

Reading Passage 1

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

The Life of Marie Curie

Marie Curie was a remarkable woman from Poland whose discoveries broke new ground in physics and chemistry, and also opened the door for advances in engineering, biology, and medicine. She was the first woman to receive a doctor of science degree in France, the first woman to win the Nobel Prize, the first woman to lecture at the Sorbonne, the first person to win two Nobel Prizes, and the first Nobel Laureate whose child also won a Nobel Prize. Her life offers insights into the changing role of women in science and academia over the past century.

Although Marie's family was not wealthy, both parents were teachers and instilled in their children a love of learning and a deep patriotism, which led to her opposing the Russian occupation of her country. At the time of her birth, Poland was not an independent country and Warsaw was in the part of Poland that was under the control of Russia. Czar Alexander II, the then ruler of Russia, hoped to stamp out Polish nationalism by keeping the people ignorant of their culture and language, and schools were strictly controlled. Although Marie did very well in her school studies, her early days did not show any startling characteristic to indicate that one day she would become the most famous woman scientist in the world.

Marie, along with her sister, Bronya, started attending the Floating University. The name 'Floating University' derived from the fact that it was an illegal night school and its classes met in changing locations to evade the watchful eyes of the Russian authorities. It was obvious that the education given by the Floating University could not match the education provided by any major European university. Both Marie and her sister nurtured a hope of going to Paris to study at the Sorbonne University, however, their father was not in a position to send them to Paris for higher studies. Both the sisters realised that individually, they did not have enough resources to enable them to go to Paris, so they decided that one of them would go first by pulling their resources together. Bronya went first, as she was the older sister and they agreed that Bronya would fund Marie after her graduation as a doctor. Marie worked several years as a governess to finance her older sister's studies at the Sorbonne. In 1890, Bronya graduated and a year later, Marie began her university degree in Paris. At graduation, one of two women in a graduating class of several thousand, Curie ranked first in physics.

After graduation, Marie returned to Poland, as she intended to work there and care for her father. However, she was persuaded by fellow scientist Pierre Curie to return to Paris. Pierre wrote, "It would be a beautiful thing if we could spend our lives near each other. Hypnotized by our dreams - your patriotic dream, our humanitarian dream and our scientific dream." Pierre and Marie married and began their historic collaboration on the nature of radioactivity at a small institute out of the mainstream of the scientific establishment.

In 1896, Becquerel had shown that uranium compounds, even if they were kept in the dark, emitted rays that would fog a photographic plate. This was an accidental discovery, as he was trying to find out whether the new radioactivity discovered by Roentgen could have a connection with fluorescence. The scientific community initially ignored Becquerel's intriguing

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finding. Marie, however, decided to make a systematic investigation of the mysterious uranium rays for her doctorate degree. Marie found that two uranium minerals, pitchblende and chalcocite, were more active than uranium itself, so she hypothesised that a new element that was considerably more active than uranium was present in small amounts.

Working in the small institute with Pierre, Marie had an independence she might not have had at the Sorbonne, where she probably would have been expected to elaborate some superior's work. In their joint work, Pierre observed the properties of the radiation, while Marie purified the radioactive elements. By July 1903, they had isolated a new element, and they wrote, "We propose to call it polonium after the name of the country of origin of one of us." Soon they had isolated another new element, radium. Both the new elements were much more radioactive than uranium and their discoveries brought the Curies international fame with the awarding of the Nobel Prize in 1903.

Following Pierre's death in a road accident in 1906, Marie's status changed again. Now she was a celebrated woman of accomplishment without a husband to make the celebrity acceptable. Marie was appointed as a professor at the Sorbonne University, but her application for membership in the Academy of Sciences in 1910 was rejected, and there can be little doubt she was refused because she was a woman. After this humiliation, Marie became involved in a romantic scandal, but, in spite of public outrage and the objections of some members of the Swedish Academy, Marie received her second Nobel Prize in 1911.

Over the next 20 or so years, Marie worked with radioactive elements and, because the dangers of working with them were not fully understood at that time, the long exposure led to her sickness and death from a type of leukaemia at the age of 66. The amount of radiation she was exposed to is shown by the fact that her old papers and even her cookbook from a hundred years ago are still too dangerous to handle without specialised protective clothing.

