Nitesh Phyzics

CUET GEOPHYSICS 2022

An Institute of
NET-JRF, IIT-JAM, GATE, JEST, TIFR
CUET Entrance in Physics
Physical Sciences
New Delhi

1. Choose the correctly spelt word

   A. Defalcation B. Difalcation C. Defalcasion D. Defalcatation

2. Given below is four sentences in jumbled order. Select the option that gives their correct order:

   A. Once on their way, the stones did not stop until they reached the bottom of the hill.

   B. You had to be very careful not to start a landslide.

   C.Loose stones rattled down the cliff.

   D. And they took other stones with them so that there was soon a cascade of stones.

   Choose the correct answer from the options given below

   A. C,A,D,B B. B,A,D,C C. B,C,A,D D. C,D,B,A

3. choose the correct sentences

   A. We went to the station to see them off.

   B. We went to the station to see them out.

   C. We went to the station to goodbye them.

   D. We went to the station to say them goodbye.

4. Choose the correct answer from the options given below

List I (Wood)		List II (Synonym)	
A.	pervasive	I.	filter
B.	sieve	II.	widespread
C.	potent	III.	netting
D.	mesh	IV.	powerful

   A. A-II, B-I, C-IV, D-III

   B. A-IV, B-III, C-II, D-I

   C. A-IV, B-I, C-III, D-II

   D. A-III, B-I, C-II, D-IV

5. Which two of the following are in the correct form?

   A. Let's go to the cinema, shall we?

   B. Let's go to the cinema, do we?

   C. Let's not go to the cinema, shall we?

   D. Let's not go to the cinema, shan't we?

   A. A and D only B. A and C only C. B and D only D. B and C only

6. Choose the option which is opposite to the following word: "Castigate"
   A. Commend B. Reprimand C. Flagellated D. Commotion

7. Identify the correct indirect narration for the following sentence:
   "Who now," they had asked. "Will listen to our trouble and protect us from the crocodile"?

   A. They had wanted to know who would listen to their troubles and protect them from the crocodiles.
   B. They had wanted to know who then would listen to their troubles and protect them from the crocodiles.
   C. They had wanted to know who will now listen to their troubles and protect them from the crocodiles.
   D. They wanted to know who will listen to their troubles and protect them from the crocodiles.

8. Which of the following is a one-word substitute for 'safe to drink'
   A. potable B. suitable C. Edible D. pilable

9. Identify suitable preposition from the options given below to compute the sentence.
   Neha would think it ————her to do such a small work
   A. under B. below C. above D. beneath

10. Identify the active voice for the following sentence:
    These things have been left here by an unknown person.

    A. An unknown person leaves these things here.
    B. An unknown person have left these things here.
    C. An unknown person has left these things here.
    D. An unknown person had left these things here.

11. Amid economy crisis and political turmoil in Sri Lanka whi has been appointed as the new PM of Sri Lanka.
    A. Maithripala Sirisena B. Ranil Wickremesinghe C. Mahindra Rajapasksa
    D. Gotabaya Rajapaksa

12. Who has become the First female to took the office of President ot Tanzania and the third government of country in East African Community?

A. Samia Sululu Hassan B. Agathe Unilingiyimana C. Sylvie kinigi D. sahle-work-Zewde

13. India held the first spot in the International Shooting Sport Federation World Cup 2022 which was being held in ————————
A. India B. China C. U.A.E. D. Egypt

14. Who has won the Men's Single Title at 79th Edition of the Italian Open held in Rome?
A. Stefanos Tsitsipas B. Novak Djokovic C. Rafael Nadal D. roger Federer

15. What is the current year estimate of the GDP growth according to the Nirmala Sitharaman in the Union Budget 2022-23?
A. 9.5% B. 9.9% C. 9.2% D. 8.5%

16. All the intellectuals are very emotional, because:
A. They are thinking beings.
B. They are logical beings.
C. They are mathematical beings.
D. They are philosophers.
E. They are laymen.
A. A,D only B. B,C only C. C,E only D. E,D only

17. Choose the best option for the football players:
A. player 'XYZ' show team spirit.
B. player 'XYZ' have sportsmanship.
C. player 'XYZ' have hatred for the other team-mates.
D. player 'XYZ' shows jealousy.
E. player 'XYZ' shows patience.
A. A,B,C only B. A and C only C. B,C,D only D. A,B,E only

18. A person can learn Sanskrit without a teacher:
A. It is not possible learning Sanskrit without a teacher, as it is a technical subject.
B. It is possible to learn Sanskrit as it is a non-technical subject.
C. Anyone can learn it, as it is just a language.
D. It can be learned by daily practice under a teacher.
E. It is easy for a person, who knows the Hindi language.
A. A, E only B. B,C,D only C. A,B,E only D. A, D only

19. Given below are two statements: In single slit experiment if we replace red light with violet light.
Statement I: Pollution level in Delhi may be reduced by reducing the factories.
Statement II: All factories are creating noise pollution and are dangerous to health.
In light of the above statements, choose the most appropriate answer from the options given below:

    A. Both Statement I and Statement II are correct.
    B. Both Statement I and Statement II are incorrect.
    C. Statement I is correct but Statement II is incorrect.
    D. Statement I is incorrect but Statement II is correct.

