



Nitesh Physics



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CUET 2022
PHYSICS

An Institute for IIT-JAM, GATE, JEST, TIFR CUET Entrance in Physics Physical Sciences

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Physical Sciences
New Delhi

GENERAL APTITUDE

1. From Among the four given options, choose the most appropriate sequences of the four phrases below to make a meaningful sentence:

1. A turn to the next page
2. B once you get to the end
3. C to find the correct answers
4. D of the quiz

Choose the correct answer from the options given below:

- A. (A),(C),(B),(D)
 - B. (D),(B),(C),(A)
 - C. (B),(D),(A),(C) ✓
 - D. (C),(A),(D),(B)
2. Choose the correctly spelt word
- A. Egaliterian
 - B. Egalitarian ✓
 - C. Egalitirian
 - D. Egaletarian
3. Choose the correct sentence.
- A. Camera is piece of equipment used to take photographs.
 - B. Camera is a piece of equipment used for taking photographs. ✓
 - C. Camera is a piece of equipment used to taking photographs.
 - D. Camera is the piece of equipment used on taking photographs.
4. Match List I with List II (word to their antonyms)
- | | |
|---------------|--------------|
| 1. lively | a) comfort |
| 2. release | b) discredit |
| 3. bother | c) check |
| 4. appreciate | d) dull |
- A. (1)-(d),(2)-(c),(3)-(a),(4)-(b) ✓
 - B. (1)-(c),(2)-(d),(3)-(a),(4)-(b)

- C. (1)-(b),(2)-(d),(3)-(a),(4)-(c)
D. (1)-(d),(2)-(b),(3)-(a),(4)-(c)
5. From among the four options given choose the word that is opposite in the meaning to “professional”
A. Unemployed B. Student C. Amateur ✓ D. Executive
6. Identify the correct direct narration for the following sentence
Moti asked Gangu whether the latter was in his sense
A. “Hey Gangu, are you in your sense now?”asked Moti.
B. “Gangu, have you lost your senses?”asked Moti.
C. “Gangu, are you in your sense?”asked Moti. ✓
D. “Are you senseless, Gangu?”asked Moti.
7. Which of the following is a one-word substitute for a ‘a government by the wealthy’?
A. oligarchy B. aristocracy C. plutocracy ✓ D. kelpocracy
8. Pick out the synonym of the word ‘Optimist’?
A. destructive B. disappointed C. hopeful ✓ D. funny
9. Fill up the blank with the correct form of verb:
Neither of the two plans _____ approved
A. were B. was ✓ C. were being D. had
10. Identify the passive voice for the following sentence.
Do not insult the poor.
A. The poor are not insulted
B. The poor should not be insulted
C. Let the poor not be insulted ✓
D. Let the poor be not insulted
11. Member of Parliament will lose his membership if he is continuously absent from his sessions for
A. 30 days B. 60 days C. 90 days ✓ D. 120 days
12. When value of money exceeds the commodity value of money, it is called
A. Full bodied money B. Credit money ✓ C. Fiat money D. Fiduciary money

13. Which of the following will become the first multilateral agency to open an office in the Gujarat International Finance Tech City(GIFT)?
A. Asian Development Bank B. Asian Development Bank C. World Bank D. International monetary fund ✓
14. Name the first Indian firm which has entered the so-called global carbon market through the farm sector
A. nurture farm ✓ B. nature farm C. unique farm D. carbon farm
15. A retired judge of a High Court is permitted to practice as a lawyer in
A. Supreme Court of India
B. Any court of India
C. High Courts other than the one from where he retired
D. (1) and (2) only ✓
16. Invariable Concomittance relations are like
1. The relation between Tree and Fruit
2. The relation between Fire and Coolness
3. The relation between Smoke and Fire
4. The relation between Earth and Smell
5. The relation where the absence of one is the negation of other.
A. 1 and 4 only B. 1,2, 3 only C. 3 and 5 only ✓ D. 1,4, 5 only
17. Match List I with List II
- | | |
|----------------|-------------|
| 1. Philosopher | a) Rational |
| 2. Truth | b) Taste |
| 3. Tounge | c) Idea |
| 4. Man | d) Eternal |
- A. (1)-(d),(2)-(a),(3)-(b),(4)-(c)
B. (1)-(b),(2)-(a),(3)-(d),(4)-(c)
C. (1)-(c),(2)-(d),(3)-(b),(4)-(a) ✓
D. (1)-(c),(2)-(b),(3)-(a),(4)-(d)

