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CUET(PG) Physics

Question Paper -2023

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CUET_PG_2023_Physics Question

PART - A

Question Label: Comprehension

It depends on who is giving the rating: Centre on India's rank in press freedom index

KRISHNADAS RAJAGOPAL, NEW DELHI

Solicitor-General Tushar Mehta, appearing for the government in the Supreme Court on Tuesday, made light of India's fall to 161st position in press freedom ranking, saying "that depends on who is giving the rating. I can have my own forum and give India the first rating".

The remake was in response to the Supreme Court's observation that India has fallen to the 161st position out of 180 countries in the World Press Freedom Index published by the non-profit organisation, reporters Without Borders. In 2022, India was ranked at 150.

India is ranked behind countries such as Afghanistan, Pakistan and Somalia.

"India is 161 in ranking in journalist freedom," Justice K.M. Joseph, addressed the Union and Gujarat government, represented by Mr. Mehta during a hearing in the Billkis Bano case.

HEARING ON JULY 10

Change between Justice Joseph and Mr. Mehta came while the Supreme Court ordered the publication of a notice giving the details of the case and the next date of court hearing, July 10, in two vernacular papers in Gujarat to alert those unserved among the 11 convicts who were released prematurely from their lift imprisonment. They had been found guilty of the gang rape of Ms. Bano and the murder of her family members. Ms. Banop and other writ petitioners have separately challenged their remission.

The hearing, at one point, saw the Supreme Court wonder whether some of the released convicts were making a "mockery" of or even "playing" with the court by either going incognito to hamper the serving of notice of the case on them or seeking time to file counter affidavits. Previous hearings have been a no go with lawyers for the men seeking adjournment on procedural grounds.

The court decided to publish the notice in the newspapers so that the convicts would not take the plea of ignorance and the case could go ahead and be heard on merits.

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Q1. Synonym of the term 'incognito' is:

(1) Inclusive (2) Inaudible (3) Undutiful (4) Concealed

(1) 1 (2) 2 (3) 3 (4) 4

Ans.: (4)

Q2. 'Made light of means:

(1) Removed darkness

(2) Put something on fire

(3) To act as if something is serious especially when it is not serious

(4) Play down

(1) 1 (2) 2 (3) 3 (4) 4

Ans.: (4)

Q3. The antonym of 'remission' is:

(A) Exoneration (B) Censure (C) Reprieve (D) Increase

Choose the correct answer from the options given below:

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

(1) 1 (2) 2 (3) 3 (4) 4

Ans.: (3)

Q4. 'Going incognito' means:

(A) Using false name (B) Wearing a disguise

(C) To be recognised (D) Not to be identified

Choose the correct answer from the options given below:

(1) (A) and (D) (2) (A), (B) and (C)

(3) (A), (B) and (D) (4) (A), (B), (C) and (D)

(1) 1 (2) 2 (3) 3 (4) 4

Ans.: (3)

Q5. Why Justice K. M. Josheph addressed Gujurat Government during the hearing?

(1) Gujurat is the reason behind our sharp fall in press freedom ranking

(2) India is ranked 161, behind nations such as Pakistan, Afganistan etc.

(3) Bilk is Bano case was iniatiated and registered in Gujurat.

(4) The murder convicts were not arrested by the then Gujurat government.

(1) 1 (2) 2 (3) 3 (4) 4

Ans.: (3)

Q6. The synonym of the word 'VINDICTIVE' is _____.

(1) Revengeful (2) Bigoted (3) Demonstrative (4) Strategic

(1) 1 (2) 2 (3) 3 (4) 4

Ans.: (1)

Q7. Fill in the blanks with appropriate prepositions from the options given below:

The e-cycle project_____ the city is slowly finding takers most of them college students who would earlier depend _____ cabs and bike taxis _____ commuting.

(1) in, upon, to (2) in, on, for (3) in, off, for (4) on, with, on

(1) 1 (2) 2 (3) 3 (4) 4

Ans.: (2)

Q8. Choose the meaning of the term "Bon voyage"

(A) Used to express good wishes to someone about to set off on a journey.

(B) Good morning

(C) Long Journey

(D) Good night

(1) 1 (2) 2 (3) 3 (4) 4

Ans.: (1)

Q9. The correctly spelt word from the following option:

(1) BITUMENEZE (2) BIBEMINIZE (3) BETUMINEZE (4) BITUMINIZE

(1) 1 (2) 2 (3) 3 (4) 4

Ans.: (4)

Q10. Fear of open spaces is called:

(1) Agoraphobia (2) Anachronism (3) Anecdote (4) Apiary

(1) 1 (2) 2 (3) 3 (4) 4

Ans.: (1)

Q11. A boat goes 12 km in one hour along the stream and 6 km in one hour against the stream. The speed of the stream in km/h is:

(1) 2 (2) 3 (3) 4 (4) 5

Ans.: (2)

Q12. For $x=3$, find the value of $x^5+x^4-x^3-x^2+x-1$.

(1) 280 (2) 270 (3) 290 (4) 300

Ans.: (3)

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Q13. The sides of three solid metallic cubes are 30 cm, 40 cm and 50 cm respectively. Find the side of the new cube formed by melting the three cubes (in cm)

(1) 60 (2) 120 (3) 90 (4) 80

Ans.: (1)

Q14. Ankit owes ₹42,580 on his credit cards, but he could pay only ₹12,580. If the annual rate of compound interest is 10%, then how much will he owe after 4 years?

