National Testing Agency

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Nanoelectronics Material Sciences

Group Number :	1
Group Id :	80487716
Group Maximum Duration :	0
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Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	300

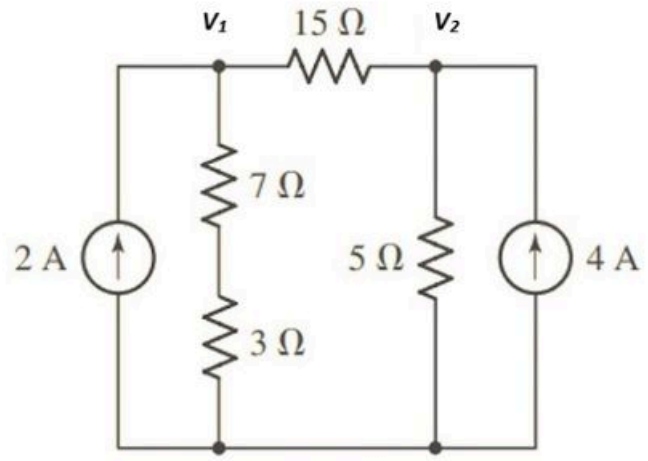
Nanoelectronics Material Sciences

Section Id :	80487716
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	75
Number of Questions to be attempted :	75
Section Marks :	300
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	80487718
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 8048771128 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Determine the node voltages v_1 and v_2 for the given circuit:



1. v_1 = 10 V, v_2 = 20 V
2. v_1 = 20 V, v_2 = 10 V
3. v_1 = 20 V, v_2 = 20 V
4. v_1 = 10 V, v_2 = 10 V

Options :

8048774501. 1

8048774502. 2

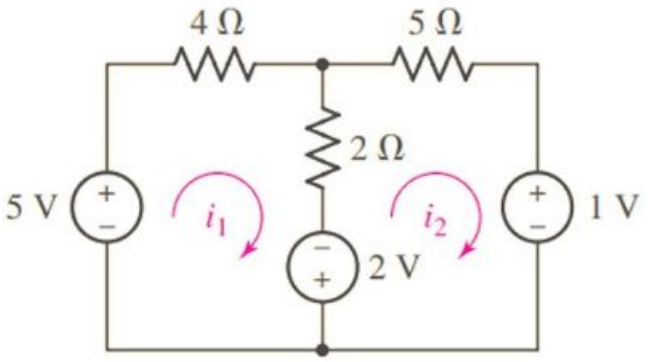
8048774503. 3

8048774504. 4

Question Number : 2 Question Id : 8048771129 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Evaluate the mesh current i_1 in the given circuit :



1. i_1 = 0.132 A
2. i_1 = 1.132 A
3. i_1 = -1.05 A
4. i_1 = -0.105 A

Options :

8048774505. 1

8048774506. 2

8048774507. 3

8048774508. 4

Question Number : 3 Question Id : 8048771130 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

In a circuit, the maximum power will be transferred only if the load resistance is equal to _____.

1. Source resistance (R_s)
2. Thevenin's equivalent resistance (R_{th})
3. 4 times of thevenin's equivalent resistance (R_{th})
4. 4 times of, source resistance (R_s)

Options :
8048774509. 1
8048774510. 2
8048774511. 3
8048774512. 4

Question Number : 4 Question Id : 8048771131 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Choose the ***correct*** statement(s) from the options given below:

(A). Non-linear distortion is expected to be minimum in, Single Side-band Suppressed Carrier(SSB-SC) systems and maximum in Amplitude Modulation (AM).

(B). The AM system is always inferior to suppressed carrier systems, from the noise performance point of view.

(C). The receiver of a suppressed carrier system is simple and cheaper than that of the AM system.

(D). An over-modulated signal refers to the condition, when the amplitude of the base-band signal is less than the carrier amplitude.

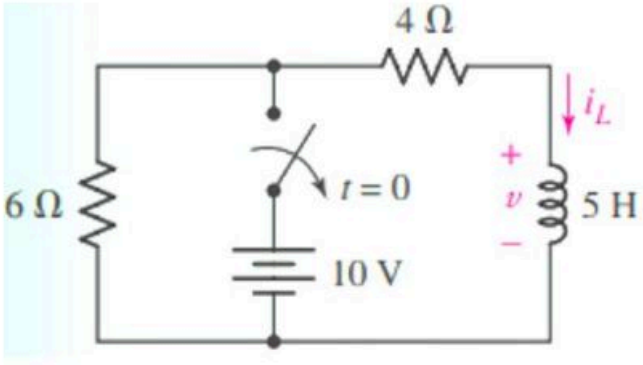
Choose the **correct** answer from the options given below:

1. (A), (B) and (D) only
2. (A) and (B) only
3. (A), (B), (C) and (D)
4. (C) and (D) only

Options :
8048774513. 1
8048774514. 2
8048774515. 3
8048774516. 4

Question Number : 5 Question Id : 8048771132 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The voltage across inductor for t > 0 in the given circuit is_____.



