COMMON ENTRANCE TEST - 2012

Question Booklet PHYSICS

Booklet No.

Roll No. | | | | | | |

Series C 116647

(Enter your Roll Number in the above space)

Time Allowed : 1.30 Hours **Max. Marks : 75**

INSTRUCTIONS :

1. Use only BLACK or BLUE Ball Pen.
2. All questions are COMPULSORY.
3. Check the BOOKLET thoroughly.

   IN CASE OF ANY DEFECT - MISPRINTS, MISSING QUESTION/S OR DUPLICATION OF QUESTION/S, GET THE BOOKLET CHANGED WITH THE BOOKLET OF THE SAME SERIES. NO COMPLAINT SHALL BE ENTERTAINED AFTER THE ENTRANCE TEST.
4. Before you mark the answer, fill in the particulars in the ANSWER SHEET carefully and correctly. Incomplete and incorrect particulars may result in the non-evaluation of your answer sheet by the technology.
5. Write the SERIES and BOOKLET NO. given at the TOP RIGHT HAND SIDE of the question booklet in the space provided in the answer sheet by darkening the corresponding circles.
6. Do not use any **eraser, fluid pens, blades** etc., otherwise your answer sheet is likely to be rejected whenever detected.
7. After completing the test, candidates are advised to hand over the OMR ANSWER SHEET to the Invigilator and take the candidate's copy with yourself.

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1. Taking the radius of the earth to be 6400 km, by what percentage will the acceleration due to gravity at a height of 100 km from the surface of the earth differ from that on the surface of the earth?

(1) about 1.5% (2) about 5% (3) about 8 % (4) about 3 %

2. Which of the following is not related to the Bernoulli's principle?

(1) rise of a liquid column inside a capillary
(2) operation of a venturimeter
(3) lift provided to an aero plane by the air
(4) propelling force provided to an aero plane by its propellers

3. The air pressure inside a soap bubble of radius R exceeds the outside air pressure by 10 pa. By how much will the pressure inside a bubble of radius 2R exceed the outside air pressure?

(1) 20 pa (2) 40 pa (3) 2.5 pa (4) 5 pa

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4. A steel wire can support a maximum load of W before reaching its elastic limit. How much load can another wire, made out of identical steel, but with a radius one half the radius of the first wire, support before reaching its elastic limit?
(1) W (2) W/2 (3) W/4 (4) 4W

5. Which of the following laws of thermodynamics forms the basis for the definition of temperature?
(1) first law (2) zeroth law (3) second law (4) third law

6. Which of the following is a true statement?
(1) The total entropy of thermally interacting systems is conserved
(2) Carnot engine has 100% efficiency
(3) Total entropy does not change in a reversible process
(4) Total entropy in an irreversible process can either increase or decrease

7. The molecules in an ideal gas at 27° C have a certain mean velocity. At what approximate temperature, will the mean velocity be doubled?
(1) 54° C (2) 327° C (3) 1200° C (4) 927° C

8. Which of the two, (i) compressing a gas isothermally until its volume is reduced by half (ii) compressing the same gas adiabatically until its volume is reduced by half, will require more work to be done?
(1) (i)
(2) (ii)
(3) both will require the same amount of work
(4) it will depend upon the nature of the gas

9. Which of the following statements is true for the three types of magnetism – para, dia and ferro?
(1) para magnetism is associated with negative susceptibility and dia and ferromagnetism with positive susceptibility
(2) diamagnetism is generally weakest of the three, and is associated with negative susceptibility
(3) ferromagnetism is the strongest of the three and is associated with negative susceptibility
(4) all three are associated with positive susceptibility, dia magnetism is the weakest form of magnetism, and ferro magnetism is the strongest form

10. Three coplanar, parallel, long straight wires are equally spaced, that is, the distance between each pair of successive wires is the same. The first and the third wire carry currents of 1 A each, in the same direction. What must be the current in the second wire (wire in the middle), so that the other two wires do not feel any net force?
(1) 0.25 A in opposite direction to those in the first and the third
(2) 0.5 A in the same direction as those in the first and the third
(3) 0.5 A in the opposite direction to those in the first and the third
(4) 0.25 A in the same direction as those in the first and the third

11. A conducting rod of length L is moving in a uniform magnetic field (B) with a velocity v without rotation. The velocity of the rod is perpendicular to the rod, and the motion of the rod is confined to a plane perpendicular to the magnetic field. What is the induced emf developed across the rod?
(1) BLv (2) Bv^2L (3) BL/v (4) BL^2v

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12. What is the resonance frequency of a driven LCR oscillator?
(1) $1/LC$ (2) $1/2\pi LC$ (3) $(LC)^{-1/2}$ (4) $(2\pi LC)^{-1/2}$

13. A bar magnet is placed upright on a floor (so that the axis of the magnet is vertical). A copper ring is held above the magnet, with its plane horizontal, and released. The copper ring falls in such a manner that its axis always coincides with that of the magnet. What will be the acceleration with which the ring will fall? Acceleration due to gravity is 10 m/s^2 :
(1) 10 m/s^2
(2) less than 10 m/s^2
(3) more than 10 m/s^2
(4) the answer will depend upon which pole of the magnet is up

14. A short solenoid of radius a, number of turns per unit length n_1, and length L is kept coaxially inside a very long solenoid of radius b, number of turns per unit length n_2. What is the mutual inductance of the system?
(1) $\mu_0\pi b^2 n_1 n_2 L$ (2) $\mu_0\pi a^2 n_1 n_2 L^2$ (3) $\mu_0\pi a^2 n_1 n_2 L$ (4) $\mu_0\pi b^2 n_1 n_2 L^2$

15. Which of the following is a semiconductor?
(1) Fe_2O_3 (2) SiO_2 (3) GaAs (4) CuO

16. What is the order of the reverse saturation current before breakdown in a Zener diode?
(1) ampere (2) milli-ampere
(3) it depends on the applied voltage (4) micro-ampere

17. Which logic gate does the following truth table represent?

Input A	Input B	Output Q
0	0	1
0	1	1
1	0	1
1	1	0

(1) NAND (2) AND (3) OR (4) NOR

18. What is the equivalent expression of the decimal number 212 in binary number system?
(1) 11000100 (2) 10010100 (3) 11010100 (4) 11010110

19. Why do we need carrier wave of high frequency to transmit audio signal over long distances?
(1) High frequency carrier wave can propagate with a faster speed
(2) High frequency carrier waves offer availability of higher transmission bandwidth
(3) High frequency carrier waves offer availability of lower transmission bandwidth
(4) High frequency carrier waves is easy to produce

20. What does the Poynting vector represent?
(1) power flowing across unit area in an electromagnetic field
(2) charge flowing across unit area per unit time in an electromagnetic field
(3) momentum flowing across unit area per unit time in an electromagnetic field
(4) angular momentum flowing across unit area per unit time in an electromagnetic field

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21. In television transmission what type of modulation is used?
(1) Only amplitude modulation
(2) Only frequency modulation
(3) Both amplitude and frequency modulation
(4) TV signal does not need any kind of modulation

22. Which of the following is true for any collision?
(1) both linear momentum and kinetic energy are conserved
(2) neither linear momentum nor kinetic energy may be conserved
(3) linear momentum is always conserved, however, kinetic energy may or may not be conserved
(4) kinetic energy is always conserved, but linear momentum may or may not be conserved

23. A uniform rod of length L and mass M is held vertical, with its bottom end pivoted to the floor. The rod falls under gravity, freely turning about the pivot. If acceleration due to gravity is g, what is the instantaneous angular speed of the rod when it makes an angle 60° with the vertical?