(1) Rs. 42,580 (2) Rs. 43,000 (3) Rs. 43,923 (4) Rs. 44,228

Ans.: (3)

Q15. The percentage of loss when an article is sold at Rs. 50 is the same as that of the profit when it is sold at Rs. 70. Percentage of profit or loss on the article is _____.

(1) 10% (2) 12% (3) $16\frac{2}{3}\%$ (4) $8\frac{1}{3}\%$

Ans.: (3)

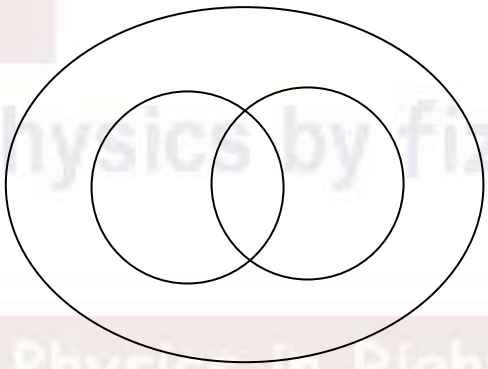
Q16. Which number comes next in the following series?

0, 5, 22, 57, 116, _____

(1) 216 (2) 205 (3) 207 (4) 192

Ans.: (2)

Q17. Which of the following group best represented by the figure below:



(A) Men, Citizens, Educated (B) Professionals, Doctors, Lawyers

(C) Diseases, Leprosy, Scurvy (D) Earth, mountain, Forests

(E) Atmosphere, Water, Hydrogen

Choose the correct answer from the options given below:

(1) (A) and (B) only (2) (B) and (D) only

(3) (A) and (D) only (4) (C) and (E) only

Ans.: (3)

Q18. Identify the correct water - image of the fig. (X)

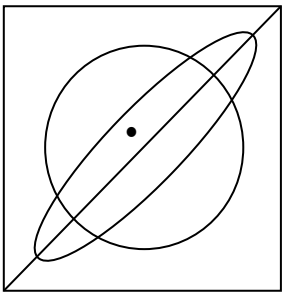
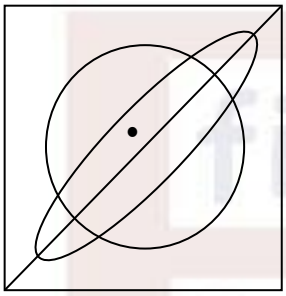


Fig.(X)

(1)



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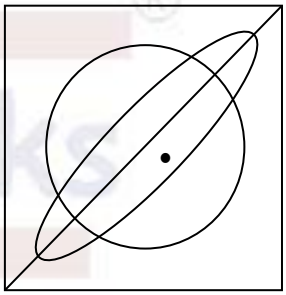

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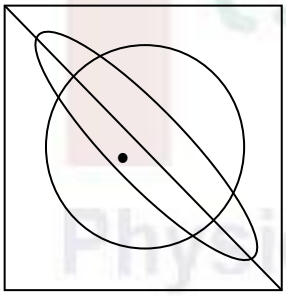
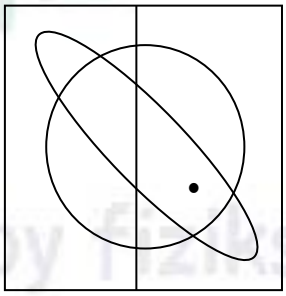


(4)



(1) 1 (2) 2 (3) 3 (4) 4

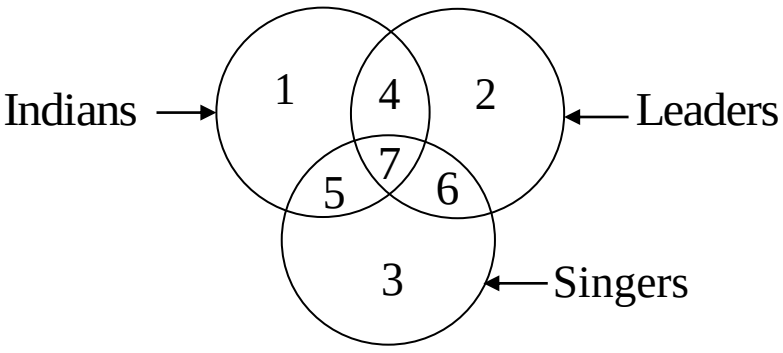
Ans.: (3)

Q19. If in a certain language, GRASP is codes as BMVNK, which word could be coded as CRANE?

(1) FUDQH (2) GVERI (3) HWFSJ (4) BQZMD

Ans.: (3)

Q20.



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Which region represents leaders who are neither singers nor Indians?

(1) 3 (2) 6 (3) 2 (4) 4

Ans.: (3)

Q21. Who has won the women's singles title of Odisha badminton tournament held in Cuttack, Odisha in the year 2022?

(1) Ashly Barty (2) Unnati Hooda (3) P V Sindhu (4) Saina Nehwal

Ans.: (2)

Q22. Pandit Shiv Kumar Sharma who passed away in May 2022 was a maestro of:

(1) Flute (2) Santoor (3) Tabla (4) EsraJ

Ans.: (2)

Q23. Largest Gas pipe line in India is operated by which company?

