

NUCLEAR ENGINEERING

1. The efficiency of a nuclear power plant in comparison to a conventional thermal power plant is

- (a) same
- (b) more
- (c) less
- (d) may be less or more depending on size
- (e) unpredictable.

Ans: c

2. Isotopes of same elements have

- (a) same atomic number and different masses
- (b) same chemical properties but different atomic numbers
- (c) different masses and different atomic numbers
- (d) different chemical properties and same atomic numbers
- (e) same chemical properties and same atomic numbers.

Ans: b

3. Atomic number of an element in the periodic table represents the numbers of

- (a) protons in the nucleus
- (b) electrons in the nucleus
- (c) neutrons in the nucleus
- (d) electrons in the atom
- (e) neutrons in the atom.

Ans: a

4. The mass number of a substance represents the sum of total number of

- (a) protons and neutrons in an atom
- (b) protons and electrons in an atom
- (c) neutrons and electrons in an atom
- (d) protons and neutrons in a nucleus
- (e) protons and electrons in a nucleus.

Ans: d

5. Which is not identical for an atom and an isotope

- (a) mass number
- (b) atomic number
- (c) chemical properties
- (d) position in periodic table
- (e) all of the above.

Ans: a

6. Amongst the following, the fissionable materials are

- (a) U^{233} and Pu^{239}
- (b) U^{235} and Pu^{239}
- (c) U^{235} and Pu^{235}
- (d) U^{238} and Pu^{239}

(e) U243andPu235

Ans: a

6. A nuclear unit becoming critical means

- (a) it is generating power to rated capacity
- (b) it is capable of generating much more than rated capacity
- (c) there is danger of nuclear spread
- (d) chain reaction that causes automatic splitting of the fuel nuclei has been established
- (e) it generates no heat.

Ans: d

7. Moderator in nuclear plants is used to

- (a) reduce temperature
- (b) extract heat from nuclear reaction
- (c) control the reaction
- (d) cause collision with the fast moving neutrons to reduce their speed
- (e) moderate the radioactive pollution.

Ans: d

8. The most commonly used moderator in nuclear plants is

- (a) heavy water
- (b) concrete and bricks
- (c) graphite and concrete
- (d) deuterium
- (e) graphite.

Ans: e

9. The nuclear energy is measured as

- (a) MeV
- (b) curie
- (c) farads
- (d) MW
- (e) kWhr.

Ans: a

10. The total energy released in fission of U is

- (a) 5 MeV
- (b) 10 MeV
- (c) 199 MeV
- (d) 168 MeV
- (e) 11 MeV.

Ans: c

11. Breeder reactor has a conversion ratio of

- (a) unity
- (b) more than unity
- (c) less than unity
- (d) zero

(e) infinity.

Ans: b

12. Boiling water reactor employs

- (a) boiler
- (b) direct cycle of coolant system
- (c) double circuit system of coolant cycle
- (d) multi pass system
- (e) single circuit system.

Ans: b

13. Fast breeder reactor uses

- (a) boiler
- (b) direct cycle of coolant system
- (c) double circuit system of coolant cycle
- (d) multi pass system
- (e) single circuit system.

Ans: c

14. One gram of uranium will produce energy equivalent to approximately

- (a) 1 tonne of high grade coal
- (b) 4.5 tonnes of high grade coal
- (c) 10 tonnes of high grade coal
- (d) 100 tonnes of high grade coal
- (e) 1000 tonnes of high grade coal.

Ans: b

15. Which of the following nuclear reactor does not need a heat exchanger for generation of steam

- (a) gas cooled
- (b) liquid metal cooled
- (c) pressurised water
- (d) boiling water
- (e) none of the above.

Ans: d

16. The number of isotopes of hydrogen are

- (a) 1
- (b) 2
- (c) 3
- (d) 4
- (e) 0

Ans: c

17. The commonly used material for shielding is

- (a) lead or concrete
- (b) lead and tin
- (c) graphite or cadmium
- (d) thick galvanised sheets

(e) black carbon papers.

