

परीक्षेचे नांव : सहायक प्राध्यापक, भौतिकशास्त्र, महाराष्ट्र शिक्षण सेवा
(महाविद्यालयीन शाखा), गट -अ, चाळणी परीक्षा-2013

परीक्षेचा दिनांक : 09 फेब्रुवारी, 2014

विषय : भौतिकशास्त्र

महाराष्ट्र लोकसेवा आयोगामार्फत सहायक प्राध्यापक, भौतिकशास्त्र, महाराष्ट्र शिक्षण सेवा (महाविद्यालयीन शाखा), गट -अ, चाळणी परीक्षा-२०१३ या चाळणी परीक्षेच्या प्रश्नपत्रिकेची उत्तरतालिका उमेदवारांच्या माहितीसाठी संकेतस्थळावर प्रसिध्द करण्यात आली होती. त्यासंदर्भात उमेदवारांनी अधिप्रमाणित (Authentic) स्पष्टीकरण / संदर्भ देऊन पाठविलेली लेखी निवेदने, तसेच तज्ज्ञांचे अभिप्राय विचारात घेऊन आयोगाने उत्तरतालिका सुधारित केली आहे. या उत्तरतालिकेतील उत्तरे अंतिम समजण्यात येतील. यासंदर्भात आलेली निवेदने विचारात घेतली जाणार नाहीत व त्याबाबत कोणताही पत्रव्यवहार केला जाणार नाही, याची कृपया नोंद घ्यावी.

उत्तरतालिका - KEY

Question Paper Preview

Notations:

1. Options shown in green color are correct.
2. Options shown in red color are incorrect.

Question Paper Name:	Assistant Professor Physics Actual
Creation Date:	2014-02-04 12:29:06.0
Cut Off:	10
Duration:	60
Number of Questions:	100

Group A

Number of optional sections to be attempted: 0	Group Maximum duration : 0	Group Minimum duration : 60
Revisit allowed for view? : No	Revisit allowed for edit? : No	Break time: 0

Assistant Professor Physics

Section type : Online	Number of Questions to be attempted:100	Mandatory or Optional: Mandatory
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Sub-Section : 1	Question Shuffling Allowed : Yes
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Question id : 4503 Question Type : MCQ

What characteristics would characterize an ideal operational amplifier?

Options :

1. An infinite voltage gain, zero input resistance and zero output resistance
2. An infinite voltage gain, zero input resistance and an infinite output resistance.
3. An infinite voltage gain, an infinite input resistance and an infinite output resistance.
4. An infinite voltage gain, an infinite input resistance and zero output resistance.

Question id : 4504 Question Type : MCQ

The dc current through each diode in a bridge rectifier equals:

Options :

1. the load current
2. half the load current
3. twice the dc load current
4. one-fourth the dc load current

Question id : 4505 Question Type : MCQ

Voltage-divider bias provides:

Options :

1. an unstable Q point
2. a stable Q point
3. a Q point that easily varies with changes in the transistor's current gain
4. a Q point that is stable and easily varies with changes in the transistor's current gain

Question id : 4506 Question Type : MCQ (Correct + 2.0 , Wrong - 0.0)

For an OP-amp with negative feedback, the output is

Options :

1. equal to input
2. increased
3. feedback to the inverting input
4. feedback to the non-inverting input

Question id : 4507 Question Type : MCQ

In an amplitude modulation, bandwidth is the audio signal frequency

Options :

1. thrice
2. twice
3. four times
4. Five times

Question id : 4508 Question Type : MCQ

Which type of special purpose diode has the characteristic voltage controlled capacitor?

Options :

1. A tunnel diode
2. A Schottky diode
3. A zener diode
4. A Varactor diode

Question id : 4509 Question Type : MCQ

Collector -feedback bias is -

Options :

1. Based on the principle of positive feedback
2. Based on beta multiplication
3. Based on the principle of negative feedback
4. Not very stable

Question id : 4510 Question Type : MCQ

The resistance of a photo-resistive cell-

Options :

1. Increase with increase in light intensity
2. Remains constant irrespective of the light intensity incident upon it
3. Decrease with increase in light intensity in a linear manner
4. Decrease with increase in light intensity in an exponential manner

Question id : 4511 Question Type : MCQ

A diode that has a negative resistance characteristic is the-

Options :

1. Schottky diode
2. Tunnel diode
3. Laser diode
4. Hot-carrier cathode

Question id : 4512 Question Type : MCQ

The time base of a CRO is developed by-

Options :