(1) Reliance Petroleum (2) GAIL (3) ONGC (4) Bharat Petroleum

Ans.: (2)

Q24. Which of the following can be recycled 100%?

(1) Food waste (2) Glass bottles (3) Alluminium cans (4) Card board

Ans.: (3)

Q25. Given below are two statements:

Statement I: "The Restoration of life of Lok Sabha and State Assemblies to 5 year" is passed in the 52nd Amendment of constitution of India

Statement II: 99th Amendment of constitution of India provides for formation of National Judicial Appointments Commission".

In the light of the above statements, choose the correct answer from the options given below:

(1) Both Statement I and Statement II are correct

(2) Both Statement I and Statement II are incorrect

(3) Statement I is correct but Statement II is incorrect

(4) Statement I is incorrect but Statement II is correct

Ans.: (4)

PART B: Physics

Q26. Given below are two statements, one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A): A given vector $\vec{F}$ is irrotational i.e., $\vec{\nabla}\times\vec{F}=0$

Reason (R): The vector $\vec{F}$ is conservative.

In the light of the above statements, choose the most appropriate answer from the options given below.

1. Both (A) and (R) are correct and (R) is the correct explanation of (A)
2. Both (A) and (R) are correct but (R) is not the correct explanation of (A)
3. (A) is correct but (R) is not correct
4. (A) is not correct but (R) is correct

Ans.: (1)

Q27. Given below are two statements: If z_1 and z_2 are complex numbers

Statement - I: $\arg\left(\frac{z_1}{z_2}\right)=\arg(z_1)-\arg(z_2)$

Statement - II: $|z_1+z_2|^2=|z_1|^2+|z_2|^2-2\,\mathrm{Re}(z_1\bar{z}_2)$

In the light of the above statements, choose the correct answer from the options given below.

1. Both Statement - I and Statement - II are true
2. Both Statement - I and Statement - II are false
3. Statement - I is correct but Statement - II is false
4. Statement - I is incorrect but Statement - II is true

Ans.: (3)

Q28. Match List - I with List II:

	List - I		List - II
(A)	$\sin z$ for $\lvert z\rvert<\infty$	(I)	$(-1)^{n-1}z^{2n-1}/(2n-2)!$
(B)	$\cos z$ for $\lvert z\rvert<\infty$	(II)	$(-1)^{n-1}z^{n}/n$
(C)	$\tan^{-1}z$ for $\lvert z\rvert<1$	(III)	$(-1)^{n-1}z^{2n-1}/(2n-1)!$
(D)	$\ln(1+z)$ for $\lvert z\rvert<1$	(IV)	$(-1)^{n-1}z^{2n-1}/(2n-1)$

Choose the correct answer from the options given below:

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

Ans.: (3)

Q29. If $A=\begin{bmatrix}2 & 3 & 1\\ 0 & -1 & 5\end{bmatrix}$ and $B=\begin{bmatrix}1 & 2 & -1\\ 0 & -1 & 3\end{bmatrix}$, what is the value of $(2A-3B)$?

1. $\begin{bmatrix}1 & 1 & 0\\ 0 & 1 & 5\end{bmatrix}$ 2. $\begin{bmatrix}1 & 0 & 5\\ 0 & 1 & 1\end{bmatrix}$ 3. $\begin{bmatrix}0 & 1 & 1\\ 1 & 0 & 5\end{bmatrix}$ 4. $\begin{bmatrix}5 & 0 & 1\\ 1 & 1 & 0\end{bmatrix}$

Ans.: (2)

Q30. The line integral per unit area along the boundary of small area around a point in vector field $\vec{A}$ is called

1. grad $\vec{A}$ 2. div $\vec{A}$ 3. curl $\vec{A}$ 4. line integral $\vec{A}$

Ans.: (3)

Q31. If $A=\begin{bmatrix}1 & 0\\ 2 & -1\end{bmatrix}$, $B=\begin{bmatrix}3 & 7\\ 4 & 8\end{bmatrix}$ and $C=\begin{bmatrix}-1 & 1\\ 0 & 0\end{bmatrix}$. The value of $A+(B+C)$ is

1. $\begin{bmatrix}3 & 7\\ 6 & 8\end{bmatrix}$ 2. $\begin{bmatrix}6 & 7\\ 3 & 8\end{bmatrix}$ 3. $\begin{bmatrix}8 & 3\\ 7 & 6\end{bmatrix}$ 4. $\begin{bmatrix}3 & 8\\ 6 & 7\end{bmatrix}$

Ans.: (4)

Q32. What is the value of div $\vec{r}$, if $\vec{r}$ is the position vector of a particle? $\left(\vec{r}=x\hat{i}+y\hat{j}+z\hat{k}\right)$

(1) 1 (2) 2 (3) 3 (4) Zero

Ans.: (3)

Q33. If $\vec{r}$ is the position vector of any point on a surface S that encloses the volume V, then find $\iint_S \vec{r}\cdot d\vec{S}$.

