2014

SUBJECT : PHYSICS	DAY – 2
SESSION : MORNING	TIME : 10.30 A.M. TO 11.50 A.M.

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER	QUESTION BOOKLET DETAILS	
	VERSION CODE	SERIAL NUMBER
	A - 1	548417

DOs :

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the **2nd Bell i.e., after 10.30 a.m.**
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS :

1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. The **3rd Bell rings at 10.40 a.m., till then;**
   - Do not remove the paper seal present on the right hand side of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

SEAL

IMPORTANT INSTRUCTIONS TO CANDIDATES

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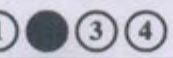
2. After the **3rd Bell is rung at 10.40 a.m.,** remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
   - Read each question carefully.
   - Choose the correct answer from out of the four available distracters (options / choices) given under each question / statement.
   - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

Correct Method of shading the circle on the OMR answer sheet is as shown below :



4. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the **last bell is rung at 11.50 a.m.,** stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
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9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

1. A physical quantity Q is found to depend on observables x, y and z, obeying relation $Q = \frac{x^3y^2}{z}$. The percentage error in the measurements of x, y and z are 1%, 2% and 4% respectively. What is percentage error in the quantity Q ?

(1) 4 %
(2) 3 %
(3) 11 %
(4) 1 %

2. Which of the following is not a vector quantity ?

(1) Weight
(2) Nuclear spin
(3) Momentum
(4) Potential energy

3. A car moves from A to B with a speed of 30 kmph and from B to A with a speed of 20 kmph. What is the average speed of the car ?

(1) 25 kmph
(2) 24 kmph
(3) 50 kmph
(4) 10 kmph

4. A body starts from rest and moves with constant acceleration for t s. It travels a distance x_1 in first half of time and x_2 in next half of time, then

(1) $x_2 = x_1$
(2) $x_2 = 2x_1$
(3) $x_2 = 3x_1$
(4) $x_2 = 4x_1$

Space For Rough Work

5. A person is driving a vehicle at uniform speed of 5 ms^{-1} on a level curved track of radius 5 m. The coefficient of static friction between tyres and road is 0.1. Will the person slip while taking the turn with the same speed ? Take g = 10 ms^{-2}.

Choose the correct statement.

(1) A person will slip if $v^2 = 5\ ms^{-1}$ (2) A person will slip if $v^2 > 5\ ms^{-1}$

(3) A person will slip if $v^2 < 5\ ms^{-1}$ (4) A person will not slip if $v^2 > 10\ ms^{-1}$

6. A stone is thrown vertically at a speed of 30 ms^{-1} making an angle of 45° with the horizontal. What is the maximum height reached by the stone ? Take g = 10 ms^{-2}.

(1) 30 m (2) 22.5 m

(3) 15 m (4) 10 m

7. A force $\vec{F} = 5\hat{i} + 2\hat{j} - 5\hat{k}$ acts on a particle whose position vector is $\vec{r} = \hat{i} - 2\hat{j} + \hat{k}$. What is the torque about the origin ?

(1) $8\hat{i} + 10\hat{j} + 12\hat{k}$ (2) $8\hat{i} + 10\hat{j} - 12\hat{k}$

(3) $8\hat{i} - 10\hat{j} - 8\hat{k}$ (4) $10\hat{i} - 10\hat{j} - \hat{k}$

8. What is a period of revolution of earth satellite ? Ignore the height of satellite above the surface of earth.

Given : (1) The value of gravitational acceleration g = 10 ms^{-2}.

(2) Radius of earth R_E = 6400 km. Take $\pi = 3.14$.

(1) 85 minutes (2) 156 minutes

(3) 83.73 minutes (4) 90 minutes

Space For Rough Work

9. A period of geostationary satellite is

(1) 24 h (2) 12 h

(3) 30 h (4) 48 h

10. What is the source temperature of the Carnot engine required to get 70% efficiency ? Given sink temperature = 27 °C

(1) 1000 °C (2) 90 °C

(3) 270 °C (4) 727 °C

11. A 10 kg metal block is attached to a spring of spring constant 1000 Nm^{-1}. A block is displaced from equilibrium position by 10 cm and released. The maximum acceleration of the block is

(1) 10 ms^{-2} (2) 100 ms^{-2}

(3) 200 ms^{-2} (4) 0.1 ms^{-2}

12. A metallic wire of 1 m length has a mass of 10×10^{-3} kg. If a tension of 100 N is applied to a wire, what is the speed of transverse wave ?