18. Put all the statements in a specific order. Choose the option which indicates valid arguments containing a logical statement that is, where the third statement is a conclusion from the preceding two statements:

1. All cats are pens
 2. All dogs are pens
 3. All dogs are cats
 4. Some dogs are pens
 5. Some pens are cats
 6. No cat is Hen
- A. (C),(D),(E) ✓
B. (A),(C),(D)
C. (B),(E),(F)
D. (C),(E),(F)

19. Match List I with List II

- | | |
|----------|------------------|
| 1. Bees | a) Consciousness |
| 2. Mind | b) Poison |
| 3. Snake | c) Honey |
| 4. Human | d) Thought |
- A. (1)-(a),(2)-(c),(3)-(b),(4)-(d)
B. (1)-(c),(2)-(d),(3)-(b),(4)-(a) ✓
C. (1)-(d),(2)-(b),(3)-(a),(4)-(c)
D. (1)-(b),(2)-(d),(3)-(c),(4)-(a)

20. Match List I with List II

- | | |
|-----------|-------------|
| 1. Forest | a) Bacteria |
| 2. Milk | b) Taste |
| 3. Water | c) Trees |
| 4. Food | d) Oxygen |
- A. (1)-(c),(2)-(a),(3)-(d),(4)-(b) ✓
B. (1)-(d),(2)-(b),(3)-(c),(4)-(a)

- C. (1)-(a),(2)-(c),(3)-(d),(4)-(b)
D. (1)-(b),(2)-(d),(3)-(c),(4)-(a)
21. The polynomial $p(x) = ax^3 + bx^2 + x - 6$ when divided by $x + 2$ and $x - 2$ leaves the remainder 0 and 4 respectively, then
A. $a = 2, b = 0$ B. $b = \frac{5}{4}, a = \frac{-1}{8}$ C. $b = 2, a = 0$ ✓ D. $a = \frac{5}{4}, b = \frac{-1}{8}$
22. In the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:
Assertion (A): If the areas of two circles are in the ratio 16:25 then their circumference is in the ratio 4:5.
Reason: If the areas of two circles are in the ratios $A_1 : A_2$ then their circumference are in the ratio $\sqrt{A_1} : \sqrt{A_2}$.
A. Both A and R are true and R is the correct explanation of A. ✓
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true.
23. The diameter of a sphere is 6cm. It is melted and drawn into a wire of diameter 4mm. Then the length of wire is
A. 54m B. 26m C. 18m D. 9m ✓
24. If a and b are the roots of quadratic equation $x^2 + ax - b = 0$ and $b \neq 0$
A. $a = -1, b = \frac{1}{2}$ B. $b = -1, a = \frac{1}{2}$ C. $a = -1, b = 2$ ✓ D. $a = 1, b = \frac{1}{2}$
25. A three-digit number is chosen at random, the probability that its hundred's digit, ten's digit and unit's digit are consecutive integers in descending order, is
A. $\frac{1}{45}$ B. $\frac{2}{225}$ ✓ C. $\frac{4}{225}$ D. $\frac{1}{75}$