1. $v = 25e^{-2t}$ V
2. $v = 2.5e^{-2t}$ V
3. $v = -2.5e^{-2t}$ V
4. $v = -25e^{-2t}$ V

Options :

8048774517. 1

8048774518. 2

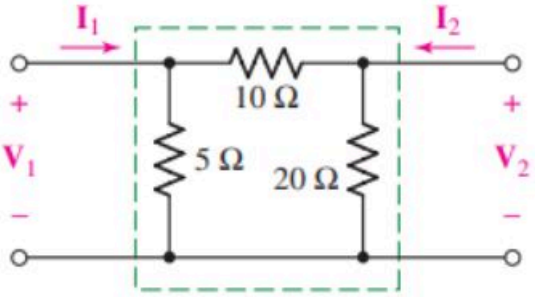
8048774519. 3

8048774520. 4

Question Number : 6 Question Id : 8048771133 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Determine the Y_{11} and Y_{12} parameters for the circuit given are_____.



1. Y_{11} = 0.3 ʊ and Y_{12} = -0.1 ʊ
2. Y_{11} = 0.3 ʊ and Y_{12} = -0.3 ʊ
3. Y_{11} = -0.1 ʊ and Y_{12} = 0.3 ʊ
4. Y_{11} = -0.3 ʊ and Y_{12} = 0.1 ʊ

Options :

8048774521. 1

8048774522. 2

8048774523. 3

8048774524. 4

Question Number : 7 Question Id : 8048771134 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The product of maxterms for the given boolean function is:

Y = ab+a'c

1. $M_0M_1M_3M_7$
2. $M_0M_2M_5M_6$
3. $M_0M_2M_4M_5$
4. $M_1M_2M_4M_5$

Options :

8048774525. 1

8048774526. 2

8048774527. 3

8048774528. 4

Question Number : 8 Question Id : 8048771135 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Characteristic equation (Q_{n+1}) is provided for the different flip-flops

(A). $Q_{n+1} = SQ_n + R'Q_n$

(B). $Q_{n+1} = D$

(C). $Q_{n+1} = T \oplus Q_n$

(D). $Q_{n+1} = JQ_n' + K'Q_n$

Where, Q_{n+1} is the next state of the flip-flop and Q_n is the present state of the flop-flop.

Choose the **correct** answer from the options given below:

1. (A), (B) and (D) only
2. (A), (B) and (C) only
3. (A), (B), (C) and (D)
4. (B), (C) and (D) only

Options :

8048774529. 1

8048774530. 2

8048774531. 3

8048774532. 4

Question Number : 9 Question Id : 8048771136 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The number of flip-flops required to implement a MOD-31 counter are_____.

1. 25
2. 5
3. 12
4. 24

Options :

8048774533. 1
8048774534. 2
8048774535. 3
8048774536. 4

Question Number : 10 Question Id : 8048771137 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The output frequency for an 8-bit Johnson counter is _____if the applied input frequency is 256 GHz.

1. 128 GHz
2. 32 GHz
3. 64 GHz
4. 16 GHz

Options :
8048774537. 1
8048774538. 2
8048774539. 3
8048774540. 4

Question Number : 11 Question Id : 8048771138 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
Counters	**Delay/Number of States**
(A). n-bit ring counter	(I). Number of states is 2^n
(B). MOD-2^n asynchronous counter	(II). Fastest counter
(C). n-bit Johnson counter	(III). Number of used states is 'n'
(D). Synchronous counter	(IV). Number of used states is '2n'

Choose the **correct** answer from the options given below:

1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
3. (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
4. (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Options :
8048774541. 1
8048774542. 2
8048774543. 3
8048774544. 4

Question Number : 12 Question Id : 8048771139 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The percentage of the total power carried by the sidebands of the AM wave for tone modulation when the modulation index is 0.3 is _____.

1. 30%
2. 4.3%
3. 43%
4. 3%

Options :

8048774545. 1

8048774546. 2

8048774547. 3

8048774548. 4

Question Number : 13 Question Id : 8048771140 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
(Modulation Schemes)	**(Modulated wave expressions)**
(A). Amplitude Modulation	(I). $x(t) = A \cos \{\omega_c t + km(t)\}$
(B). Phase Modulation	(II). $x(t) = A \cos \{\omega_c t + k\int m(t)dt\}$
(C). Frequency Modulation	(III). $x(t) = A + m(t)\}\cos \omega_c t$
(D). DSB-SC Modulation	(IV). $x(t) = m(t)\cos \omega_c t$

Choose the **correct** answer from the options given below:

1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
3. (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
4. (A) - (III), (B) - (I), (C) - (II), (D) - (IV)

Options :

8048774549. 1

8048774550. 2

8048774551. 3

8048774552. 4

Question Number : 14 Question Id : 8048771141 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In amplitude modulation:

(A). The envelope detector operates properly, only if $(1/f_c) \leq RC \leq (1/f_m)$

(B). Vestigial sideband modulation is used in television broadcasting.

(C). Selective fading produces more distortion in the SSB-SC systems than in the DSB-SC system.

