



PHYSICS

BOOKS - SARAS PUBLICATION

ATOMS AND NUCLEI

Example

1. Nickel shows ferromagnetic property at room temperature. If the temperature is

increased beyond Curie temperature, then it will show

- A. diamagnetism
- B. paramagnetism
- C. anti ferromagnetism
- D. no magnetic property

Answer:



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2. A 5 watt source emits monochromatic light of wavelength $5000\overset{\circ}{\text{A}}$. When placed 0.5m away, it liberates photoelectrons from a photosensitive metallic surface. When the source is moved to a distance of 1.0m, the number of photo electrons liberates will:

- A. be reduced by a factor of 2
- B. be reduced by a factor of 4
- C. be reduced by a factor of 8
- D. be reduced by a factor of 16

Answer:



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3. In radioactive decay process, the negatively charged emitted β - particles are:

A. the electrons orbiting around the nucleus

B. the electrons present inside the nucleus

C. the electrons produced as a result of the decay of neutrons inside the nucleus

D. the electrons produced as a result of collisions between atoms

Answer:



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4. Two radioactive substances A and B have decay constants 5λ and λ respectively. At $t = 0$ they have the same number of

nuclei. The ratio of number of nuclei of A to those of B will be after $\left(\frac{1}{e}\right)^2$ a time interval:

A. $\frac{1}{2\lambda}$

B. $\frac{1}{4\lambda}$

C. 4λ

D. 2λ

Answer:



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5. The radioactive materials X_1 and X_2 have decay constants 5λ and λ respectively. If initially they have the same number of nuclei, then the ratio of number of nuclei of X_1 to that of X_2 will be $\frac{1}{e}$

A. λ

B. $\frac{1}{2}\lambda$

C. $\frac{1}{4\lambda}$

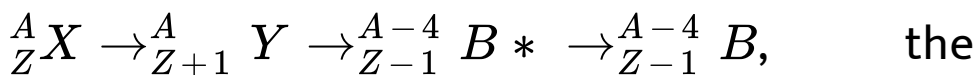
D. $\frac{e}{\lambda}$

Answer:



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6. In the nuclear decay given below:



particles emitted in the sequence are:

A. γ, β, α

B. β, γ, α

C. $\alpha, \beta\gamma$

D. β, α, γ

Answer:



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7. The number of β particles emitted by a radioactive substance is twice the number of α particles emitted by it. The resulting daughter is an:

- A. isomer of parent
- B. isotone of parent
- C. isotope of parent
- D. isobar of parent

Answer:



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8. In a Rutherford scattering experiment when projectile of charge Z_1 and mass M_1 approaches a target nucleus of charge Z_2 and mass M_2 the distance of closest approach is r_0 . The energy of the projectile is:

A. directly proportional to $Z_1 Z_2$

B. inversely proportional to Z_1

C. directly proportional to mass M_1

D. directly proportional to $M_1 \times M_2$

Answer:



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9. The ionization energy of the electron in the hydrogen atom in its ground state is 13.6 eV. The atoms are excited to higher energy levels to emit radiations of 6 wavelengths. Maximum

wavelength of emitted radiation corresponds to the transition between

A. $n = 3$ to $n = 1$ states

B. $n = 2$ to $n = 1$ states

C. $n = 4$ to $n = 3$ states

D. $n = 3$ to $n = 2$ states

Answer:



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10. Sodium has body centered packing .

Distance between two nearest atoms is 3.7\AA .

The lattice parameter is:

A. 4.3\AA

B. 3.0\AA

C. 8.6\AA

D. 6.8\AA

Answer:



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11. The activity of a radioactive sample is measured as N_0 counts per minute at $t=0$ and N_0/e counts per minutes at $t=5$ minutes. The time (in minutes) at which the activity reduces to half its value is :

A. $(\log_e 2 / 5$

B. $\frac{5}{\log_e 2}$

C. $5 \log_{10} 2$

D. $5 \log_e 2$

Answer:



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12. An alpha nucleus of energy $\frac{1}{2}mv^2$ bombards a heavy nuclear target of charge Ze . Then the distance of closest approach for the alpha nucleus will be proportional to

A. $\frac{1}{Z}e$

B. V^2

C. $\frac{1}{m}$

D. $\frac{1}{V^4}$

Answer:



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13. A radioactive nucleus of mass M emits a photon of frequency ν and the nucleus recoils.