PHYSICS

- Find $\vec{a} \times (\vec{b} \times \vec{c})$ where
 $\vec{a} = \hat{i} + \hat{j} - \hat{k}, \vec{b} = \hat{i} - \hat{j} + \hat{k}, \vec{c} = \hat{i} - \hat{j} - \hat{k}$
 A. $\hat{i} - \hat{j}$ B. $2\hat{i} - 2\hat{j}$ C. $2\hat{j} - 2\hat{i}$ D. $\hat{j} - \hat{i}$
- Given, $A = x^2 + y^2 + z^2$
 $x = r \sin\theta \cos\phi$
 $y = r \sin\theta \sin\phi$
 $z = r \cos\theta$ then $\frac{\partial A}{\partial r}$ value will be
 A. $2r$ ✓ B. r C. r^2 D. $2r^2$
- Integrating factor of the differential equation $\frac{dy}{dx} + Py = Q$ is given by
 A. $I.F. = e^{\int Q dy}$ ✓ B. $I.F. = e^{\int P dy}$ C. $I.F. = e^{\int P dx}$ D. $I.F. = e^{\int Q dx}$
- Among the following equations, which is a homogeneous equation
 A. $\frac{dy}{dx} = \frac{x^2 + 2y^2}{2x^2 + 3y^3}$
 B. $\frac{dy}{dx} = \frac{2x^3 + y^3}{3x^2 + 2y^2}$
 C. $\frac{dy}{dx} = \frac{x^2 + y^2}{3x^2 + 2y}$ ✓
 D. $\frac{dy}{dx} = \frac{x^2 + 2y^2}{2x^2 + 4y^2}$
- If $x + y + z = a, y + z = ab, z = abc$. The value of $\frac{\partial(x,y,z)}{\partial(a,b,c)}$
 A. $-a^2b$ B. a^2b C. b^2a D. $-b^2a$ ✓
- In questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:
 Assertion: Modulus of the complex number $\frac{1+2i}{1-(1-i)^2}$ is 1.
 Reason: Multiplication of $3+4i$ with $7-3i$ gives result as $33+19i$.
 A. Both A and R are true and R is the correct explanation of A.
 B. Both A and R are true but R is not the correct explanation of A. ✓
 C. A is true but R is false.
 D. A is false but R is true.
- Given below two statements:
 Statement I: The order of a differential equation is the order of the highest coefficient present in

the equation.

Statement II: The degree of a differential equation is the lowest derivative after removing the radical sign and fraction in the equation.

- A. Both statement I and Statement II are correct and Statement II is the correct explanation of Statement I
- B. Both Statement I and Statement II are correct but Statement II is not the correct explanation of Statement I
- C. Statement I is correct but Statement II is incorrect. ✓
- D. Statement II is correct but Statement I is incorrect.
8. A fluid motion is given by $\vec{v} = (t + z)\vec{i} + (x + z)\vec{j} + (x + y)\vec{k}$
- A. Solenoidal B. Rotational C. Both A and B ✓ D. Ir-rotational
9. which of the statements given below are correct?
- If the dot product of two vector is zero, then vectors are perpendicular to each other.
 - Work done is a dot product of force and displacement.
 - Vector product is commutative.
 - Vector Product is associative with respect to a scalar.
 - The scalar product of two non-zero vectors is always positive.

Choose the correct answer from the option given below:

- A. A and C B. B and C C. A, B and D ✓ D. E and C
10. Match List I with List II
- | | |
|--|---|
| 1. Transverse vibration of a string | a) $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$ |
| 2. Two-dimensional heat flow | b) $\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \frac{\partial u}{\partial r} + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0$ |
| 3. One-dimensional heat flow | c) $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ |
| 4. Two-dimensional heat flow in polar form | d) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ |
- A. (1)-(d),(2)-(a),(3)-(b),(4)-(c)
- B. (1)-(b),(2)-(c),(3)-(a),(4)-(d)
- C. (1)-(a),(2)-(d),(3)-(c),(4)-(b) ✓
- D. (1)-(c),(2)-(b),(3)-(d),(4)-(a)

11. Given below two statements:

Statement I: The General displacement of a rigid body with one fixed point is a rotation about the same axis.

Statement II: the most general displacement of a rigid body is a translation plus a rotation.

- A. Both statement I and Statement II are correct and Statement II is the correct explanation of Statement I
- B. Both Statement I and Statement II are correct but Statement II is not the correct explanation of Statement I
- C. Statement I is correct but Statement II is incorrect
- D. Statement II is correct but Statement I is incorrect. ✓

12. The correct relationship between Cartesian coordinate (x, y, z) and the spherical polar coordinate (r, θ, ϕ)

- A. $x = r \sin \theta \sin \phi, y = r \sin \theta \cos \phi, z = r \cos \theta$
 - B. $x = r \sin \theta \cos \phi, y = r \sin \theta \sin \phi, z = r \cos \theta$, ✓
 - C. $x = r \sin \theta, y = r \sin \theta, z = r \cos \phi$,
 - D. $x = r \cos \theta, y = r \sin \theta \cos \phi, z = r \cos \theta \cos \phi$,
13. Consider a planet moving in an elliptical orbit around Sun. Which of the following quantities will remain constant in a planetary motion as seen from the sun?
- A. Speed
 - B. Angular Velocity
 - C. Kinetic Energy
 - D. Areal Velocity ✓

14. Given below two statements:

Statement I: The Product of the area of cross-section and the speed remain the same at all the points of a tube in laminar flow.