1. Sawtooth waveform
2. Square waveform
3. Triangular waveform
4. Sinusoidal waveform

Question id : 4513 Question Type : MCQ

A silicon diode is in series with a $1.0\text{ k}\Omega$ resistor and a 5V battery. If the anode is connected to the positive battery terminal, the cathode voltage with respect to the negative battery terminal is-

Options :

1. 0.7V
2. 0.3V
3. 5.7V
4. 4.3V

Question id : 4514 Question Type : MCQ

The internal resistance of a photodiode-

Options :

1. Increases with light intensity when reverse-biased
2. Decreases with light intensity when reverse-biased
3. Increases with light intensity when forward-biased
4. Decreases with light intensity when forward-biased

Question id : 4515 Question Type : MCQ

A JFET always operates with-

Options :

1. The gate-to-source pn junction reverse-biased
2. The gate-to-source pn junction forward-biased
3. The grain connected to ground
4. The gate connected to the source

Question id : 4516 Question Type : MCQ

An n-channel D-MOSFET with a positive V_{GS} is operating in-

Options :

1. The depletion mode
2. The enhancement mode
3. Cut off
4. Saturation

Question id : 4517 Question Type : MCQ

One condition for oscillation is-

Options :

1. A phase shift around the feedback loop of 1800
2. A gain around the feedback loop of one third
3. A phase shift around the feedback loop of 900
4. A gain around the feedback loop of less than 1

Question id : 4518 Question Type : MCQ

The Wein-bridge oscillator's positive feedback circuit is-

Options :

1. An RL circuit
2. An LC circuit
3. A voltage divider
4. A lead-lag circuit

Question id : 4519 Question Type : MCQ

For Hartley self start gain-

Options :

1. $A_v > L_2/L_1$
2. $A_v L_2/L_1$
3. $A_v > L_1/L_2$
4. $A_v > L_2^2/L_1$

Question id : 4520 Question Type : MCQ

Colpitts, Clapp and Hartley are names that refers to-

Options :

1. Types of RC oscillators
2. Inventers of the transistors
3. Types of LC oscillators
4. Types of filters

Question id : 4521 Question Type : MCQ

Digital circuit can be made by repetitive use of-

Options :

1. NOT gates
2. OR gates
3. AND gates
4. NAND gates

Question id : 4522 Question Type : MCQ

A differential amplifier-

Options :

1. Is part of an op-amp
2. has one input and one output
3. has two outputs
4. both 'Part of an op-amp and two outputs'

Question id : 4523 Question Type : MCQ

A certain op-amp has bias currents of $50\mu\text{A}$ and $49.3\mu\text{A}$. The input offset current is-

Options :

1. 700 nA
2. $99.3\ \mu\text{A}$
3. $49.7\ \mu\text{A}$
4. 500 nA

Question id : 4524 Question Type : MCQ

In a scaling adder, the input resistor are-

Options :

1. All the same value
2. All of different values
3. Each proportional to the weight of its input
4. Related by a factor of two

Question id : 4525 Question Type : MCQ

A Zener diode works on the principle of-

Options :

1. Tunneling of charge carriers across the junction
2. Thermo-ionic emission
3. Diffusion of charge carriers across the junction
4. Hopping of charge carriers across the junction

Question id : 4526 Question Type : MCQ

Infra-red LED is usually fabricated from-

Options :

1. Ge
2. Si
3. Ga As
4. Ga As P

Question id : 4527 Question Type : MCQ

An n-channel JFET has a pinch off voltage of $V_p = -5V$, $V_{DS(max)} = 20V$ and $g_m = 2 \text{ mA/V}$. The minimum 'ON' resistance is achieved in the JFET for-

Options :

1. $V_{GS} = -7V$ and $V_{DS} = 0V$
2. $V_{GS} = 0V$ and $V_{DS} = 0V$
3. $V_{GS} = 0V$ and $V_{DS} = 20V$
4. $V_{GS} = -7V$ and $V_{DS} = 20V$

Question id : 4528 Question Type : MCQ

A dynamic RAM cell which hold 5V has to be refreshed every 20 msec, so that stored voltage does not fall below 0.5V. If the cell has a constant discharge current of 0.1 pA, the storage capacitance of the cell is-

Options :