(1) $\left(\frac{g}{L}\right)^{1/2}$ (2) $\left(\frac{3g}{4L}\right)^{1/2}$ (3) $\left(\frac{3\sqrt{3}\,g}{2L}\right)^{1/2}$ (4) $\left(\frac{3g}{2L}\right)^{1/2}$

24. A cheetah, weighing 150 kg, chases a deer, weighing 30 kg, in a straight path. The speed of the cheetah is 20 m/s and that of the deer is 25 m/s. The approximate speed of the centre of mass of the pair is :
(1) 21 m/s (2) 24 m/s (3) 26 m/s (4) zero

25. A tennis racket can be idealized as a uniform ring of mass M and radius R, attached to a uniform rod also of mass M and length L. The rod and the ring are coplanar, and the line of the rod passes through the centre of the ring. The moment of inertia of the object (racket) about an axis through the centre of the ring and perpendicular to its plane is :

(1) $\frac{1}{12}M\left(6R^2+L^2\right)$ (2) $\frac{1}{12}M\left(18R^2+L^2\right)$

(3) $\frac{1}{3}M\left(6R^2+L^2+3LR\right)$ (4) None of these

26. How long will a satellite, placed in a circular orbit of radius that is $1/4^{th}$ the radius of a geostationary satellite, take to complete one revolution around the earth?
(1) 12 hours (2) 6 hours (3) 3 hours (4) 4 days

27. A rocket is fired from inside a deep mine, so as to escape the earth's gravitational field. The minimum velocity to be imparted to the rocket is :
(1) exactly the same as the escape velocity of fire from the earth's surface
(2) a little more than the escape velocity of fire from the earth's surface
(3) a little less than the escape velocity of fire from the earth's surface
(4) infinity

28. Which of the following is the correct Kirchhoff's Loop rule?
(1) The algebraic sum of the currents meeting at a junction is zero
(2) The algebraic sum of potential drops across all resistors in a circuit is zero
(3) The algebraic sum of the currents across all the resistors in a circuit is zero

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(4) The algebraic sum of potential drops across all resistors plus those across sources in a circuit is zero

29. What are the dimensions of electrical conductivity? (I is current).

(1) $ML^{-3}T^{3}I^{2}$ (2) $M^{-1}L^{3}T^{3}I^{2}$ (3) $M^{-1}L^{-3}T^{3}I^{2}$ (4) $M^{-1}L^{-3}T^{3}I$

30. A coil has resistance 25.00 Ohm and 25.17 Ohm at 20° C and 35° C respectively. What is the temperature coefficient of resistance?

(1) 4.545×10^{-4} / °C (2) 4.545×10^{-3} / °C

(3) 4.545×10^{-2} / °C (4) 4.545×10^{-5} / °C

31. An electron and a proton, both having the same kinetic energy, enter a region of uniform magnetic field, in a plane perpendicular to the field. If their masses are denoted by m_e and m_p respectively, then the ratio of the radii (electron to proton) of their circular orbits is :

(1) $\sqrt{m_p/m_e}$ (2) $\sqrt{m_e/m_p}$ (3) m_e/m_p (4) 1

32. In using Ampere's law to find the magnetic field of a straight, long solenoid, the loop (Amperian loop) that is taken is :

(1) a circular loop, coaxial with the solenoid

(2) a rectangular loop in a plane perpendicular to the axis of the solenoid

(3) a rectangular loop in a plane containing the axis of the solenoid, the loop being totally within the solenoid

(4) a rectangular loop in a plane containing the axis of the solenoid, the loop being partly inside the solenoid, and partly outside it

33. A rectangular coil, of sides 2 cm and 3 cm respectively, has 10 turns in it. It carries a current of 1 A, and is placed in a uniform magnetic field of 0.2 T in such a manner that its plane makes an angle 60° with the field direction. The torque on the loop is :

(1) 6.0×10^{-4} N-m (2) 6.0×10^{-5} N-m

(3) 1.2×10^{-3} N-m (4) 6.0 N-m

34. Which of the following facts about the photoelectric effect can be understood without invoking the quantum concept of light propagation?

(1) the rate of photoelectrons emission, when they are emitted, increases with the intensity of light used

(2) there is a threshold frequency, below which no photoelectrons are emitted, no matter how long the light is thrown on the metallic surface

(3) once the frequency of light is more than the threshold frequency, photoelectrons are emitted almost instantaneously, no matter how weak the light intensity is

(4) for each frequency of light, exceeding the threshold frequency, there is a maximum kinetic energy of the emitted electrons

35. Consider the four gases-hydrogen, oxygen, nitrogen and helium – at the same temperature. Arrange them in the increasing order of the de Broglie wavelengths of their molecules :

(1) hydrogen, helium, nitrogen, oxygen

(2) oxygen, nitrogen, hydrogen, helium

(3) oxygen, nitrogen, helium, hydrogen

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(4) nitrogen, oxygen, helium, hydrogen

36. The half-life of ^{60}Co is approximately 5.25 years. In a sample containing 1 gm of freshly prepared ^{60}Co, how much of the isotope will be left after 21 years?

(1) 125 mg (2) 62.5 mg
(3) nothing will be left (4) 31.25 mg

37. Which of the following is true of the Balmer series of the hydrogen spectrum?

(1) the entire series falls in the ultraviolet region
(2) the entire series falls in the infrared region
(3) the series is partly in the visible region and partly in the ultraviolet region
(4) the series is partly in the visible region and partly in the infrared region

38. In a nuclear fusion reaction, two nuclei, A & B, fuse to produce a nucleus C, releasing an amount of energy ΔE in the process. If the mass defects of the three nuclei are ΔM_A, ΔM_B & ΔM_C respectively, then which of the following relations holds? Here, c is the speed of light :

(1) $\Delta M_A + \Delta M_B = \Delta M_C - \Delta E/c^2$ (2) $\Delta M_A + \Delta M_B = \Delta M_C + \Delta E/c^2$
(3) $\Delta M_A - \Delta M_B = \Delta M_C - \Delta E/c^2$ (4) $\Delta M_A - \Delta M_B = \Delta M_C + \Delta E/c^2$

39. Which of the following postulates of the Bohr model led to the quantization of energy of the hydrogen atom?

(1) the electron goes around the nucleus in circular orbits
(2) the angular momentum of the electron can only be an integral multiple of $h/2\pi$
(3) the magnitude of the linear momentum of the electron is quantized
(4) quantization of energy is itself a postulate of the Bohr model

40. A certain vector in the xy plane has an x – component of 12 m and a y – component of 8 m. It is then rotated in the xy plane so that its x – component is halved. Then its new y – component is approximately :

(1) 14 m (2) 13.11 m (3) 10 m (4) 2.0 m

41. A block is placed on a plane inclined at 12° to the horizontal. What is the maximum value of coefficient of static friction for which the block slides down the plane?

(1) $\tan 12°$ (2) $\cos 12°$ (3) $\sin 12°$ (4) None of these

42. A brick of mass m, tied to a rope, is being whirled in a vertical circle, with a uniform speed. The tension in the rope is :

(1) the same throughout
(2) largest when the brick is at the highest point of the circular path and smallest when it is at the lowest point
(3) largest when the rope is horizontal and smallest when it is vertical
(4) largest when the brick is at the lowest point and smallest when it is at the highest point

43. Two blocks, of mass 1 kg and 2 kg respectively, are connected by a spring and kept on a frictionless table. The blocks are pulled apart, so that the spring is stretched, and released from rest. At a certain instant of time, the block of mass 1 kg, is found to be moving at a speed 2 m/s. What must be the speed of the other block at this instant?

(1) 1 m/s (2) 0.5 m/s (3) 4 m/s (4) 0.25 m/s

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44. A coin of mass 10 g rolls along a horizontal table with a velocity of 6 cm/s. Its total kinetic energy is :

(1) $9\ \mu J$ (2) $18\ \mu J$ (3) $27\ \mu J$ (4) $36\ \mu J$

45. A simple harmonic oscillator oscillates with an amplitude A. At what point of its motion, is the power delivered to it by the restoring force maximum?

(1) when it is at a displacement $\pm A/\sqrt{2}$ from the equilibrium point and moving towards the equilibrium point

(2) when it is at the maximum displacement

(3) when it passes through the equilibrium point, either way

(4) when it is at a displacement $\pm A/\sqrt{2}$ from the equilibrium point and moving away from the equilibrium point

46. There is a point charge q located at the centre of a cube. What is the electric flux of this point charge, through a face of the cube?