(1) 100 ms^{-1} (2) 10 ms^{-1}

(3) 200 ms^{-1} (4) 0.1 ms^{-1}

13. A train is approaching towards a platform with a speed of 10 ms^{-1} while blowing a whistle of frequency 340 Hz. What is the frequency of whistle heard by a stationary observer on the platform ? Given speed of sound = 340 ms^{-1}.

(1) 330 Hz (2) 350 Hz

(3) 340 Hz (4) 360 Hz

Space For Rough Work

14. A rotating wheel changes angular speed from 1800 rpm to 3000 rpm in 20 s. What is the angular acceleration assuming to be uniform ?

(1) 60π rad s^{-2} (2) 90π rad s^{-2}

(3) 2π rad s^{-2} (4) 40π rad s^{-2}

15. A flow of liquid is streamline if the Reynold number is

(1) less than 1000 (2) greater than 1000

(3) between 2000 to 3000 (4) between 4000 to 5000

16. A pipe of 30 cm long and open at both the ends produces harmonics. Which harmonic mode of pipe resonates a 1.1 kHz source ? Given speed of sound in air = 330 ms^{-1}.

(1) Fifth harmonic (2) Fourth harmonic

(3) Third harmonic (4) Second harmonic

17. In anomalous expansion of water, at what temperature, the density of water is maximum ?

(1) 4 °C (2) < 4 °C

(3) > 4 °C (4) 10 °C

18. An aeroplane executes a horizontal loop at a speed of 720 kmph with its wings banked at 45°. What is the radius of the loop ? Take g = 10 ms^{-2}.

(1) 4 km (2) 4.5 km

(3) 7.2 km (4) 2 km

Space For Rough Work

19. A body having a moment of inertia about its axis of rotation equal to 3 kg-m^2 is rotating with angular velocity of 3 rad s^{-1}. Kinetic energy of this rotating body is same as that of a body of mass 27 kg moving with velocity v. The value of v is

(1) 1 ms^{-1} (2) 0.5 ms^{-1}

(3) 2 ms^{-1} (4) 1.5 ms^{-1}

20. A cycle tyre bursts suddenly. What is the type of this process ?

(1) Isothermal (2) Adiabatic

(3) Isochoric (4) Isobaric

21. An object is placed at 20 cm in front of a concave mirror produces three times magnified real image. What is focal length of the concave mirror ?

(1) 15 cm (2) 6.6 cm

(3) 10 cm (4) 7.5 cm

22. A focal length of a lens is 10 cm. What is power of a lens in dioptre ?

(1) 0.1 D (2) 10 D

(3) 15 D (4) 20 D

Space For Rough Work

23. A microscope is having objective of focal length 1 cm and eyepiece of focal length 6 cm. If tube length is 30 cm and image is formed at the least distance of distinct vision, what is the magnification produced by the microscope ? Take D = 25 cm.

(1) 6 (2) 150

(3) 25 (4) 125

24. A fringe width of a certain interference pattern is $\beta = 0.002$ cm. What is the distance of 5^{th} dark fringe from centre ?

(1) 1×10^{-2} cm (2) 11×10^{-2} cm

(3) 1.1×10^{-2} cm (4) 3.28×10^{6} cm

25. Diameter of the objective of a telescope is 200 cm. What is the resolving power of a telescope ? Take wavelength of light = 5000 Å.

(1) 6.56×10^{6} (2) 3.28×10^{5}

(3) 1×10^{6} (4) 3.28×10^{6}

26. A polarized light of intensity I_o is passed through another polarizer whose pass axis makes an angle of 60° with the pass axis of the former. What is the intensity of emergent polarized light from second polarizer ?