(1) 1V (2) 2V (3) 3V (4) 4V

Ans.: (3)

Q34. A infinite long wire is stretched horizontally 4m above the surface of the earth, It has a charge of 1.0 micro-coulomb (μC) per cm of its length. The value of electric field at a point on earth vertically below the wire is

1. 4.5 N/C 2. 45.0 N/C 3. 4.5×10^5 N/C 4. 2.5×10^3 N/C

Ans.: (3)

Q35. Choose the correct sequence of the four statements given below, so that the phrase makes a complete sense:

A. Then the sets of equations connecting both are known as transformation of co-ordinates.

B. We can associate a unique set of co-ordinates.

C. Given a point P in rectangular co-ordinates.

D. Called the curvilinear co-ordinates of P.

Choose the correct answer from the options given below.

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

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

Ans.: (3)

Q36. The general form of a central force is represented by $\vec{F} = \frac{C}{r^n}\hat{r}$ (C = constant) known as Inverse Power law.

A. The force represented by above equation will be attractive if $C < 0$.

B. The force represented by above equation will repulsive if $C < 0$.

C. The force represented by above equation will be repulsive if $C > 0$.

D. The force represented by above equation will be attractive if $C > 0$.

Choose the correct answer from the options given below.

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

Ans.: (3)

Q37. There are three planets in circular orbits around a star at a distance a, $9a$ and $16a$ respectively. At time $t = t_0$, the star and the planets are in a straight line. The period of revolution of the closest planet is T. How long after t_0, will they again be in the same line?

(1). 216 T (2). 512 T (3). 1728 T (4). 3456 T

Ans.: (4)

Q38. What will be the expression for moment of inertia of a rectangular lamina (ABCD having length l and breadth b) about an axis passing through one of its corners and perpendicular to its plane?

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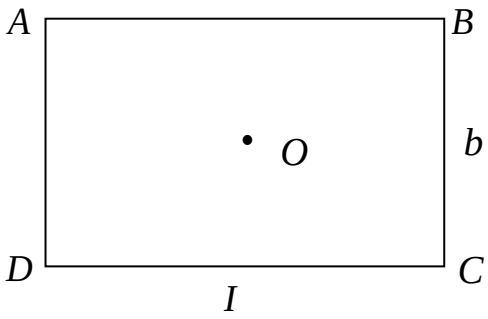

1. $I=\frac{M}{12}\left(l^2+b^2\right)$ 2. $I=M\left(\frac{l^2}{12}+\frac{b^2}{6}\right)$ 3. $I=M\left(\frac{l^2}{6}+\frac{b^2}{12}\right)$ 4. $I=\frac{M}{3}\left(l^2+b^2\right)$

Ans.: (4)

Q39. Match List-I with List-II:

	List-I		List-II
(A)	Green's theorem	(I)	Moment of inertia
(B)	Kepler's laws	(II)	Vectors
(C)	Theorem of parallel and perpendicular axes	(III)	Inertia
(D)	Newton's law	(IV)	Motion of planets

Choose the correct answer from the options given below:

(1). (A)-(I); (B)-(III); (C)-(II); (D)-(IV)

(2). (A)-(III); (B)-(II); (C)-(IV); (D)-(I)

(3). (A)-(II); (B)-(IV); (C)-(I); (D)-(III)

(4). (A)-(IV); (B)-(III); (C)-(I); (D)-(II)

Ans.: (3)

Q40. Gravitational force between two masses m_1 and m_2 separated by a distance r is

(A) central force (B) non-central force (C) attractive force

(D) repulsive force (E) directly proportional to the distance between m_1 and m_2

Choose the correct answer from the options given below.

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

Ans.: (3)

Q41. A bullet of mass 10g moving horizontally with a speed of 500 m/s passes through a block of wood of mass 1 kg, initially at rest on a frictionless surface. The bullet comes out of the block with a speed of 200 m/s. What is the final speed of the block?

(1) 0 (2) 1 m/s (3) 2 m/s (4) 3 m/s

Ans.: (4)

Q42. What will be the spring constant of a spring? When it is stretched 10 cm, it has potential energy of 5600 J.

(1) 1.12 N/m (2) 11.2 N/m (3) 1.12×10^{6} N/m (4) Zero

Ans.: (3)

Q43. The work done in a gravitational field between two points does not depend upon the path between these points. The field

1. can be conservative or non-conservative
2. is conservative
3. is non-conservative
4. Nature of field cannot be determined

Ans.: (2)

Q44. Two bodies of different masses are moving with the same kinetic energy. Which one has a greater momentum?

(1) Body of greater mass will have the greater momentum

(2) Body of lighter mass will have the greater momentum

(3) Both bodies will have same momentum

(4) Depending on initial conditions any body can have greater momentum

Ans.: (1)

Q45. If the earth suddenly contracts to half its radius, what would be the length of the day?

(1) Remain the same (2) 6 hours (3) 12 hours (4) 18 hours

Ans.: (2)

Q46. The angular speed of a motor wheel is increased from 1200 r.p.m. to 3120 r.p.m. in 16s. What is its angular acceleration?

(1) $\pi\,\text{rad/s}^2$ (2) $2\pi\,\text{rad/s}^2$ (3) $3\pi\,\text{rad/s}^2$ (4) $4\pi\,\text{rad/s}^2$

Ans.: (4)

Q47. Given below are two statements:

Statement - I: In case of bi-prism, the coherent sources are produced by the phenomenon of refraction.

Statement-II: In case of Llyod mirror, coherent sources are produced by the phenomenon of reflection.

In the light of above statements, choose the correct answer from the options given below.