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Complete the notes below.

Write **NO MORE THAN THREE WORDS** for each answer.

Write your answers in boxes **1 - 7** on your answer sheet.

The Life of Marie Curie

* Marie's achievement for a scientist and a woman were unprecedented and changed people's views about the developing (1) _____ in her academic field.

* Marie's parents made her a successful student in Russian-controlled Warsaw; due to her (2) _____, she was against the Russian occupation.

* Although attending the Floating University with Bronya, they both wanted to study at the Sorbonne. Lacking the (3) _____ for both their studies, Bronya studied first and, after becoming a doctor, paid for Marie's studies. Marie came first in her class.

* Marie married Pierre Curie after graduation and decided to take a doctorate and study (4) _____, which had recently been discovered by Becquerel. Marie wanted to search for what she believed was a new element in the (5) _____ where uranium was found.

* With the help of her husband, Marie discovered polonium and radium, the former named after her (6) _____. Marie and Pierre won the Nobel Prize.

* After Pierre died, Marie became a professor at the Sorbonne, was refused entry to the Academy of Sciences, was involved in a scandal and won her second Nobel Prize.

* Marie's (7) _____ to radioactivity all her working life led to her dying of leukaemia when she was 66.

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Look at the different significant years in Marie Curie's life (questions **8 - 13**) and match them to the events that took place in those years (**A - F**).

Write your answers in boxes **8 - 13** on your answer sheet.

Significant Years in Marie Curie's Life

8 1891

9 1896

10 1903

11 1906

12 1910

13 1911

A Marie's attempt to join the Academy of Sciences was blocked.

B Marie received her second Nobel Prize.

C Becquerel discovered radioactivity by accident.

D Marie and Pierre won the Nobel Prize for physics.

E Marie began her studies at the Sorbonne.

F Pierre died.

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Tidal Energy

Tidal energy is a form of hydropower that utilises large amounts of power within the ocean's tides to generate electricity. Tidal energy is a renewable energy source, as the Earth uses the gravitational forces of both the moon and the sun everyday to move vast quantities of water around the oceans to produce tides.

There are different kinds of tidal power systems. A tidal barrage is a type of tidal power generation that involves the construction of a fairly low dam wall, known as a 'barrage', across the entrance of a tidal inlet or basin, creating a tidal reservoir. This dam has a number of underwater tunnels cut into its width allowing seawater to flow through them in a controllable way, using a sluice gate on the sea and reservoir side, which can slide down or up to release or retain water as desired. Fixed within the tunnels are propellers that are turned by the tidal flow and they in turn spin a turbine. The movement creates a magnetic field within the generator above, which is converted to electricity.

One disadvantage of tidal barrage electricity generation is that it can only generate electricity when the tide is actually flowing either in or out, as during high and low tide times the tidal water is stationary. However, as the tides are completely predictable, it is straightforward to plan how to compensate for low generation times with other providers in the energy mix. Supporters of tidal power also point out that other renewable energy resources, such as solar and wind farms, are much more unpredictable and intermittent. Other disadvantages of a tidal barrage system are the high construction costs and the environmental effects that a long concrete dam may have on the estuary it spans.

A tidal stream generation system reduces some of the environmental effects of tidal barrages by using turbine generators beneath the surface of the water. Major tidal flows and ocean currents, like the Gulf Stream, can be exploited to extract their tidal energy, using underwater rotors and turbines. Tidal stream generation is very similar in principal to wind power generation, except this time, water currents flow across a turbine's rotor blades that rotate the turbine, much like how wind currents turn the blades for wind power turbines. In fact, tidal stream generation areas on the seabed can look just like underwater wind farms.

Unlike offshore wind power turbines, which can suffer from storms or heavy sea damage, tidal stream turbines operate just below the sea surface or are fixed to the seabed. Tidal streams are formed by the horizontal fast flowing volumes of water caused by the ebb and flow of the tide, as the profile of the seabed causes the water to speed up as it approaches the shoreline. As water is much denser than air and has a much slower flow rate, tidal stream turbines have much smaller diameters and higher tip speed rates compared to an equivalent wind turbine. One of the disadvantages of tidal stream generation is that, as the turbines are submerged under the surface of the water, they can create hazards to navigation and shipping.