(1) $I = I_o$ (2) $I = I_o/6$

(3) $I = I_o/5$ (4) $I_o/4$

Space For Rough Work

27. What is the de Broglie wavelength of the electron accelerated through a potential difference of 100 Volt ?

(1) 12.27 Å (2) 1.227 Å

(3) 0.1227 Å (4) 0.001227 Å

28. The maximum kinetic energy of the photoelectrons depends only on

(1) potential (2) frequency

(3) incident angle (4) pressure

29. Which of the following spectral series of hydrogen atom is lying in visible range of electromagnetic wave ?

(1) Paschen series (2) Pfund series

(3) Lyman series (4) Balmer series

30. What is the energy of the electron revolving in third orbit expressed in eV ?

(1) 1.51 eV (2) 3.4 eV

(3) 4.53 eV (4) 4 eV

31. The relation between half life (T) and decay constant (λ) is

(1) $\lambda T = 1$ (2) $\lambda T = \frac{1}{2}$

(3) $\lambda T = \log_e 2$ (4) $\lambda = \log 2T$

Space For Rough Work

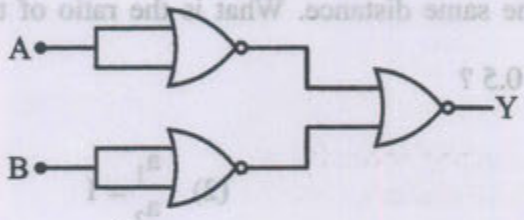
32. A force between two protons is same as the force between proton and neutron. The nature of the force is

(1) Weak nuclear force
(2) Strong nuclear force
(3) Electrical force
(4) Gravitational force

33. In n type semiconductor, electrons are majority charge carriers but it does not show any negative charge. The reason is

(1) electrons are stationary
(2) electrons neutralize with holes
(3) mobility of electrons is extremely small
(4) atom is electrically neutral

34. For the given digital circuit, write the truth table and identify the logic gate it represents :



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

35. If α-current gain of a transistor is 0.98. What is the value of β-current gain of the transistor ?

(1) 0.49
(2) 49
(3) 4.9
(4) 5

Space For Rough Work

36. A tuned amplifier circuit is used to generate a carrier frequency of 2 MHz for the amplitude modulation. The value of $\sqrt{LC}$ is

(1) $\frac{1}{2\pi \times 10^6}$ (2) $\frac{1}{2 \times 10^6}$

(3) $\frac{1}{3\pi \times 10^6}$ (4) $\frac{1}{4\pi \times 10^6}$

37. If a charge on the body is 1 nC, then how many electrons are present on the body ?

(1) 1.6×10^{19} (2) 6.25×10^9

(3) 6.25×10^{27} (4) 6.25×10^{28}

38. Two equal and opposite charges of masses m_1 and m_2 are accelerated in an uniform electric field through the same distance. What is the ratio of their accelerations if their ratio of masses is $\frac{m_1}{m_2} = 0.5$?

(1) $\frac{a_1}{a_2} = 0.5$ (2) $\frac{a_1}{a_2} = 1$

(3) $\frac{a_1}{a_2} = 2$ (4) $\frac{a_1}{a_2} = 3$

39. What is the nature of Gaussian surface involved in Gauss law of electrostatic ?

(1) Scalar (2) Electrical

(3) Magnetic (4) Vector

Space For Rough Work

40. What is the electric potential at a distance of 9 cm from 3 nC ?

(1) 270 V (2) 3 V

(3) 300 V (4) 30 V

41. A voltmeter reads 4 V when connected to a parallel plate capacitor with air as a dielectric. When a dielectric slab is introduced between plates for the same configuration, voltmeter reads 2 V. What is the dielectric constant of the material ?

(1) 0.5 (2) 2

(3) 8 (4) 10

42. A spherical conductor of radius 2 cm is uniformly charged with 3 nC. What is the electric field at a distance of 3 cm from the centre of the sphere ?

(1) 3×10^6 V m^{-1} (2) 3 V m^{-1}

(3) 3×10^4 V m^{-1} (4) 3×10^{-4} V m^{-1}

43. A carbon film resistor has colour code Green Black Violet Gold. The value of the resistor is

(1) 50 MΩ (2) 500 MΩ

(3) 500 ± 5% MΩ (4) 500 ± 10% MΩ

44. Two resistors of resistances 2 Ω and 6 Ω are connected in parallel. This combination is then connected to a battery of emf 2V and internal resistance 0.5 Ω. What is the current flowing through the battery ?

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

(3) $\frac{4}{17}$ A (4) 1 A

Space For Rough Work

45. The equivalent resistance of two resistors connected in series is 6 Ω and their parallel equivalent resistance is $\frac{4}{3}$ Ω. What are the values of resistances ?