(1) Both Statement-I and Statement-II are true

(2) Both Statement-I and Statement-II are false

(3) Statement-I is correct but Statement-II is false

(4) Statement-I is incorrect but Statement-II is true

Ans.: (1)

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Q48. If two simple harmonic motions having angular frequency 440 rad/s and 396 rad/s are superimposed, what will be the number of beats produced?

(1) 5 beats/s (2) 6 beats/s (3) 7 beats/s (4) 8 beats/s

Ans.: (3)

Q49. Which will be the separation between the coherent sources formed by a bi-prism whose inclined faces makes an angle of 2° with its base, the slit source being 0.10 m away from the bi-prism (Given $\mu = 1.5$)?

(1) 1.5 mm (2) 2.5 mm (3) 3.5 mm (4) 4.5 mm

Ans.: (3.5)

Q50. A grating has 15 cm of the surface ruled with 6000 lines per cm. What is the Dispersive power of grating at the angle of $\theta = 60°$ in the first order?

(1) 8000 rad/m (2) 20000 rad/m (3) 8000 rad/cm (4) 2000 rad/cm

Drop

Q51. The Lissajous figure of two rectangular SHMs of equal frequency and phase difference of $\pi/2$ is

(1) Straight line (2) Circle (3) Ellipse (4) Parabola

Ans.: (3)

Q52. What is the phase change for a light of wavelength 5000 Å, passing through a glass plate, if the refractive index of the glass plate is changed from $\mu_0 = 1.5418$ to $\mu = 1.5508$.

(1) 3.14 radian (2) 6.28 radian (3) 36.17 radian (4) 3.617 radian

Drop

Q53. Angular width of central maxima of a diffraction pattern of a single slit does not depend upon

(1) wavelength of light (2) frequency of light
(3) distance between slit and source (4) width of the slit

Ans.: (3)

Q54. The Lissajous figure may be a straight line if the phase difference is

(1) 0 or π (2) $\pi/4$ (3) $\pi/2$ (4) $\pi/3$

Ans.: (1)

Q55. If I_0 is the intensity of the principal maxima in a single slit diffraction pattern, then what will be its intensity when the slit width is doubled?

(1) $I_0/2$ (2) I_0 (3) $2I_0$ (4) $4I_0$

Ans.: (4)

Q56. The kinetic energy of a particle executing simple harmonic motion is

(A) maximum at equilibrium position (B) constant

(C) minimum at extremes positions (D) zero (E) negative

Choose the correct answer from the options given below.

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

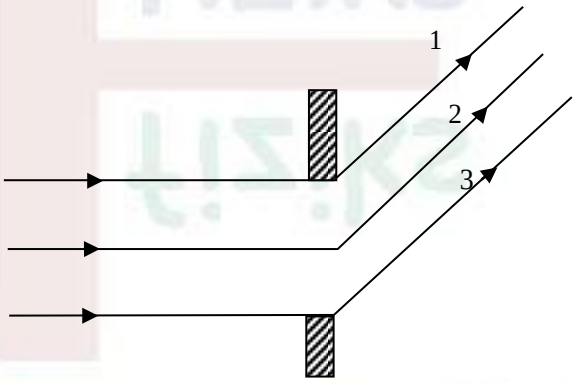
Ans.: (1)

Q57. Given $\vec{A}\times\vec{B}=\vec{C}$, where $\vec{A}=x\hat{i}+y\hat{j}+3\hat{k}$, $\vec{B}=y\hat{i}+x\hat{j}+2\hat{k}, \vec{C}=-5\hat{i}+5\hat{k}$. Find the value of x and y

(1) $x=2, y=3$ (2) $x=3, y=2$ (3) $x=1, y=3$ (4) $x=2, y=1$

Ans.: (2)

Q58. Figure shows Fraunhofer's diffraction due to a single slit. If first minima is obtained in the direction shown, then the path difference between ray 1 and ray 3 is



(1) $\lambda/3$ (2) $\lambda/2$ (3) λ (4) zero

Ans.: (3)

Q59. In the given question, choose the correct sequence of four statements given below:

(A) It was found that the charge determined in each case

(B) Which reveals that charge is quantised

(C) When the experiment was repeated for a number of times

(D) Was an integral multiple of elementary charge

Choose the correct answer from the options given below.

(1) (A), (B), (D), (C) (2) (C), (A), (D), (B)

(3) (D), (B), (A), (C) (4) (C), (A), (B), (D)

Ans.: (2)

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Q60. Given below are two statements:

Statement - I: Important characteristic of electromagnetic wave is that it can transport energy from one point to another point.

Statement - II: The direction of electromagnetic wave at a given point is the direction in which energy is being transmitted.

In the light of the above statements, choose the correct answer from the options given below.

(1) Both Statement - I and Statement - II are true

(2) Both Statement - I and Statement - II are false

(3) Statement - I is correct but Statement - II is false

(4) Statement - I is incorrect but Statement - II is true

Ans.: (1)

Q61. The relative magnitude of $\vec{H}$ in a plane wave is $1 Am^{-1}$. What will be the magnitude of $\vec{E}$ for a plane wave in free space?

(1) 3760 V/m (2) 3.760 V/m (3) 37.60 V/m (4) 376.0 V/m

Ans.: (4)

Q62. If magnetic monopole existed, then which of the following Maxwell's equations will be modified?

