **B** popular **C** polluting

**D** 80 **E** benefit **F** although

**G** 70 **H** polluted **l** alternate

**J** alternative **K** 220 **L** use

**M** popularity **N** 180 **O** despite

**Questions 9-13**

Look at the following statements and the list of people below.

Match each statement with the correct person: **A, B, C,** or **D**.

Write the correct letter; **A, B, C,** or **D,** in boxes 9-13 on your answer sheet.

**9** He claims the hybrid Airpod can travel 1500 kilometres on four litres of petrol.

**10** He imagines the Airpod will appeal to the elderly.

**11** He doesn't think the Airpod will compete with golf buggies unless it changes its appearance.

**12** He doesn’t believe the Airpod can drive as far as its creator maintains.

**13** He has agreed to the manufacture of the Airpod in a number of countries.

**List of people**

**A** Bill Robertson

**B** Guy Negre

**C** Hamid Khan

**D** Ulf Bossel

**READING PASSAGE 2**

You should spend about 20 minutes on **Questions 14-27**, which are based on Reading Passage 2.

**Questions 14-19**

Reading Passage 2 has seven sections: **A-G**.

Choose the correct heading for sections **B-G** front the list of headings below.

Write the correct number, **i-ix**, in boxes 14-19 on your answer sheet.

|  |  |
| --- | --- |
| **List of Headings**  **i** Middle-aged bliss  **ii** Some new definitions of happiness  **iii** Overall and temporary measures  **iv** Children bring pleasure and pain  **v** Culture and contentment  **vi** How wealth and age relate to happiness  **vii** Acceptance affects happiness  **viii** The benefits of an ageing population  **ix** Countries that use happiness measures | **Section A**  In the past, economists measured the wealth of a country and its inhabitants according to the amount of income generated annually, using a figure called the Gross Domestic Product (GDP) or the Gross National Income (GNI) From GDP or GNI, an average income of individuals within a country could be extrapolated. It was also widely held that the richer a country was, the happier its citizens were. More recently, economists have started to rate countries according to additional criteria like: how livable its main cities are; what access to decent education and green space its people have; how safe a country is; and, how clean-or uncorrupt-its government is.  The Human Development Index (HDI) is considered the most reliable of these new economic indicators, but an even more focused measure, the Human Happiness Index (HHI), is steadily gaining in popularity. |
| Example Answer  **Section A** **ii** |

**Section B**

In 2008, Bhutan, a country surrounded by India, Nepal, and China, developed its own Gross National Happiness index to assist in its planning policies. If its inhabitants indicated one of their major concerns was rising fuel costs, then the government attempted to subsidise fuel, not only because it hoped to retain power, but also because if this anxiety were reduced, its citizens would be happier and more productive. Another apprehension of the Bhutanese may be the quality of primary education. Once alerted to this, the state can commence investment. The same year, two famous economists, Amartya Sen and Joseph Stiglitz, were invited by the President of France to devise a happiness index for his country; Britain has recently followed suit.

**Section C**

There are two common measures of happiness: a global measure and a hedonic measure. The former appraises life in general: the latter a person's emotional feeling just yesterday. Two measures are considered necessary because altered circumstances produce different results. As any parent can attest, having children makes people happier overall, especially as the children mature and start their own families, yet, on a day-to-day basis, when the children are young, raising them can be difficult: parents may experience stress, anger, and in some rare cases even misery. Globally, parents are glad they have family; hedonically, they may be going through a bad patch. Likewise employment: a secure enjoyable job contributes greatly to a person’s happiness, but being temporarily unemployed can have a deleterious impact.

**Section D**

Using both these measures - the global and hedonic - some surprising data have come to light. Firstly, wealthier is indeed happier, but there are still some miserable rich people. Danes and Hong Kong Chinese have almost identical purchasing power, meaning although they earn different amounts of money, what they can do with it is about the same. Yet, on a scale of one to ten, Hong Kongers consistently rate their happiness as 5.5 whereas Danes give theirs as 8. Likewise, incomes in Latin America vary little from those in countries of the former Soviet Union, like Ukraine or Kazakhstan, but Latinos are far healthier, longer-living, and more cheerful.

The second significant finding is that the level of happiness increases with age. Despite the body’s decay and fewer financial resources, older people are more stable, less anxious, and most importantly, less angry. It is now universally agreed that suicide rates worldwide peak in the early forties for women and the early fifties for men. Of 72 countries in one recent poll, the average age was 46 after which life became easier. Ukrainians bucked this trend, not finding happiness until after 62, while the Swiss were fortunate for their discontent to decline from 35.