Ans: a

18. The main interest of shielding in nuclear reactor is protection against

- (a) X-rays
- (b) infra-red rays
- (c) α , β , and γ rays
- (d) neutrons and gamma rays
- (e) electrons.

Ans: d

19. Reflector in nuclear plants is used to

- (a) return the neutrons back into the core
- (b) shield the radioactivity completely
- (c) check pollution
- (d) conserve energy
- (e) is not used.

Ans: a

20. The energy required to be applied to a radioactive nucleus for the emission of a neutron is

- (a) 1 MeV
- (b) 2.4 MeV
- (c) 4.3 MeV
- (d) 7.8 MeV
- (e) 20 MeV.

Ans: d

21. Which of the following are fertile materials

- (a) U^{233} and Pu^{239}
- (b) U
- (c) U^{238} and Pu^{239}
- (d) U^{238} and Th^{232}
- (e) none of the above

Ans: b

22. Fertile material is

- (a) the most fissionable material
- (b) the basic fuel for nuclear plants
- (c) basic raw material for nuclear plants
- (d) the material which absorbs neutrons and undergoes spontaneous changes leading to the formation of fissionable material
- (e) none of the above.

Ans: d

23. Enriched uranium is one in which

- (a) %age of U^{235} has been artificially increased
- (b) %age of U has been artificially increased
- (c) %age of U^{234} has been artificially increased

- (d) extra energy is pumped from outside
- (e) all impurities have been removed.

Ans: a

24. Which of the following particles is the lightest

- (a) nucleus
- (b) electron
- (c) proton
- (d) meson
- (e) neutron.

Ans: b

25. Which of the following is the heaviest

- (a) neutron
- (b) proton
- (c) atom
- (d) electron
- (e) nucleus.

Ans: c

26. In fast breeder reactors

- (a) any type of moderator can be used
- (b) graphite is used as the moderator
- (c) heavy water is used as the moderator
- (d) moderator may or may not be used
- (e) moderator is dispensed with.

Ans: e

27. In nuclear fission each neutron that causes fission releases

- (a) no new neutron
- (b) at least one new neutron
- (c) one new neutron
- (d) more than one new neutrons
- (e) many-fold neutrons.

Ans: d

28. The breeding gain in case of thermal breeder reactor as compared to fast breeder reactor is

- (a) same
- (b) lower
- (c) higher
- (d) unity
- (e) higher/lower depending on the size of reactor.

Ans: b

29. Gas cooled reactor uses following materials as moderator, and coolant

- (a) graphite, CO₂
- (b) graphite, air
- (c) heavy water, CO₂

- (d) lead, H₂
- (e) concrete, N₂.

Ans: a

30. A nuclear fission produces energy of following order in MeV

- (a) 20
- (b) 200
- (c) 2000
- (d) 20,000
- (e) 2×10^5 .

Ans: b

31. The process by which a heavy nucleus is splitted into two light nuclei is known as

- (a) splitting
- (b) fission
- (c) fusion
- (d) disintegration
- (e) chain reaction.

Ans: b

32. A nuclear fission is initiated when the critical energy as compared to neutron binding energy of the atoms is

- (a) same
- (b) more
- (c) less
- (d) there is no such criterion
- (e) none of the above.

Ans: b

33. The fast breeder reactor uses the following moderator

- (a) demineralised water
- (b) carbon dioxide
- (c) heavy water
- (d) graphite
- (e) no moderator is used.

Ans: e

34. The first nuclear power plant in India is located at

- (a) Kota
- (b) Kalapakkam
- (c) Tarapur
- (d) Barailly
- (e) Kerala.

Ans: c

35. The nuclear power plant at Tarapur has the following reactor

- (a) fast breeder
- (b) pressurised water

- (c) boiling water
- (d) sodium graphite
- (e) none of the above.

Ans: c

35. Boiling water reactor uses the following as moderator, coolant and working fluid

- (a) ordinary fluid
- (b) heavy water
- (c) molten lead
- (d) hydrogen gas
- (e) none of the above.