(1) div $\vec{D} = \rho$ (2) div $\vec{B} = 0$ (3) curl $\vec{E} = -\frac{\partial \vec{B}}{\partial t}$ (4) curl $\vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t}$

Ans.: (2)

Q63. When a charge particle moves in a uniform magnetic field, its kinetic energy

(1) goes on increasing

(2) goes on decreasing

(3) remains unchanged

(4) may increase or decrease depending upon the sign of charge

Ans.: (3)

Q64. The relative permittivity of distilled water is 81. What is the velocity of light in the distilled water?

(1) 1.1×10^{7} m/s (2) 2.2×10^{7} m/s (3) 3.3×10^{7} m/s (4) 3×10^{8} m/s

Ans.: (3)

Q65. Given below are two statements, one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A): All points inside a charged hollow spherical conducting sphere are at equal potential.

Reason (R): The electric field inside a charged hollow spherical conducting sphere is non-zero.

In the light of the above statements, choose the correct answer from the options given below.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

Ans.: (3)

Q66. The time period of oscillation of the charge in a circuit containing inductance (L) and capacitance (C) only is

(1) $\frac{1}{2\pi\sqrt{LC}}$ (2) $\frac{2\pi}{\sqrt{LC}}$ (3) $\frac{\sqrt{LC}}{2\pi}$ (4) $2\pi\sqrt{LC}$

Ans.: (4)

Q67. The self-inductance of a solenoid is

(1) directly proportional to the current in the solenoid

(2) inversely proportional to the length of the solenoid

(3) directly proportional to the cross-sectional area of the solenoid

(4) inversely proportional to the cross-sectional area of the solenoid

Ans.: (3)

Q68. A solenoid of length 30 cm is wound uniformly with 3000 turns of wire. The wire carries a current of 10 A. What is the value of $\vec{B}$ on the axis within the solenoid? [$\mu_0 = 4\pi \times 10^{-7} T\, m/A$]

(1) 0.126 T (2) 1.26 T (3) 12.6 T (4) 0 T

Ans.: (1)

Q69. What will be potential and field due to a dipole of dipole moment 4.5×10^{-10} cm at a distance from 1m from the center of the dipole along its axis?

(1) 4.05 V and 8.1 V/m

(2) 4.05 V and 10.1 V/m

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(3) 6.05 V and 8.1 V/m

(4) 6.05 V and 10.1 V/m

Ans.: (1)

Q70. A parallel plate capacitor consists of two square metal plates 5.0 cm of side and separated by 1 cm. A sulphur slab of thickness 5 mm is placed on the lower plate. What will be the capacitance of the capacitor? (Dielectric constant of sulphur = 4)

(1) $2.5\times10^{-12}F$ (2) $3.5\times10^{-12}F$ (3) $4.5\times10^{-12}F$ (4) $5.5\times10^{-12}F$

Ans.: (2)

Q71. The change in entropy (ΔS) for a reversible adiabatic process is

(1) $\Delta S>0$ (2) $\Delta S=0$ (3) $\Delta S<0$ (4) $\Delta S>0$ and $\Delta S<0$

Ans.: (2)

Q72. The r.m.s. speed of hydrogen atom at room temperature (300 K) is 2000 m/s. What is the r.m.s. speed of hydrogen atom on the surface of sun where temperature is $T=2\times10^{6}$ K?

(1) 164 m/s (2) 1640 m/s (3) 164000 m/s (4) 16400 m/s

Ans.: (3)

Q73. In Fermi-Dirac statistics, the particles are

(1) indistinguishable and obey Pauli exclusion principle with half integer spin angular momentum

(2) indistinguishable with integral spin angular momentum

(3) distinguishable with integral spin angular momentum

(4) indistinguishable and do not obey Pauli exclusion principle

Ans.: (1)

Q74. Which is the relation between Boyle temperature (T_B) and critical temperature (T_C) of a gas?

(1) $T_B=\frac{27}{8}T_C$ (2) $2T_B=\frac{8}{27}T_C$ (3) $T_B=\frac{3}{7}T_C$ (4) $3T_B=2T_C$

Ans.: (1)

Q75. What is the change in entropy when 10 g of ice at 0°C is converted into water at the same temperature? The latent heat of ice is 80 cal/g.

(1) 0 cal/K (2) 2.93 cal/K (3) 29.3 cal/K (4) 293 cal/K

Ans.: (2)

Q76. Five Carnot engines operate between reservoir temperatures of

(A) 100 K and 500 K (B) 200 K and 500 K

(C) 400 K and 500 K (D) 200 K and 800 K

(E) 200 K and 400 K

Arrange the engines according to their decreasing efficiencies.

Choose the correct answer from the options given below.

(1) B, C, D, A, E (2) A, D, B, E, C

(3) A, B, C, D, E (4) A, E, B, C, D

Ans.: (2)

Q77. C_1 and C_2 represent the specific heat of a liquid and its saturated vapour where as L is latent heat of vaporization. (T is the temperature) the correct option is

(1) $C_2 - C_1 = \frac{dL}{dT} - \frac{L}{T}$ (2) $C_1 - C_2 = \frac{dL}{dT} + \frac{L}{T}$

(3) $C_1 + C_2 = \frac{dL}{dT} - \frac{L}{T}$ (4) $C_1 + C_2 = \frac{dL}{dT} + \frac{L}{T}$

Ans.: (1)

Q78. The Bose-Einstein distribution is applied on

(1) identical, distinguishable particles

(2) identical, indistinguishable particles that do not obey exclusion principle

(3) identical, indistinguishable particles which obey exclusion principle

(4) distinguishable particles which obey exclusion principle

Ans.: (2)

Q79. Given below are two statements:

Statement - I: Law of conservation of momentum is invariant to Galilean transformation.