A good example of a successful tidal power project is the La Rance power station in France. This tidal barrage is still the largest tidal power station in the world, in terms of installed capacity, with a peak rating of 240 megawatts generated by its 24 turbines, and an annual

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output of approximately 600 gigawatts. The development costs were significant, even back in 1966 when it was opened, but these have now been recovered and electricity production costs are lower than that of nuclear power. The high cost of tidal barrages, however, is what has discouraged the further construction of similar projects.

The environment at La Rance has remained healthy, but there have been changes. The barrage has caused limited silting of the Rance ecosystem, although this has been manageable. Sand eels and plaice have reduced in numbers, but sea bass and cuttlefish have returned to the river. The tidal flows are regulated in the estuary by the operators, who adjust them to minimise the biological impact.

The La Rance tidal plant produces a source of energy that is clean, renewable and sustainable. It has no impact on climate, because it does not emit any greenhouse gases. The pattern of the tides is preserved, so that the impact on species living in the estuary is minimal. The operator monitors the tides and weather forecasts to program the barrage operations on a weekly basis.

Since the construction of the barrage, a new ecological equilibrium has been established in the Rance estuary and there is an abundance of fish, bird and other wild life. The mean water level in the lagoon is higher than it was before the construction, which has promoted an increase in boating and sailing activities. The facility attracts approximately 70,000 visitors per year and a canal lock in the west end of the dam permits the passage of 20,000 vessels each year between the English Channel and the Rance.

Tidal power offers society a clean and renewable source of energy. Although technology is still at a relatively immature stage, economic projections indicate that tidal energy could become cost-competitive over the long-term and governments should explore potential sites for taking advantage of these natural opportunities.

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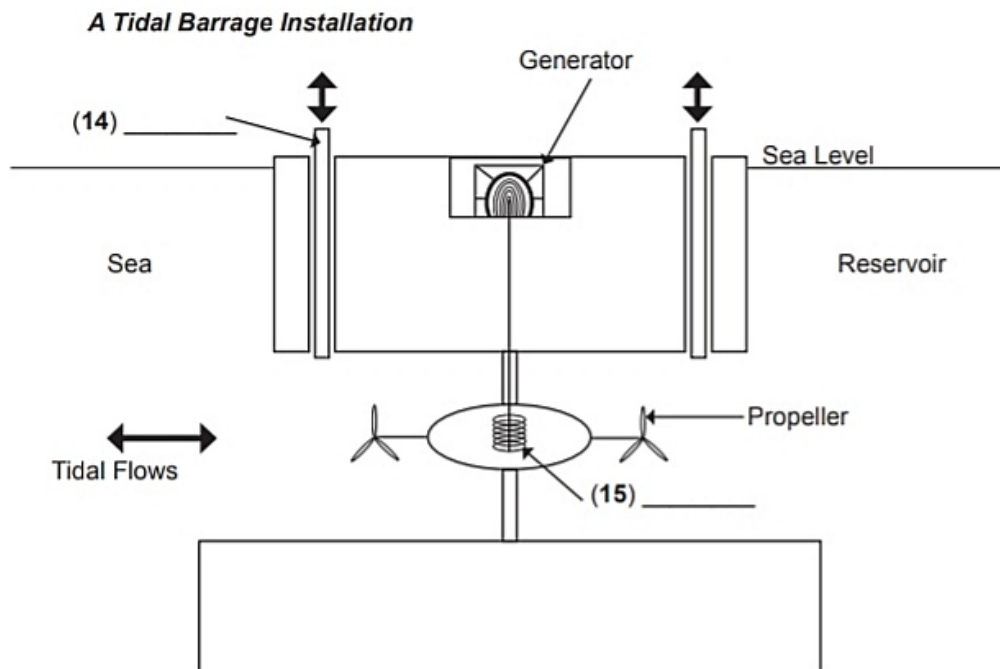
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Questions 14 and 15

Label the diagram below.

