

A2 Physics Questions - Nuclear Fission (Multiple Choice)

1. What is the binding energy of the nucleus ${}_{92}^{238}\text{U}$?

Use the following data:

mass of a proton	= 1.00728 u
mass of a neutron	= 1.00867 u
mass of a ${}_{92}^{238}\text{U}$ nucleus	= 238.05076 u
1 u	= 931.3 MeV

- A 1685 MeV
 B 1732 MeV
 C 1755 MeV
 D 1802 MeV



(Total 2 marks)

2. The fission of one nucleus of uranium 235 releases 200 MeV of energy. What is the value of this energy in J?

- A $3.2 \times 10^{-25}\text{J}$
 B $3.2 \times 10^{-17}\text{J}$
 C $3.2 \times 10^{-11}\text{J}$
 D $2.0 \times 10^6\text{J}$

(Total 2 marks)

3. The mass of the nuclear fuel in a nuclear reactor decreases at a rate of 1.2×10^{-5} kg per hour. Assuming 100% efficiency in the reactor what is the power output of the reactor?

- A 100 MW
 B 150 MW
 C 200 MW
 D 300 MW

(Total 2 marks)

4. The moderator in a nuclear reactor is sometimes made of graphite. What is the purpose of the graphite?

- A to absorb all the heat produced
 B to decrease the neutron speeds
 C to absorb α and γ radiations
 D to prevent the reactor from going critical

(Total 2 marks)

5. Which line, A to D, in the table gives a combination of materials that is commonly used for moderating, controlling and shielding respectively in a nuclear reactor?

	moderating	controlling	shielding
A	graphite	carbon	lead
B	cadmium	carbon	concrete
C	cadmium	boron	lead
D	graphite	boron	concrete

(Total 2 marks)

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6. Which one of the following statements is **not** true about the control rods used in a nuclear reactor?
- A They must absorb neutrons.
 - B They must slow down neutrons to thermal speeds.
 - C They must retain their shape at high temperatures.
 - D The length of rod in the reactor must be variable.

(Total 2 marks)

7. A thermal nuclear reactor is shut down by inserting the control rods fully into the core. Which line, **A** to **D**, shows correctly the effect of this action on the fission neutrons in the reactor?

	number of fission neutrons	average kinetic energy of fission neutrons
A	reduced	reduced
B	reduced	unchanged
C	unchanged	reduced
D	unchanged	unchanged

(Total 2 marks)

8. For a nuclear reactor in which the fission rate is constant, which one of the following statements is correct?

- A There is a critical mass of fuel in the reactor.
- B For every fission event, there is, on average, one further fission event.
- C A single neutron is released in every fission event.
- D No neutrons escape from the reactor.

(Total 2 marks)

9. Artificial radioactive nuclides are manufactured by placing naturally-occurring nuclides in a nuclear reactor. They are made radioactive in the reactor as a consequence of bombardment by

- A α particles.
- B β particles.
- C protons.
- D neutrons.

(Total 2 marks)

10. In a thermal reactor, induced fission is caused by the ${}_{92}^{235}\text{U}$ nucleus capturing a neutron, undergoing fission and producing more neutrons. Which one of the following statements is true?

- A To sustain the reaction a large number of neutrons is required per fission.
- B The purpose of the moderator is to absorb all the heat produced.
- C The neutrons required for induced fission of ${}_{92}^{235}\text{U}$ should be slow neutrons.
- D The purpose of the control rods is to slow down neutrons to thermal speeds.

(Total 2 marks)