(D). Efficiency of a suppressed carrier system is 100 %, whereas, in the AM system the maximum efficiency is only 33.3%.

Choose the **correct** answer from the options given below:

1. (A), (B) and (D) only
2. (B) and (C) only
3. (A), (C) and (D) only
4. (B), (C) and (D) only

Options :

8048774553. 1

8048774554. 2

8048774555. 3

8048774556. 4

Question Number : 15 Question Id : 8048771142 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The transmission efficiency of an ordinary AM signal with a modulation percentage of 80% is_____

1. 24.24%
2. 48.48%
3. 20.22%
4. 33.33%

Options :

8048774557. 1

8048774558. 2

8048774559. 3

8048774560. 4

Question Number : 16 Question Id : 8048771143 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Consider following statements

(A). Built-in potential across the diode reduces due to increase in temperature.

(B). The electron concentration of n-type semiconductor becomes equal to intrinsic concentration at Curie temperature.

(C). Drain current of MOSFET is a positive temperature coefficient (PTC).

(D). Collector current of BJT has a PTC.

Choose the **correct** statements from the options given above:

1. (A), (B) and (D) only
2. (A), (B) and (C) only
3. (A), (B), (C) and (D)
4. (B), (C) and (D) only

Options :

8048774561. 1

8048774562. 2

8048774563. 3

8048774564. 4

Question Number : 17 Question Id : 8048771144 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In case of Gallium Arsenide Phosphide (GaAsP) the energy band gap of a semiconductor is E_g = 1.9 eV, then the corresponding emission wavelength is:

1. 7538 Å
2. 6338 Å
3. 6533 Å
4. 6133 Å

Options :

8048774565. 1

8048774566. 2

8048774567. 3

8048774568. 4

Question Number : 18 Question Id : 8048771145 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
(Amplifiers)	**(Characteristics)**
(A). CE Amplifier	(I). Current buffer circuit
(B). CB Amplifier	(II). Voltage buffer circuit
(C). CC Amplifier	(III). High current gain
(D). Darlington Amplifier	(IV). High power gain.

Choose the **correct** answer from the options given below:

1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (IV), (B) - (I), (C) - (II), (D) - (III)
3. (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
4. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Options :

8048774569. 1

8048774570. 2

8048774571. 3

8048774572. 4

Question Number : 19 Question Id : 8048771146 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The consequences of Early effect on BJT are:

(A). Effective base width reduces.

(B). Emitter injection efficiency and base transport factor increases.

(C). α and β of the device decreases.

(D). Emitter injection efficiency and base transport factor decreases.

Choose the **correct** answer from the options given below:

1. (A) and (B) only
2. (A), (B) and (C) only
3. (C) and (D) only
4. (B), (C) and (D) only

Options :

8048774573. 1

8048774574. 2

8048774575. 3

8048774576. 4

Question Number : 20 Question Id : 8048771147 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The DC collector current is _____ for a BJT, whose $\alpha = 0.99$, $I_B = 25\ \mu A$ and $I_{CBO} = 200\ nA$.

1. 2.495 mA
2. 2.518 mA
3. 2.9 mA
4. 250 nA

Options :

8048774577. 1

8048774578. 2

8048774579. 3

8048774580. 4

Question Number : 21 Question Id : 8048771148 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

(A). Tunnel diode is a heavily doped pn junction diode that exhibits negative differential resistance.

(B). Stability factor (S) is the maximum for a voltage divider bias circuit.

(C). The operational amplifier works as a comparator circuit in open loop configuration.

(D). Biasing is done to set the quiescent point of the transistor in the middle of the DC load line.

Choose the **correct** statements from the options given below:

1. (A), (C) and (D) only
2. (A), (B) and (C) only
3. (A), (B), (C) and (D)
4. (B), (C) and (D) only

Options :

8048774581. 1

8048774582. 2

8048774583. 3

8048774584. 4

Question Number : 22 Question Id : 8048771149 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Arrange the following devices in increasing order of their input resistances:

(A). MOSFET

(B). BJT

(C). JFET

(D). PN junction diode

Choose the **correct** answer from the options given below:

1. (A), (B), (C), (D)
2. (A), (C), (B), (D)
3. (B), (A), (D), (C)
4. (D), (B), (C), (A)

Options :

8048774585. 1

8048774586. 2

8048774587. 3

8048774588. 4

Question Number : 23 Question Id : 8048771150 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
(Effects)	**(Electronic Devices)**
(A). Channel length modulation	(I). Zener diode
(B). Channel width modulation	(II). BJTs
(C). Early effect	(III). JFETs
(D). Tunneling effect	(IV). MOSFETs

Choose the **correct** answer from the options given below:

1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
3. (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
4. (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

Options :