1. $4 \times 10^{-6} \text{ F}$
2. $4 \times 10^{-9} \text{ F}$
3. $4 \times 10^{-12} \text{ F}$
4. $4 \times 10^{-15} \text{ F}$

Question id : 4529 Question Type : MCQ

When a program is being executed in an 8085 microprocessor, its program counter contains-

Options :

1. The memory address of the instruction that is to be executed next
2. The number of instruction in the current program that have already been executed
3. The total number of instructions in the program being executed
4. The memory address of the instruction that is being currently executed

Question id : 4530 Question Type : MCQ

In 8085 microprocessor system with memory mapped I/O -

Options :

1. I/O devices have 8-bit addresses
2. Arithmetic and logic operations can be directly performed with the I/O data.
3. I/O devices are accessed using IN and OUT instructions
4. There can be maximum of 256 input devices and 256 output devices

Question id : 4531 Question Type : MCQ

The sodium doublet lines are due to transition from $^2P_{3/2}$ and $^2P_{1/2}$ levels to $^2S_{1/2}$ level. On application of weak magnetic field, the total number of allowed transitions becomes:

Options :

1. 4
2. 6
3. 8
4. 10

Question id : 4532 Question Type : MCQ

A photon is emitted when an electron in a hydrogen atom makes a transition from $n=2$ to $n=1$ state. Given that the ionization potential of the hydrogen is 13.6 eV. The momentum of the photon thus emitted will be:

Options :

1. $4.53 \times 10^{-8} \text{ m/s}$
2. $16.32 \times 10^{-19} \text{ m/s}$
3. $16.32 \times 10^{-8} \text{ m/s}$
4. $5.44 \times 10^{-27} \text{ m/s}$

Question id : 4533 Question Type : MCQ

In HCl molecule, the energy gap between the vibrational levels is 0.36 eV. Its zero point energy will be :

Options :

1. 0
2. 0.18 eV
3. 0.36 eV
4. 0.54 eV

Question id : 4534 Question Type : MCQ

A spectral line of wavelength 600 nm has a width of $5 \times 10^{-6} \text{ nm}$, the minimum time spent by the atomic system in the associated energy state is

Options :

1. $1.0 \times 10^{-8} \text{ s}$
2. $5.0 \times 10^{-8} \text{ s}$
3. $3.82 \times 10^{-8} \text{ s}$
4. $1.92 \times 10^{-10} \text{ s}$

Question id : 4535 Question Type : MCQ

The spectral line width of the He-Ne laser is 0.01 nm and the cross sectional area of the beam is 0.01 cm^2 . If the output power is 1mW, the radiation intensity per unit wavelength (in W/cm^2) is

Options :

1. 10^{16}
2. 10^8
3. 10^{-8}
4. 10^{-10}

Question id : 4536 Question Type : MCQ

The ratio of Einstein coefficients A and B for laser is proportional to

Options :

1. v
2. v^2
3. v^3
4. v^4

Question id : 4537 Question Type : MCQ

The dependence of Doppler broadened line width of a laser transition on temperature T is given by

Options :

1. T
2. $T^{-1/2}$
3. $T^{1/2}$
4. T^2

Question id : 4538 Question Type : MCQ

Rayleigh range Z_R of a Gaussian laser beam is defined as:

Options :

1. $Z_R = \frac{\pi\omega_0^2}{\lambda}$
2. $Z_R = \frac{\omega_0^2}{\pi\lambda}$
3. $Z_R = \frac{\lambda\omega_0^2}{\pi}$
4. $Z_R = 0$

Question id : 4539 Question Type : MCQ

If

$$\Psi = A e^{-\alpha x^2/2} e^{iEt/\hbar}$$

is a normalized wave function, the value of A will be-

Options :

1. 1
2. 0
3. $(\pi/\alpha)^{-1/4}$
4. $\alpha/2$

Question id : 4540 Question Type : MCQ

In the linear Stark effect, the application of an electric field-

- Options :
1. Completely lifts the degeneracy of $n=2$ level of hydrogen atom and splits $n=2$ level into four levels
 2. Partially lifts the degeneracy of $n=2$ level of hydrogen atom and splits $n=2$ level into three levels
 3. Partially lifts the degeneracy of $n=2$ level of hydrogen atom and splits $n=2$ level into two levels
 4. Does not affect the $n=2$ level

Question id : 4541 Question Type : MCQ

The electron in a hydrogen atom with a radius equal to first Bohr radius has a velocity equal to-