Write **NO MORE THAN TWO WORDS** from the text for each answer.

Write your answers in boxes **14** and **15** on your answer sheet.



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Questions 16 - 19

Complete each sentence with the correct ending (A - F) below. Write the correct letter (A - F) in answer boxes 16 - 19 on your answer sheet.

- 16 A problem with tidal barrages is
- 17 Less impact on the environment is
- 18 The generation of tidal stream energy is
- 19 The higher density of the water that passes through tidal stream turbines is
- A created by projects with a tidal stream energy source rather than tidal barrage projects.
- B their potential for negative impact on the area behind the dam.
- C much more expensive than fossil fuel installations.
- D one reason the turbines that are rotated are smaller.
- E not a popular choice with local people and governments.
- F largely the same process used with another renewable power source.

Questions 20 – 26

Complete the summary below.

Write **NO MORE THAN THREE WORDS AND/OR A NUMBER** from the text for each answer. Write your answers in boxes 20 - 26 on your answer sheet.

The La Rance Tidal Barrage

Built in 1966, the La Rance Tidal Power Station is the world's largest tidal barrage. The considerable (20) _____ have been recovered and it's now more efficient than (21) _____. Negative environment effects have been limited and (22) _____ are controlled to reduce problems. The zero emissions don't affect the (23) _____ and wildlife is little affected. Knowledge of tides and (24) _____ helps this. The estuary ecology has changed, but sometimes for the better. The higher (25) _____ has led to increases in tourism and a (26) _____ regulates busy water traffic through the barrage.

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Reading Passage 3

You should spend about 20 minutes on **Questions 27 - 40**, which are based on Reading Passage 3 below.

Is imprisonment the solution to crime? With soaring crime rates being made up mostly of re-offenders, people are questioning the effectiveness of prisons and whether there are viable options to replace or work in conjunction with them.

There seems to be confusion as to what exactly prison is for. Prison director, Katherine Soames, has mixed feelings about her establishment's purpose. "Some say prison is for punishment, but prison is an oblique and expensive way of punishing people. Heavy fines would surely give back more to society than having them languish in a cell. Some say deterrence is the main factor, but there is little evidence of such an effect. Hardened criminals do not fear prison and short prison sentences are probably counterproductive in that they operate as 'schools for crime'. As for rehabilitation, prisons stigmatise people, sever family ties and make it more difficult to get employment on release."

Another reason sometimes given for putting people in prison is retribution, the argument being that people should 'have to pay for what they have done'. Unfortunately, this often penalises people for the consequences of their behaviour, regardless of whether harm was intended. If a driver falls asleep at the wheel and causes the death of ten people, he has no more criminal intent than if he hit a tree and injured himself. He is not dangerous after his driving licence has been taken away, but a man was recently sentenced to five years in prison for this. Prosecutor Angela Martin comments on this case. "While prison might please the relatives of those killed, it is unnecessary for the protection of society and expensive to the taxpayer. I believe the only proper use of prison is for the containment of dangerous criminals, including violent men and serial burglars who cannot be reformed."

Can prison be of use at rehabilitation? Ministry of Justice executive, Colin Case, explains some facts. "Recidivism figures give little cause for optimism regarding the effectiveness of short- or medium-term prison sentences. Ministry of Justice figures show that a crime is committed every 10 minutes by a criminal on bail." Other figures support Case. In the UK for example, one-third of those cautioned or convicted last year had at least 15 previous convictions and only ten per cent were first time offenders. One 66-year-old shoplifter had 330 convictions over fifty years and was still released immediately with a short prison sentence, because he had already served half of it while awaiting trial.

Can we predict in advance which criminals are likely to reoffend? Researchers have attempted to do so. Recently, a study measured impulse control while monitoring brain activity with an MRI. Error-related responses in the anterior cingulate cortex (ACC) indicative of impulsiveness were predictive of rearrest within the four years following release from prison. Those with low activity in the ACC were about twice as likely to be recidivists. The researcher in charge of the study, Sophie Meaker, comments on the results. "While our study gives us some data to help guide our actions with regard to reoffending, they are still not accurate enough for determining life-altering decisions with respect to individuals."