8048774589. 1

8048774590. 2

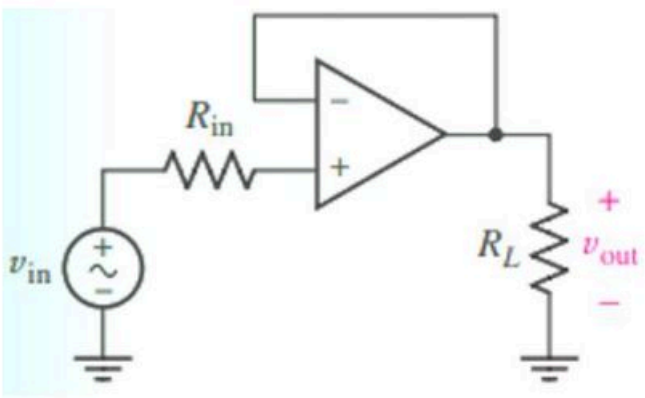
8048774591. 3

8048774592. 4

Question Number : 24 Question Id : 8048771151 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Express v_{out} in terms of v_{in} for the given circuit, conditioning the op-amp to be ideal.



1. $2v_{in}$
2. v_{in}
3. $0.5v_{in}$
4. 0

Options :

8048774593. 1

8048774594. 2

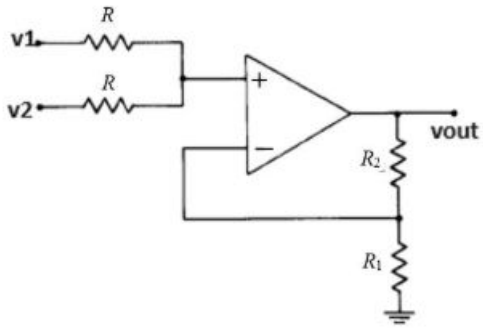
8048774595. 3

8048774596. 4

Question Number : 25 Question Id : 8048771152 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Considering the op-amp to be ideal, the V_{out} is expressed as:



1. $0.5(V_1 + V_2)(1 + \frac{R_2}{R_1})$
2. $(V_1 + V_2)(1 + \frac{R_2}{R_1})$
3. $1.5(V_1 + V_2)(1 + \frac{R_2}{R_1})$
4. $0.5(V_1 - V_2)(1 + \frac{R_2}{R_1})$

Options :

8048774597. 1

8048774598. 2

8048774599. 3

8048774600. 4

Question Number : 26 Question Id : 8048771153 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Arrange the following fabrication steps of MOSFET from initials:

(A). Metallization

(B). Oxidation

(C). Etching

(D). Diffusion/Ion implantation

Choose the **correct** answer from the options given below:

1. (A), (B), (C), (D)
2. (B), (C), (A), (D)
3. (B), (A), (D), (C)
4. (B), (C), (D), (A)

Options :

8048774601. 1

8048774602. 2

8048774603. 3

8048774604. 4

Question Number : 27 Question Id : 8048771154 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The cutoff frequency of a first order low pass filter for $R_1 = 1.2\,k\Omega$ and $C_1 = 0.02\,\mu F$ is _____.

1. 8.86 kHz
2. 4.63 kHz
3. 6.63 kHz
4. 10.63 kHz

Options :

8048774605. 1

8048774606. 2

8048774607. 3

8048774608. 4

Question Number : 28 Question Id : 8048771155 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
(Electric field)	**(Mobility)**
(A). Low electric field	(I). Mobility decreases by 1/E
(B). Medium electric field	(II). Mobility decreases by 1/√E
(C). High electric field	(III). Mobility remains constant

Choose the **correct** answer from the options given below:

1. (A) - (III), (B) - (II), (C) - (I)
2. (A) - (I), (B) - (II), (C) - (III)
3. (A) - (III), (B) - (I), (C) - (II)
4. (A) - (II), (B) - (III), (C) - (I)

Options :

8048774609. 1

8048774610. 2

8048774611. 3

8048774612. 4

Question Number : 29 Question Id : 8048771156 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The unit of ratio of diffusion constant (D) and mobility (μ) is_____

1. $cm^2/V\text{-}sec$
2. Volts
3. cm^2/sec
4. A/m^2

Options :

8048774613. 1

8048774614. 2

8048774615. 3

8048774616. 4

Question Number : 30 Question Id : 8048771157 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A Silicon crystal is doped with a group III element, the electron concentration falls below intrinsic concentration ($n_i = 1.5 \times 10^{10}/cm^3$) by a factor of 10^6, so the concentration of impurity present is_____ $/cm^3$

1. 1.5×10^{16}
2. 1.5×10^{10}
3. 1.5×10^{4}
4. 2.25×10^{14}

Options :

8048774617. 1

8048774618. 2
8048774619. 3
8048774620. 4

Question Number : 31 Question Id : 8048771158 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Choose the wrong option from the following for the given statement.

Statement: Electric field is conservative.

1. curl to be identically zero.
2. potential difference between any two points is zero.
3. gradient of a scalar potential gives magnitude of electric field.
4. work done in a closed path inside the field is zero.