(1) $\frac{q}{\varepsilon_0}$ (2) $\frac{q}{6\varepsilon_0}$

(3) $\frac{q}{3\varepsilon_0}$ (4) it will depend upon the size of the cube

47. A point dipole is located at the origin in some orientation. The electric field at the point (10 cm, 10 cm) on the x-y plane is measured to have a magnitude $1.0 \times 10^{-3}\ V/m$. What will be the magnitude of the electric field at the point (20 cm, 20 cm)?

(1) $5.0 \times 10^{-4}\ V/m$

(2) $2.5 \times 10^{-4}\ V/m$

(3) it will depend on the orientation of the dipole

(4) $1.25 \times 10^{-4}\ V/m$

48. Which of the following statements is false for a perfect conductor?

(1) the surface of the conductor is an equipotential surface

(2) the electric field just outside the surface of a conductor is perpendicular to the surface

(3) the charge carried by a conductor is always uniformly distributed over the surface of the conductor

(4) none of these

49. A parallel plate capacitor without any dielectric within its plates, has a capacitance C, and is connected to a battery of emf V. The battery is disconnected and the plates of the capacitor are pulled apart until the separation between the plates is doubled. What is the work done by the agent pulling the plates apart, in this process?

(1) $\frac{1}{2}CV^2$ (2) $\frac{3}{2}CV^2$ (3) $-\frac{3}{2}CV^2$ (4) CV^2

50. Consider a copper wire of length L, cross-sectional area A. It has 'n' number of free electrons per unit volume. Which of the following is the correct expression of drift velocity of the electrons when the wire carries a steady current I?

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(1) I/neL (2) I/n^2eL (3) I/neA (4) I/ne^2LA

51. A resistor has the following colour code, sequentially from the left :
Black Brown Orange Red and Black.
What is the resistance of the resistor?
(1) 13 Ohm (2) 1300 Ohm (3) 130 Ohm (4) 13000 Ohm

52. Which of the following is false for interference of light?
(1) coherence of the sources is an essential condition for interference
(2) the minima of the interference pattern need not be of zero intensity
(3) interference simply redistributes light energy, without destroying any of it
(4) the minima of the interference pattern must always be of zero intensity

53. Totally unpolarized light of intensity I_0 is incident normally on a polarizer, and the emerging light is made to pass through a second, parallel polarizer with its axis making an angle of 60° with that of the first. What is the intensity of light emerging out of the second polarizer?
(1) Zero (2) $I_0/8$ (3) $I_0/4$ (4) $I_0/16$

54. A concave mirror has a focal length of 5 cm. When an object is placed at a distance of 15 cm from the mirror, where is the image formed?
(1) 10 cm in front of the mirror (2) 7.5 cm behind the mirror
(3) 2.5 cm in front of the mirror (4) 7.5 cm in front of the mirror

55. The power of a convex lens is 2 diopters. Its power is to be reduced to 1.5 diopters, by putting another lens in combination with it. Which of the following lenses will serve the purpose?
(1) a concave lens of focal length 2 m
(2) a concave lens of focal lens 4 m
(3) a convex lens of focal lens 2 m
(4) a concave lens of focal length 1 m

56. Spherical wave fronts, emanating from a point source, strike a plane reflecting surface. What will happen to these wave fronts, immediately after reflection?
(1) they will remain spherical with the same curvature, both in magnitude and sign
(2) they will become plane wave fronts
(3) they will remain spherical, with the same curvature, but sign of curvature reversed
(4) they will remain spherical, but with different curvature, both in magnitude and sign

57. Which of the following is true for the minimum angular separation of two stars, $\Delta\theta_{min}$, that can be resolved by a telescope? In the following, aperture is the diameter of the objective :
(1) it decreases with the increase in aperture of the telescope
(2) it is independent of the aperture of the telescope
(3) it increases linearly with the aperture of the telescope
(4) it increases quadratically with the aperture of the telescope

58. The flux density of mass is defined as the amount of mass crossing unit area per unit time. The dimension of this quantity is :
(1) $ML^{-2}T^{-1}$ (2) ML^2T^{-1} (3) MLT^{-1} (4) $M^{-1}L^{-2}T$

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(1) MLT^{-1} (2) $ML^{-1}T$ (3) MLT (4) $M^{-1}L^{-1}T$

59. A physical quantity z, depends upon two other physical quantities x and y, as follows. $z = ax^2y^{1/2}$ where, a is a constant.

In an experiment, the quantity x is determined by measuring z and y, and using the above expression. If the percentage of error in the measurement of z and y are 10% and 12% respectively, then the percentage of error in the determined value of x is :

(1) 2%

(2) 8%

(3) 15%

(4) without the value of the constant a, the percentage of error cannot be calculated

60. If a particle moves with an acceleration, then which of the following can remain constant? :

(1) both speed and velocity (2) neither speed nor velocity

(3) only the velocity (4) only the speed

61. A rubber ball is bounced on the floor of a room which has its ceiling at a height of 3.2 m from the floor. The ball hits the floor with a speed of 10 m/s, and rebounds vertically up. If all collisions simply reverse the velocity of the ball, without changing its speed, then how long does it take the ball for a round trip, from the moment it bounces from the floor to the moment it returns back to it? Acceleration due to gravity is 10 m/s² :

(1) 4 s (2) 2 s (3) 0.8 s (4) 1.2 s

62. Two vectors $\vec{a}$ & $\vec{b}$, add up to a vector $\vec{c}$. When vector $\vec{a}$ is made 3 times as long and vector $\vec{b}$ is doubled in length, without changing their directions, then it is found that vector $\vec{c}$ is also doubled in length, without change in direction. Then which of the following is true?

(1) all three vectors must be parallel

(2) $\vec{b}$ & $\vec{c}$ must be parallel to each other, but $\vec{a}$ need not be parallel to $\vec{b}$ & $\vec{c}$

(3) $\vec{a}$ & $\vec{b}$ must be perpendicular to each other

(4) it is impossible for three non-zero vectors $\vec{a}, \vec{b}$ & $\vec{c}$ to have the property stated above

63. Which of the following is not an assumption of the kinetic theory of gases?

(1) the molecules travel in straight paths until they undergo collision with other molecules

(2) molecules of the gas are small hard spheres, occupying negligible volume compared with the total volume of the gas

(3) the molecules do not undergo any collisions at all

(4) the molecules undergo elastic collisions only

64. The equation describing the motion of a simple harmonic oscillator along the x axis is given as : $x = A\cos(\omega t + \phi)$. If at time $t = 0$, the oscillator is at $x = 0$ and moving in the negative x direction, then the phase angle ϕ is :

(1) $\pi/2$ (2) $-\pi/2$ (3) π (4) 0

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65. At a displacement from the equilibrium position, that is one-half the amplitude of oscillation, what fraction of the total energy of the oscillator is kinetic energy?

(1) 1/2 (2) 1/4 (3) $1/\sqrt{2}$ (4) 3/4

66. Which of the following does not change as a wave moves from one medium to another?

(1) wavelength (2) wave velocity (3) frequency (4) none of these

67. An organ pipe is closed at one end and open at the other. What is the ratio of frequencies of the 3rd and 4th fundamental modes of vibration?