Ans: a

36. Ideally the neutron flux in reactor should be

- (a) maximum in center and zero at side
- (b) maximum at side and zero in center
- (c) uniform throughout
- (d) zero throughout
- (e) none of the above.

Ans: c

37. Enriched uranium may contain fissionable contents of the order of

- (a) 1-99%
- (b) 1-25%
- (c) 1-50%
- (d) 1-75%
- (e) 1-90%.

Ans: a

38. U235 will undergo fission by

- (a) high energy (fast) neutrons alone
- (b) low energy (slow) neutrons alone
- (c) either fast or slow neutrons
- (d) medium energy neutrons
- (e) none of the above.

Ans: c

39. U238 will undergo fission by

- (a) high energy (fast) neutrons alone
- (b) low energy (slow) neutrons alone
- (c) either fast or slow neutrons
- (d) medium energy neutrons
- (e) none of the above.

Ans: a

40. A reactor capable of converting a fertile material into fissile isotopes is called

- (a) regenerative reactor
- (b) fast breeder reactor

- (c) breeder reactor
- (d) boiling water reactor
- (e) ferrite reactor.

Ans: a

41. Hydrogen is preferred as better coolant in comparison to CO₂ because former

- (a) is lighter
- (b) is inert
- (c) has high specific heat
- (d) is a good conductor
- (e) all of the above.

Ans: c

42. Natural uranium is made up of

- (a) 99.282% U²³⁸, 0.712% U²³⁵, 0.006% U²³⁴
- (b) 99.282% U²³⁵, 0.712% U²³⁸, 0.06% U²³⁴
- (c) 99.282% U²³⁴, 0.712% U²³⁸, 0.006% U²³⁵
- (d) 99.282% U²³⁵, 0.712% U²³⁴, 0.006% U²³⁸
- (e) none of the above.

Ans: a

43. The risk of radioactive hazard is greatest in the turbine with following reactor

- (a) pressurised water
- (b) boiling water
- (c) gas cooled
- (d) liquid metal cooled
- (e) all of the above.

Ans: b

44. Plutonium is produced

- (a) as basic raw material
- (b) by neutron irradiation of U₂₃₅
- (c) by neutron irradiation of thorium
- (d) artificially
- (e) in high capacity furnace.

Ans: b

45. Electron-volt is the unit of

- (a) atomic power
- (b) energy
- (c) voltage
- (d) radio activity
- (e) there is no such unit.

Ans: b

46. Pick up the wrong statement

- (a) In a heterogeneous or solid-fuel reactor, the fuel is mixed in a regular pattern within moderator.
- (b) Slow or thermal neutrons have energy of the order or 0.025 eV

- (c) Fast neutrons have energies above 1000 eV
- (d) Fast reactor uses moderator
- (e) Most serious drawback in using water as coolant in nuclear plants is its high vapour pressure.

Ans: d

47. The unit of radio-activity is

- (a) electron-volt
- (b) electron-ampere
- (c) curie
- (d) MeV
- (e) AMU.

Ans: c

48. Pick up the wrong statement Fast breeder reactors

- (a) operate at extremely high power densities.
- (b) are liquid-metal cooled
- (c) produce more fuel than they consume
- (d) are unmoderated
- (e) use water as coolant.

Ans: e

49. Uranium-233 is produced

- (a) as basic raw material
- (b) by neutron irradiation of Uz
- (c) by neutron irradiation of thorium
- (d) artificially
- (e) in high capacity furnaces.

Ans: c

50. Plutonium-239 is produced

- (a) as basic raw material
- (b) by neutron irradiation of IT*
- (c) by neutron irradiation of thorium
- (d) artificially
- (e) in high capacity furnaces.

Ans: b

51. Which of the following type of pump is used in liquid metal cooled reactor for circulation of liquid metal

- (a) centrifugal
- (b) axial
- (c) reciprocation
- (d) electromagnetic
- (e) diaphragm.