Options :
8048774621. 1
8048774622. 2
8048774623. 3
8048774624. 4

Question Number : 32 Question Id : 8048771159 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

(A). $\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$: represents Ampere's circuital law

(B). $\vec{\nabla} \cdot \vec{B} = 0$: represents magnetic monopole dosn't exit experimentally

(C). $\vec{\nabla} \times \vec{E} = 0$: represents conservative nature of electric field

(D). $\vec{\nabla} \times \vec{A} = 0$: represents solenoidal condition for vector field

Choose the **correct** answer from the options given below:

1. (A), (B) and (D) only
2. (A), (B) and (C) only
3. (A), (B), (C) and (D)
4. (A), (C) and (D) only

Options :
8048774625. 1
8048774626. 2
8048774627. 3
8048774628. 4

Question Number : 33 Question Id : 8048771160 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
(Laws)	**(Expressions)**
(A). Faraday's Law	(I) $\vec{\nabla}.\vec{E} = \frac{\rho}{\varepsilon_0}$
(B). Conservation Law	(II) $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$
(C) Ohm's law	(III) $\vec{\nabla} \times \vec{A} = 0$
(D). Gauss's Law	(IV) $\vec{J} = \sigma \vec{E}$

Choose the **correct** answer from the options given below:

1. (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
2. (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
3. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
4. (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

Options :

8048774629. 1

8048774630. 2

8048774631. 3

8048774632. 4

Question Number : 34 Question Id : 8048771161 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Gauss's law in magnetostatics is expressed as_____.

1. $\oint \vec{B} \cdot d\vec{S} = 0$
2. $\oint \vec{B} \cdot \vec{dl} = 0$
3. $\oint \vec{B} \cdot \hat{n} dV = 0$
4. $\oint \vec{B} \cdot d\vec{l} = \mu_0 I_{enc}$

Options :

8048774633. 1

8048774634. 2

8048774635. 3

8048774636. 4

Question Number : 35 Question Id : 8048771162 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If in a free space, the electric field is given as:

$$\vec{E} = 20\cos(\omega t - 50x)\hat{y}\ \text{V/m}$$

then, the expression of displacement current density (J_d).

1. $-20\omega\epsilon_0\cos(\omega t - 50x)\hat{y}\ \text{A/m}^2$
2. $-20\omega\epsilon_0\sin(\omega t - 50x)\hat{y}\ \text{A/m}^2$
3. $-10\omega\epsilon_0\sin(\omega t - 50x)\hat{y}\ \text{A/m}^2$
4. $-20\omega\sin(\omega t - 50x)\hat{y}\ \text{A/m}^2$

Options :

8048774637. 1

8048774638. 2

8048774639. 3

8048774640. 4

Question Number : 36 Question Id : 8048771163 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If electric $(\vec{E})$ and magnetic $(\vec{B})$ fields are defined as

$$\vec{E}(r,t) = \vec{E}_0 e^{i(k.r-\omega t)}\hat{n} \text{ and } \vec{B}(r,t) = \frac{1}{c}\hat{k} \times \vec{E}(r,t)$$

where k is the propagation vector and $\hat{n}$ is the polarization vector. E and B are transverse in nature, if they satisfy which of the following condition?

1. $\hat{n} \times k = 0$
2. $\hat{n} \cdot k = 0$
3. $\hat{n}k = 0$
4. $k \cdot r = 0$

Options :

8048774641. 1

8048774642. 2

8048774643. 3

8048774644. 4

Question Number : 37 Question Id : 8048771164 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The characteristic length scale of nanomaterials is:

1. 1-100 nm
2. 1-500 nm
3. 1-200 nm
4. 1-300 nm

Options :

8048774645. 1

8048774646. 2

8048774647. 3
8048774648. 4

Question Number : 38 Question Id : 8048771165 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
Quantum Structure	**Delocalization Dimensions**
(A). Quantum wells	(I). 1
(B). Quantum wires	(II). 2
(C). Quantum dots	(III). 3
(D). Bulk conductors	(IV). 0

Choose the **correct** answer from the options given below:

1. (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
2. (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
3. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
4. (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

Options :
8048774649. 1
8048774650. 2
8048774651. 3
8048774652. 4

Question Number : 39 Question Id : 8048771166 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If the diameter of the chiral carbon nanotubes increases, then

1. the band gap of semiconducting chiral carbon nanotubes decreases linearly
2. the band gap of semiconducting chiral carbon nanotubes increases linearly
3. the band gap of semiconducting chiral carbon nanotubes decreases exponentially
4. the band gap of semiconducting chiral carbon nanotubes increases exponentially

Options :
8048774653. 1
8048774654. 2
8048774655. 3
8048774656. 4

Question Number : 40 Question Id : 8048771167 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The Extreme Ultraviolet (EUV) lithography employs _____ wavelength.

1. 13.5 nm
2. 53.5 nm
3. 100 nm
4. 50 nm

Options :
8048774657. 1
8048774658. 2
8048774659. 3
8048774660. 4

Question Number : 41 Question Id : 8048771168 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Attenuation in optical fibre can be measured in

1. KdB/m
2. dB/m
3. dB/km
4. dB/mm

Options :
8048774661. 1
8048774662. 2
8048774663. 3
8048774664. 4

Question Number : 42 Question Id : 8048771169 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

_____ nanoparticles are extraordinarily efficient for clinical diagnostic purposes as they give strong signatures in optical absorption, fluorescence spectroscopy, X-Ray diffraction and electrical conductivity.