(1) 3/4 (2) 5/7 (3) 3/5 (4) 9/11

68. The Doppler shift in the frequency received by a stationary receiver when the source is moving towards it, was measured to be $\Delta\nu_{air}$ when both receiver and source are in air, and it was measured to be $\Delta\nu_{water}$ when both are under water. Then :

(1) $\Delta\nu_{air} > \Delta\nu_{water}$ (2) $\Delta\nu_{air} < \Delta\nu_{water}$

(3) $\Delta\nu_{air} = \Delta\nu_{water}$ (4) $\Delta\nu_{water} = 0$, $\Delta\nu_{air} > 0$

69. Which of the following is false for electric lines of force?

(1) they always start from positive charges and terminate on negative charges
(2) they are always perpendicular to the surface of a charged conductor
(3) they always form closed loops
(4) they are parallel and equally spaced in a region of uniform electric field

70. A uniform magnetic field B points vertically up and is slowly changed in magnitude, but not in direction. The rate of change of the magnetic field is α. A conducting ring of radius r and resistance R is held perpendicular to the magnetic field, and is totally inside it. The induced current in the ring is

(1) zero (2) $2\pi rB/R$ (3) $r\alpha/R$ (4) $\pi r^2\alpha/R$

71. A plane electromagnetic wave is propagating along the z direction. If the electric field component of this wave is in the direction $(\hat{i} + \hat{j})$, then which of the following is the direction of the magnetic field component?

(1) $(-\hat{i} + \hat{j})$ (2) $(\hat{i} - \hat{j})$ (3) $(-\hat{i} - \hat{j})$ (4) $(\hat{i} + \hat{k})$

72. Which of the following is the correct arrangement of the electromagnetic spectrum in the increasing order of frequency?

(1) Microwaves, infrared, radio waves, visible light, X-rays
(2) Radio waves, microwaves, infrared, visible light, X-rays
(3) X-rays, visible light, infrared, microwaves, radio waves
(4) Microwaves, radio waves, infrared, visible light, X-rays

73. Which of the following optical phenomena is involved in the propagation of light in an optical fibre?

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(1) refraction (2) dispersion
(3) interference (4) total internal reflection

74. In a Young's double-slit experimental arrangement, the light used has wavelength 5000 A^0, the slit separation is 2 mm and slits to screen distance is 1 m. What is the width of the fringes produced on the screen?
(1) 0.25 mm (2) 0.1 mm (3) 0.5 mm (4) 0.025 mm

75. In a single-slit diffraction experiment, the width of the slit is reduced by half. Which of the following needs to be done if the width of the central maxima has to remain the same?
(1) reduce the distance between the slit and screen by half
(2) reduce the distance between the slit and the screen to $1/4^{th}$ the original separation
(3) double the distance between the slit and the screen
(4) no need to do anything, as the width of the central maxima does not depend on the slit width

JKCET 2012 Chemistry Question Paper

JKCET 2012 Chemistry Question Paper is given below.

NOTE : DO NOT BREAK THE SEAL UNTIL YOU GO THROUGH THE FOLLOWING INSTRUCTIONS

COMMON ENTRANCE TEST - 2012

Question Booklet CHEMISTRY

Booklet No.

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Series A 216645

(Enter your Roll Number in the above space)

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7. After completing the test, candidates are advised to hand over the OMR ANSWER SHEET to the Invigilator and take the candidate's copy with yourself.

1. Avogadro No. $\left(6.023 \times 10^{+23}\right)$ of Carbon atoms are present in :

(1) 12 grams of $^{12}CO_2$
(2) 22.4 lit $^{12}CO_2$ in room temperature
(3) 44 grams of $^{12}CO_2$
(4) 12 moles of $^{12}CO_2$

2. The volume of 0.1 M $Ca(OH)_2$ required to neutralize 10 ml of 0.1 N HCl :

(1) 10 ml (2) 20 ml (3) 5 ml (4) 15 ml

3. Which of the following statement is correct?

(1) The equivalent mass of $KMnO_4$ in alkaline medium is molar mass divided by five.
(2) The equivalent mass of $KMnO_4$ in strongly alkaline medium is molar mass divided by three.
(3) The equivalent mass of $KMnO_4$ in neutral medium is molar mass divided by three.
(4) The equivalent mass of $KMnO_4$ in weakly acidic medium is molar mass divided by three.

4. Isotones have :

(1) Same neutron number but different proton number
(2) Same proton number but different neutron number
(3) Same proton and neutron number
(4) Same proton but different electron number

5. Maximum number of electrons in a shell with principle quantum number 'n' is given by :

(1) n (2) 2n (3) n^2 (4) $2n^2$

6. Bohr model of Hydrogen atom was unable to explain :

(1) Rydberg's formula of atomic spectra
(2) Heisenberg's uncertainty principle
(3) Planck's law of energy quantization
(4) Rutherford's model of atomic structure

7. The de Broglie wave length of a particle is :

(1) Proportional to its mass
(2) Proportional to its velocity

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(3) Inversely proportional to its momentum
(4) Proportional to its total energy

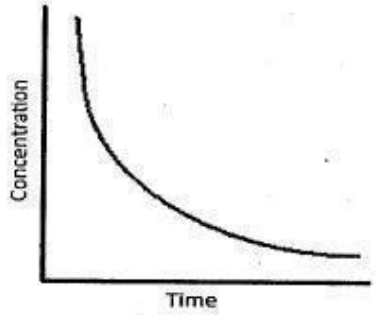
8. At room temperature, for the reaction $NH_4SH\ (s) \leftrightarrow NH_3(g) + H_2S\ (g)$:
(1) $K_p = K_c$ (2) $K_p > K_c$
(3) $K_p < K_c$ (4) K_p and K_c do not relate

9. According to Le-Chatelier's principle, the equilibrium constant of a reversible reaction will NOT shift by :
(1) Increasing the temperature of an exothermic reaction
(2) Increasing the temperature of an endothermic reaction
(3) Changing the concentrations of the reactants
(4) The effect of a catalyst

10. pH of 0.0002 M formic acid [$K_a = 2 \times 10^{-4}$] approximately is :
(1) 1.35 (2) 0.5 (3) 3.7 (4) 1.85

11. The buffer present in blood plasma is :
(1) borax, sodium hydroxide
(2) carbonic acid, bicarbonate ion
(3) acetic acid, sodium acetate
(4) citric acid, potassium dihydrogen phosphate

12. Certain reactions follow the relation between concentrations of the reactant vs. time as :



What is the expected order for such reactions?
(1) 0 (2) 1 (3) 2 (4) Infinity

13. A first order reaction has a rate constant $k = 3.01 \times 10^{-3}$ /s . How long it will take to decompose half of the reaction?
(1) 2.303 s (2) 23.03 s (3) 230.3 s (4) 2303. s

14. The rate of reactions exhibiting negative activation energy :
(1) decreases with increasing temperature
(2) increases with increasing temperature
(3) does not depend of temperature
(4) depends on the height of the potential barrier

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15. Normal human blood sugar range is 65 – 105 mg/dL. Considering density of human blood 1.06 kg/lit, if a patient sugar level reads 720 ppm, his/her blood sugar at that time is :

(1) normal (2) high (3) low (4) cannot say

16. Addition of a non-volatile solute in an volatile ideal solvent :

(1) increases the vapour pressure of the solvent

(2) decreases the vapour pressure of the solvent

(3) decreases the boiling point of the solvent

(4) increases the freezing point of the solvent

17. The dissolution of a gas in a liquid is governed by :

(1) Raoult's law (2) Henry's law

(3) Dalton's law of partial pressure (4) Van't Hoff factor

18. Desalination of sea water can be done by :

(1) osmosis (2) reverse osmosis

(3) filtration (4) diffusion

19. Entropy of a perfectly crystalline solid at 0°K is :

(1) positive (2) negative

(3) zero (4) either positive or negative

20. Enthalpy of combustion of carbon to CO_2 is –393.52 kJ/mol. The heat released upon formation of 11 g of CO_2 from carbon and dioxygen is :

(1) 35.77 kJ (2) 98.38 kJ (3) 1574.08 kJ (4) 393.52 kJ

21. Entropy change in a process where 1 Lit. of liq. He is poured into ice cold water is :

(1) Finite and positive (2) Finite and negative

(3) Zero (4) Infinity

22. For an ideal system at thermal equilibrium, the velocity distribution of the constituting particles will be governed by :

(1) Gaussian distribution

(2) Maxwell-Boltzmann distribution

(3) Lorentzian distribution

(4) Log-normal distribution

23. During spontaneous discharge of an electrochemical cell Gibb's f...

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23. During spontaneous discharge of an electrochemical cell Gibb's free energy will :

(1) increase (2) decrease (3) not change (4) be infinity

24. Standard electrode potential of half cell reactions are given below :

$Cu^{2+} + 2e^- \rightarrow Cu$; $E^0 = 0.34$ V

$Zn^{2+} + 2e^- \rightarrow Zn$; $E^0 = -0.76$ V

What is the EMF of the cell?