(1) 4 Ω, 6 Ω (2) 8 Ω, 1 Ω

(3) 4 Ω, 2 Ω (4) 6 Ω, 2 Ω

46. In a potentiometer experiment of a cell of emf 1.25 V gives balancing length of 30 cm. If the cell is replaced by another cell, balancing length is found to be 40 cm. What is the emf of second cell ?

(1) $\simeq$ 1.57 V (2) $\simeq$ 1.67 V

(3) $\simeq$ 1.47 V (4) $\simeq$ 1.37 V

47. A charged particle experiences magnetic force in the presence of magnetic field. Which of the following statement is correct ?

(1) The particle is moving and magnetic field is perpendicular to the velocity.

(2) The particle is moving and magnetic field is parallel to velocity.

(3) The particle is stationary and magnetic field is perpendicular.

(4) The particle is stationary and magnetic field is parallel.

48. If a velocity has both perpendicular and parallel components while moving through a magnetic field, what is the path followed by a charged particle ?

(1) Circular (2) Elliptical

(3) Linear (4) Helical

Space For Rough Work

49. A solenoid has length 0.4 cm, radius 1 cm and 400 turns of wire. If a current of 5 A is passed through this solenoid, what is the magnetic field inside the solenoid ?

(1) 6.28×10^{-4} T (2) 6.28×10^{-3} T

(3) 6.28×10^{-7} T (4) 6.28×10^{-6} T

50. A gyromagnetic ratio of the electron revolving in a circular orbit of hydrogen atom is 8.8×10^{10} C kg^{-1}. What is the mass of the electron ? Given charge of the electron = 1.6×10^{-19} C.

(1) 1×10^{-29} kg (2) 0.1×10^{-29} kg

(3) 1.1×10^{-29} kg (4) $\frac{1}{11} \times 10^{-29}$ kg

51. What is the value of shunt resistance required to convert a galvanometer of resistance 100 Ω into an ammeter of range 1A ?

Given : Full scale deflection of the galvanometer is 5 mA.

(1) $\frac{5}{9.95}\Omega$ (2) $\frac{9.95}{5}\Omega$

(3) 0.5 Ω (4) 0.05 Ω

52. A circular coil of radius 10 cm and 100 turns carries a current 1A. What is the magnetic moment of the coil ?

(1) 3.142×10^4 A m^2 (2) 10^4 A m^2

(3) 3.142 A m^2 (4) 3 A m^2

Space For Rough Work

53. A susceptibility of a certain magnetic material is 400. What is the class of the magnetic material ?

(1) Diamagnetic (2) Paramagnetic

(3) Ferromagnetic (4) Ferroelectric

54. A solenoid of inductance 2H carries a current of 1 A. What is the magnetic energy stored in a solenoid ?

(1) 2 J (2) 1 J

(3) 4 J (4) 5 J

55. A multimeter reads a voltage of a certain A.C. source as 100 V. What is the peak value of voltage of A.C. source ?

(1) 200 V (2) 100 V

(3) 141.4 V (4) 400 V

56. A series LCR circuit contains inductance 5 mH, capacitance 2 μF and resistance 10 Ω. If a frequency A.C. source is varied, what is the frequency at which maximum power is dissipated ?

(1) $\frac{10^5}{\pi}$ Hz (2) $\frac{10^{-5}}{\pi}$ Hz

(3) $\frac{2}{\pi} \times 10^5$ Hz (4) $\frac{5}{\pi} \times 10^3$ Hz

Space For Rough Work

57. A step down transformer has 50 turns on secondary and 1000 turns on primary winding. If a transformer is connected to 220 V 1A A.C. source, what is output current of the transformer ?

(1) $\frac{1}{20}$ A (2) 20 A

(3) 100 A (4) 2 A

58. The average power dissipated in A.C. circuit is 2 watt. If a current flowing through a circuit is 2 A and impedance is 1 Ω, what is the power factor of the AC circuit ?

(1) 0.5 (2) 1

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

59. A plane electromagnetic wave of frequency 20 MHz travels through a space along x direction. If the electric field vector at a certain point in space is 6 V m^{-1}, what is the magnetic field vector at that point ?

(1) 2×10^{-8} T (2) $\frac{1}{2} \times 10^{-8}$ T

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

60. Two capacitors of 10 PF and 20 PF are connected to 200 V and 100 V sources respectively. If they are connected by the wire, what is the common potential of the capacitors ?