20. Given below are two statements: In single slit experiment if we replace red light with violet light.
Statement I: Education is important for both male and female.
Statement II: Government must encourage co-education, as it is required for country's development.
In light of the above statements, choose the most appropriate answer from the options given below:

    A. Both Statement I and Statement II are correct.
    B. Both Statement I and Statement II are incorrect.
    C. Statement I is correct but Statement II is incorrect.
    D. Statement I is incorrect but Statement II is correct.

21. If $x^2 + \frac{1}{x^2} = 2$ then the value of $x^3 + \frac{1}{x^3}$ is
A. ± 2 B. ± 8 C. ± 1 D. ± 4

22. Given below are two statements: One is labeled as Assertion A and the other is labeled as Reason R.

    Assertion A: If the volume of two cubes are in the ratio of 3:27, then their surface areas are in the ratio 4:9.
    Reason R: If the surface areas of two cubes are in the ratio $S_1 : S_2$, then their volumes are in the ratio $S_1^{2/3} : S_2^{2/3}$
    In light of the above statements, choose the most appropriate answer from the options given below:

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true and R is NOT the correct explanation of A.

C. A is true but R is false.

D. R is true but A is false.

23. If the high and base radius of a cone are increased by 50% and 25% respectively then the ratio between the volume of a given cone and the new cone is
A. 8:27 B. 75:32 C. 32:75 D. 27:8

24. The probability of selecting a vowel from the word TRIANGLE is-
A. $\frac{2}{7}$ B. $\frac{1}{8}$ C. $\frac{3}{8}$ D. $\frac{5}{8}$

25. If one root of quadratic equation $2x^2 - 3x + (2k+1) = 0$ is five times the other then the value of k is:
A. $\frac{3}{16}$ B. $-\frac{3}{16}$ C. $-\frac{3}{8}$ D. $\frac{3}{8}$

26. Given below are two statements: One is labeled as Assertion A and the other is labeled as Reason R.
Consider the relation $C_p - C_v = -T\left(\frac{\partial V}{\partial T}\right)_P^2 \left(\frac{\partial P}{\partial V}\right)_T$
Assertion A: C_P can never be less than C_V
Reason R: $\left(\frac{\partial P}{\partial T}\right)_T$ is always negative for all known substance and the value of $\left(\frac{\partial V}{\partial T}\right)_P^2$
In light of the above statements, choose the most appropriate answer from the options given below:

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true and R is NOT the correct explanation of A.

C. A is true but R is false.

D. R is true but A is false.

27. Choose the correct answer from the options given below

A. A-I, B-III, C-IV, D-II

B. A-II, B-I, C-III, D-IV

C. A-I, B-II, C-III, D-IV

D. A-I, B-III, C-II, D-IV

LIST I (Irreversible Thermodynamic process)		LIST II (Entropy change)	
A.	Adiabatic dissipation of work into internal energy of the system	I.	$C_p \ln \frac{T_R}{T_i}$
B.	Free expansion of an ideal gas	II.	$2nR \ln \frac{V_F}{T_i}$
C.	Transfer of heat through a medium from hotter to cooler reservoir	III.	$nR \ln \frac{V_F}{V_i}$
D.	Diffusion of two dissimilar inert ideal gas	IV.	0

28. Given below are two statements: Electromagnetic wave boundary condition are.
Statement I: the tangential component of an E field is continuous across the interface.
Statement II: The tangential component of an H field is continuous across the interface where the surface current exist.
In light of the above statements, choose the most appropriate answer from the options given below:

    A. Both Statement I and Statement II are correct.

    B. Both Statement I and Statement II are incorrect.

    C. Statement I is correct but Statement II is incorrect.

    D. Statement I is incorrect but Statement II is correct.

29. Given below are two statements: In single slit experiment if we replace red light with violet light.
Statement I: Diffraction bands will become narrower and crowd together.
Statement II: No change will occur.
In light of the above statements, choose the most appropriate answer from the options given below:

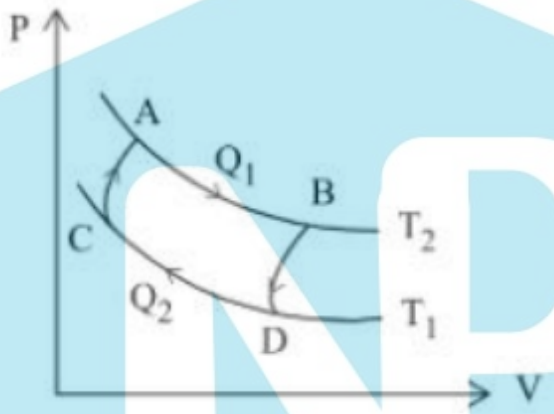
    A. Both Statement I and Statement II are correct.