The recoil energy will be:

A. $h\nu$

B. $(Mc^2) - (h\nu)$

C. $\frac{H^2\nu^2}{2Mc^2}$

D. Zero

Answer:



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14. The half life of a radioactive isotopes X is 50 years . It decays to another element Y which is stable . The two elements X and Y were found to be in the ratio of 1 : 15 in a sample of a given rock. The age of the rock was estimated to be :

A. 100 years

B. 150 years

C. 200 years

D. 250 years

Answer:



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15. In photoelectric effect, electrons are ejected from metals, if the incident light has a certain minimum

A. Frequency

B. Power

C. wavelength

D. intensity

Answer:



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16. A nucleus ${}^m_n X$ emits one α -particles and two β -particles. The resulting nucleus is:

A. ${}_{m-2}^{m-4}Y$

B. ${}_{m-4}^{m-6}Z$

C. ${}_n^{m-6}Z$

D. ${}_n^{m-4}X$

Answer:



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17. If the nuclear radius of ${}^{27}Al$ is 3.6 fermi, the approximate nuclear radius of ${}^{64}Cu$ is

A. 1.2

B. 4.8

C. 3.6

D. 2.4

Answer:



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18. A mixture consists of two radioactive materials A_1 and A_2 with half lives of 20s and 10s respectively . Initially the mixture has 40g

of A_1 and 160 g of A_2 . The amount of the two in the mixture will become equal after:

A. 80s

B. 20s

C. 40 s

D. 60s

Answer:



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19. An electron of a stationary hydrogen atom passes from the fifth energy level to the ground level. The velocity that the atom acquired as a result of photon emission will be :

A. $\frac{25hR}{24m}$

B. $\frac{5m}{24hR}$

C. $\frac{24m}{25hR}$

D. $(24hR)(25m)$

Answer:



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20. The half life of a radioactive isotopes 'X' is 20 years . It decays to another element 'Y' which is stable . The two elements 'X' and 'Y' were found to be in the ratio of 1:7 in a sample of a given rock. The age of the rock was estimated to be :

A. 40 years

B. 60 years

C. 80 years

D. 100 years

Answer:



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21. In a n-type semiconductor , which of the following statement is true?

A. Electrons are majority carriers and trivalent atoms are dopants

B. Electron are minority carriers and pentavalent atoms are dopants

C. Holes are minority carriers and pentavalent atoms are dopants

D. Holes are majority carriers and trivalent atoms are dopants

Answer:



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22. α - particle , β - particle and γ rays are all having same energy . Their penetrating power in a given medium in increasing order will be:

A. β, γ, α

B. γ, α, β

C. α, β, γ

D. β, α, γ

Answer:



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23. How does the Binding Energy per nucleon vary with the increase in the number of nucleons?

A. Increases continuously with mass number

B. Decrease continuously with mass number

C. First decreases and then increases with increase in mass number

D. First increases and then decreases with
increase in mass number

Answer:



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24. Hydrogen atom in ground state is excited by a monochromatic radiation of $\lambda = 975\text{\AA}$. Number of spectral lines in the resulting spectrum emitted will be

A. 3

B. 2

C. 6

D. 10

Answer:



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25. The binding energy per nucleon of ${}^7_3\text{Li}$ and ${}^4_2\text{He}$ nuclei are 5.60 MeV and 7.06 MeV, respectively. In the nuclear reaction

${}^7_3\text{Li} + {}^1_1\text{H} \rightarrow {}^2_4\text{He} + {}^4_2\text{He} + Q$, the value of

energy Q released is:

A. 19.6 MeV

B. -2.4 MeV

C. 8.4 MeV

D. 17.3 MeV

Answer:



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26. A radio isotope X with a half life 1.4×10^9 years decays to Y which is stable. A sample of the rock from a cave was found to contain X and Y in the ratio 1 : 7. The age of the rock is:

A. 1.96×10^9 years

B. 3.92×10^9 years

C. 4.20×10^9 years

D. 8.40×10^9 years

Answer:



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27. A nucleus of uranium decays at rest into nuclei of thorium and helium . Then:

- A. The helium nucleus has less kinetic energy than the thorium nucleus
- B. The helium has more kinetic energy than the thorium nucleus
- C. The helium nucleus has less momentum than' the thorium nucleus

D. The helium nucleus has more momentum than the thorium nucleus

Answer:



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28. Water rises to height 'h' on capillary tube .

If the length of capillary tube above the surface of water is made less than 'h' then:

A. water does not rise at all

- B. water rises upto the tip of ,icapillary tube and then starts overflowing like a fountain
- C. water rises upto the top of capillary tube and stays there without overflowing
- D. water rises upto a point a little below the top and stays there.

Answer:



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29. The value of coefficient of volume expansion of glycerine is $5 \times 10^{-4} \text{K}^{-1}$ fractional change in the density of glycerine for a rise of 40°C in its temps is

A. 0.010

B. 0.015

C. 0.020

D. 0.025

Answer:



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30. An electron is moving in a circular path under the influence of a transverse magnetic field of $3.57 \times 10^{-2} \text{T}$. If the value of e/m is $1.76 \times 10^{11} \text{C/kg}$, the frequency of revolution of the electron is:

A. 62.8 MHz

B. 6.28 MHz

C. 1 GHz

D. 100 MHz

Answer:



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31. If an electron in a hydrogen atom jumps from the 3rd orbit to the 2nd orbit, it emits a photon of wavelength λ . When it jumps from the 4th orbit to the 3rd orbit, the corresponding wavelength of the photon will be:

A. $\frac{20}{7} \lambda$

B. $\frac{20}{13} \lambda$

C. $\frac{16}{25} \lambda$

D. $\frac{9}{16} \lambda$

Answer:



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32. The half - life of a radioactive substance is 30minutes . The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is:

A. 45

B. 60

C. 15

D. 30

Answer:



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33. When an α - particle of mass 'm' moving with velocity 'v' bombards on a heavy nucleus

of charge Ze its distance of closet approach the nucleus depend on m as:

A. m

B. $\frac{1}{m}$

C. $\frac{\sqrt{1}}{m}$

D. $\frac{1}{m^2}$

Answer:



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34. Given the value of Rydberg constant is $10^7 m^{-1}$, the wave number of the last line of the Balmer series in hydrogen spectrum will be:

A. $2.5 \times 10^7 m^{-1}$

B. $0.025 \times 10^4 m^{-1}$

C. $0.5 \times 10^7 m^{-1}$

D. $0.25 \times 10^7 m^{-1}$

Answer:



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35. Suppose the charge of proton and an electron differ slightly . One of them is e , the other is $(e + \Delta e)$. If the net of electrostatic force and gravitational force between two hydrogen atoms placed at a distance d (much greater than atomic size) apart is zero , then Δe is of the order of [Given mass of hydrogen $m_h = 1.67 \times 10^{-27} \text{ kg}$

A. $10^{-23} C$

B. $10^{-37} C$

C. $10^{-47} C$

D. $10^{-20}C$

Answer:



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36. Radioactive material 'A' has decay constant 8λ and material 'B' has decay constant ' λ '. Initially they have same number of nuclei. After what time the ratio of number 'B' to that 'A' will be $\frac{1}{e}$.

A. $\frac{1}{7\lambda}$

B. $\frac{1}{8\lambda}$

C. $\frac{1}{9\lambda}$

D. none of these

Answer:



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