(1) 133.3 volt (2) 150 volt

(3) 300 volt (4) 400 volt

Space For Rough Work

A-1

SEAL

2014

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1. 25 cm^3 of oxalic acid completely neutralised 0.064 g of sodium hydroxide. Molarity of the oxalic acid solution is

(1) 0.045 (2) 0.032

(3) 0.064 (4) 0.015

2. The statement that is NOT correct is

(1) Energies of stationary states in hydrogen like atoms is inversely proportional to the square of the principal quantum number.

(2) The radius of the first orbit of He^+ is half that of the first orbit of hydrogen atom.

(3) Angular quantum number signifies the shape of the orbital.

(4) Total number of nodes for 3s orbital is three.

3. For the equilibrium :

$CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$; $K_p = 1.64$ atm at 1000 K

50 g of $CaCO_3$ in a 10 litre closed vessel is heated to 1000 K. Percentage of $CaCO_3$ that remains unreacted at equilibrium is

(Given R = 0.082 L atm K^{-1} mol^{-1})

(1) 50 (2) 20

(3) 40 (4) 60

4. Conversion of oxygen into ozone is non-spontaneous at

(1) high temperature (2) low temperature

(3) all temperatures (4) room temperature

Space For Rough Work

5. Density of carbon monoxide is maximum at

(1) 0.5 atm and 273 K (2) 4 atm and 500 K

(3) 2 atm and 600 K (4) 6 atm and 1092 K

6. The acid strength of active methylene group in

(a) $CH_3COCH_2COOC_2H_5$

(b) $CH_3COCH_2COCH_3$

(c) $C_2H_5OOCCH_2COOC_2H_5$ decreases as

(1) a > b > c (2) c > a > b

(3) a > c > b (4) b > a > c

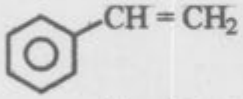
7. A metallic oxide reacts with water to form its hydroxide, hydrogen peroxide and also liberates oxygen. The metallic oxide could be

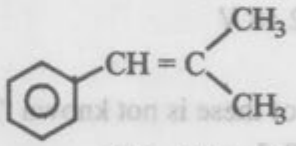
(1) KO_2 (2) Na_2O_2

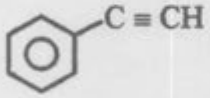
(3) CaO (4) Li_2O

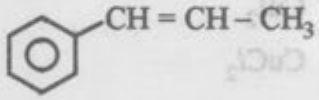
8. $X \xrightarrow[\text{(Reductive)}]{\text{Ozonolysis}} Y + Z$

Y can be obtained by Etard's reaction, Z undergoes disproportionation reaction with concentrated alkali. X could be

(1) 

(2) 

(3) 

(4) 

Space For Rough Work

9. Gold Sol is not

(1) a lyophobic colloid (2) negatively charged colloid

(3) a macro molecular colloid (4) a multimolecular colloid

10. Carbocation as an intermediate is likely to be formed in the reaction :

(1) Acetone + HCN $\xrightarrow{^{-}OH}$ acetonecyanohydrin

(2) Hexane $\xrightarrow{\text{Anhy. } AlCl_3 / HCl}$ 2-methyl pentane

(3) Propene + $Cl_2 \xrightarrow{h\nu}$ 2-chloropropane

(4) Ethylbromide + Aq KOH $\xrightarrow{\Delta}$ ethyl alcohol

11. For an ideal binary liquid mixture

(1) $\Delta H_{(mix)} = 0 ; \Delta S_{(mix)} < 0$ (2) $\Delta S_{(mix)} > 0 ; \Delta G_{(mix)} < 0$

(3) $\Delta S_{(mix)} = 0 ; \Delta G_{(mix)} = 0$ (4) $\Delta V_{(mix)} = 0 ; \Delta G_{(mix)} > 0$

12. For hydrogen – oxygen fuel cell at one atm and 298 K

$$H_{2(g)} + \frac{1}{2}O_{2(g)} \longrightarrow H_2O_{(l)}; \Delta G^\circ = -240 \text{ kJ}$$

E° for the cell is approximately,

(Given F = 96,500 C)

(1) 1.24 V (2) 1.26 V

(3) 2.48 V (4) 2.5 V

13. Which one of these is not known ?

(1) CuI_2 (2) $CuBr_2$

(3) $CuCl_2$ (4) CuF_2

Space For Rough Work

14. The correct statement is

(1) The extent of actinoid contraction is almost the same as lanthanoid contraction.