    B. Both Statement I and Statement II are incorrect.

    C. Statement I is correct but Statement II is incorrect.

D. Statement I is incorrect but Statement II is correct.

30. In the given P-V diagram, AB and CD are two isotherms at temperature T_1 and T_2 respectively where $(T_1 > T_2)$ whereas AC and BD are two reversible adiabats. In the given Carnot cycle, which of the following statement is true



A. $\frac{Q_1}{T_1} = \frac{Q_2}{T_2}$

B. entropy of the system decreases

C. entropy of the system increases

D. Work done by the system $W = Q_2 - Q_1$

31. An electron has a debroglie wavelength of 2×10^{-10}m and rest mass energy $e_o = 511 keV$. The kinetic energy of electron is

A. 803 keV B. 292 keV C. 511 keV D. 622 keV

32. Choose the correct answer from the options given below

A. A-III, B-I, C-II, D-IV

B. A-III, B-IV, C-II, D-I

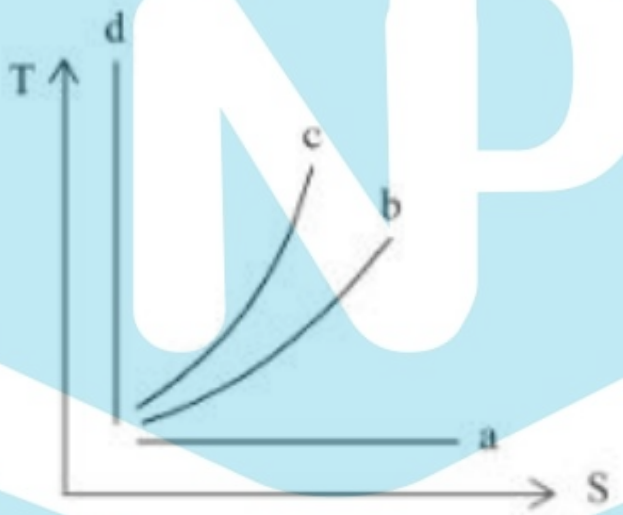
C. A-I, B-II, C-III, D-IV

D. A-I, B-III, C-IV, D-II

33. Following diagram represents the reversible process of a hydrostatic system on a TS diagram

Find the correct order of the process

LIST I		LIST II	
A.	Rayleigh scatteraing	I.	Elastic scattering from molecular particles whose diameter is larger than the wavelength of incident light
B.	Raman scattering	II.	keV to MeV range scattering
C.	Compton scattering	III.	Elastic Scattering
D.	Mie scattering	IV.	eV range scattering



A. a: Isothermal; b:isobar; c: isochor; d: Isentrope

B. a: Isothermal; b:isochor; c: isobar ; d: Isentrope

C. a: Isentrope; b:isobar; c: isochor; d: Isothermal

D. a: Isentrope; b:isochor; c: isobar; d: Isothermal

34. A Carnot engine operates with a source at 500K and sink at 375K. If the engine takes 600kCal of heat in one cycle, the heat rejected to the sink per cycle is A. 250kCal B. 350kCal C. 450kCal D. 550kCal

35. The relationship between the current gain of a common emitter β and current gain of common base transistor α is given as

A. $\beta = \frac{\alpha}{1-\alpha}$ B. $\alpha = \frac{\beta}{1-\beta}$ C. $\beta = \alpha(1-\alpha)$ D. $\alpha = \beta(1-\beta)$

36. Given below are two statements: One is labeled as Assertion A and the other is labeled as Reason R.

Assertion A: Thermal energy produces more electron-hole pairs in germanium as compared to the silicon

Reason R: In a germanium atom the valence band is much closer to the conduction band in comparison to the valence and conduction band position for the silicon atom.

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

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true and R is NOT the correct explanation of A.

C. A is true but R is false.

D. R is true but A is false.

37. A thermodynamic system is maintained at constant temperature and pressure. In thermodynamic equlibirum, its

A. Enthalpy is maximum B. Helmholtz free energy is minimum C. Internal energy is zero D. Gibbs free energy is minimum

38. The Poynting vector of an electromagnetic wave represents

A. Radiation Pressure B. Radiation temperature C. Energy Flux D. Direction of the magnetic field

39. A system consists of N number of particles, $N \gg 1$. Each particle can have only one of the two energies E_1 or $E_1 + \epsilon$ ($\epsilon > 0$). If the system is in equilibrium at a temperature T, the average number of particles with energy E_1 is-

A. $\frac{N}{2}$ B. $\frac{N}{e^{\epsilon/KT}+1}$ C. $\frac{N}{e^{-\epsilon/KT}+1}$ D. $\frac{N}{e^{-\epsilon/KT}}$

40. The electric field inside a uniformly charged solid sphere with charge density ρ can be given by

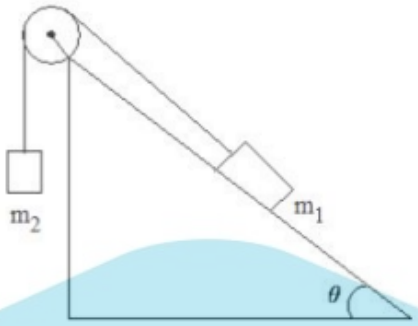
A. $\frac{Q}{4\pi\epsilon_o R^3}\hat{r}$ B. $\frac{Q}{4\pi\epsilon_o r^2}\hat{r}$ C. $\frac{Q}{4\pi\epsilon_o R^5}\hat{r}$ D. $\frac{Q}{20\pi\epsilon_o R^5}\hat{r}$