Ans: d

52. Which of the following is the primary fuel

- (a) Ulii

- (b) U
 - (c) U238
 - (d) Pu:
 - (e) Pu
- Ans: b

53. Which of the following is secondary fuel

- (a) Th232andU238
- (b) U233andPu239
- (c) U233andPu238

Ans: c

54. A pressurised water reactor employs pressuriser for the following application

- (a) to maintain constant pressure in primary circuit under varying load
- (b) to Supply high pressure steam
- (c) to increase pressure of water in primary circuit
- (d) to provide subcooled water at high pressure
- (e) all of the above.

Ans: a

55. Which of the following can be used as a coolant in nuclear plant

- (a) light or heavy water
- (b) molten lead
- (c) carbon dioxide
- (d) freon
- (e) carbon tetrachloride.

Ans: a

56. Reactors for propulsion applications use

- (a) natural uranium
- (b) molten lead
- (c) any form of uranium
- (d) thorium
- (e) plutonium.

Ans: b

57. The function of control rods in nuclear plants is to

- (a) control temperature
- (b) control radioactive pollution
- (c) control absorption of neutron
- (d) control fuel consumption
- (e) none of the above.

Ans: c

58. Breeder reactors employ liquid metal coolant because it

- (a) acts as good moderator
- (b) produces maximum steam
- (c) transfers heat from core at a fast rate

- (d) breeds neutrons
- (e) increases rate of reaction in core.

Ans: c

59. In triggering fission, which type of neutrons are more effective

- (a) fast
- (b) slow
- (c) in bulk
- (d) static
- (e) activated.

Ans: b

60. For economical operation of a nuclear plant

- (a) used fuel should be reprocessed
- (b) moderator should be used
- (c) coolant should be employed
- (d) control rods should be used
- (e) reflector should be used.

Ans: a

61. The size of the reactor is said to be critical when

- (a) chain reaction can be initiated
- (b) it becomes uncontrollable
- (c) it explodes
- (d) it produces no power
- (e) it produces tremendous power.

Ans: a

62. When a reactor becomes critical, then the production of neutrons is

- (a) infinite
- (b) zero
- (c) exactly balanced by the loss of neutrons through leakage
- (d) initiated
- (e) stopped.

Ans: c

63. In the breeder reactors the generation of new fissionable atom is

- (a) at the lower rate than the consumption
- (b) at a higher rate than the consumption
- (c) at an equal rate of the consumption
- (d) depends on other considerations
- (e) unpredictable.

Ans: b

64. The energy produced by a thermal reactor of same size as a breeder reactor is

- (a) almost same
- (b) slightly more
- (c) slightly less

- (d) much less
- (e) much more.

Ans: d

65. Reactors designed for propulsion applications are designed for

- (a) natural uranium
- (b) enriched uranium
- (c) pure uranium
- (d) any type of uranium
- (e) none of the above.

Ans: b

66. Superheated steam is generated in following reactor

- (a) boiling water
- (b) gas cooled
- (c) pressurised water
- (d) all of the above
- (e) none of the above.

Ans: b

67. Solid- fuel for nuclear reactions may be fabricated into various small shapes such as

- (a) plates
- (b) pallets
- (c) pins
- (d) any one of the above
- (e) none of the above.

Ans: d

68. Which of the following is more appropriate for a moderator. One which

- (a) does not absorb neutrons
- (b) absorbs neutrons
- (c) accelerates neutrons
- (d) eats up neutrons
- (e) regenerates neutrons.

Ans: a

69. A fission chain reaction in uranium can be developed by

- (a) slowing down fast neutrons so that U₂₃₅ fission continues by slow motion neutrons
- (b) accelerating fast neutrons
- (c) absorbing all neutrons
- (d) using moderator
- (e) enriching U₂₃₅.

Ans: a

70. In triggering fission, the following types of neutrons are desirable

- (a) fast moving
- (b) slow moving
- (c) critical neutrons

- (d) neutrons at rest
- (e) none of the above.

Ans: b

71. Effective moderators are those materials which contain

- (a) light weight atoms
- (b) heavy weight atoms
- (c) critical atoms
- (d) zero weight atoms
- (e) there is no such criterion.

