II PUC

NUCLEAR PHYSICS, RADIOACTIVITY AND SOLID STATE PHYSICS, ELEMENTARY PARTICLES, DIGITAL ELECTRONICS AND SOFT CONDENSED MATTER PHYSICS QUESTION BANK.

Questions carrying one mark

1. What is the energy equivalent of 1 atomic mass unit?
2. What are nuclear forces?
3. What is the function of cadmium or boron rode in a nuclear reactor?
4. Which quantity determines the size of the nucleus?
5. What is the order of nuclear density?
6. The binding energy per nuclear curve is sharp for helium what does it shows?
7. What is the radius of a nucleus of mass number 64?
8. Define atomic mass unit (amu)?
9. Why nuclear forces are called exchanged forces?
10. Nuclear forces are saturated forces. Why?
11. Give an example showing the conversion of energy into mass?
12. What is mass defect?
13. What do you mean by fissile material?
14. What is the function of moderator in a nuclear reactor?
15. How does the nuclear radius of an atomic nucleus is related to mass number A ?
16. What is meant by specific binding energy?
17. The binding energy of the nuclear of C-12 is 92.17 Mev. Find its specific binding energy?
18. Why are nuclear forces called exchanged forces?
19. In which nuclear reaction, nuclear fission or nuclear fusion is more energy per nuclear released?
20. What is radioactivity?
21. What happens when gamma rays are subjected to electric or magnetic field?

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22. How many disintegrations per second will occur in one milli curie?

23. Define 'Curie'?

24. Give the relation between curie and Becquerel?

25. When an alpha particle is emitted, what is the change in atomic number and mass number?

26. Which radioactive radiation is used in the treatment of cancer?

27. Give the relation between mean life and decay constant?

28. All the elements found in nature are not radioactive. Why is this property in heavy elements only?

29. Which is the particle emitted along with electron when a neutron is converted into Proton in a nucleus?

30. What is meant by rectification?

31. What are the majority charge carriers in p-type semiconductor?

32. What is a transistor?

33. Name the device which converts ac voltage into dc voltage.

34. What is meant by extrinsic semiconductor?

35. What is an intrinsic semiconductor?

36. Mention any one application of LED.

37. Write the circuit symbol of AND gate.

38. Write the Boolean equation for OR gate.

39. What is half-adder.

40. What is a liquid crystal?

41. What is an emulsion?

42 .Give an example for oil in water emulsion.

43. Give an example for water in oil emulsion.

44. What is foam?

45. Give an example of a gel.

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QUESTIONS CARRYING TWO MARKS:

46. Explain nuclear chain reaction.
47. Explain nuclear binding energy.
48. Define packing fraction.
49. Define specific binding energy and draw binding energy curve.
50. Define mass defect and binding energy .
51. State Soddy's group displacement law.
52. After how many days the mass of a radioactive sample will reduce from 40 mgm to 1.25mgm,if its half-life period is 2 days?
53. What are the biological effects of radiations?
54. What are leptons? Give an example.
55. What are Quarks? What is its spin?
56. Write the quark model for proton and neutron.
57. What are hadrons? Give an example.
58. Distinguish between p-type and n-type semiconductor.
59 Distinguish between extrinsic semiconductor and intrinsic semiconductor.
60. What is a photodiode? In which biasing does it work?
61. Write two differences between collector region and emitter region of a transistor.
62. Give the circuit symbol and the truth table of OR gate.
63. Give the circuit symbol and truth table of AND gate.
64. Give the circuit symbol and truth table of NOR gate.
65. Give the circuit symbol and truth table of NAND gate.
66. What are the uses of liquid crystals?
67. Which are the different types of liquid crystals?
68. Mention any two groups of thermo tropic liquid crystals.
69. What are emulsions? give an example.

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QUESTIONS CARRYING FOUR/FIVE MARKS:

70. What are the characteristics of nuclear forces?
71. Define atomic mass unit and eV.show that 1 amu=931MeV.
72. Explain the terms ‘mass defect” and ‘nuclear binding ‘energy.
73. Distinguish between nuclear fission and nuclear fusion.
74. Explain any five characteristics of atomic nucleus.
75. State the law of radioactive decay and arrive at the expression for the number of atoms of a radioactive element at any instant of time.
76. Define decay constant and half life of a radioactive element. Arrive at the relation connecting them.
77. What are the properties of radio active radiations?
78. State and explain Soddy’s group displacement laws.
79. Classify conductors, semiconductotrs and insulators based on band theory of solids.
80. Describe with a neat circuit diagram ,the action of a diode as a half wave rectifier.
81. Describe with a neat circuit diagram, the action of a diode as a full wave rectifier.
82. Explain with examples N-type and P-type semiconductors.
83what is a transistor? Distinguish between p-n-p and n-p-n transistors.
84. List out any four differences between intrinsic and extrinsic semiconductors.

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NUMERICALS

Q1. Calculate the mass in kg of 10 micro curie of Pb^{214} , if its half life is 26.8 minutes.

Q2. The half life of a radio active element is $4x10^8$ years. Calculate its decay constant and mean life.

Q3. Find the Activity of one gram of Radium ($_{88}R^{226}$) whose half life is 1620 years.
Avogadro number = $6.023x10^{23}$

Q4. Calculate the mass in gram of radium-226, whose activity is 1 curie and half life, is 1620 years.
(Avogadro number = $6.023x10^{23}$)

Q5. Activity of 1 gm of radium-226 is $3.7x10^{10}$ dis s^{-1}. Calculate the Half life of radium-226 in seconds.

Q6. Find the activity in curie of 1gm of Radon: 222, whose half-life is 3.825 days. Avogadro number =$6.023x10^{23}$
1 curie = $3.7x10^{10}$ dis/sec

Q7. Find the energy released in the following nuclear reaction.

$$_{92}U^{235}+_{0}n^{1} \longrightarrow {}_{56}Ba^{141}+_{36}Kr^{92}+3_{0}n^{1}+Q$$

Given:
Mass of U^{235} = 235.040 amu,
Mass of Ba^{141} = 140.910 amu,
Mass of Kr^{92} = 91.900 amu,
Mass of $_{0}n^{1}$ = 1.00867 amu.

Q8. Calculate the energy released by 1 gram of U^{235} in the following nuclear reaction. Express the energy in MeV.

$$_{92}U^{235} + {}_{0}n^{1} \longrightarrow {}_{56}Ba^{141} + {}_{36}Kr^{92} + 3\,{}_{0}n^{1}$$

Given:
Mass of U^{235} = 235.0439 amu,
Mass of Ba^{141} = 140.9178 amu,
Mass of Kr^{92} = 91.8854 amu,
Mass of neutron = 1.0087 amu.

Q9. Calculate the binding energy of an alpha (α) particle from the following data and express it in MeV.
Mass of helium atom=4.00260amu
Mass of neutron = 1.008665amu
Mass of proton = 1.007825amu.

Q10. Calculate the mass defect and specific binding energy of $_{7}N^{14}$.
Given: The rest mass of nitrogen nucleus is 14.003 amu,
m_p =1.00729 amu,
m_n =1.00867 amu.

Q11. Calculate the energy released in kilowatt-hour (kWh) when 0.2 kg of $_{92}U^{235}$ undergoes fission completely. Assume that the average energy released per fission of $_{92}U^{235}$ nucleus is 200 MeV.

Q12. After how many days the mass of radioactive sample will reduce from 40 mg to 1.25 mg, if its half life period is 2 days?

Q13. Calculate the mass in gram of radium 226. Whose activity is 1 curie and half life is 1620 years.
(Avogadro number = 6.023×10^{23})