1. Silver
2. Copper
3. Gold
4. Iron

Options :
8048774665. 1
8048774666. 2
8048774667. 3
8048774668. 4

Question Number : 43 Question Id : 8048771170 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Bio-functionalization of magnetic nanoparticles has been extensively used for the development of biosensors such as:

1. Fe_3O_4
2. ZnO
3. $C_5O_2H_8$
4. GaAs

Options :

8048774669. 1

8048774670. 2

8048774671. 3

8048774672. 4

Question Number : 44 Question Id : 8048771171 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A multiplexer (MUX)

(A). is a parallel to serial converter

(B). is also known as data distributer

(C). can be used as a logic function generator

(D). switch the data from several lines to one line

Choose the **correct** answer from the options given below:

1. (A), (B), (C) and (D)
2. (A), (B) and (D) only
3. (B), (C) and (D) only
4. (A), (C) and (D) only

Options :

8048774673. 1

8048774674. 2

8048774675. 3

8048774676. 4

Question Number : 45 Question Id : 8048771172 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A 32:1 Mux can be designed using

1. two 16:1 Muxs and one two input OR gate
2. two 16:1 Muxs and one two input AND gate
3. two 16:1 Muxs and one two input NOR gate
4. two 16:1 Muxs only

Options :

8048774677. 1

8048774678. 2

8048774679. 3

8048774680. 4

Question Number : 46 Question Id : 8048771173 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

In the first window of optical fibre, light sources are generally:

1. GaAlP
2. GaAlBr
3. GaAlAs
4. GeAlAs

Options :
8048774681. 1
8048774682. 2
8048774683. 3
8048774684. 4

Question Number : 47 Question Id : 8048771174 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Following statements are given in reference of 8085 Microprocessor:

(A). Its memory size is 64 KB

(B). It is 40 pin IC.

(C). Its clock frequency lies between 3 to 5 MHz.

(D). It has 16 bit of each data and address lines.

Choose the **correct** answer from the options given below:

1. (A), (B) and (D) only
2. (A), (B) and (C) only
3. (A), (B), (C) and (D)
4. (B), (C) and (D) only

Options :
8048774685. 1
8048774686. 2
8048774687. 3
8048774688. 4

Question Number : 48 Question Id : 8048771175 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Fibre optic sensors may be classified into three categories. Choose the ***incorrect*** option.

1. Intensity-modulated sensors
2. Phase sensors
3. Diffraction sensors
4. Conducting sensors

Options :

8048774689. 1

8048774690. 2

8048774691. 3

8048774692. 4

Question Number : 49 Question Id : 8048771176 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following is the most appropriate transmission frequency in optical fibre?

1. 10^9 Hz
2. 10^{11} Hz
3. 10^{14} Hz
4. 10^4 Hz

Options :

8048774693. 1

8048774694. 2

8048774695. 3

8048774696. 4

Question Number : 50 Question Id : 8048771177 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which part of optical fibre have higher refractive index:

1. Core
2. Cladding
3. Seath
4. Both Cladding and Seath

Options :

8048774697. 1

8048774698. 2

8048774699. 3

8048774700. 4

Question Number : 51 Question Id : 8048771178 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
(Instructions)	**(Addressing mode)**
(A). LDA 2100 H	(I). Immediate
(B). RAL	(II). Register
(C). ADD C	(III). Direct
(D). ANI 08 H	(IV). Implied

Choose the **correct** answer from the options given below:

1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
3. (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
4. (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

Options :

8048774701. 1

8048774702. 2

8048774703. 3

8048774704. 4

Question Number : 52 Question Id : 8048771179 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

(A). MOV A, C is a one-byte instruction.

(B). OUT 03 H is a two-byte instruction.

(C). ANI 76 H is a three-byte instruction.

(D). STA 3000 H is a three-byte instruction.

Choose the **correct** answer from the options given below:

1. (A), (B) and (D) only
2. (A), (B) and (C) only
3. (A), (B), (C) and (D)
4. (B), (C) and (D) only

Options :

8048774705. 1

8048774706. 2

8048774707. 3

8048774708. 4

Question Number : 53 Question Id : 8048771180 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following statement about hydrogen peroxide is INCORRECT?

1. It is a chemical threat agent as its excessive concentration as a product of industry and from atomic power stations affects the environment.
2. It can not be used for the disinfection of water pools, food, and beverage packages as it is a chemical threat agent.
3. It is the most valuable marker for oxidative stress and recognized as one of the major risk factors in the progression of disease-related pathophysiological complications in diabetes.
4. It is the most valuable marker for inflammatory processes and a mediator for apoptotic cell death.