Ans: a

72. In a fission process, maximum %age of energy is released as

- (a) kinetic energy of neutrons
- (b) kinetic energy of fission products
- (c) instantaneous release of gamma rays
- (d) gradual radioactive decay of fission products
- (e) none of the above.

Ans: b

73. The following present serious difficulty in designing reactor shield

- (a) alpha particles
- (b) beta particles
- (c) thermal neutrons
- (d) fast neutrons and gamma rays
- (e) none of the above.

Ans: d

74. In nuclear fission

- (a) the original elements change into completely different elements
- (b) the electrons of the element change
- (c) the molecules rearrange themselves to form other molecules
- (d) none of the above.

Ans: a

75. In order to have constant chain reaction to produce a constant rate of heat output, the value of ratio of the number of neutrons in one generation to the number of neutrons in the immediately preceding generation must be

- (a) greater than 1.0
- (b) less than 1.0
- (c) equal to zero
- (c) equal to 1.0
- (e) equal to infinity.

Ans: d

75. Each fission of U235 produces following number of fast neutrons per fission

- (a) 1 neutron
- (b) 1 — neutrons

- (c) 1 - 2 neutrons
- (d) 2 — neutrons
- (e) infinite.

Ans: d

76. A fast breeder reactor uses following as fuel

- (a) enriched uranium
- (b) plutonium
- (c) thorium
- (d) U235
- (e) natural uranium.

Ans: d

77. A boiling water reactor uses following as fuel

- (a) enriched uranium
- (b) plutonium
- (c) thorium
- (d) U
- (e) natural uranium.

Ans: a

78. A fast breeder reactor

- (a) uses graphite rods as moderator
- (b) has powerful moderator
- (c) has no moderator
- (d) uses ferrite material as moderator
- (e) uses pressurised water as moderator.

Ans: c

79. Artificial radioactive isotopes find application in

- (a) power generation
- (b) nucleonic devices
- (c) nuclear fission
- (d) nuclear fusion
- (e) medical field.

Ans: e

80. A fast breeder reactor uses

- (a) 90% U-235
- (b) U-238
- (c) U-235
- (d) Pu-239
- (e) U-239.

Ans: a

81. Half life of a radioactive isotope corresponds to the time required for half of the following to decay

- (a) electrons

- (b) protons
- (c) neutrons
- (d) nucleus
- (e) atom.

Ans: e

82. Pressurised water reactor is designed

- (a) for boiling water in the core
- (b) to use liquid sodium metal as coolant
- (c) to use intermediate coolant
- (d) to prevent the water coolant from boiling in the core
- (e) to eliminate the coolant loop of the pressurised water.

Ans: d

83. The coolant used in boiling water reactor is

- (a) CO_2
- (b) pressurised water
- (c) mixture of water and steam
- (d) liquid metal
- (e) mercury.

Ans: c

84. In boiling water reactor, moderator is

- (a) coolant itself
- (b) ferrite rod
- (c) graphite rod
- (d) liquid sodium metal
- (e) blanket of thorium.

Ans: a

85. The most practical fuel for a thermo-nuclear reactor, both from economic and nuclear consideration is

- (a) plutonium
- (b) uranium
- (c) deuterium
- (d) thorium
- (e) lithium.

Ans: c

86. The efficiency of a nuclear power plant in comparison to conventional and nuclear consideration is

- (a) higher cost of nuclear fuel
- (b) high initial cost
- (c) high heat rejection in condenser
- (d) lower temperature and pressure conditions
- (e) nuclear hazard risk.

Ans: d

87. The presence of reflector in nuclear power plants results in

- (a) increased production of neutrons
- (b) complete absorption of neutrons
- (c) controlled production of neutrons
- (d) decreased leakage of neutrons
- (e) decrease of speed of neutrons.

Ans: d

88. The fuel needed, with reflector in nuclear power plant, in order to generate sufficient neutrons to sustain a chain reaction, would be

- (a) more
- (b) less
- (c) same
- (d) zero
- (e) negative, i.e. fuel would be generated.

Ans: b

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