(2) Ce^{+4} in aqueous solution is not known.

(3) The earlier members of lanthanoid series resemble calcium in their chemical properties.

(4) In general, lanthanoids and actinoids do not show variable oxidation states.

15. $P \xrightarrow[2.\ H_3O^+]{1.\ CH_3MgBr} R \xrightarrow[2.\quad \Delta]{1.\ \text{dil. NaOH}}$ 4–methylpent–3–en–2–one

P is

(1) ethanamine (2) ethanal

(3) propanone (4) ethanenitrile

16. When $CH_2 = CH - O - CH_2 - CH_3$ reacts with one mole of HI, one of the products formed is

(1) ethanol (2) ethanal

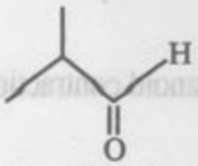
(3) ethane (4) iodoethene

17. 0.44 g of a monohydric alcohol when added to methylmagnesium iodide in ether liberates at S.T.P., 112 cm^3 of methane. With PCC the same alcohol forms a carbonyl compound that answers silver mirror test. The monohydric alcohol is

(1) $(CH_3)_3C - CH_2OH$ (2) $(CH_3)_2CH - CH_2OH$

(3) $CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_2 - CH_3$ (4) $CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_2 - CH_2 - CH_3$

Space For Rough Work

18.  $+ CH_3MgBr \xrightarrow{ether}$ 'A' $\xrightarrow{H_3O^+}$ B

The IUPAC name of 'B' is

(1) 2–methylbutan–3–ol
(2) Pentan–2–ol
(3) 3–methylbutan–2–ol
(4) 2–methylbutan–2–ol

19. For Freundlich isotherm a graph of $\log \frac{x}{m}$ is plotted against log P. The slope of the line and its y-axis intercept, respectively corresponds to

(1) $\log \frac{1}{n}$, k
(2) $\log \frac{1}{n}$, log k
(3) $\frac{1}{n}$, k
(4) $\frac{1}{n}$, log k

20. A plot of $\frac{1}{T}$ Vs. k for a reaction gives the slope -1×10^4 K. The energy of activation for the reaction is

(Given R = 8.314 J K^{-1} mol^{-1})

(1) 1.202 kJ mol^{-1}
(2) 83.14 kJ mol^{-1}
(3) 8314 J mol^{-1}
(4) 12.02 J mol^{-1}

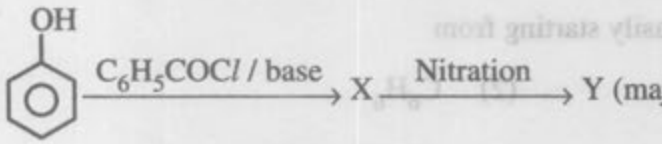
21. The IUPAC name of the complex ion formed when gold dissolves in aquaregia is

(1) tetrachloridoaurate(I)
(2) dichloridoaurate(III)
(3) tetrachloridoaurate(III)
(4) tetrachloridoaurate(II)

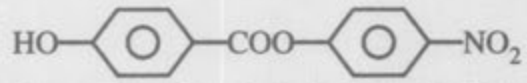
22. The correct sequence of reactions to be performed to convert benzene into m-bromoaniline is

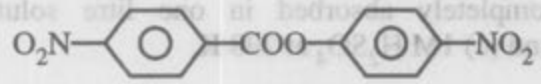
(1) bromination, nitration, reduction
(2) reduction, nitration, bromination
(3) nitration, reduction, bromination
(4) nitration, bromination, reduction

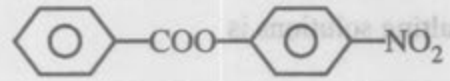
Space For Rough Work

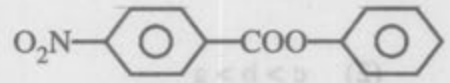
23. 