Statement II: If the pressure in a liquid is changed at a particular point, the change would be transmitted in the entire liquid, with the diminished magnitude.

- A. Both statement I and Statement II are correct and Statement II is the correct explanation of Statement I
- B. Both Statement I and Statement II are correct but Statement II is not the correct explanation of Statement I
- C. Statement I is correct but Statement II is incorrect. ✓
- D. Statement II is correct but Statement I is incorrect.

15. Which of the following statements given below are correct?
1. The linear momentum of a particle is independent of the frame of reference. kinetic energy of a particle is dependent of the frame of reference.
 2. In an elastic collision, the initial kinetic energy is equal to the final kinetic energy.
 3. In an inelastic collision, the kinetic energy first increases then decreases.
 4. In an elastic collision, the linear momentum is not conserved.
- A. A,B B. B,D,E C. B,C ✓ D. C,D,E
16. A satellite is revolving around the Earth at a height of 3600km. Then, the time of the period of the satellite is
(Assume, Radius of Earth =6400km, mass of Earth = 6×10^{24} kg)
- A. 2.77 hours ✓ B. 1.77 hours C. 1.61 hours D. 16.1 hours
17. A reference frame attached to the Earth is
- A. is an inertial frame by definition.
 - B. is an inertial frame because Newton's law of motion is applicable in this frame.
 - C. cannot be an inertial frame because the Earth is revolving around the Sun. ✓
 - D. cannot be an inertial frame because Newton's law of motion is not applicable in this frame.
18. Match List I with List II
- | | |
|-------------------------------|-----------------------------|
| 1. Bi-quartz Polarimeter | a) Optical Refractive Index |
| 2. Michelson's Interferometer | b) Diffracting Screen |
| 3. Zone Plate | c) Mounting |
| 4. Concave grating | d) optical Rotation |
- A. (1)-(b),(2)-(c),(3)-(d),(4)-(a)
B. (1)-(d),(2)-(a),(3)-(b),(4)-(c) ✓
C. (1)-(c),(2)-(d),(3)-(a),(4)-(b)
D. (1)-(d),(2)-(b),(3)-(a),(4)-(c)
19. Given below two statements:
Statement I: A line spectra contains information about atoms.
Statement II: A band spectra contains information about molecules and atomic clusters.

- 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 II is correct but Statement I is incorrect.
20. Motion of the particle is shown in the figure. At each point does the particle have an unstable equilibrium? (where U is the potential energy)

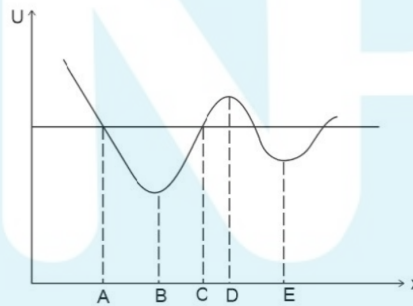


Figure 1: figure for question 45

- A. A B. B C. D ✓ D. E
21. The relation between quality factor Q and relaxation time of an oscillator is (ω being the angular speed)
- A. $Q = \frac{\omega}{t}$ B. $Q = \frac{t}{\omega}$ C. $Q = \omega t$ ✓ D. $Q = \frac{1}{\omega t}$
22. What is the Lissajous figure of the two rectangular S.H.M. of equal frequencies and phase difference of $\frac{\pi}{2}$?
- A. Ellipse ✓ B. Circle C. Straight line D. Parabola
23. When a body is set into oscillation by an external periodic force of the same frequency as the natural frequency of the body, the phenomenon is known as
- A. Stiffening B. Resonance ✓ C. Damping D. Reverberation
24. The equation for a wave travelling in x-direction on a string is