- Options :
1. $c/5$
 2. $c/10$
 3. $c/137$
 4. $c/8$

Question id : 4542 Question Type : MCQ

The ratio of frequencies of the first line of the Lyman series and the first line of Balmer series is-

- Options :
1. $27/5$
 2. $27/8$
 3. $8/27$
 4. $4/27$

Question id : 4543 Question Type : MCQ

The Bohr model gives the value for the ionization potential of Li^{2+} ion as-

- Options :
1. 13.6 eV
 2. 27.2 eV
 3. 40.8 eV
 4. 122.4 eV

Question id : 4544 Question Type : MCQ

An SR flip-flop does not accept the input entry when-

- Options :
1. Both inputs zero
 2. Both inputs at one
 3. Zero at R and one at S
 4. Zero at S and one at R

Question id : 4545 Question Type : MCQ

Which of the interactions cause the non-conservation of orbital angular momentum of the electrons in an atom?

- Options :
1. Spin-orbit interaction
 2. Spin-spin interaction
 3. Electrostatic interaction between electrons
 4. Electrostatic interaction between electrons and nucleus

Question id : 4546 Question Type : MCQ

In hyperfine interaction, there is coupling between the electron angular momentum \vec{j} and nuclear angular momentum \vec{I} , forming resultant angular momentum \vec{F} . The selection rules for the corresponding quantum number F in hyperfine transitions are-

Options :

1. $\Delta F = \pm 2$ only
2. $\Delta F = \pm 1$ only
3. $\Delta F = 0, \pm 1$
4. $\Delta F = \pm 1, \pm 2$

Question id : 4547 Question Type : MCQ

The normal Zeeman effect is-

Options :

1. Observed only in atoms with an even number of electrons
2. Observed only in atoms with an odd number of electrons
3. A confirmation of space quantization
4. Not a confirmation of space quantization

Question id : 4548 Question Type : MCQ

The linear Stark effect is possible in a hydrogen atom but not in a sodium atom because-

Options :

1. The principle quantum number for the ground state of the sodium atom is different from that of the hydrogen atom in the ground state
2. Spin-orbit interaction is stronger in sodium than in hydrogen
3. The electronic energy levels of sodium do not exhibit l-degeneracy
4. The electronic energy levels of hydrogen exhibit l-degeneracy

Question id : 4549 Question Type : MCQ

Which one of the following statement concerning the Compton effect is NOT correct?

Options :

1. The wavelength of the scattered photon is greater than or equal to the wavelength of the incident photon
2. The electron can acquire a kinetic energy equal to the energy of the incident photon
3. The energy of the incident photon equals to the kinetic energy of the electron plus the energy of the scattered photon
4. The K.E. acquired by the electron is largest when the incident and scattered photons move in opposite direction

Question id : 4550 Question Type : MCQ

If 50 kV is the applied potential in an X-ray tube, then the minimum wavelength of X-rays produced is-

Options :

1. 0.2 nm

2. 2 nm
3. 0.2 Å
4. 2 Å

Question id : 4551 Question Type : MCQ

A laser beam emerging from a laser tube operating at 80 nm has a cross-sectional diameter of 2 mm. The diameter of the beam at a distance of 1 Km is approximately given by-

Options :

1. 10 mm
2. 8 cm
3. 80 cm
4. 10 m

Question id : 4552 Question Type : MCQ

The splitting of a spectral line in the presence of an electric field is called-

Options :

1. Stark effect
2. Zeeman effect
3. Paschen-Back effect
4. Raman effect

Question id : 4553 Question Type : MCQ

The spectrum of a sodium atom can be explained by considering-

Options :

1. J-J coupling
2. Relativistic correction
3. L-S coupling
4. Hietler-London theory

Question id : 4554 Question Type : MCQ

Angular momentum quantization is directly established by-

Options :

1. Stern-Gerlach experiment
2. Franck-Hertz experiment
3. Photo-electric effect
4. Davisson-Germer experiment

Question id : 4555 Question Type : MCQ

The number of crystallographically equivalent planes in the {110} family of a cubic crystal system is:

Options :

1. 4
2. 6
3. 8
4. 12

Question id : 4556 Question Type : MCQ

The concentration of Schottky imperfections 'n' in an ionic solid at a certain temperature T is given by:

Options :