Statement - II: Law of conservation of energy is invariant to Galilean transformation.

In the light of the above statements, choose the correct answer from the options given below.

(1) Both Statement - I and Statement - II are true

(2) Both Statement - I and Statement - II are false

(3) Statement - I is correct but Statement - II is false

(4) Statement - I is incorrect but Statement - II is true

Ans.: (1)

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Q80. What is the kinetic energy of an electron in the lowest energy level of a hydrogen atom?

(1) 27.2 eV (2) 13.6 eV (3) 1.36 eV (4) 2.72 eV

Ans.: (2)

Q81. A white dwarf star has volume V and contains N electrons so that the density of electron is $n = \frac{N}{V}$. Taking the temperature of the star to be 0 K, what will be the expression for average energy per electron in the star?

(1) $\frac{3\hbar^2}{m}\left(3\pi^2 n\right)^{3/2}$ (2) $\frac{3\hbar^2}{10m}\left(3\pi^2 n\right)^{2/3}$ (3) $\frac{\hbar^2}{m}\left(3\pi^2 n\right)^{2/3}$ (4) $\frac{3\hbar^2}{10m}\left(3\pi^2 n\right)^{1/3}$

Ans.: (2)

Q82. The de Broglie wavelength of an electron having kinetic energy of 100 eV is

(1) 200 pm (2) 120 pm (3) 50 pm (4) 300 pm

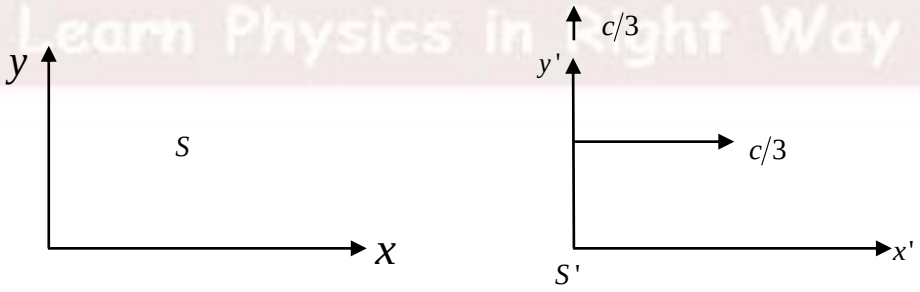
Ans.: (2)

Q83. A metal has work function $w_0 = 3.3\times10^{-19}\,J$. What should be the minimum frequency of the incident radiation that can remove an electron from the metal surface? [Given $h = 6.6\times10^{-34}$ J-s]

(1) 5×10^{10} Hz (2) 5×10^{12} Hz (3) 5×10^{14} Hz (4) 5×10^{15} Hz

Ans.: (3)

Q84. Consider an inertial frame S' moving at a speed $\frac{c}{3}$ away from another inertial frame S along the common x-axis, where c is the speed of light. As observed from S', a particle is moving with speed $\frac{c}{3}$ in the y' direction as shown in the figure. The speed of the particle as seen from S will be



(1) $\frac{\sqrt{15}}{9}c$ (2) $\frac{\sqrt{17}}{9}c$ (3) $\frac{\sqrt{21}}{9}c$ (4) $\frac{\sqrt{18}}{9}c$

Ans.: (2)

Q85. What will be drift velocity v_d of the free electron in a copper wire whose cross-sectional area is $A = 1.00\,mm^2$ when the wire carries a current of 1.0 A. Assume that each copper atom contributes 1 electron to the electron gas. [Given density of copper $= 8.94\times10^3\,kg/m^3$, atomic mass of copper $= 63.5u$, $1u = 1.66\times10^{-27}$ kg)

(1) 7.4×10^{-5} m/s (2) 7.4×10^{-2} m/s (3) 7.4×10^{-7} m/s (4) 7.4 m/s

Ans.: (1)

Q86. Given below are two statements:

Statements - I: Compton effect can be explained on the basis of wave nature of light.

Statements - II: Diffraction pattern of light can be explained on the basis of particle nature of light.

In the light of the above statements, choose the correct answer from the options given below.

(1) Both Statement - I and Statement - II are true

(2) Both Statement - I and Statement - II are false

(3) Statement - I is correct but Statement - II is false

(4) Statement - I is incorrect but Statement - II is true

Ans.: (2)

Q87. What is the relation between half-life (T) and decay constant (λ) of a radioactive element?

(1) $T = 0.693\lambda$ (2) $T = \dfrac{\lambda}{0.693}$ (3) $T = \dfrac{0.693}{\lambda}$ (4) $T = \dfrac{0.693}{\lambda^2}$

Ans.: (3)

Q88. Consider Rydberg (hydrogen-like) atoms in a highly excited state with n around 400. The wavelength of radiation coming out of these atoms for transitions to the adjacent levels in the range.

(1) Gamma rays (λ ~pm) (2) Ultra violet rays (λ ~nm)

(3) infrared rays ($\lambda \sim \mu m$) (4) radio frequency (λ ~m)

Ans.: (4)

Q89. What is the mean life time $(\bar{T})$ of a radioactive substance of which the decay constant (λ) is 4.28×10^{-4} per year?