$$y = (3\text{cm})\sin[(3.14\text{cm}^{-1})x - (314\text{s}^{-1})t]$$

- . What is the maximum velocity of the particle of the string?
A. 9.4m/sec ✓ B. 9.2m/sec C. 9.4cm/sec D. 9.0m/sec
25. Which is the correct option?
A. The energy of any small part of a string remains constant in a travelling wave.
B. The energy of any small part of a string remains constant in a standing wave. ✓
C. The energies of any small part of equal length are equal in a travelling wave.
D. The energies of any small part of unequal length are equal in a standing wave.
26. The engine of a moving train sounds a whistle at a frequency ν . Then the frequency heard by the passenger in the train is
A. $>\nu$ B. $<\nu$ C. $=\frac{1}{\nu}$ D. $=\nu$ ✓
27. A plano-convex lens of radius 350 cm is placed on a flat plate and illuminated by monochromatic light giving the 6th bright ring of the diameter 0.68cm. What is the wavelength of the light source used?
A. 5000Å B. 6000Å ✓ C. 5500Å D. 6500Å
28. For a zone plate the focal length of red colour is given by (f_R, f_Y, f_V are respective focal lengths for red, yellow and violet colour)
A. $f_R < f_V$ ✓ B. $f_R = f_V$ C. $f_R > f_V$ D. $f_R = f_Y$
29. The electron microscope offers better resolution capability to be compared to the optical microscope primarily because
A. Electron microscope uses the shorter wavelength of radiation. ✓
B. Electron microscope uses better electronic circuits.
C. Electron microscope uses complicated accessories
D. Electron microscope uses larger objective lenses
30. A tube of sugar solution 20 cm long is placed between crossed Nicol's and illuminated with light of wavelength 6×10^{-5} cm. If the optical rotation produced is 13° and specific rotation is $65^\circ / dm / g / cm^3$, then what will be the strength of the solution used?
A. 100 % B. 10 % ✓ C. 50 % D. 20 %
31. Given below two statements:
Statement I: The magnitude of the emf E introduced in a conducting loop is equal to the rate at

which the magnetic field changes with time.

Statement II: If a conducting plate moves out of a magnetic field, the relative motion of the field and conductor induced a current in the plate.

- 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 II is correct but Statement I is incorrect. ✓
32. Which of the following statements given below are correct?
- A. An electric dipole has its least potential energy when it's moment is lined up with the electric field \vec{E} .
 - B. In a uniform electric field, the net force on an electric dipole is zero.
 - C. The electric dipole's potential energy is defined to be maximum when the electric dipole is parallel to the applied electric field.
 - D. The density of field lines in any region is inversely proportional to the magnitude of the electric field in that region.
- A. B,C
 - B. B,D
 - C. C,D
 - D. A,B ✓
33. In the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:
- Assertion (A): The electric potential inside a conductor is constant.
- Reason: The net charge density inside a conductor is zero.
- A. Both A and R are true and R is the correct explanation of A. ✓
 - B. Both A and R are true but R is not the correct explanation of A.
 - C. A is true but R is false.
 - D. A is false but R is true.

34. Match List I with List II

- | | |
|--------------------|----------------------------------|
| 1. Inductance | a) TmA^{-1} |
| 2. Magnetic field | b) Tm^2A^{-1} |
| 3. Permeability | c) Tm^2A |
| 4. Magnetic energy | d) $\text{NA}^{-1}\text{m}^{-1}$ |

- A. (1)-(b),(2)-(c),(3)-(a),(4)-(d)
 B. (1)-(c),(2)-(d),(3)-(b),(4)-(a)
 C. (1)-(d),(2)-(c),(3)-(a),(4)-(b)
 D. (1)-(b),(2)-(d),(3)-(a),(4)-(c) ✓

35. The concept of displacement current is introduced in which of Maxwell's law of electromagnetics?

- A. First law B. Second law C. Third law D. Fourth law ✓

36. The electric potential at point P is

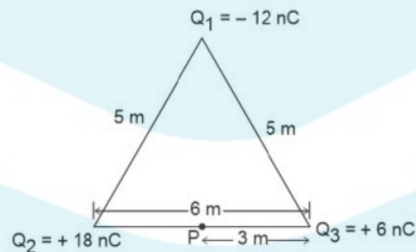


Figure 2: figure for question 61

- A. 98.89V B. 62.93V C. 44.95V ✓ D. 8.99V

37. The magnetic field at a distance R from the centre of a long wire of radius a(a>R)

- A. inversely with R^2 B. inversely with a C. directly with R^2 ✓ D. directly with a