1. $N \exp(-E_p/kT)$

2. $N \exp(E_p/kT)$
 3. $N \exp(-E_p/2kT)$
 4. $N \exp(E_p/2kT)$
-

Question id : 4557 Question Type : MCQ

The natural cut off frequency ω_m for a one dimensional periodic lattice with force constant K and mass M is given by:

Options :

1. $(4K/M)$
 2. $(4M/K)$
 3. $(4K/M)^{1/2}$
 4. $(4M/K)^{1/2}$
-

Question id : 4558 Question Type : MCQ

A crystal is subjected to a monochromatic X-ray beam, the first order diffraction is obtained at an angle of 15° . If the same X-ray beam is used, what is the angle corresponding to the third order diffraction:

Options :

1. (15°)
 2. (31°)
 3. (51°)
 4. (61°)
-

Question id : 4559 Question Type : MCQ

The lowest energy of an electron confined to move in a one dimensional potential well of length 0.75 \AA is:

Options :

1. 150.7eV
 2. 250.7eV
 3. 350.7eV
 4. 450.7eV
-

Question id : 4560 Question Type : MCQ

The potential of an electron in a one dimensional arrangement of atoms is identical to that used in the Kronig-Penney model. If $V_0 \alpha b < h^2/4\pi^2 m$, the energy band gap at $k=\pi/\alpha$ is :

Options :

1. $2V_0 b/\alpha$
 2. $2V_0 \alpha/b$
 3. $V_0 b/2\alpha$
 4. $V_0 \alpha/2b$
-

Question id : 4561 Question Type : MCQ

The susceptibility of a piece of ferric oxide is 1.5×10^{-3} . If the material is subjected to a magnetic field of 10^6 A/m , the flux density in the material is:

Options :

1. 0.259T
 2. 1.259T
 3. 2.259T
-

4. 3.259T

Question id : 4562 Question Type : MCQ

NaCl has fcc lattice with $a=5.63\text{\AA}$, the spacing of {100} planes is-

Options :

1. 2.82 \AA
 2. 5.64 \AA
 3. 1.41 \AA
 4. 4.23 \AA
-

Question id : 4563 Question Type : MCQ

How many atoms per unit cell are in fcc structure ?

Options :

1. 1
 2. 2
 3. 4
 4. 6
-

Question id : 4564 Question Type : MCQ

The one which is not compatible with crystal symmetry is-

Options :

1. One-fold symmetry
 2. Three-fold symmetry
 3. Five-fold symmetry
 4. Six-fold symmetry
-

Question id : 4565 Question Type : MCQ

The class having the highest possible symmetry for a system is called-

Options :

1. Hemihedral
 2. Tetrahedral
 3. Holohedral
 4. Dihedral
-

Question id : 4566 Question Type : MCQ

The co-ordination number in case of FCC is-

Options :

1. 12
 2. 8
 3. 6
 4. 4
-

Question id : 4567 Question Type : MCQ

The nature of bonding for a crystal with alternate and evenly spaced positive and negative ions is-

Options :

1. Ionic
2. Covalent
3. Metallic
4. Dipole

Question id : 4568 Question Type : MCQ

Point defect in a crystal constitutes of-

Options :

1. Only vacancies in lattice sites
2. Vacancies and impurity atoms
3. Vacancies, impurity atoms and interstitials
4. Impurity atoms and interstitials

Question id : 4569 Question Type : MCQ

For a conventional superconductor, which of the following statement is NOT true ?

Options :

1. Specific heat is discontinuous at transition temperature T_C
2. The resistivity falls sharply at T_C
3. It is diamagnetic below T_C
4. It is paramagnetic below T_C

Question id : 4570 Question Type : MCQ

The temperature at which a conductor becomes a superconductor is called-

Options :

1. Superconducting temperature
2. Curie temperature
3. Onne's temperature
4. Transition temperature

Question id : 4571 Question Type : MCQ

In an R-2R ladder D/A converter, the input resistance is-

Options :

1. Not same for all digital inputs
2. R for each input
3. 2R for each input
4. 3R for each input

Question id : 4572 Question Type : MCQ

Point defects in crystals cannot be produced by-

Options :

1. Elastic deformation
2. Quenching from high temperatures
3. Plastic deformation
4. Irradiation with X-rays

Question id : 4573 Question Type : MCQ

In the original BCS model of superconductivity the dependence of T_C on isotope mass is-

Options :