(1) +1.10 V (2) –1.10 V (3) –0.42 V (4) +0.42 V

25. Anode reaction of a fuel cell is :

(1) $Zn(Hg) + 2OH^- \rightarrow ZnO\,(s) + H_2O + 2e^-$

(2) $Pb(s) + SO_4^{2-}\,(aq) \rightarrow PbSO_4\,(s) + 2e^-$

(3) $2H_2\,(g) + 4OH^-\,(aq) \rightarrow 4H_2O\,(l) + 4e^-$

(4) $2Fe\,(s) \rightarrow 2Fe^{2+} + 4e^-$

26. Molar conductivity decreases with decrease in concentration :

(1) for strong electrolytes

(2) for weak electrolytes

(3) both for strong and weak electrolytes

(4) for non electrolytes

27. Dimension of universal gas constant (R) is :

(1) $[VPT^{-1}n^{-1}]$ (2) $[VP^{-1}Tn^{-1}]$ (3) $[VPTn^{-1}]$ (4) $[VPT^{-1}n]$

28. Total no. of metal atoms per unit cell in a face-centered cubic lattice is :

(1) 14 (2) 8 (3) 6 (4) 4

29. Conduction in a p-type semiconductor is increased by :

(1) increasing the band gap

(2) decreasing the temperature

(3) adding appropriate electron deficit impurities

(4) adding appropriate electron rich impurities

30. Chromatographic analysis is done based on the property of :

(1) Diffusion (2) Absorption

(3) Adsorption (4) Condensation

31. Glucose can be converted into ethyl alcohol using :

(1) Invertase (2) Zymase

(3) Maltase (4) Diastase

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32. Bakelite is formed by polymerization between :

(1) Acrylonitrile molecules

(2) Tetrafluoroethene molecules

(3) Urea and formaldehyde molecules

(4) Phenol and formaldehyde molecules

33. The correct order of electron gain enthalpy (Δ_{eg} H) of the halogen atoms is :

(1) F < Cl < Br < I

(2) Cl < F < Br < I

(3) I < Br < Cl < F

(4) Cl < Br < I < F

42. A compound with nitro group was reduced by Sn/HCl, followed by treatment with $NaNO_2$/HCl and followed by phenol. The chromophore group in the final compound is :

(1) NO_2 group

(2) NH_2 group

(3) Azo group

(4) OH group

43. The correct order for leaving group ability in a nucleophilic substitution reaction is :

(1) $Br^- > Cl^- > CH_3CO_2^- > HO^- > H^-$

(2) $H^- > OH^- > CH_3CO_2^- > Cl^- > Br^-$

(3) $Br^- > CH_3CO_2^- > Cl^- > OH^- > H^-$

(4) $CH_3CO_2^- > Br^- > Cl^- > OH^- > H^-$

44. Among the choices of alkyl bromide, the least reactive bromide in a SN_2 reaction is:

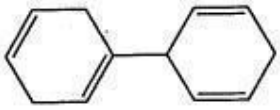
(1) 1-bromopentane

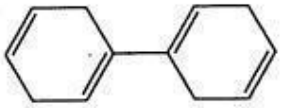
(2) 2-bromo-2-methylbutane

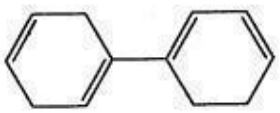
(3) 1-bromo-3-methylbutane

(4) 1-bromo-2-methylbutane

45. Which is the most stable compound among the following?

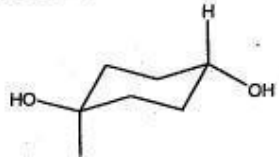
(1) 

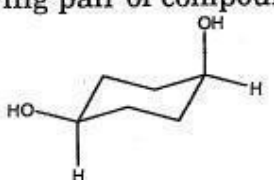
(2) 

(3) 

(4) All the compounds have same stability

46. The correct relation between the following pair of compounds is :





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(1) Constitutional isomers (2) Enantiomers

(3) Diastereomers (4) None of these

47. For a electrophilic aromatic substitution reaction :

(1) Chlorine is o-p directing group and also electron releasing group

(2) Chlorine is o-p directing group and also electron withdrawing group

(3) Chlorine is meta directing group and also electron releasing group

(4) Chlorine is meta directing group and also electron withdrawing group

48. A nucleophilic substitution reaction proceeds through SN_1 mechanism. So, the reaction is :

(1) Unimolecular

(2) Bimolecular

(3) Termolecular

(4) Rate depends on concentration of incoming nucleophile

49. 2-bromobutane reacts with OH^- in H_2O to give 2-butanol. The reaction involves :

(1) Retention in configuration (2) Inversion in Configuration

(3) Racemization (4) Mutarotation

50. Among the following, which is the least stable conformation of cyclohexane?

(1) Boat conformation (2) Half chair conformation

(3) Twist boat conformation (4) Chair conformation

51. A ketone gives a yellow precipitate when treated with I_2 in an alkaline solution. Thus, the ketone is :

(1) a cyclic ketone

(2) a methyl ketone

(3) an unsaturated ketone

(4) none of these

52. Tollens test can be used to distinguish :

(1) Propionaldehyde and acetone (2) Propanol and propionic acid

(3) Propene and isobutene (4) Isopropanol and propanol

53. The strongest acid among the choices is :

(1) Dichloroacetic acid (2) Dimethylacetic acid

(3) Trifluoroacetic acid (4) Triiodoacetic acid

54. If a compound gives an orange or red precipitate with 2,4 dinitrophenylhydrazine,

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54. If a compound gives an orange red precipitate with 2,4-DNP reagent, then the compound is :

(1) An Alkyl halide
(2) An Aryl halide
(3) An Amine
(4) A Carbonyl compound

55. Anti-Markownikoff addition of HBr is not observed in :

(1) propene
(2) butene
(3) 2-butene
(4) 2- pentene

56. $(CH_3)_3C-OH$ on treatment with NaCl in aqueous medium gives :

(1) No reaction
(2) $(CH_3)_3C^-Na^+$
(3) $(CH_3)_3C^-Cl^-$
(4) Isobutylene

57. When $FeCl_3$ is added to phenol?

(1) No reaction occurs
(2) A colored complex will be formed
(3) Fe^{3+} will be oxidized to higher state
(4) O-chlorophenol will be formed

58. The correct order of decreasing Lewis acidity is :

(1) $BF_3 > BCl_3 > BBr_3 > BI_3$
(2) $BI_3 > BCl_3 > BBr_3 > BF_3$
(3) $BI_3 > BBr_3 > BCl_3 > BF_3$
(4) $BCl_3 > BF_3 > BBr_3 > BI_3$

59. Boron is unable to form BF_6^{3-} because of :

(1) high electronegativity of boron
(2) high electronegativity of fluorine
(3) lack of d-orbitals in boron
(4) less difference in electronegativity between B and F

60. The molecule NO is :

(1) Paramagnetic
(2) Diamagnetic
(3) Ferromagnetic
(4) An even electron molecule

61. The correct order of bond energy is :

(1) $Cl_2 > Br_2 > F_2 > I_2$
(2) $Cl_2 > F_2 > Br_2 > I_2$
(3) $I_2 > Br_2 > Cl_2 > F_2$
(4) $I_2 > Br_2 > F_2 > Cl_2$

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62. H_5IO_6 is a :

(1) strong reducing agent
(2) strong base
(3) strong oxidizing agent
(4) weak base

