Mechanical Engineering Nuclear Power Plants Important MCQs

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1. The efficiency of a nuclear power plant in comparsion to a conventional thermal power plant is
(a) same
(b) more
(c) less
(d) may be less or mote 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 me 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) U233 and Pu239
(b) U235 and Pu233
(c) U235 and Pu235
(d) U238 and Pu239
(e) U243 and Pu235
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) deutrium
(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) U
(c) 3
(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) a, P, and y 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 polllution
(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 ferrite materials
(a) U233andPu239
(b) U
(c) U238andPu239
(d) U238andTh239
(e) none of the above
Ans: b

22. Ferrite material is
(a) the most fissionable material
(b) the basic fuel for nuclear paints
(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 U235 has been artificially in-creased
(b) %age of U has been artificially increased
(c) %age of U234 has been artificially in-creased
(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, C02
(b) graphite, air
(c) heavy water, C02
(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 x 105.
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 unclear power plant in India is located at
(a) Kota
(b) Kalapakkam
(c) Tarapur
(d) Baraeilly
(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 ferrite 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 C02 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 Uz
(c) by neutron irradiation of throium
(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) Th232 and U238
(b) U233 and Pu239
(c) U233 and Pu238
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 circut
(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 readioactive 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 constuption
(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. Supertheated 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 Uz 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 readioactive 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 clain 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) natrual 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) nulceus
(e) atom.
Ans: e

82. Pressurised water reactor isdesigned
(a) for boiling pi 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) Co2
(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 econocical 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 condi-tions
(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