Options :

8048774709. 1

8048774710. 2

8048774711. 3

8048774712. 4

Question Number : 54 Question Id : 8048771181 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
(Data Bus Status (Output)	**Status signals (IO/M', S1, S0.)**
(A). Memory read	(I). 0, 1, 1
(B). Op-code fetch	(II). 0, 1, 0
(C). INTR acknowledge	(III). 0, 0, 1
(D). Memory write	(IV). 1, 1, 1

Choose the **correct** answer from the options given below:

1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
3. (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
4. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Options :

8048774713. 1

8048774714. 2

8048774715. 3

8048774716. 4

Question Number : 55 Question Id : 8048771182 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

_____ refers to the inability to faithfully repeat recorded data output when measuring a range of values and scanning from different directions.

1. Selectivity
2. Resolution
3. Hysteresis
4. Detection limit

Options :

8048774717. 1

8048774718. 2

8048774719. 3

8048774720. 4

Question Number : 56 Question Id : 8048771183 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

_____ is vector address of TRAP interrupt.

1. 003C H
2. 0024 H
3. 002C H
4. 0034 H

Options :

8048774721. 1

8048774722. 2

8048774723. 3

8048774724. 4

Question Number : 57 Question Id : 8048771184 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

What is the word length of 8 bit microprocessor?

1. 16 bit
2. 32 bit
3. 8 bit
4. may vary in between 8 bit to 32 bit

Options :

8048774725. 1

8048774726. 2

8048774727. 3

8048774728. 4

Question Number : 58 Question Id : 8048771185 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

To expand a 4-bit parallel adder to a 8-bit parallel adder, we can

(A). use two 4-bit adders and connect the sum output of one to the input bit of the other

(B). use four 4-bit adders with no interconnections

(C). use two 4-bit adders with the carry output of one connected to the carry input of the other

(D). use eight 4-bit adders with no interconnections

Choose the **correct** answer from the options given below:

1. (A), (C) only
2. (B), (D) only
3. (A) only
4. (C) only

Options :

8048774729. 1

8048774730. 2

8048774731. 3

8048774732. 4

Question Number : 59 Question Id : 8048771186 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following statement(s) about Digital-to-Analog(DAC) converter is/are correct?

(A). DAC is said to be monotonic if its output decreases as the binary input is incremented from one value to the next.

(B). Ideally, the output of a DAC should be zero when the binary input is zero.

(C). The operating speed of a DAC is usually specified by giving its settling time.

(D). Resolution is the reciprocal of the number of discrete steps in the full-scale output of the DAC.

Choose the **correct** answer from the options given below:

1. (A), (B) and (D) only
2. (A), (B) and (C) only
3. (A), (B), (C) and (D)
4. (B), (C) and (D) only

Options :

8048774733. 1

8048774734. 2

8048774735. 3

8048774736. 4

Question Number : 60 Question Id : 8048771187 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Major problems with the large-scale utilization of carbon nanotubes

(A). synthesis in pure forms.

(B). dispersion in solvents.

(C). reducing their length.

(D). tailoring into a desired orientation.

Choose the **correct** answer from the options given below:

1. (A), (B) and (D) only
2. (A), (B) and (C) only
3. (A), (B), (C) and (D)
4. (B), (C) and (D) only

Options :

8048774737. 1

8048774738. 2

8048774739. 3

8048774740. 4

Question Number : 61 Question Id : 8048771188 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
(A). Purification	(I). to improve interactions with a solid or liquid matrix
(B). De-agglomeration	(II). methods include thermal annealing in air or oxygen; acid treatment, microfiltration
(C). Chemical functionalization	(III). can be made in a carbon arc, but burning a hydrocarbon feedstock with strict control of the oxygen supply is a more controllable method
(D). Fullerenes	(IV). methods include ultrasonication, electrostatic plasma treatment, electric field manipulation and polymer wrapping, ball milling

Choose the **correct** answer from the options given below:

1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
3. (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
4. (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

Options :

8048774741. 1

8048774742. 2

8048774743. 3

8048774744. 4

Question Number : 62 Question Id : 8048771189 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In nanomaterials production, according to Aufbau principle the self-assembly of complicated structures takes place in a hierarchical fashion in the following sequence:

(A). the linear chains are bundled to form two-dimensional monolayers

(B). single molecules join up to form linear chains

(C). a finite number of independent molecules

(D). the two-dimensional monolayers are stacked to form the final three-dimensional crystal

Choose the **correct** answer from the options given below:

1. (A), (B), (C), (D)
2. (A), (C), (B), (D)
3. (B), (A), (D), (C)
4. (C), (B), (A), (D)

Options :

8048774745. 1

8048774746. 2

8048774747. 3

8048774748. 4

Question Number : 63 Question Id : 8048771190 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Number of cubes of each side of 1 nm and the collective surface area that can be carved out from a cube with each side of 1 m are respectively:

1. 1×10^{27} and 6000 km^2
2. 1×10^{27} and 600 km^2
3. 1×10^{25} and 5000 km^2
4. 1×10^{27} and 500 km^2

Options :

8048774749. 1

8048774750. 2

8048774751. 3

8048774752. 4

Question Number : 64 Question Id : 8048771191 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The process of transferring a pattern into a reactive polymer film which will subsequently be used to replicate that pattern into an underlying thin film is called:

1. Electrochemical Deposition
2. Lithography
3. Mechanical Exfoliation
4. Electroless Deposition

Options :

8048774753. 1

8048774754. 2

8048774755. 3

8048774756. 4

Question Number : 65 Question Id : 8048771192 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The Process of synthesizing large polymer molecules is:

1. top-down approach
2. bottom-up approach
3. spontaneous process
4. forced process

Options :

8048774757. 1

8048774758. 2

8048774759. 3

8048774760. 4

Question Number : 66 Question Id : 8048771193 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match **List-I** with **List-II**

List-I	**List-II**
Nanostructures and Nanomaterials fabrication technologies	**Definitions**
(A). Vapor phase growth	(I). including vapor-liquid-solid growth for nanowires
(B). Liquid phase growth	(II). including laser reaction pyrolysis for nanoparticle synthesis and atomic layer deposition for thin film deposition.
(C). Solid phase formation	(III). including colloidal processing for the formation of nanoparticles and self assembly of monolayers.
(D). Hybrid growth	(IV). including phase segregation to make metallic particles in glass matrix and two-photon included polymerization for the fabrication of three-dimensional photonic crystals.

Choose the **correct** answer from the options given below:

1. (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
2. (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
3. (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
4. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Options :

8048774761. 1

8048774762. 2
8048774763. 3
8048774764. 4

Question Number : 67 Question Id : 8048771194 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The process of transferring growth species from a source or target and deposit them on a substrate to form a film is called:

1. Molecular Beam Epitaxy
2. Physical Vapor Deposition
3. Chemical Vapor Deposition
4. Atomic Layer Deposition

Options :
8048774765. 1
8048774766. 2
8048774767. 3
8048774768. 4

Question Number : 68 Question Id : 8048771195 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

In X-ray diffraction, a collimated beam of X-rays, with most appropriate wavelength ranging from _____, is incident on a specimen and is diffracted by the crystalline phases of the specimen.

1. 0.1 to 2 Å
2. 5 to 10 Å
3. 10 to 20 Å
4. 20 to 30 Å

Options :
8048774769. 1
8048774770. 2
8048774771. 3
8048774772. 4

Question Number : 69 Question Id : 8048771196 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

_____ are electromagnetic radiation with typical photon energies in the range of 100 eV to 100 keV.

1. X-rays
2. Infrared rays
3. optical spectroscopy
4. raman spectroscopy

Options :
8048774773. 1
8048774774. 2

8048774775. 3
8048774776. 4

Question Number : 70 Question Id : 8048771197 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Measurement of grain size by using X-ray diffraction line broadening can be done by:

1. Bragg's Law
2. Debye-Scherrer Formula
3. Total Internal Reflection
4. Moseley Law

Options :
8048774777. 1
8048774778. 2
8048774779. 3
8048774780. 4

Question Number : 71 Question Id : 8048771198 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Quantum well lasers were first fabricated using the _____ material systems.

1. InGaAsN/GaAs
2. GaAs/AlGaAs
3. InGaAsP/InP
4. GaAs/InP

Options :
8048774781. 1
8048774782. 2
8048774783. 3
8048774784. 4

Question Number : 72 Question Id : 8048771199 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The measurement of Nitric Oxide(NO) is quite difficult due to its _____ half-life and _____ reactivity with other biological components such as superoxide, oxygen, thiols.

1. Short, High
2. Short, Low
3. Long, High
4. Long, Low

Options :
8048774785. 1
8048774786. 2
8048774787. 3
8048774788. 4

Question Number : 73 Question Id : 8048771200 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

In the ISFET pH measurement system, the voltage circuit has _____ impedance and the current circuit has _____ impedance.

1. High, Low
2. zero, High
3. Low, zero
4. Low, High

Options :
8048774789. 1
8048774790. 2
8048774791. 3
8048774792. 4

Question Number : 74 Question Id : 8048771201 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

_____ type of electrochemical detection measures the electric current associated with the electron transfer, involved in redox processes whereas _____ type of electrochemical detection measures conductance or capacitance changes associated with, changes in the overall ionic medium between the two electrodes.

1. amperometry, potentiometry
2. potentiometry, impedance spectroscopy
3. amperometry, impedance spectroscopy
4. potentiometry, amperometry

Options :
8048774793. 1
8048774794. 2
8048774795. 3
8048774796. 4

Question Number : 75 Question Id : 8048771202 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Which of the following statements is incorrect about Light-addressable potentiometric sensors(LAPS)?

1. In the LAPS with EIS structure, a semiconductor substrate (silicon) is covered with an insulator (SiO_2).
2. An enzyme deposited on the LAPS surface allows one to observe the spatial distribution of a specific substrate.
3. In the LAPS with electrolyte–insulator–semiconductor (EIS) structure, a semiconductor substrate (silicon) is covered with an insulator (SiO_2).
4. A sensing ion-selective layer, for instance, pH-sensitive S_3N_4, is deposited on the bottom of the insulator.

Options :
8048774797. 1
8048774798. 2
8048774799. 3
8048774800. 4