1. $T_C \propto M^{-1}$
2. $T_C \propto M$
3. $T_C \propto M^{-1/2}$

4. $T_C \propto M^{1/2}$

Question id : 4574 Question Type : MCQ

An electron beam of 4 keV is diffracted through Bragg's angle of 16° for the first maxima. If the energy is increased to 16 keV, the corresponding Bragg's angle of diffraction will nearly be-

Options :

1. 4°
 2. 8°
 3. 12°
 4. 16°
-

Question id : 4575 Question Type : MCQ

The Van der Waal crystal is-

Options :

1. Copper
 2. Argon
 3. Ice
 4. Rock salt
-

Question id : 4576 Question Type : MCQ

In a ferromagnetic material, as the applied field is gradually reduced to zero, the polarization still left is known as-

Options :

1. Coercive polarization
 2. Remanent polarization
 3. Zero polarization
 4. Positive polarization
-

Question id : 4577 Question Type : MCQ

For a type 1 semiconductor, the surface energy is-

Options :

1. Always positive
 2. Always negative
 3. Sometimes positive and sometimes negative
 4. Depends on its T_C
-

Question id : 4578 Question Type : MCQ

The potential energy of a diatomic molecule in terms of interatomic distance R is given by

$$U(R) = -A/R^m + B/R^n$$

where A, B, m and n are constant characteristic for the MX-molecules. The equilibrium separation R_e is obtained as:

Options :

1. $(nA/mB)^{1/n-m}$
2. $(nA/mB)^{1/m-n}$
3. $(nB/mA)^{1/m-n}$

4. $(nB/mA)^{1/n-m}$

Question id : 4579 Question Type : MCQ

A nucleus of medium mass with excess of neutrons may decay with the emission of

Options :

1. Neutrons
 2. Protons
 3. Electrons
 4. Positrons
-

Question id : 4580 Question Type : MCQ

In the semi-empirical formulae the observed parity of odd Z and odd N nuclei in nature is taken care of by the

Options :

1. Surface energy term
 2. Coloumbs energy term
 3. Delta Term
 4. Asymmetry term
-

Question id : 4581 Question Type : MCQ

The binding energy per nucleon of helium nucleus is 7 MeV and that of Deuteron is 1 MeV. Then

Options :

1. Helium nucleus is more stable
 2. Deuteron nucleus is more stable
 3. Both are less stable
 4. Both are equally stable
-

Question id : 4582 Question Type : MCQ

The ratio of the mass defect of the nucleus to its mass number is maximum among following nuclei is

Options :

1. N ¹⁴
 2. Si ²⁸
 3. Fe ⁵⁶
 4. U ²³⁸
-

Question id : 4583 Question Type : MCQ

Nuclear forces are

Options :

1. Spin dependent and have no non-central part
 2. Spin dependent and have a non-central part
 3. Spin independent and have no non-central part
 4. Spin independent and have a non-central part
-

Question id : 4584 Question Type : MCQ

An admissible potential between the proton and the neutron in a deuteron is

Options :

1. Coloumb
2. Harmonic oscillator

3. Finite square well

4. Infinite square well

Question id : 4585 Question Type : MCQ

The ground state of the deuteron is a

Options :

1. Pure 3S_1 state

2. Pure 3P_1 state

3. Mixture of 3S_1 and 3P_1 states

4. Mixture of 3S_1 and 3D_1 states

Question id : 4586 Question Type : MCQ

The angular momentum and parity of ${}^{17}\text{O}_8$ nucleus, according to the nuclear

Shell model (including spin-orbit coupling) is

Options :

1. 0^+

2. $1^-/2$

3. $3^+/2$

4. $5^+/2$

Question id : 4587 Question Type : MCQ

Parity non-conservation was established in β -decay when it was observed

That from polarized ${}^{60}\text{Co}$ nuclei

Options :

1. Electrons were emitted equally in all directions

2. More electrons were emitted in direction opposite to that of magnetic field

3. More electrons were emitted perpendicular to the direction of magnetic field

4. Electrons were not emitted in any direction

Question id : 4588 Question Type : MCQ

The probability of leakage of an α -particle of energy 5 MeV through a potential

Barrier of height 10 MeV and width 10^{-14} m

(Given $\hbar = 1.05 \times 10^{-34}$ J \cdot s, mass of α -particle = 6.4×10^{-27} Kg)

Options :

1. 1.7×10^{-8}

2. 1.7×10^{-10}

3. 1.7×10^{-6}

4. 1.7×10^{-12}

Question id : 4589 Question Type : MCQ

The evidence for the non-conservation of parity in β -decay has been obtained from the observation that the β -intensity