41. The moment of inertia of a thin rod, of length l and mass m, about its center of mass, is

A. $\frac{ml^2}{12}$ B. $\frac{ml^2}{4}$ C. ml^2 D. $\frac{ml^2}{8}$

42. The acceleration of mass m_1 and m_2 for the system in the given figure is-

A. $\frac{m_1 sin\theta - m_2}{m_1+m_2}g$ B. $\frac{m_1 sin\theta + m_2}{m_1+m_2}g$ C. $\frac{m_1 sin\theta - m_2}{m_1-m_2}g$ D. $\frac{m_1 sin\theta + m_2}{m_1-m_2}g$



43. Given below are two statements: One is labeled as Assertion A and the other is labeled as Reason R.
Assertion A: In a 1-D elastic collision, the relative velocity of two particles after a collision is the negative of the relative velocity before the collision.
Reason R: Energy and momentum are conserved in the elastic collision.
In light of the above statements, choose the most appropriate answer from the options given below:

    A. Both A and R are true and R is the correct explanation of A.

    B. Both A and R are true and R is NOT the correct explanation of A.

    C. A is true but R is false.

    D. R is true but A is false.

44. A mass M moves with velocity v along the x-direction. It breaks up into two pieces that move at angle θ_1 and θ_2 with respect to the original v of direction M. The magnitude
A. $\frac{mvsin\theta_2}{sin(\theta_1+\theta_2)}$ B. $\frac{mvsin\theta_1}{sin(\theta_1+\theta_2)}$ C. $\frac{mvcos\theta_2}{sin(\theta_1+\theta_2)}$ D. $\frac{mvcos\theta_1}{sin(\theta_1+\theta_2)}$

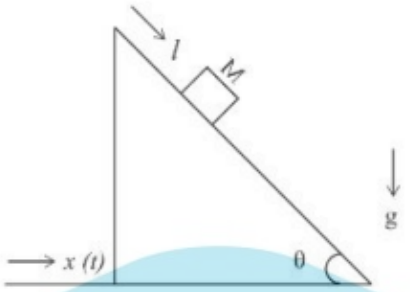
45. A block of mass M slides on a frictionless inclined plane which is driven so that it moves horizontally, the displacement of the plane at time t being some known function $x(t)$. Use D'Alembert's principle to find the acceleration of the block, taking as generalized coordinate the displacement, l of the block down the plane. Note that the acceleration of the block is not down the plane.

    A. $gsin\theta - \ddot{x}cos\theta$

    B. $gcos\theta + \ddot{x}sin\theta$

    C. $gsin\theta + \ddot{x}cos\theta$

    D. $gcos\theta - \ddot{x}sin\theta$



46. A body of rest mass m and energy E decays to two bodies P and Q. If several such decays take place then the conservation of energy and momentum requires that A. P and Q will always carry the same momentum and energy. B. P and Q will come out with varying energy and momentum in successive decays. C. P and Q will always have the same energy but varying momentum. D. P and Q will have the same momentum but varying energy.

47. The continuity equation $\nabla.J = \frac{-\partial S}{\partial t}$ leads us to the
A. conservation of fields B. conservation of currents C. conservation of charges
D. conservation of charge density

48. Which of the following Maxwell's equations tells us that magnetic mono-poles cannot exist.

A. $\nabla \times B = \mu_o J + \mu_o \epsilon_o \frac{\partial E}{\partial t}$

B. $\nabla.B = 0$

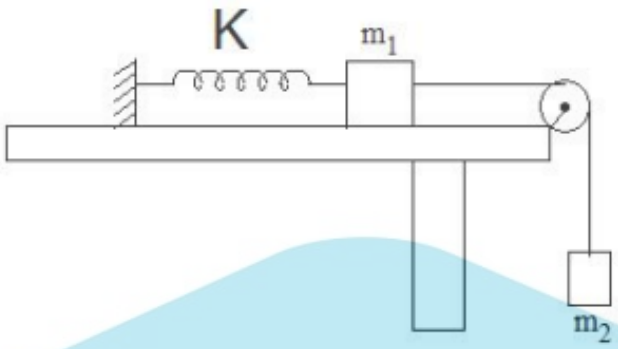
C. $\nabla.E = \frac{\rho}{\epsilon_o}$

D. $\nabla \times E = \frac{-\partial B}{\partial t}$

49. The Poynting vector for monochromatic plane waves propagation in the z-direction can be given by-
A. $c\epsilon_o E_o^2 cos^2(kz-\omega t+\delta)\hat{z}$ B. $c\epsilon_o E_o^2 cos^2(kz-\omega t-\delta)\hat{z}$ C. $c\epsilon_o E_o cos^2(kz-\omega t+\delta)\hat{z}$
D. $c\epsilon_o E_o cos^2(kz-\omega t-\delta)\hat{z}$

50. The acceleration of the system in the figure below would be given as A. $\frac{-Kx+m_2 g}{m_1+m_2}$
B. $\frac{Kx-m_2 g}{m_1+m_2}$ C. $\frac{Kx-m_2 g}{m_1-m_2}$ D. $\frac{-Kx-m_2 g}{m_1-m_2}$

51. For a circular and parabolic orbit in an attractive $\frac{1}{r}$ potential having the same angular momentum, the perihelion distance of the parabola is a times the radius of the circle,



where a would be-

A. $\frac{2}{3}$ B. $\frac{1}{2}$ C. $\frac{1}{3}$ D. $\frac{1}{4}$

52. A man standing near a railway track hears a train's whistle when the train is coming directly towards him and then when it is going directly away from him. The two observed frequencies are 250 Hz and 200 Hz. What is the speed of the train? Assume the speed of the sound in the air to be 360m/s.