38. ¹ A circular loop of wire, 20mm in radius carries a current of 8A. The value of the energy density at the centre of the loop is

- A. $1.28 \times 10^{-5} \text{ J/m}^3$ B. $1.28\pi \times 10^{-5} \text{ J/m}^3$ C. $1.28 \times 10^{-7} \text{ J/m}^3$ D. $1.28\pi \times 10^{-7} \text{ J/m}^3$

39. A plane wave $\vec{E}_1(x,y) = E_{o1} e^{i(k_1x - \omega t)} \hat{j}$ approaches an interface (yz plane) between two linear media with velocity v_1 . The value of $B_R(x,t)$ in the reflected wave is

¹DROPPED QUESTION

- A. $\frac{E_{01}}{v_1} e^{i(k_1 x - \omega t)} \hat{k}$
- B. $-\frac{E_{01}}{v_1} e^{i(-k_1 x - \omega t)} \hat{k}$ ✓
- C. $-\frac{E_{01}}{v_1} e^{i(k_1 x - \omega t)} \hat{k}$
- D. $\frac{E_{01}}{v_1} e^{i(-k_1 x - \omega t)} \hat{k}$

40. In a circuit shown below, the value of current I through the battery just after the switch is closed is

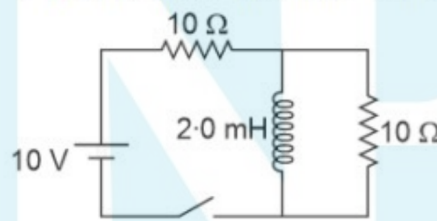


Figure 3: figure for question 65

- A. 0.5A ✓ B. 1.0A C. 2.0A D. 0A
41. The internal energy of boson gas becomes zero at
- A. $T < T_c$ B. $T > T_c$ C. $T = T_c$ D. $T = 0$ ✓
42. A carnot engine is made to work between $-23^\circ C$ and $-223^\circ C$. Its efficiency is
- A. 89 % B. 80 % ✓ C. 10% D. 20 %
43. Mean free path varies
- A. linearly with a number of molecules.
 - B. linearly with the diameter of the molecules.
 - C. inversely with the density of the molecules. ✓
 - D. inversely with the square of the diameter of the molecules.
44. When the temperature of a substance is raised from $T_1 K$ to $T_2 K$, then change in entropy is
- A. $1 - \frac{T_2}{T_1}$
 - B. $m c \log_e \frac{T_2}{T_1}$ ✓
 - C. $m c \log_e \frac{T_1 - T_2}{T_1}$

D. $mc \log_e \frac{T_2}{T_1 - T_2}$

45. The work done in an adiabatic change in a particular gas depends upon only

- A. change in pressure.
- B. change in volume.
- C. change in temperature. ✓
- D. change in heat.

46. A piece of ice of mass 10kg is pushed with a velocity of 10 m/s along a horizontal surface. The piece stops after travelling 30m due to friction between the piece and the surface. If the latent heat of ice is 80cal/g, then the mass of the melted ice is

- A. 1.0g B. 1.5g ✓ C. 2.0g D. 0.0g

47. Match List I with List II

- | | |
|--|------|
| 1. $\left(\frac{\partial U}{\partial S}\right)_V$ | a) P |
| 2. $-\left(\frac{\partial F}{\partial V}\right)_T$ | b) T |
| 3. $\left(\frac{\partial G}{\partial P}\right)_V$ | c) S |
| 4. $\left(\frac{\partial G}{\partial T}\right)_P$ | d) V |

- A. (1)-(a),(2)-(b),(3)-(c),(4)-(d)
- B. (1)-(c),(2)-(d),(3)-(a),(4)-(b)
- C. (1)-(d),(2)-(c),(3)-(b),(4)-(a)
- D. (1)-(b),(2)-(a),(3)-(d),(4)-(c) ✓

48. In the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:

Assertion (A): Every thermodynamics system in an equilibrium state possesses internal energy which is a function of state only.

Reason: In thermodynamic system, energy is conserved.

- A. Both A and R are true and R is the correct explanation of A.
- B. Both A and R are true but R is not the correct explanation of A. ✓
- C. A is true but R is false.
- D. A is false but R is true.