One possible more humane alternative to prison and one of the best is community service. This has elements of punishment (deprivation of freedom and some degree of humiliation), reparation (payback to the community) and rehabilitation (it maintains community ties and

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promotes a work ethic). Jason Howell, a judge in Australia, is a fan. "It is better than short-term prison sentences at reducing reoffending and allows monitoring without a prison sentence. It can take the pressure off the prison system, yet still enforce justice."

Another answer to the over-crowding and ineffectiveness of prison is to turn to electronic tagging, which is the attachment of a transmitter to an offender, usually to the ankle. A control centre can monitor the whereabouts and movements of anyone wearing a tag. This can and ought to be used as a sentence in itself or part of an early release system. It can enforce many of the benefits of prison by requiring offenders to be at home for certain specified hours of the day or night, without incurring the expense of running the prison.

John Dawson, a US child psychologist, explains one key benefit. "Electronic tagging can be of immeasurable benefit for young offenders. Instead of being sent to a young offenders' institute, where they might mix and learn bad habits from other offenders, they can remain in society with their families, and still be monitored. Many young people are very scared by the repercussions of what they have done and keeping them away from negative role models can be enough to allow them to avoid a life of crime."

Research has suggested that electronic tagging would create significant monetary savings, although so far, conclusions have only been based on extrapolating the results of limited trials. There has also been some criticism. Activist Tom Wilkinson argues that tagging should be illegal. "Tagging clearly contravenes a couple of basic human rights, such as the right not to undergo degrading treatment or the right to a private family life. Tagged prisoners have frequently complained of being stigmatised and treated like animals." Parole officer, Alison Headley, opposes tagging for almost an opposite reason. "Tagging is a soft option and one that most prisoners, especially re-offenders, would prefer. It does not punish sufficiently or effectively and does not discourage re-offending." When taking this into account, it seems that tagging is not a suitable measure for re-offenders.

Whatever one's point of view, finding the right solution to the punishment system in today's society is still open to debate. Prison will continue to be widely used, but there will be constant efforts to find alternatives that can punish effectively in an economic way.

Glossary

Recidivism – A return to criminal behaviour.

MRI – Magnetic resonance imaging.

Parole – The conditional release of a prisoner with certain agreed requirements.

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Questions 27 - 33

Look at the following statements (questions 27 - 33) and the list of people below.

Match each statement with the correct person's initials.

Write the correct initials in boxes 27 - 33 on your answer sheet.

- 27 There is still not enough evidence to understand why criminals reoffend.
- 28 Prison should still be used for violent criminals.
- 29 Electronic tagging would often be the punishment of choice for many criminals.
- 30 Prison can severely affect family relationships for offenders.
- 31 Community service can be more effective than brief prison sentences at stopping people committing crimes after release.
- 32 Electronic tagging can be inhumane.
- 33 Reoffending statistics show that prison is ineffectual as a deterrent to committing crime.

KS	Katherine Soames
AM	Angela Martin
CC	Colin Case
SM	Sophie Meaker
JH	Jason Howell
TW	Tom Wilkinson
AH	Alison Headley

In boxes **34 - 39** on your answer sheet write:

YES *if the statement agrees with the writer's views*

NO *if the statement doesn't agree with the writer's views*

NOT GIVEN *if it is impossible to say what the writer thinks about this*

- 34 The purpose for the existence of prisons is unclear for some people.
- 35 One problem with community service is that it cannot impose the feeling of embarrassment for having committed a crime.
- 36 Researchers should study the reactions of prisoners to community service in order to measure its effectiveness.
- 37 Electronic tagging should not be a method for shortening a criminal's prison sentence.
- 38 Electronic tagging should not be an option for repeat offenders.
- 39 The use of prison in society will diminish.

Question 40

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

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

- 40 What is the best title for the text in Section 3?
- A** Prison – Still the Best Punishment
- B** Prison and its Alternatives
- C** UK Prison Life Today
- D** The Benefits of Electronic Tagging