(1) 584 years (2) 1168 years (3) 1619 years (4) 2336 years

Ans.: (4)

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Q90. The dispersion relation for electromagnetic waves travelling in a plasma is given by $\omega^2 = c^2k^2 - \omega_\rho^2$, where c and ω_ρ are constants. In this plasma, group velocity will be

(1) proportional to but not equal to phase velocity

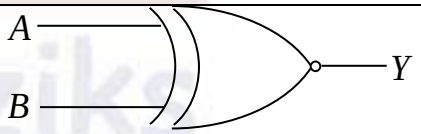
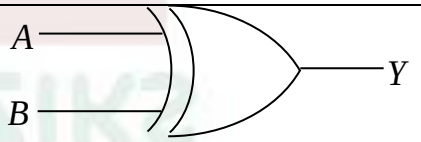
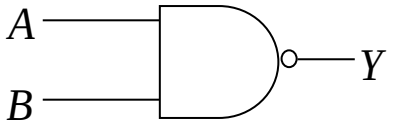
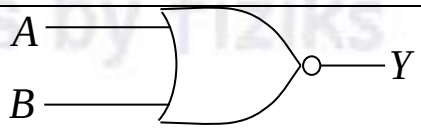
(2) equal to the phase velocity

(3) inversely proportional to the phase velocity

(4) constant

Ans.: (3)

Q91. Match List - I with List - II:

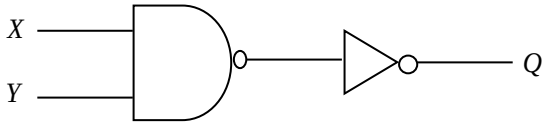
	List - I		List - II
(A)	NAND Gate	(I)	
(B)	NOR Gate	(II)	
(C)	X-NOR Gate	(III)	
(D)	XOR Gate	(IV)	

Choose the correct option from those given below.

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

Ans.: (3)

Q92. The following logic circuit represents



1. NAND gate with output $Q = \bar{X} + \bar{Y}$
2. NOR gate with output $Q = \overline{X + Y}$
3. AND gate with output $Q = X \cdot Y$
4. NOR gate with output $Q = \bar{X} + \bar{Y}$

Ans.: (3)

Q93. Find the shortest wavelength present in the radiation from an x-ray machine whose accelerating potential is 50000 V.

(1) 0.0248 Å (2) 0.248 Å (3) 2.48 Å (4) 24.80 Å

Ans.: (2)

Q94. What happens if the electron spin is 3/2 instead of ½?

(1) The Bohr levels will change (2) The size of atoms will change

(3) Energy will change (4) Atoms will not be stable

Ans.: (3)

Q95. Operational amplifiers can be used as

(A) Summing circuit (B) Voltage regulator (C) Integrator

(D) Differentiator (E) Clipping Circuit

Choose the correct answer from the options given below.

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

Ans.: (3)

Q96. Given below are two statements:

Statement - I: We can join two P-N junctions back-to-back to form a transistor

Statement - II: In a transistor the emitter base junction is forward biased while base collector junction is reverse biased

In the light of the above statements, choose the correct answer from the options given below.

(1) Both Statement - I and Statement - II are true

(2) Both Statement - I and Statement - II are false

(3) Statement - I is correct but Statement - II is false

(4) Statement - I is incorrect but Statement - II is true

Ans.: (4)

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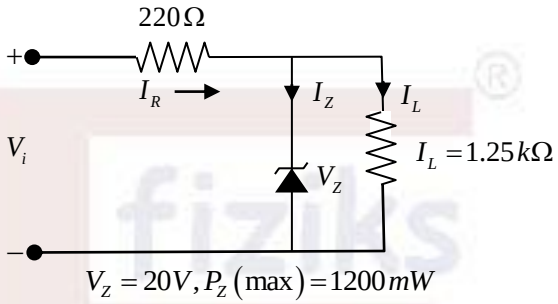
Q97. Electrons are accelerated by 344 volts and reflected from the crystal. The first reflection maximum occurs when glancing angle is 30°. What will be the value of interplaner spacing of the crystal? [Given $h = 6.62\times10^{-34}\,Js$, $m_e = 9.1\times10^{-31}\,\text{kg}$]

(1) $0.06\times10^{-10}\,\text{m}$ (2) $0.66\times10^{-10}\,\text{m}$ (3) $1.66\times10^{-10}\,\text{m}$ (4) $2.66\times10^{-10}\,\text{m}$

Ans.: (2)

Q98. What will be the range of input voltage V_i in which the Zener diode shown in the figure below, conducts?



(1) 20.52 V to 30.72 V (2) 23.52 V to 36.72 V

(3) 26.52 V to 40.72 V (4) 30.52 V to 42.72 V

Ans.: (2)

Q99. The phase space is a

(1) two-dimensional space (2) one-dimensional space

(3) three-dimensional space (4) six-dimensional space

Ans.: (4)

Q100. Find the output voltage of a non-inverting OP-AMP having $R_1 = 100\,k\Omega$, $R_f = 500\,k\Omega$, when the input signal is of 2.0 V.

(1) 6 V (2) 8 V (3) 12 V (4) 16 V

Ans.: (3)