A. 30m/sec B. 35m/sec C. 40m/sec D. 45m/sec

53. The magnetic field at the center of the square loop carrying a steady current I will be given by- (assuming the sides of the square to be 2r)

A. $\frac{\mu_o I}{\pi r}$ B. $\frac{\sqrt{2}\mu_o I}{\pi r}$ C. $\frac{\sqrt{2}\mu_o I}{2\pi r}$ D. $\frac{\mu_o I}{2\pi r}$

54. Given below are two statements: One is labeled as Assertion A and the other is labeled as Reason R.

Assertion A: The total energy of the particle is conserved.

Reason R: The forces acting on the particle are conserved.

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

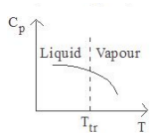
A. Both A and R are true and R is the correct explanation of A.

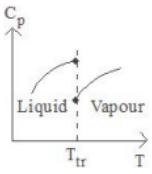
B. Both A and R are true and R is NOT the correct explanation of A.

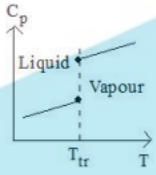
C. A is true but R is false.

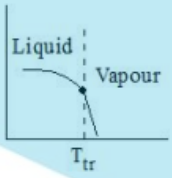
D. R is true but A is false.

55. For a liquid to vapor phase transition at T_{tr}, which one of the following plots between molar heat capacity C_p and T is correct?

A. 

B. 

C. 

D. 

56. Estimate the moment of inertia of slab of mass M, length a and width b about a perpendicular axis passing through the center.

A. $\frac{1}{2}M(a^2+b^2)$ B. $\frac{2}{5}M(a^2+b^2)$ C. $\frac{1}{12}M(a^2+b^2)$ D. $\frac{2}{3}M(a^2+b^2)$

57. Two independent sound waves of equal amplitude a and angular frequencies ω_1 and ω_2 are superimposed, then which of the following is correct?

A. The resultant amplitudes are constant and are 2a.

B. The resultant amplitudes vary with angular frequency $\omega_1+\omega_2$.

C. The resultant amplitudes varies with angular frequency $\frac{1}{2}(\omega_1+\omega_2)$.

D. The resultant amplitudes vary with angular frequency $\omega_1+\omega_2$.

58. During a parabolic path of a firework rocket, it explodes into two equal parts moving in different directions, in the absence of air drag. Which one of the following is correct?

A. Kinetic energy of the center of mass remains constant.

B. Center of mass of the fragments will have the same potential energy.

C. Center of mass of the fragments would continue to follow the original path.

D. Center of mass will have a zig-zag path, after the explosion.

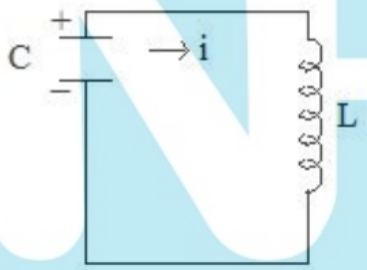
59. Considering the elliptical orbits of the planets around the sun, which one of the following quantities remains constant, as seen from the sun

A. Linear Momentum B. Angular Momentum C. Kinetic Energy D. Total Energy

60. If a black body at temperature T_1 is in equilibrium with surrounding at temperature T_2, then the heat radiated by the black body E, per unit area, per unit time will be, (here σ is Stephen's constant)

A. $E = \sigma(T_1^4 - T_2^4)$ B. $E = \sigma(T_1^4 + T_2^4)$ C. $E = \sigma(T_1^2 - T_2^2)$ D. $E = \sigma(T_1^2 + T_2^2)$

61. The following LC circuit has initial current i flowing in it. From this circuit, which one of



the following is not correct?

A. The charge oscillates back and forth between the plates of the conductor.

B. The charge oscillates back and forth in the coil.

C. The field oscillates back and forth between $\vec{E}$ in the capacitor and $\vec{B}$ in the coil.

D. The angular frequency of oscillation $\omega = \frac{1}{2\pi\sqrt{LC}}$

62. If the pressure is increased thermally for the water between 0 to 4^o, the process will come

A. heat emission B. heat absorption C. neither emission nor absorption of heat D. negative heat transfer

63. Photoelectric effect is generally observed in the range of the electromagnetic spectrum.

A. Microwave B. Ultraviolet and visible C. Infrared D. Radiowaves

64. The results of Michelson - Morley experiment process

A. The speed of light in free space depends on the relative motion of the source or observer.

B. orbital speed of the Earth around the sun 3×10^4m/sec.

C. The light has a particle nature.

D. Absence of hypothetical medium ether

65. Given below are two statements: One is labeled as Assertion A and the other is labeled as Reason R.
Assertion A: In the Fresnel class of diffraction, the shape of the wavefront on the diffracting object can not be rectangular
Reason R: In the Fresnel class of diffraction, the source is placed near the diffracting object
In light of the above statements, choose the most appropriate answer from the options given below:

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true and R is NOT the correct explanation of A.