Y is

(1) 

(2) 

(3) 

(4) 

24. $A_{(g)} \xrightarrow{\Delta} P_{(g)} + Q_{(g)} + R_{(g)}$, follows first order kinetics with a half life of 69.3 s at 500 °C. Starting from the gas 'A' enclosed in a container at 500 °C and at a pressure of 0.4 atm, the total pressure of the system after 230 s will be

(1) 1.32 atm (2) 1.12 atm

(3) 1.15 atm (4) 1.22 atm

25. $MnO_2 + HCl \xrightarrow{\Delta} A_{(g)}$

$A_{(g)} + F_{2(excess)} \xrightarrow{573\ K} B_{(g)}$

$B_{(l)} + U_{(s)} \longrightarrow C_{(g)} + D_{(g)}$

The gases A, B, C and D are respectively

(1) Cl_2, ClF_3, UF_6, ClF (2) O_2, O_2F_2, U_2O_3, OF_2

(3) Cl_2, ClF, UF_6, ClF_3 (4) O_2, OF_2, U_2O_3, O_2F_2

Space For Rough Work

26. Acetophenone cannot be prepared easily starting from

(1) $C_6H_5CH_3$ (2) C_6H_6

(3) $C_6H_5CH(OH)CH_3$ (4) $C_6H_5C \equiv CH$

27. One mole of ammonia was completely absorbed in one litre solution each of (a) 1M HCl, (b) 1M CH_3COOH and (c) 1M H_2SO_4 at 298 K.

The decreasing order for the pH of the resulting solutions is

(Given $K_b(NH_3) = 4.74$)

(1) a > b > c (2) c > b > a

(3) b > c > a (4) b > a > c

28. 5.5 mg of nitrogen gas dissolves in 180 g of water at 273 K and one atm pressure due to nitrogen gas. The mole fraction of nitrogen in 180 g of water at 5 atm nitrogen pressure is approximately

(1) 1×10^{-5} (2) 1×10^{-4}

(3) 1×10^{-6} (4) 1×10^{-3}

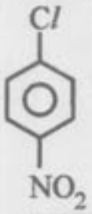
29. 50 cm^3 of 0.04 M $K_2Cr_2O_7$ in acidic medium oxidizes a sample of H_2S gas to sulphur. Volume of 0.03 M $KMnO_4$ required to oxidize the same amount of H_2S gas to sulphur, in acidic medium is

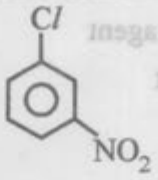
(1) 80 cm^3 (2) 120 cm^3

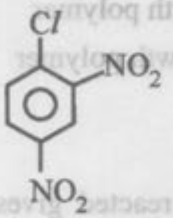
(3) 60 cm^3 (4) 90 cm^3

Space For Rough Work

30. The compound that reacts the fastest with sodium methoxide is

(1) 

(2) 

(3) 

(4) 

31. The pair of compounds having identical shapes for their molecules is

(1) BCl_2, ClF_3 (2) SO_2, CO_2

(3) CH_4, SF_4 (4) XeF_2, $ZnCl_2$

32. Conductivity of a saturated solution of a sparingly soluble salt AB at 298 K is 1.85×10^{-5} S m^{-1}. Solubility product of the salt AB at 298 K is

Given $\Lambda_m^\circ(AB) = 140 \times 10^{-4}$ S m^2 mol^{-1}

(1) 1.32×10^{-12} (2) 1.74×10^{-12}

(3) 5.7×10^{-12} (4) 7.5×10^{-12}

33. An incorrect statement with respect to S_N1 and S_N2 mechanisms for alkyl halide is

(1) Competing reaction for an S_N2 reaction is rearrangement.

(2) A weak nucleophile and a protic solvent increases the rate or favours S_N1 reaction.

(3) A strong nucleophile in an aprotic solvent increases the rate or favours S_N2 reaction.

(4) S_N1 reactions can be catalysed by some Lewis acids.

Space For Rough Work

34. Butylated hydroxy toluene as a food additive acts as

(1) flavouring agent
(2) emulsifier
(3) antioxidant
(4) colouring agent

35. Terylene is NOT a

(1) polyester fibre
(2) step growth polymer
(3) copolymer
(4) chain growth polymer

36. The correct statement is

(1) One mole each of benzene and hydrogen when reacted gives 1/3 mole of cyclohexane and 2/3 mole unreacted hydrogen.
(2) It is easier to hydrogenate benzene when compared to cyclohexene.
(3) Cyclohexadiene and cyclohexene cannot be isolated with ease during controlled hydrogenation of benzene.
(4) Hydrogenation of benzene to cyclohexane is an endothermic process.