49. Given below two statements:

Statement I: The change in enthalpy during an isobaric process is equal to the heat transfer.

Statement II: The internal energy of a system which is available for work in reversible isothermal change.

- 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 II is correct but Statement I is incorrect.

50. Which of the statements given below are correct?

A: For a closed system undergoing a cycle of processes, the cyclic integral of heat is equal to the cyclic integral of work.

B: The mean free path of the molecule of a gas is independent of the absolute temperature of the gas.

C: The work done by the system is zero in an isochoric process.

D: The internal energy of the system does not change in an adiabatic process.

E: In an adiabatic process, temperature remains constant.

- A. A,C ✓ B. B,C,E C. B,D,E D. A,D

51. In an scattering by an elementary particle experiment, the scattering cross-section depends upon the energy(E) of the incident particle. Planck's constant(h) and velocity of Light(c). On the basis of dimension, scattering cross-section would be proportional to

- A. $\left(\frac{hc}{E}\right)^2$ ✓ B. $\left(\frac{hc}{E^2}\right)^2$ C. $\left(\frac{h}{Ec}\right)^2$ D. $\left(\frac{h^2}{E^2c}\right)$

52. Match List I with List II

- | | |
|-----------------------------------|---|
| 1. Frank-Hertz Experiment | a) Wave nature of particle |
| 2. Zeeman effect | b) Quantization of energy level of electron in atom |
| 3. Davisson and Germer Experiment | c) Existence of spin |
| 4. Stern-Gerlach experiment | d) space experiment of angular momentum |

A. (1)-(d),(2)-(b),(3)-(a),(4)-(c)

B. (1)-(a),(2)-(b),(3)-(c),(4)-(d)

C. (1)-(b),(2)-(d),(3)-(a),(4)-(c) ✓

D. (1)-(b),(2)-(d),(3)-(c),(4)-(a)

53. The expectation value $\langle x \rangle$ of the position of an electron trapped in a box of width L is
A. L B. $\frac{L}{4}$ C. $\frac{L}{2}$ ✓ D. 0
54. In black body radiation in a cavity, photons are created and annihilated as a result of emission and absorption by the walls of the cavity because
(1). Photon has spin one.
(2). Entropy of photon is very high.
(3). Chemical potential of the photon is zero.
(4). Photon obeys Pauli's exclusion principle.
A. 1 B. 2 C. 3 ✓ D. 4
55. The de-Broglie wavelength of an electron in a metal at 27°C is
A. 6.2nm ✓ B. 3.1nm C. 3.1pm D. 6.2pm
56. An electron is known to have a speed of 200m/s to an accuracy of 1%. What is the minimum uncertainty with which its position can be estimated?
A. $14.46\mu\text{m}$ B. $28.93\mu\text{m}$ ✓ C. $0.2846\mu\text{m}$ D. $0.1446\mu\text{m}$
57. The two isotopes of Chlorine $^{35}_{17}\text{Cl}$ and $^{37}_{17}\text{Cl}$ do not have same
A. colour(yellow)
B. suffocating odour
C. efficiency(as poisons and bleaching agents)
D. boiling and freezing points ✓
58. An electron ($m_0 = 0.511\text{MeV}/c^2$) has an estimated momenta of $2.00\text{MeV}/c$, then its total energy will be
A. 2.000 MeV B. 2.064 MeV ✓ C. 0.000 MeV D. 2.511 MeV
59. According to Moseley's law, the frequency of the characteristic X-ray is proportional to the square of
A. Atomic number of the element. ✓
B. Atomic weight of the element.
C. Mass number of the element.
D. density of the element.

