Q1.

Which of the following particles is absorbed and emitted during a nuclear fission reaction?

(1)

☒ **A** electron

☒ **B** neutron

☒ **C** positron

☒ **D** proton

(Total for question = 1 mark)

Q2.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

(i) In a controlled chain reaction of uranium-235, which of these could cause a uranium-235 nucleus to undergo fission?

(1)

☒ **A** an alpha particle

☒ **B** a beta particle

☒ **C** a neutron

☒ **D** a proton

(ii) The kinetic energy of one of the particles released in a fission reaction is 1.2 × 10–11 J.

The mass of the particle is 1.4×10^{-25} kg.

Calculate the velocity of the particle.

(3)

velocity of the particle = ... m/s

(Total for question = 4 marks)

Q3.

Explain how neutrons enable a nuclear chain reaction to take place.

(2)

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(Total for question = 2 marks)

Q4.

Describe how the energy released in the chain reaction in a nuclear reactor is used to drive a turbine in a nuclear power station.

(3)

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(Total for question = 3 marks)

Q5.

(a) Both nuclear fission and nuclear fusion release thermal energy.

Describe how the thermal energy released could be converted into electrical energy in a power station.

(3)

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(Total for Question = 3 marks)

Q6.

Figure 6 is a diagram of a nuclear reactor.

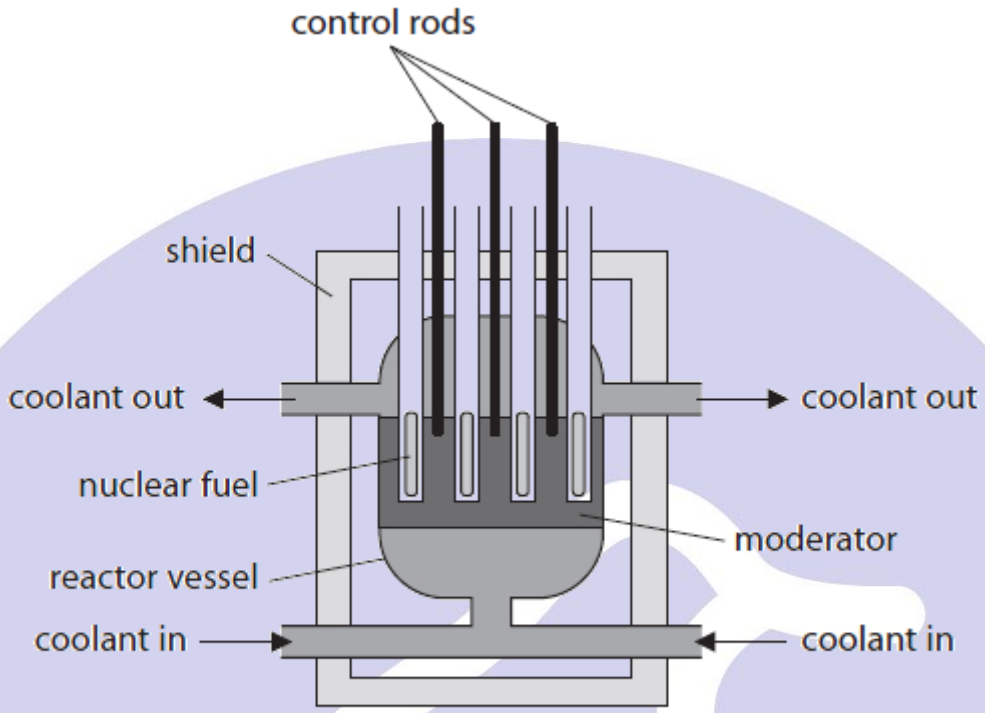

Figure 6

The nuclear reaction is the first stage in the process of generating electricity.

Describe how energy is transferred from the nuclear reaction to the next stage in the process.

(2)

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(Total for question = 2 marks)

Q7.

In a nuclear reactor, a chain reaction is produced and controlled.

Explain what happen inside a nuclear reactor if neutron speeds are not controlled.

(3)

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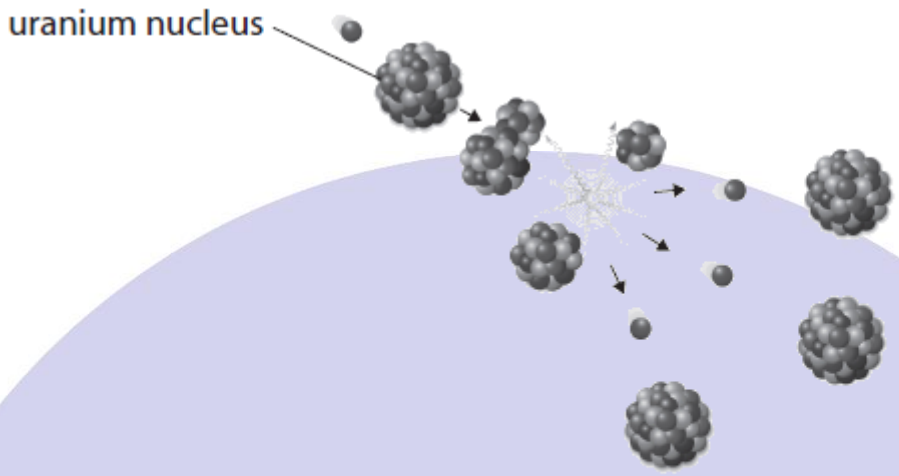
(Total for question = 3 marks)

Q8.

Figure 8 shows what happens during a fission chain reaction.



(Source: © Designua/Shutterstock)

Figure 8

Explain what happens when **one** neutron interacts with **one** uranium nucleus.

(3)

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(Total for question = 3 marks)

Q9.

In a nuclear reactor, a chain reaction is produced and controlled.

(i) Uranium-235 is the isotope used in many nuclear reactors.

Explain how the fission of uranium-235 can lead to a chain reaction.

(4)

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(ii) Nuclei of beryllium-9 do not absorb neutrons.

Instead, nuclei of beryllium-9 absorb alpha particles and emit neutrons.
Give a reason why a chain reaction can result from the emission of neutrons by uranium nuclei but not by beryllium nuclei.

(1)

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(Total for question = 5 marks)

Q10.

*The global demand for electricity is increasing.

There is a debate about whether nuclear power generation should or should not contribute to meeting this increasing demand.

Discuss the arguments for and against using nuclear power to meet the increasing global demand for electricity.

(6)

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(Total for question = 6 marks)

Q11.

When it is time to replace the cobalt-60 rods there are two options.

- The rods can be disposed of.
- The rods can be transported to a nuclear reactor to turn more of the cobalt-59 into cobalt-60 so that they can be used again.Discuss the hazards in these two options.

(6)

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(Total for Question = 6 marks)