**Section E**

Some common beliefs have been confirmed by the happiness data, for instance that introverted cultures produce more unhappy people. Asians all identified themselves as being unhappier than Western Europeans (with the exception of the Portuguese and Greeks). In 2010, Japan rated highly on the HDI, but near the middle of the HHI. Still, Japan has the world's longest- living women - 83 years is their average life expectancy – so, if people are generally happier as they age, Japanese women do have longer than women elsewhere in which to get happy!

**Section F**

What are the reasons for happiness after middle age? Basically, people understand where they fit in the world. Their ambitions have settled to realistic levels - they accept what they can and cannot do. For example, I won't be able to win the Nobel Prize for Literature, but I could conceivably take first place in a local short-story competition.

**Section G**

It is good news that people get happier as they grow older because populations in most developed countries are ageing, and projections are for many developing countries to have more people over 50 after 2020. Governments have had some concern about the burden on younger taxpayers of this greying population, but perhaps they should reconsider the data: older people, being happier, are potentially more capable than younger ones. Loss of memory and poorer physical skills are balanced by their cheerfulness. Therefore, retirement age can be extended without concern about productivity.

Personally, I would rather have a smiling competent grey-haired colleague than a pretty twenty- something who pretends to know it all but, undemeath. is a seething mass of discontent.

**Questions 20-25**

Choose **ONE WORD OR A NUMBER** from the passage for each answer:

Write your answers in boxes 20-25 on your answer sheet.

**20** There are many different ways to gauge a country’s success. Recent indices concentrate on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_in particular.

**21** A hedonic measure shows a person's emotional condition\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**22** Despite being financially well off, people in Hong Kong did not seem happy. They rated themselves as only\_\_\_\_\_\_\_\_\_\_\_\_\_\_ out of ten.

**23** The international average age for people becoming happier was\_\_\_\_\_\_\_\_\_\_\_\_.

**24** People from less outgoing\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rated themselves as unhappier.

**25** Middle-aged happiness is probably due to a(n)\_\_\_\_\_\_\_\_\_\_\_\_\_ understanding of a person’s place in the world.

**Questions 26-27**

Choose the correct letter: **A, B, C,** or **D**.

Write the correct letter in boxes 26-27 on your answer sheet.

**26** Which of the following does the writer think is true of older people?

1. Government spending on them will always outweigh their productivity.
2. They should retire earlier.
3. Their life expectancy relates to their level of happiness.
4. Because they are more cheerful, they make better employees.

**27** Which of the following is the most suitable title for Reading Passage 2?

1. Happiness surveys give oldies plenty to smile about
2. Gender affects happiness in curious ways
3. We’re richer and happier now than ever before
4. Novel ways to measure happiness

**READING PASSAGE 3**

You should spend about 20 minutes on **Questions 28-40**, which are based on Reading Passage 3 on the following pages.

**SPACE - BASED SOLAR POWER**

In an energy-hungry world, new safe ways to generate electricity are constantly being sought.

Space-based solar power, or SBSP, is not yet up and running, but several space agencies and commercial companies are keenly pursuing it.

SBSP is a system that would harness sunlight in space, convert it into electrical energy, and beam this to receivers in the Earth‘s equatorial zone. SBSP satellites would be in low orbit 1100 kilometres (684 miles) above the Earth.

**Advantages**

To date, solar energy has been collected on the ground, but it is estimated there is 144% more solar power available in space as the Earth’s atmosphere absorbs light. Furthermore, since our planet rotates, energy can only be collected during daylight. It is possible at the poles to when light almost continuously in summer, but in winter such plants cannot operate due to snow, ice, and darkness. In space, however, solar power collection could occur around the clock.

A further benefit may be that the energy produced could be directed to multiple locations whereas terrestrial power plants are limited to sending power one way into a grid.

**Design**

Most prototypes of SBSP structures look like a giant tent hanging in space. Its light, hollow equilateral triangular frame is 336 metres (1103 feet) long while its depth is 303 metres (994 feet). Down two sides are solar collectors, called arrays; on the floor of the ‘tent' sit a solar converter and a transmitting antenna. The antenna sends microwaves to Earth. These waves are at a frequency of 2.45-5.8 gigahertz, or somewhere between infrared and radio signals. They pass through Earth’s atmosphere easily with only minor energy loss. On Earth, the invisible column of microwave energy - perhaps two to three kilometres (3 mile or two) wide – is received by a large oval-shaped ‘rectenna‘ - a new word combining ‘rectifying’ + 'antenna’. A pilot beam, also on Earth, ensures the satellite Stays in position in space.