Options :

1. Antiparallel to the nuclear spin directions is same as that along the nuclear spin directions

2. Antiparallel to the nuclear spin directions is not the same as that along the nuclear spin directions
3. Shows a continuous distribution as a function of momentum
4. Is independent of nuclear spin direction

Question id : 4590 Question Type : MCQ

The half life of one of the atoms of a radioactive sample is

Options :

1. $\exp(-\lambda/2)$
2. $\ln 2 / \lambda$
3. $\ln \lambda / 2$
4. $\lambda/2$

Question id : 4591 Question Type : MCQ

When a gamma ray is scattered by an electron at rest, it is observed that

Options :

1. The wavelength of scattered rays is less than original rays
2. The wavelength of scattered rays is greater than the original rays
3. The wavelength of scattered rays cannot be smaller than the de-Broglie Wavelength of electron
4. The wavelength of scattered rays is greater than original rays and depends on the angle of scattering

Question id : 4592 Question Type : MCQ

β -particle spectrum is found to be continuous upto a certain maximum because

Options :

1. β -particle is emitted with continuous energy
2. β -particle carries only a part of the energy leaving the nucleus in an excited state
3. With β -particle another charged particle is emitted
4. With β -particle a chargeless particle is also emitted so that the momentum and energy is distributed among these particles and the recoiling nucleus

Question id : 4593 Question Type : MCQ

Fast neutrons may be easily slowed down by

Options :

1. Passing them through a substance rich in hydrogen
2. Using shield of lead
3. Diffraction through a slit
4. None of these

Question id : 4594 Question Type : MCQ

The theory governing combinations of quarks based on quantum electrodynamics is called

Options :

1. Baryon Theory
2. Quantum chromodynamics
3. Meson theory
4. Lepton theory

Question id : 4595 Question Type : MCQ

In a synchrotron, the magnetic field must change to compensate for

Options :

1. Loss of energy due to air resistance
2. Relativistic mass increase

3. Increase in the radius of the circular path

4. heating of the coils

Question id : 4596 Question Type : MCQ

The method of carbon dating works because

Options :

1. C^{14} has higher atomic weight than C^{12}

2. C^{14} is a stable isotope

3. C^{14} content of the dead body increases with time because of cosmic ray bombardment

4. C^{12} is a stable isotope

Question id : 4597 Question Type : MCQ

Which of the following nuclear reactions is possible

Options :

1. $^{14}N_7 \rightarrow ^{13}C_6 + \beta^+ + \nu_e$

2. $^{13}N_7 \rightarrow ^{13}C_6 + \beta^+ + \nu_e$

3. $^{13}N_7 \rightarrow ^{13}C_6 + \beta^+$

4. $^{13}N_7 \rightarrow ^{13}C_7 + \beta^+ + \nu_e$

Question id : 4598 Question Type : MCQ

A stationary particle in free space is observed to spontaneously decay into two photons

Options :

1. The particle carries electric charge

2. The spin of the particle must be greater than or equal to 2

3. The particle is a boson

4. The mass of the particle must be greater than or equal to the mass of the hydrogen atom

Question id : 4599 Question Type : MCQ

Which of the following functions describes the nature of the interaction potential $V(r)$ between two quarks inside a nucleon ? (r is the distance between the quarks and a and b are positive constants of suitable dimensions)

Options :

1. $V(r) = a/r + br$

2. $V(r) = -a/r + br$

3. $V(r) = a/r - br$

4. $V(r) = -a/r -br$

Question id : 4600 Question Type : MCQ

The minimum number of FLIP-FLOPS required for a synchronous decade counter is-

Options :

1. 1

2. 2

3. 4

4. 10

Question id : 4601 Question Type : MCQ

Which of the following decay is forbidden

Options :

1. $\mu^- \rightarrow e^- + \nu_\mu + \bar{\nu}_e$

2. $\pi^+ \rightarrow \mu^+ + \nu_\mu$

3. $\pi^+ \rightarrow e^+ + \nu_e$

4. $\mu^- \rightarrow e^+ + e^- + e^-$

Question id : 4602 Question Type : MCQ

The process $\Lambda^0 \rightarrow p + \pi^-$ is

Options :

1. Weak and strangeness non-conserving

2. Strong and strangeness non-conserving

3. Electromagnetic and strangeness non-conserving

4. Strong and strangeness conserving