60. When an X-ray's photon of wavelength 0.1nm collides with an electron and is scattered through 90° . What is the new wavelength of the X-ray's photon?
A. 0.2048 nm B. 0.1048 nm C. 0.1248 nm D. 0.1024 nm ✓
61. What is the energy of the emitted photo-electron if light of frequency $1 \times 10^{15}\text{ Hz}$ is incident on a sodium target? (Work function of sodium is 2.5eV)
A. $2.01 \times 10^{-20}\text{ J}$
B. $2.01 \times 10^{-19}\text{ J}$
C. $2.63 \times 10^{-20}\text{ J}$
D. $2.63 \times 10^{-19}\text{ J}$ ✓
62. Rutherford scattering formula for scattering of alpha particle by a thin foil depends upon the kinetic energy(E) of the alpha particle as
A. E^2 B. E C. $\frac{1}{E^2}$ ✓ D. $\frac{1}{E}$
63. The radius of the innermost orbit is customarily called the Bohr radius of the hydrogen atom. Its value is
A. 0.5292 pm B. 52.92 pm ✓ C. 5.292 pm D. 529.2 pm
64. In a CE configuration of npn transistor the base curve looks like that of
A. Zener diode B. LED C. Ordinary diode ✓ D. Photodiode
65. In the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:
Assertion (A): Number of atoms present in the unit cell of hcp structure is 6.
Reason: Packing fraction of hcp is 68%.
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false. ✓
D. A is false but R is true.

66. The emitter current for the pnp transistor is

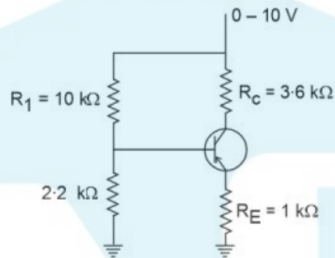


Figure 4: figure for question 66

- A. 10mA B. 1mA C. 1.8mA ✓ D. 11mA
67. Given below two statements:
 Statement I: mobility of electron is negative and hole is positive.
 Statement II: Mobility of electrons and holes are both positive.
- 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 II is correct but Statement I is incorrect. ✓
68. Among following applications, which is the correct applications of the transistors
 A. clamper B. rectifier C. clipper D. switch ✓
69. Closed loop voltage gain of an inverting amplifier is given by
- A. The ratio of input resistance to feedback resistance.
 B. feedback resistance divided by input resistance. ✓
 C. Input resistance multiplied by feedback resistance.
 D. Difference of input Resistance and feedback resistance.
70. When binary 110.001 is converted to a decimal number the answer is
- A. 7.125
 B. 6.125 ✓
 C. 7.75

- D. 6.75
71. Packing fraction of bcc, fcc, sc can be represented as
- A. $fcc > sc > bcc$
 - B. $sc > bcc > fcc$
 - C. $sc < bcc < fcc$ ✓
 - D. $bcc < fcc < sc$
72. In the following transistor circuit, $\beta = 100$ and I_{CO} is negligible. The transistor current are [Given, $V_{BE} = 0.7V$]

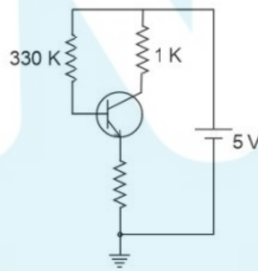


Figure 5: figure for question 72

- A. $I_c = 1mA, I_B = 1mA$
- B. $I_c = 0.01mA, I_B = 1mA$
- C. $I_c = 1mA, I_B = 0.01mA$ ✓
- D. $I_c = 0.1mA, I_B = 0.01mA$

73. ²Three audio signals are given in the summing amplifiers as shown in the figure. What is the ac output voltage among the following options?

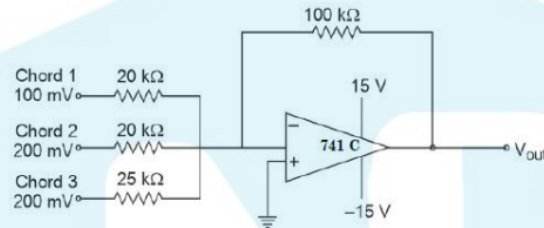


Figure 6: figure for question 98

- A. -2.7V B. -3.1V C. 3.1V D. 2.7V
74. Given are the following equations
 (A) $\overline{A+B} = \overline{A}\overline{B}$
 (B) $A + \overline{A} = A$
 (C) $A + BC = (A + B)C$
 (D) $A + AB = A$
 A. B,D B. A,C C. C,D D. A,D ✓
75. In binary circuits
 (A) $1-1=0$
 (B) $0+1=0$
 (C) $1+1=10$
 (D) $10+1=111$
 A. A,B B. B,C C. A,C ✓ D. C,D

²DROPPED QUESTION