63. The complex $[Co(NH_3)_5Br]^{2+}\ SO_4^{2-}$ and $[Co(NH_3)_5SO_4]^{+}\ Br^{-}$ are :

(1) Coordination isomers
(2) Linkage isomers
(3) Stereoisomers
(4) Ionization isomers

64. The C-H bond distance is the longest in :

(1) C_2H_2
(2) C_2H_4
(3) C_2H_6
(4) $C_2H_2Br_2$

65. The effective atomic number for $[Rh(H_2O)_6]^{3+}$ (At. No. for Rh is 45) is :

(1) 42 (2) 45 (3) 48 (4) 54

66. The spin only magnetic moment of $[CrF_6]^{4-}$ (At. No. for Cr is 24) is :

(1) 0 (2) 1.73 BM (3) 2.83 BM (4) 4.9 BM

67. Glucose and fructose can be distinguished by:

(1) Lucas test
(2) Ninhydrin test
(3) Benedict reagent test
(4) All the above

68. CCl_4 and freons :

(1) Are green compounds because they are green colored
(2) Depletes ozone concentration
(3) Causes increase in ozone concentration

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(4) Have no effect on ozone concentration

69. The correct order of increasing oxidizing power in the series is :

(1) $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$ (2) $Cr_2O_7^{2-} < VO_2^+ < MnO_4^-$

(3) $Cr_2O_7^{2-} < MnO_4^- < VO_2^+$ (4) $MnO_4^- < Cr_2O_7^{2-} < VO_2^+$

70. The most stable oxidation state exhibited by Thallium is :

(1) 0 (2) 1+ (3) 2+ (4) 3+

71. Wrought iron contains :

(1) Cr (2) Cu (3) C (4) Ag

72. The crystal structure of solid Mn(II) oxide is :

(1) NaCl structure (2) Fe_2O_3 structure

(3) CaF_2 structure (4) Na_2O structure

73. The ore magnetite is :

(1) Fe_3O_4 (2) $ZnCO_3$

(3) $CuCO_3.Cu(OH)_2$ (4) FeS_2

74. The first step in the extraction of Cu from copper pyrites is :

(1) Reduction by carbon (2) Electrolysis of ore

(3) Roasting of ore in O_2 (4) Magnetic separation

75. The reduction of zinc oxide with coke occurs at temperature :

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(1) Greater than that for CuO (2) Less than that for CuO

(3) Less than that for Ag_2O (4) Equal to that for CuO

JKCET 2012 Maths Question Paper

JKCET 2012 Maths Question Paper is given below.

COMMON ENTRANCE TEST - 2012

Question Booklet MATHEMATICS

Booklet No.

Roll No. | | | | | | |

Series C 401003

(Enter your Roll Number in the above space)

Time Allowed : 1.30 Hours **Max. Marks : 75**

INSTRUCTIONS :

1. Use only BLACK or BLUE Ball Pen.
2. All questions are COMPULSORY.
3. Check the BOOKLET thoroughly.

   IN CASE OF ANY DEFECT – MISPRINTS, MISSING QUESTION/S OR DUPLICATION OF QUESTION/S, GET THE BOOKLET CHANGED WITH THE BOOKLET OF THE SAME SERIES. NO COMPLAINT SHALL BE ENTERTAINED AFTER THE ENTRANCE TEST.
4. Before you mark the answer, fill in the particulars in the ANSWER SHEET carefully and correctly. Incomplete and incorrect particulars may result in the non-evaluation of your answer sheet by the technology.
5. Write the SERIES and BOOKLET NO. given at the TOP RIGHT HAND SIDE of the question booklet in the space provided in the answer sheet by darkening the corresponding circles.
6. Do not use any **eraser, fluid pens, blades** etc., otherwise your answer sheet is likely to be rejected whenever detected.
7. After completing the test, candidates are advised to hand over the OMR ANSWER SHEET to the Invigilator and take the candidate's copy with yourself.

(MATHEMATICS)

Choose the most suitable answer in the following questions :

1. In a triangle ABC, let $\angle A = \frac{\pi}{2}$ and $(a+b+c)(b+c-a) = \lambda bc$, then λ equals to

   (1) 0 (2) 1 (3) 2 (4) –2

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2. In a triangle, the lengths of the two larger sides are 10 and 9 respectively. If the angles are in A.P. then the length of the third side can be

(1) 4 (2) 5 (3) $6-\sqrt{6}$ (4) $5+\sqrt{6}$

3. If θ lies in the second quadrant and $3\tan\theta+4=0$, then the value of $\sin\theta+\cos\theta$ is equal to

(1) $\frac{1}{5}$ (2) $\frac{2}{5}$ (3) $\frac{3}{5}$ (4) $\frac{4}{5}$

4. Let A and B be acute angles such that $\sin A=\sin^2 B$ and $2\cos^2 A=3\cos^2 B$. Then A equals to

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{3}$ (4) none of the above

5. If $\sin x\cos y=\frac{1}{4}$ and $3\tan x=4\tan y$ then $\sin(x-y)$ equals to

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

6. If $A+B+C=\pi$ and $\sin C+\sin A\cos B=0$ then $\tan A\cdot\cot B$ is equals to

(1) 0 (2) $-\frac{1}{2}$ (3) 1 (4) -1

7. If n is an even integer, then the value of ${}^nC_0+{}^nC_2+{}^nC_4+\cdots+{}^nC_n$ equals to

(1) 2^n (2) 2^{n+1} (3) 2^{n-1} (4) 2^{2n}

8. The coefficient of the term independent of x in the expansion of $\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^{10}$ is equal to

(1) 10 (2) 252 (3) 20 (4) 256

MATH

9. The range of the function $f(x)=\log_a x$, $a>0$ is

(1) $(0,\infty)$ (2) $(-\infty,\infty)$
(3) $(-\infty,\infty)-\{0\}$ (4) none of these

10. The number of points at which the function $f(x)=\frac{1}{\log_e|x|}$ is discontinuous is

(1) 1 (2) 2 (3) 3 (4) ∞

11. The value of $\underset{x\to 0}{\text{Lt}}\frac{\sin(\pi\cos^2 x)}{x^2}$ is equal to

(1) $\frac{\pi}{2}$ (2) π (3) $-\pi$ (4) 1

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12. The function $f(x)=\frac{x}{1+x^2}$ decreases in the interval

(1) $(-\infty,-1]\cup[1,\infty)$ (2) $(-1,1)$

(3) $(-\infty,\infty)$ (4) none of these

13. Let $f:\mathbb{R}\to\mathbb{R}$ be a function such that the third derivative of $f(x)$ vanishes for all x. If $f(0)=1$, $f'(2)=4$ and $f''(1)=2$, then $f(x)$ equals

(1) x^2+1 (2) x^2+2x+1 (3) $4x+1$ (4) x^2-2x+1

14. If $f'(x)=g(x)$ and $g'(x)=-f(x)$ for all x and $f(1)=5$, $f'(1)=4$, then the value of $f^2(1)+g^2(1)$ is equal to

(1) 25 (2) 16 (3) 41 (4) 9

15. The degree of the differential equation satisfied by the curves

$$\sqrt{1+x}-a\sqrt{1+y}=1,$$

where 'a' is a parameter is

(1) 1 (2) 2 (3) 3 (4) none of the above

---

16. The probability that atleast one of the events A and B occurs is 0.5. If A and B occur simultaneously with probability 0.2, then $P(A^C)+P(B^C)$ is equal to

(1) 1.0 (2) 1.1 (3) 0.7 (4) 1.3

17. The following table gives the probability that a certain computer will malfunction 0, 1, 2, 3, 4, 5 or 6 times on any day:

No. of malfunctions x :	0	1	2	3	4	5	6
Probability $f(x)$:	0.17	0.29	0.27	0.16	0.07	0.03	0.01

Then mean of this probability distribution is

(1) 1.74 (2) 1.80 (3) 0.74 (4) none of these

18. For the married couple living in Jammu, the probability that a husband will vote in an election is 0.5 and the probability that a wife will vote is 0.4. The probability that the husband votes, given that his wife also votes is 0.7. Then the probability that husband and wife both will vote is