C. A is true but R is false.

D. R is true but A is false.

66. In the Michelson interferometer experiment, if the source consists of all wavelengths lying between λ and $\lambda + d\lambda$, then no interferometer pattern will be observed, if the mirror displacement d is - A. $2d \leq \frac{\lambda^2}{\Delta\lambda}$ B. $2d \leq \frac{\Delta\lambda}{\lambda^2}$ C. $2d \geq \frac{\Delta\lambda}{\lambda^2}$ D. $2d \geq \frac{\lambda^2}{\Delta\lambda}$

67. A body is traveling at 0.9c speed. The body has relativistic contraction of- A. 9.99% B. 99.99% C. 43.6% D. 50.0%

68. Frequency spread of a spectral line is-

A. Independent of the coherence time

B. Of the order of coherence time

C. Of the order of the inverse of the coherence time

D. Of the order of the square of the coherence time

69. In Newton's ring experiment, the light consists of two closely spaced wavelengths λ_1 and λ_2. If the lens is moved up by a distance d, the interference pattern will be washed out, if A. $d = \frac{\lambda_1\lambda_2}{(\lambda_1 - \lambda_2)}$ B. $d = \frac{\lambda_1 - \lambda_2}{\lambda_1\lambda_2}$ C. $d = \frac{\lambda_1\lambda_2}{4(\lambda_1 - \lambda_2)}$ D. $d = \frac{4(\lambda_1 - \lambda_2)}{\lambda_1\lambda_2}$

70. Given below are two statements: One is labeled as Assertion A and the other is labeled as Reason R.

Assertion A: The highest order of the fringes lies at the center of circular fringes

Reason R: Michelson Interferometer fringes are fringes of equal inclination.

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

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true and R is NOT the correct explanation of A.

C. A is true but R is false.

D. R is true but A is false.

71. Solution of the equation $x\frac{dy}{dx}+2y=x^3cos4x$ is

A. $y=x^2sin4x+cx^3$

B. $y=\frac{1}{4}x^2sin4x+cx^3$

C. $y=x^2sin4x+cx^2$

D. $y=\frac{1}{4}x^2sin4x+cx^2$

72. Let $I(\alpha)=\int_a^b f(x,\alpha)dx$ where f is continuous and differential. If a and b are differential functions of α, then

A. $\frac{dI}{d\alpha}=\int_a^b\frac{df}{d\alpha}dx+f(b,a)\frac{db}{d\alpha}+f(a,\alpha)\frac{da}{d\alpha}$

B. $\frac{dI}{d\alpha}=\int_a^b\frac{df}{d\alpha}dx+f(b,a)\frac{db}{d\alpha}-f(a,\alpha)\frac{da}{d\alpha}$

C. $\frac{dI}{d\alpha}=\int_a^b\frac{df}{d\alpha}dx+f(b,a)\frac{db}{d\alpha}$

D. $\frac{dI}{d\alpha}=\int_a^b\frac{df}{d\alpha}dx+f(b,a)\frac{db}{d\alpha}$

73. Given below are two statements:

Statement I: Even functions can have no sine terms in its Fourier expansion

Statement II: Odd functions can have no sine term in its Fourier expansion

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

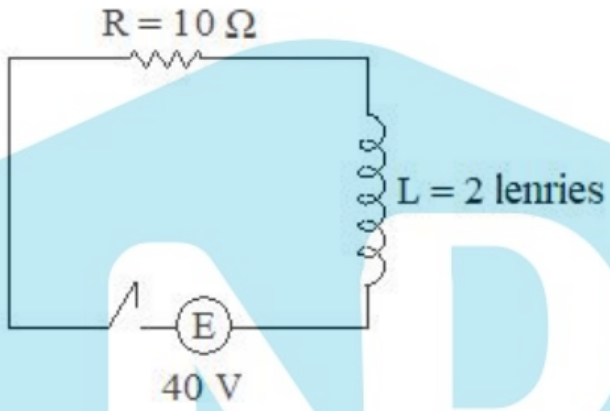
A. Both Statement I and Statement II are correct.