Two major technical obstacles remain before SBSP becomes a reality. The first is launching satellites into orbit. While most scientists favour low orbit, others believe a higher orbit like 36,050 kilometres (22,400 miles), about one tenth of the distance between Earth and the Moon, would harness more sunlight. However, no agency or company has any experience of launching and controlling a satellite in high orbit, and the cost would be exorbitant. The second problem is wireless power transmission. While this seemed like a physicist’s fantasy a few years ago, in 2009, US and Japanese researchers successfully sent microwave energy between two islands in Hawaii which are 145 km (90 miles) apart-equidistant to Earth’s atmosphere - but it is unknown whether this can be reproduced in space.

**History**

SBSP is not a new idea. Dr Peter Glaser designed a system in the late 1960s, and was granted a US patent in 1973. The US Department of Energy in conjunction with NASA (the American space agency) conducted feasibility studies in the 1970s, but a conservative administration in the 1980s discontinued investment. Only in 1997 did the US government reconsider the idea.

In 2009, an American commercial company Space Energy Incorporated announced it planned to provide SBSP ‘within a decade’. Subsequently, a company called Solaren stated it was likely to provide 200 megawatts of solar power from an SBSP to Pacific Gas and Electric from 2016. PowerSat Corporation has begun the process of patenting a system of interconnected satellites that will project one extremely powerful microwave beam down to Earth. It has also developed a special thruster to lift a satellite from low orbit into higher orbit.

Small-scale scientific projects connected to SBSP have long been in operation in Europe. In 2010, several private European firms joined the space power race, and scientific conferences were held on electromagnetic wireless transmission in Italy and Germany.

**Japanese initiatives**

It is the Japanese, however, who have come nearest to producing a reliable system. Both Mitsubishi Electric Corporation and IHI Corporation currently fund research. Since 1998, JAXA (the Japanese space agency) has been involved in all aspects of SBSP, and it predicts its first satellite will be in orbit by 2030.

There are six broad areas that JAXA is working on. These are: (1) general configuration; (2) assembly work and operation; (3) solar array; (4) transmitting antenna: (5) power transmission and reception system; and, (6) testing methods. The first of these is the most developed. The solar array and transmitting antenna are second in terms of development. Testing methods are relatively unsolved. Assembly work and operation, and power transmission and reception system remain far from being solved.

**Disadvantages**

SBSP has numerous detractors. There are those people who imagine the microwave beam to be something like a science-fiction death ray. Physicists reassure the public it is a non-ionising wave, like a radio wave or x-ray. It cannot displace electrons from atoms to charge particles, so it does not damage DNA. The waves may be slightly warm, but they present no danger to wildlife or humans.

Other opponents of SBSP say that while there is neither corrosion nor damage from plants or animals in space, background radiation could harm the satellite. There is the very real danger of collision with space junk as recently happened at the International Space Station, or with small meteors’ hitting it. The less likely event of an enemy nation firing rockets to destroy the equipment also causes concern. Repairing an unmanned structure so far from Earth would be extremely difficult.

Solar power via the Moon is an option which some scientists say can be in operation in ten years at a fraction of the cost.

But the majority of those against SBSP consider it expensive and unnecessary given that many other forms of renewable energy on Earth are operating successfully. Terrestrial solar power is relatively underdeveloped; the Arizona Desert in the US, and deserts across North Africa provide easily-accessible locations for new systems that would be five times more cost-effective than SBSP.

**Viability**

Nevertheless, as energy requirements accelerate, as unrest in oil-producing regions and nuclear accidents make alternative energy more attractive, space-based solar power may have the future after all.

**Question 28**

Which map below- **A, B,** or **C** - best illustrates the most effective zone for Space-based Solar Power (SBSP)receivers?

Write your answer in box 28 on your answer sheet.



**Questions 29-32**

What are the following statements according to information in the passage?

In boxes 29-32 on your answer sheet, write:

**TRUE** if the statement agrees with the information

**FALSE** if the statement contradicts the information

**NOT GIVEN** if there is no information on this

**29** Solar energy would be beamed down to Earth in SBSP.

**30** SBSP satellites would orbit 100 kilometres above the Earth.

**31** Unlike terrestrial solar power collection, SBSP satellites could collect sunlight 24 hours a day all year round.

**32** SBSP may be sent to anyone who has a rectenna.

**Questions 33-36**

Label the diagram below.

Choose **ONE WORD OR A NUMBER** from the passage for each answer.

Write your answers in boxes 33-36 on your answer sheet.



**Questions 37-39**

Label the diagram below.

Choose **TWO WORDS** from the passage for each answer.

Write your answers in boxes 37-39 on your answer sheet.



**Question 40**

Choose the correct letter: **A, B, C,** or **D**.

Write the correct letter in box 40 on your answer sheet.

Which represents the view of most critics of SBSP‘?

**A** It is a fantasy of physicists, and impossible to build.

**B** Dangers in space mean satellites could easily be destroyed.

**C** It is better to concentrate on clean energy production on Earth.

**D** Oil and nuclear energy are cheaper in the short term.