

Unit 4 - Week 2 : Radioactivity and nuclear Reactions

Course outline

How does an NPTEL online course work?

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Week 1: Fundamentals of Nuclear Power

Week 2 : Radioactivity and nuclear Reactions

● Lec 1 : Radioactivity and radioactive decay

○ Lec 2 : Different types of nuclear transmutation

● Lec 3 : Artificial radioactivity and neutron-nucleus interactions

● Lec 4 : Energy and momentum conservation

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Week 4:Chain Reaction in Reactors

Week 5 : Reactor Thermalhydraulics

Week 6:Reactor Control

Week 7:Thermal Reactors

Week 8:Breeder Reactors

Week 9:Nuclear Fusion

Week 10:Biological Effects of Radiation

Week 11:Reactor Safety & Security

Week 12:Waste Management

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Assignment 2

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-02-12, 23:59 IST.

1) The term *Radioactivity* was coined by

1 point

- Marie & Pierre Curie
 Ernest Rutherford & Frederick Soddy
 Henry Becquerel
 Wilhelm Roentgen

No, the answer is incorrect.
Score: 0

Accepted Answers:
Marie & Pierre Curie

2) 1Ci corresponds to the activity of

1 point

- 1 g of Pu-239
 1 g of U-235
 1 g of Ra-226
 1 g of Po-216

No, the answer is incorrect.
Score: 0

Accepted Answers:
1 g of Ra-226

3) Mean life of a radioisotope is

1 point

- equal to its half life
 double of its half life
 about 1.45 times its half-life
 about 0.7 times its half-life

No, the answer is incorrect.
Score: 0

Accepted Answers:
about 1.45 times its half-life

4) A nucleus with high N/Z ratio is likely to undergo

1 point

- α decay
 β decay
 positron decay
 electron capture

No, the answer is incorrect.
Score: 0

Accepted Answers:
 β decay

5) Identify X from the following reaction ${}^{198}_{80}\text{Hg} + X \rightarrow {}^{198}_{79}\text{Au} + {}^1_0\text{P}$

1 point

- electron
 positron
 deuterium
 neutron

No, the answer is incorrect.
Score: 0

Accepted Answers:
neutron

6) The atomic number of the daughter nucleus produced during a particular nuclear reaction is found to be 1 lesser than the parent nucleus, while the mass number remains identical. The reaction it underwent was

1 point

- α decay
 β decay
 positron decay
 electron capture

No, the answer is incorrect.
Score: 0

Accepted Answers:
positron decay

7) The pair of ${}^1_6\text{C}$ and ${}^1_7\text{N}$ is an example of

1 point

- isotope
 isobar
 isomer
 isotone

No, the answer is incorrect.
Score: 0

Accepted Answers:
isobar

8) A particular nuclear reaction is represented in the following short-hand form. Then which of the following reaction is correct?
 ${}^{27}_{13}\text{Al}(\alpha, n){}^{30}_{13}\text{P}$

1 point

- ${}^{27}_{13}\text{Al} + {}^4_2\text{He} + 3{}_0^1\text{n} \rightarrow {}^{30}_{13}\text{P} + {}^0_{-1}\text{e}$
 ${}^{30}_{13}\text{P} + 2{}_0^1\text{e} \rightarrow {}^{27}_{13}\text{Al} + 3{}_0^1\text{n}$
 ${}^{30}_{13}\text{P} + {}^1_0\text{n} \rightarrow {}^{27}_{13}\text{Al} + {}^4_2\text{He}$
 ${}^{27}_{13}\text{Al} + {}^4_2\text{He} \rightarrow {}^{30}_{13}\text{P} + {}^1_0\text{n}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 ${}^{27}_{13}\text{Al} + {}^4_2\text{He} \rightarrow {}^{30}_{13}\text{P} + {}^1_0\text{n}$

9) The following nuclear reaction is an example of ${}^{111}_{48}\text{Cd} + {}^1_0\text{n} \rightarrow {}^{112}_{48}\text{Cd}$

1 point

- Radiative capture
 Charged particle reaction
 Elastic collision
 Neutron emission

No, the answer is incorrect.
Score: 0

Accepted Answers:
Radiative capture

10) Which among the following quantities is not conserved during an inelastic collision?

1 point

- Thermal energy
 Momentum
 Kinetic energy
 Potential energy

No, the answer is incorrect.
Score: 0

Accepted Answers:
Kinetic energy

11) Macroscopic cross-section has a dimension to

1 point

- collision per unit volume
 area per unit volume
 volume per unit area
 area

No, the answer is incorrect.
Score: 0

Accepted Answers:
area per unit volume

12) As per Pauli's postulate, emission of a β -particle must always be accompanied by the appearance of a particle, which is

1 point

- positively charged & has negligible mass
 negatively charged & heavy in mass
 electrically neutral & lighter than electron in terms of mass
 electrically neutral & heavy in mass

No, the answer is incorrect.
Score: 0

Accepted Answers:
electrically neutral & lighter than electron in terms of mass

13) Cs-137 undergoes β decay with a half-life of 30.2 years. Then the initial activity of a sample containing 3×10^{19} atoms/cc is _____ Ci.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.58,0.60

14) _____ MeV of energy is released following the association of electron & positron following a positron decay

1 point

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 1.021,1.023

15) The velocity of a neutron thermalized in an environment of 50 °C is _____ m/s.

1 point

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 2307,2308

16) Rest energy of electron is _____ MeV.

1 point

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.510,0.512

17) The fuel for a reactor contains pellets of UO_2 , which has a density of 10.5 g/cc. If the uranium is enriched to 30% in U-235 (rest U-238), the atom density of U-235 in fuel is _____ $\times 10^{21}$ atoms/cc. Consider molecular weight of U-235, U-238 & oxygen to be 235.0439, 238.0508 & 15.999 kg/kmol respectively.

1 point

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 7.10,7.12

18) Fission of a single U-235 nucleus produces 200 MeV of energy. If only 85% of total neutrons absorbed in uranium can induce fission, the rate of consumption of U-235 is _____ kg/day, in a reactor producing 1500 MW of thermal power. Molecular weight of U-235 is 235.0439 kg/kmol.

1 point

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 1.83,1.88