B. Both Statement I and Statement II are incorrect.

C. Statement I is correct but Statement II is incorrect.

D. Statement I is incorrect but Statement II is correct.

74. In the following circuit, $R = 10\Omega$, $L = 2H$ and a battery of 40V are connected in series. At t=0, the switch is closed what will be current for $t > 0$



A. $I = 12(1 - e^{-5t})$ B. $I = (1 - e^{-5t})$ C. $I = 4(1 - e^{-5t})$ D. $I = 10e^{2t}$

75. Choose the correct answer from the options given below

Match List I with List II

LIST I		LIST II	
A.	Displacement Element (dr)	I.	$r^2 \sin\theta \, d\rho \, d\theta \, d\phi$
B.	Area Element $(d\sigma)$	II.	$\sin\theta \, d\theta \, d\phi$
C.	Volume Element $(d\tau)$	III.	$\hat{e}_r \, dr + r\hat{e}_\theta \, d\theta + r\sin\theta \, \hat{e}_\phi \, d\phi$
D.	Solid angle Element $(d\Omega)$	IV.	$r^2 \sin\theta \hat{e}_r \, d\theta \, d\phi + r\sin\theta \hat{e}_\phi \, dr \, d\phi + r\hat{e}_\phi \, dr \, d\phi$

A. A-IV, B-III, C-I, D-II

B. A-I, B-IV, C-III, D-II

C. A-III, B-IV, C-I, D-II

D. A-II, B-I, C-III, D-IV

76. For a field F= grad g satisying the assumptions of divergence theorem with f and g as scalar function; Green's second formula can be written as

A. $\iiint_T (f\nabla^2 g + g\nabla^2 f)dv = \iint_S \left(f\frac{\partial g}{\partial n} - g\frac{\partial f}{\partial n}\right)dA$

B. $\iiint_T g\nabla^2 f\,dv = -\iint_S \left(f\frac{\partial g}{\partial n} - g\frac{\partial f}{\partial n}\right)dA$

C. $\iiint_T f\nabla^2 g dv = \iint_S \left(f\frac{\partial g}{\partial n} - g\frac{\partial f}{\partial n}\right)dS$

D. $\iiint_T (f\nabla^2 g - g\nabla^2 f)dv = \iint_S \left(f\frac{\partial g}{\partial n} - g\frac{\partial f}{\partial n}\right)dA$

77. Let f and g be scalar functions, such that $F = f\,grad\,g$. The value of $div\vec{F}$ will be

A. $\nabla^2 fg + grad\,f.grad\,g$

B. $f\nabla^2 g + g\nabla^2 f$

C. $\nabla^2 fg + grad\,f$

D. $f\nabla^2 g + grad\,f.grad\,g$

78. Which one of the following equations represents the irrational character of gradient fields

A. $curl(grad\,f) = 1$

B. $div(grad\,f) = 0$

C. $curl(grad\,f) = 0$

D. $grad(curl\,f) = 1$

79. For two scalar f and g, the value of $div(f\nabla g)$ is equal to

A. $f\nabla^2 g + g\nabla^2 f$ B. $f\nabla^2 g + \nabla f \times \nabla g$ C. $f\nabla^2 g - g\nabla^2 f$ D. $f\nabla^2 g + \nabla f.\nabla g$

80. The initial amount at time t = 0, for any radioactive substance is 0.5gm. The time rate of decay of substance y is proportional to $y(t)$. The amount of substance left after time t, will be

A. $y(t) = e^{-kt}$ B. $y(t) = \frac{e^{-kt}}{0.5}$ C. $y(t) = 0.5e^{-kt}$ D. $y(t) = e^{-0.5t}$

81. The solution of Laplace's equation $\nabla^2 f = 0$, where $f(x,y,z) = \frac{c}{r}$ with $r > 0$; will give-

A. Gravitational force of attraction B. Columbian force of repulsion C. Strong nuclear force of attraction D. Weak nuclear force of repulsion

82. The volume integral of the function $f(r,\theta,\phi) = r^2 cos\theta$ over the region $0 \le r \le 2; 0 \le \theta \le \frac{\pi}{3}; 0 \le \phi \le 2\pi$, correct to nearest integer is -

A. 12 B. 24 C. 36 D. 15

83. For a linear homogeneous second-order ordinary differential equation

$$y'' + P(x)y' + Q(x)y = 0$$

The point x_o is singularity if-

A. P(x) or Q(x) diverges there

B. P(x) or Q(x) diverges there but $(x - x_o)P(x)$ and $(x - x_o)^2 Q(x)$ remain finite

C. P(x) diverges faster than $\frac{1}{(x-x_o)}$

D. Q(x) diverges faster than $\frac{1}{(x-x_o)^2}$

84. The meromorphic function $\frac{z}{(z-1)(z+3)^2}$ has

A. one pole B. two poles C. three poles D. four poles

85. Given below are two statements:

Statement I: Stokes theorem is the analog of the Gauss theorem.

Statement II: Stokes theorem relates a surface integral of a derivative of a function to the line integral of the function, with the path of the integration being the perimeter bounding the surface.