(1) 0.28 (2) 0.20 (3) 0.35 (4) 0.15

19. Let

$$f(x)=\frac{k}{1+x^2},\ -\infty<x<\infty$$

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be the probability density of a random variable. Then k equals to

(1) π (2) $-\pi$ (3) $\frac{1}{\pi}$ (4) 1

20. If mean and variable of a binomial variate X are 2 and 1 respectively, then the probability that X takes a value at least one is

(1) $\frac{1}{16}$ (2) $\frac{3}{16}$ (3) $\frac{5}{16}$ (4) $\frac{15}{16}$

21. Let A and B be two mutually exclusive events such that $P(A \cap B^C) = 0.25$ and $P(A^C \cap B) = 0.5$. Then $P\left((A \cup B)^C\right)$ is equal to

(1) 0.25 (2) 0.50 (3) 0.75 (4) 0.40

22. If the product of n positive real numbers is one, then their sum is

(1) $n + \frac{1}{n}$ (2) $n - \frac{1}{n}$

(3) $2n + \frac{1}{n}$ (4) never less than n

23. The sum of the series

$$5 - \frac{10}{3} + \frac{20}{9} - \frac{40}{27} + \cdots$$

is equal to

(1) 1 (2) 2 (3) 3 (4) none of these

24. The sum of n terms of the series

$$\frac{3}{1^2 \cdot 2^2} + \frac{5}{2^2 \cdot 3^2} + \frac{7}{3^2 \cdot 4^2} + \cdots$$

is equal to

(1) $\frac{n^2 - 2n}{(n+1)^2}$ (2) $\frac{n^2 - 2}{(n+1)^2}$ (3) $\frac{n^2 + 2n}{(n+1)^2}$ (4) $\frac{n^2 + 2}{(n+1)^2}$

25. If ${}^{m+n}P_2 = 90$ and ${}^{m-n}P_2 = 30$, then (m, n) is given by (m and n are positive integers)

(1) (8, 2) (2) (5, 6) (3) (3, 7) (4) (8, 3)

26. In the binomial expansion of $(a-b)^n$, $n \geq 5$, the sum of 5th and 6th term is zero. Then $\frac{a}{b}$ equals to

(1) $\frac{n-4}{2}$ (2) $\frac{n-4}{3}$ (3) $\frac{n-4}{5}$ (4) $\frac{n-4}{4}$

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27. The value of $\tan\left(\cos^{-1}\frac{4}{5}+\tan^{-1}\frac{2}{3}\right)$ is equal to

(1) $\frac{17}{6}$ (2) $\frac{22}{15}$ (3) $\frac{16}{5}$ (4) $\frac{16}{9}$

28. If A is a skew symmetric matrix of order 3×3, then determinant of $|A|$ equals to

(1) 0 (2) 1 (3) 2 (4) -1

29. The trajectory of the differential equation

$$\frac{dx}{dt} = rx\left(1-\frac{x}{k}\right),\ r>0$$

is monotonically increasing if

(1) $x(0) < k$ (2) $x(0) > k$

(3) $\frac{k}{2} < x(0) < 2k$ (4) none of these

30. If $f(x) = (1+x)^n$, then the value of

$$f(0) + f'(0) + \frac{f''(0)}{2!} + \cdots + \frac{f^{(n)}(0)}{n!}$$

is equal to

(1) 2^{n-1} (2) $2n$ (3) n (4) 2^n

31. If $f : \mathbb{R} \to \mathbb{R}$ be a differentiable function such that $f(4) = 6$ and $f'(4) = 2$, then

$$\lim_{x\to 4} \frac{xf(4) - 4f(x)}{x-4}$$

is equal to

(1) 2 (2) -2 (3) 0 (4) 1

32. If $xe^{xy} = y + \sin^2 x$, then $\frac{dy}{dx}$ at $x = 0$ is equal to

(1) 0 (2) 1 (3) e (4) -1

33. Let $P(x, y)$ be a point on the curve $y^2 = 4x$ at which the tangent is perpendicular to the line $2x + y = -2$. Then the co-ordinates of the point P are

(1) $(4, 4)$ (2) $(4, -4)$ (3) $(-4, 4)$ (4) $(-4, -4)$

34. Let a line makes an angle of 60° with each of the x and y axes. Then the angle made by the line with z-axis is

(1) 30° (2) 45° (3) 60° (4) none of these

35. The value of $\lim$ for which the

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35. The value of a for which the volume of parallelopiped formed by the vectors $\hat{i}+a\hat{j}+\hat{k}$, $\hat{j}+a\hat{k}$ and $a\hat{i}+\hat{k}$ is minimum is

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

36. The angle between the two lines

$$\frac{2-x}{1}=\frac{y}{2}=\frac{z+3}{1} \text{ and } \frac{x-4}{4}=\frac{y-1}{1}=\frac{z-5}{2}$$

is

(1) $0°$ (2) $90°$ (3) $45°$ (4) none of these

37. If the foot of perpendicular from the origin to a plane is (1, 2, 3), then equation of the plane is

(1) $2x-y+z=3$ (2) $x+y+z=6$

(3) $x-y-z=-4$ (4) $x+2y+3z=14$

38. The length of perpendicular from the point (1, 0, 1) to the plane $3x+\sqrt{6}y+7z+6=0$ is

(1) 2 (2) 6 (3) 8 (4) 7

39. If the line $\frac{x-4}{1}=\frac{y-2}{1}=\frac{z-k}{2}$ lies in the plane $2x-4y+z=5$, then k is equal to

(1) 0 (2) 1 (3) 7 (4) 5

40. If A and B be two independent events such that $P(A)=\frac{2}{3}$ and $P(B)=\frac{1}{5}$, then $P(A\cup B)$ equals to

(1) $\frac{1}{15}$ (2) $\frac{11}{15}$ (3) $\frac{2}{15}$ (4) $\frac{13}{15}$

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41. If $iz^3-z^2+z+i=0$, then z lies on

(1) a circle with centre (0, 0) and radius 1
(2) a circle with centre (1, 0) and radius 1
(3) a circle with centre (0, 1) and radius 1
(4) a straight line

42. If $|z|=1$ and $w=\frac{z+1}{z-1}$ (where $z\neq 1$), then Re(w) equals to

(1) $\frac{1}{|z-1|}$ (2) $\frac{1}{|z+1|}$ (3) $\left|\frac{z}{z-1}\right|$ (4) 0

43. If $f(x)=\sin\left(\log\left(\frac{\sqrt{16-x^2}}{\ldots}\right)\right)$, then domain of $f(x)$ is equal to

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43. If $f(x) = \sin\left(\log\left(\frac{2-x}{\quad}\right)\right)$, then domain of $f(x)$ is equal to

(1) $(-4, 2)$ (2) $(-4, 4)$ (3) $(-4, 4]$ (4) $[-4, 4]$

44. The real value of θ for which the expression $\frac{1+i\sin\theta}{1-2i\sin\theta}$ is a real number.

(1) $n\pi$, n is an integer (2) $2n\pi+\frac{\pi}{2}$, n is an integer

(3) $2n\pi-\frac{\pi}{2}$, n is an integer (4) $n\pi+\frac{\pi}{2}$, n is an integer

45. Let α and β be the roots of equation

$$x^2-(a-2)x-a-1=0$$

then $\alpha^2+\beta^2$ assumes the least value if

(1) $a=0$ (2) $a=1$ (3) $a=-1$ (4) $a=2$

46. For a real x, the equation

$$e^{\sin x}-e^{-\sin x}-16=0$$

has

(1) one and only one solution (2) four solutions
(3) infinite number of solutions (4) no solution

47. The number of distinct real roots of

$$\begin{vmatrix}\sin x & \cos x & \cos x\\ \cos x & \sin x & \cos x\\ \cos x & \cos x & \sin x\end{vmatrix}=0$$

in the interval $-\frac{\pi}{4}\le x\le\frac{\pi}{4}$ is

(1) 0 (2) 1 (3) 2 (4) 4

48. Let $a>0$, $b>0$ and

$$f(x)=\begin{vmatrix}x & a & a\\ b & x & a\\ b & b & x\end{vmatrix}$$

then which of the following statements is true?