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

A. Both Statement I and Statement II are correct.

B. Both Statement I and Statement II are incorrect.

C. Statement I is correct but Statement II is incorrect.

D. Statement I is incorrect but Statement II is correct.

86. The Fourier transform of the function $f(X) = \begin{cases} 1 & \text{for } |x| < 0 \\ 0 & \text{for } |x| > a \end{cases}$ is

A. $\sqrt{\frac{2}{\pi}}\frac{cosSa}{S}$ B. $\sqrt{\frac{\pi}{2}}\frac{cosSa}{S}$ C. $\sqrt{\frac{\pi}{2}}\frac{sinSa}{S}$ D. $\sqrt{\frac{2}{\pi}}\frac{sinSa}{S}$

87. The value of limit $\lim_{x\to\infty}\left(\frac{1}{n}\right)^{\frac{1}{n}}$ is

A. 0 B. $\frac{1}{e}$ C. e D. 1

88. The $sin\left(\frac{\pi}{4} + i\right)$ is equal to

A. $\frac{\sqrt{2}}{4}\left(e + \frac{1}{e}\right) + \frac{\sqrt{2}}{2}\left(e + \frac{1}{e}\right)i$ B. $\frac{\sqrt{2}}{4}\left(e - \frac{1}{e}\right) + \frac{\sqrt{2}}{2}\left(e - \frac{1}{e}\right)i$ C. $\frac{\sqrt{2}}{4}\left(e - \frac{1}{e}\right) + \frac{\sqrt{2}}{2}\left(e + \frac{1}{e}\right)i$

D. $\frac{\sqrt{2}}{4}\left(e + \frac{1}{e}\right) + \frac{\sqrt{2}}{2}\left(e - \frac{1}{e}\right)i$

89. A particle of mass m experience a force $F(t) = me^{-bt}$. What will be $x(t)$ for this particle? Consider the initial speed and position as zero

A. $\frac{e^{-bt}}{b^2} + \frac{t}{b} + \frac{1}{b^2}$ B. $\frac{e^{-bt}}{b^2} - \frac{t}{b} + \frac{1}{b^2}$ C. $\frac{e^{-bt}}{b^2} - \frac{t}{b} - \frac{1}{b^2}$ D. $\frac{e^{-bt}}{b^2} + \frac{t}{b} - \frac{1}{b^2}$

90. The D' Alembert's principle can be stated in the equation form as (F_i is the applied force)

A. $\sum_i (F_i + \dot{p}_i).\delta r_i = 0$ B. $\sum_i (F_i - \dot{p}_i).\delta r_i = 0$ C. $(F-p)\delta r = 0$ D. $(F+p)\delta r = 0$

91. The value of $\frac{d(\delta(y))}{dy}$ will be equal to

A. $\int_{-\infty}^{\infty} \frac{e^{ixy}}{x} dx$ B. $\frac{i}{\pi}\int_{-\infty}^{\infty} xe^{ixy} dx$ C. $\frac{i}{2\pi}\int_{-\infty}^{\infty} xe^{ixy} dx$ D. $\frac{i}{2\pi}\int_{-\infty}^{\infty} \frac{e^{ixy}}{x} dx$

92. The equation of the straight line passing through the points (-1,3) and (4,-2)

A. y-3=x B. y-3=2 C. y+2x=3 D. 3y+x=7

93. The pole of the straight line $9x+y-28=0$ with respect to the circle $2x^2+2y^2-3x+5y-7=0$ is

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

94. The eccentricity of the equilateral or rectangular hyperbola is

A. $\frac{1}{\sqrt{3}}$ B. $\sqrt{3}$ C. $\frac{1}{\sqrt{2}}$ D. $\sqrt{2}$

95. The inverse of the matrix

$$M = \begin{pmatrix} 0 & 1 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$$

is

A. $M-I$ B. M^2-I C. $I-M^2$ D. $I-M$

96. Given a function f(x,t) of both position x and time t, the value of $\frac{\partial \dot{f}}{\partial \dot{x}}$ where $\dot{f} = \frac{df(x,t)}{dt}, \dot{x} = \frac{dx}{dt}$

A. $\frac{df}{dx}$ B. $\frac{\partial f}{\partial x}$ C. $\frac{\dot{f}}{\dot{x}}$ D. $\frac{\partial^2 f}{\partial x^2}$

97. If A= $\begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}$, B= $\begin{pmatrix} -1 & 1 \\ 2 & -4 \end{pmatrix}$, C= $\begin{pmatrix} 1 & 4 \\ -2 & -1 \end{pmatrix}$ then A(BC) will be

A. $\begin{pmatrix} 2 & 4 \\ -13 & -14 \end{pmatrix}$ B. $\begin{pmatrix} -4 & 2 \\ 6 & -18 \end{pmatrix}$ C. $\begin{pmatrix} 1 & 6 \\ 0 & -1 \end{pmatrix}$ D. $\begin{pmatrix} -16 & -22 \\ 18 & 16 \end{pmatrix}$

98. Find the eigenvalues of the matrix $\begin{pmatrix} 2 & 2 \\ -1 & 5 \end{pmatrix}$

A. (3,4) B. (1,2) C. (2,5) D. (-1,2)

99. The determinant of $\begin{vmatrix} 3 & -2 & 2 \\ 1 & 2 & -3 \\ 4 & 1 & 2 \end{vmatrix}$

A. 35 B. 2 C. 76 D. 33

100. In the following matrices estimate the value of x and y

$$\begin{pmatrix} 2 & -1 \\ -3 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 8 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

A. $x=\frac{11}{3}, y=\frac{7}{15}$ B. $x=\frac{2}{33}, y=\frac{-5}{26}$ C. $x=\frac{-33}{4}, y=\frac{-26}{5}$ D. $x=\frac{-3}{4}, y=\frac{-1}{3}$