(1) $f(x)$ has a local minimum at $x=\sqrt{ab}$
(2) $f(x)$ has a local maximum at $x=\sqrt{ab}$
(3) $f(x)$ has neither local minimum at $x=\sqrt{ab}$ nor local maximum at $x=\sqrt{ab}$
(4) none of the above

49. The system of homogeneous equations

$$tx+(t+1)y+(t-1)z=0$$

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$$(t+1)x+ty+(t+2)z=0$$
$$(t-1)x+(t+2)y+tz=0$$

has non-trivial solutions for

(1) exactly three real values of t (2) exactly two real values of t

(3) exactly one real value of t (4) infinite number of values of t

50. Matrix A is such that $A^2=2A-I$, where I is the identity matrix, then for $n\geq 2$, A^n is equal to

(1) $2^{n-1}A-(n-1)I$ (2) $2^{n-1}A-I$

(3) $nA-(n-1)I$ (4) $nA-I$

51. If A is a matrix of order n, then determinant $|-A|$ is equal to

(1) $|A|$ (2) $-|A|$ (3) $(-1)^n|A|$ (4) $n|A|$

---

52. The value of the integral

$$\int_{-\pi/2}^{\pi/2}\sqrt{1-\cos^2\theta}\,d\theta$$

is equal to

(1) 0 (2) 1 (3) 2 (4) -2

53. If

$$f(x)=\int_1^x\sqrt{4-t^2}\,dt,$$

then real roots of the equation $x-f'(x)=0$ are

(1) ± 1 (2) $\pm\sqrt{2}$ (3) 0 and 1 (4) ± 2

54. If

$$f(x)=\log_e(1+x)-\log_e(1-x),$$

then the value of $\int_{-1/2}^{1/2}f(x)\,dx$ equals to

(1) 0 (2) 1 (3) $\frac{1}{2}$ (4) $-\frac{1}{2}$

55. Let $f:(0,\infty)\to\mathbb{R}$ and $F(x)=\int_0^x f(t)\,dt$. If $F(x^2)=x^2(1+x)$, then $f(1)$ equals to

(1) $\frac{5}{2}$ (2) 5 (3) $\frac{2}{5}$ (4) 2

56. The vectors $\vec{a}=\hat{i}+4\hat{j}-7\hat{k}$, $\vec{b}=\lambda\hat{i}-\hat{j}+4\hat{k}$ and $\vec{c}=-9\hat{i}+18\hat{k}$ are coplanar if λ equals

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to

(1) 0 (2) 1 (3) 2 (4) 3

57. Let $\vec{a}$ and $\vec{b}$ be two unit vectors such that $\vec{a}+2\vec{b}$ and $5\vec{a}-4\vec{b}$ are perpendicular to each other, then the angle between $\vec{a}$ and $\vec{b}$ is

(1) $30°$ (2) $45°$ (3) $60°$ (4) $90°$

58. Let $\mathbb{R}$ be the set of real numbers and $f:\mathbb{R}\to\mathbb{R}$ be a function defined by $f(x)=x^2+4$. Then $f^{-1}(29)$ equals to

(1) ϕ (2) $\{5,-5\}$ (3) $\{4,-4\}$ (4) $\{2,-2\}$

59. The function $f:\mathbb{R}\to\mathbb{R}$ defined by

$$f(x)=\frac{e^{|x|}-e^{-x}}{e^{x}+e^{-x}}$$

is

(1) one-one and onto
(2) one-one but not onto
(3) not one-one but onto
(4) neither one-one nor onto

60. The sum of the coefficients of the polynomial $(1+x+x^2-4x^3)^{2149}$ is

(1) 1 (2) -1 (3) 2143 (4) 2156

61. If $z=1-i$, then principal value of $\arg(z)$ equals to

(1) $-\frac{\pi}{4}$ (2) $\frac{\pi}{4}$ (3) $-\frac{7\pi}{4}$ (4) none of these

62. The number of solutions to the equation $z^2+\bar{z}=0$ is equal to

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

63. i^i (when $i=\sqrt{-1}$) is

(1) a purely real number
(2) a purely complex number
(3) a complex number whose real part is always a negative real number
(4) a complex number whose real part is always a positive integer

64. The equation of the directrix of the parabola $y^2+4x+4y+2=0$ is

(1) $x=-1$ (2) $x=1$ (3) $x=-\frac{3}{2}$ (4) $x=\frac{2}{3}$

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(1) $x=1$ (2) $x=-1$ (3) $x=\frac{}{2}$ (4) $x=\frac{}{3}$

65. Equation of the ellipse having vertices at $(\pm 5, 0)$ and foci at $(\pm 4, 0)$ is

(1) $\frac{x^2}{25}+\frac{y^2}{9}=1$ (2) $\frac{x^2}{25}+\frac{y^2}{16}=1$

(3) $\frac{x^2}{9}+\frac{y^2}{16}=1$ (4) $\frac{x^2}{4}+\frac{y^2}{5}=1$

66. The number of integer values of m, for which the x-co-ordinate of the point of intersection of the lines $x+y=3$ and $y=3mx+1$ is also an integer, is

(1) 0 (2) 1 (3) 2 (4) 4

67. The points $(a, 0)$, $(0, b)$ and $(1, -1)$ are collinear $(a \neq 0, b \neq 0)$ if

(1) $b-a=ab$ (2) $a+b=ab$

(3) $a-b=ab$ (4) $a+b=-ab$

68. If the points $(2a, a)$, $(a, 2a)$ and (a, a) form a triangle of area 32 sq. units, then the centroid of the triangle is

(1) (32, 32) (2) (−32, −32) (3) (3, 3) (4) $\left(\frac{32}{3}, \frac{32}{3}\right)$

69. If the curve $x^2+y^2-2x-2y+1=0$ intersects or touches the co-ordinate axes at A and B, then equation of the straight line joining A and B is

(1) $x+y=\sqrt{2}$ (2) $x+y=1$

(3) $x-y=1$ (4) $x-y=\sqrt{2}$

70. If the system of equations $(k+1)x+8y=4k$ and $kx+(k+3)y=3k-1$ has infinitely many solutions, then k is equal to

(1) 0 (2) 1 (3) 3 (4) −3

71. The solution of the differential equation

$$\frac{dy}{dx}+\frac{y}{1+x^2}=\frac{e^x}{e^{\tan^{-1}x}},\ y(0)=1$$

is

(1) $y=e^{x-\tan^{-1}x}$ (2) $y=e^x\cdot\tan^{-1}x+1$

(3) $y=\tan^{-1}x+1$ (4) $y=e^{x+\tan^{-1}x}$

72. The value of the integral $\int_0^1 x(1-x)^{49}\,dx$ is equal to

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(1) $\frac{1}{2550}$ (2) $\frac{1}{2500}$ (3) $\frac{10}{490}$ (4) $\frac{1}{49}$

73. The value of

$$\lim_{x \to 0} \frac{\int_0^x \sin(t^2)\, dt}{x^3}$$

is equal to

(1) 0 (2) 1 (3) 3 (4) none of these

74. The value of the integral

$$\int \frac{e^x (1+\sin x)}{1+\cos x}\, dx$$

is equal to (k is any constant)

(1) $\log_e |\tan x| + k$ (2) $e^x \tan\left(\frac{x}{2}\right) + k$

(3) $e^x \tan x + k$ (4) $e^x \log_e |\sec x| + k$

75. The area bounded by the curves $y = \sqrt{x}$, $2y + 3 = x$ and the x-axis lying in the first quadrant, is (area in sq. units)

(1) 9 (2) 27 (3) $\frac{27}{2}$ (4) 18

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