37. Among the elements from atomic number 1 to 36, the number of elements which have an unpaired electron in their s subshell is

(1) 7
(2) 9
(3) 4
(4) 6

38. The statement that is NOT correct is

(1) Van der Waals constant 'a' measures extent of intermolecular attractive forces for real gases.
(2) Boyle point depends on the nature of real gas.
(3) Compressibility factor measures the deviation of real gas from ideal behaviour.
(4) Critical temperature is the lowest temperature at which liquefaction of a gas first occurs.

Space For Rough Work

39. The correct arrangement for the ions in the increasing order of their radii is

(1) Ca^{+2}, K^{+}, S^{-2} (2) Cl^{-}, F^{-}, S^{-2}

(3) Na^{+}, Cl^{-}, Ca^{+2} (4) Na^{+}, Al^{+3}, Be^{+2}

40. The correct arrangement of the species in the decreasing order of the bond length between carbon and oxygen in them is

(1) $CO_2, HCO_2^{-}, CO, CO_3^{-2}$ (2) $CO, CO_3^{-2}, CO_2, HCO_2^{-}$

(3) $CO, CO_2, HCO_2^{-}, CO_3^{-2}$ (4) $CO_3^{-2}, HCO_2^{-}, CO_2, CO$

41. The species that is not hydrolysed in water is

(1) BaO_2 (2) CaC_2

(3) P_4O_{10} (4) Mg_3N_2

42. For the properties mentioned, the correct trend for the different species is in

(1) inert pair effect – $Al > Ga > In$

(2) first ionization enthalpy – $B > Al > Tl$

(3) strength as Lewis acid – $BCl_3 > AlCl_3 > GaCl_3$

(4) oxidising property – $Al^{+3} > In^{+3} > Tl^{+3}$

43. A correct statement is

(1) $[MnBr_4]^{-2}$ is tetrahedral.

(2) $[Ni(NH_3)_6]^{+2}$ is an inner orbital complex.

(3) $[Co(NH_3)_6]^{+2}$ is paramagnetic.

(4) $[CoBr_2(en)_2]^{-}$ exhibits linkage isomerism.

Space For Rough Work

44. Iodoform reaction is answered by all, except

(1) CH_3CHO (2) $CH_3 - CH_2 - CH_2OH$

(3) $CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - COOH$ (4) $CH_3 - CH_2 - OH$

45. A crystalline solid XY_3 has ccp arrangement for its element Y. X occupies

(1) 33% of tetrahedral voids (2) 33% of octahedral voids

(3) 66% of tetrahedral voids (4) 66% of octahedral voids

46. $C_6H_5COOH \xrightarrow[2.\ \Delta]{1.\ NH_3} P \xrightarrow{NaOBr} Q \xrightarrow[2.\ \text{heat to } 460\ K]{1.\ \text{Conc. } H_2SO_4}$ 'R'

'R' is

(1) sulphanilamide (2) p-bromo sulphanilamide

(3) o-bromo sulphanilic acid (4) sulphanilic acid

47. The statement that is NOT correct is

(1) Carbohydrates are optically active.

(2) Lactose has glycosidic linkage between C_4 of glucose and C_1 of galactose unit.

(3) Aldose or ketose sugars in alkaline medium do not isomerise.

(4) Penta acetate of glucose does not react with hydroxylamine.

Space For Rough Work

48. Match the reactant in Column – I with the reaction in Column – II :

I	II
(i) Acetic acid	(a) Stephen
(ii) Sodium phenate	(b) Friedel-Crafts
(iii) Methyl cyanide	(c) HVZ
(iv) Toluene	(d) Kolbe's

(1) i – d, ii – b, iii – c, iv – a (2) i – c, ii – d, iii – a, iv – b

(3) i – c, ii – a, iii – d, iv – b (4) i – b, ii – c, iii – a, iv – d

49. The statement that is NOT correct is

(1) In solid state PCl_5 exists as $[PCl_4]^+[PCl_6]^-$

(2) Phosphorous acid on heating disproportionates to give metaphosphoric acid and phosphine.

(3) Hypophosphorous acid reduces silver nitrate to silver.

(4) Pure phosphine is non-inflammable.

50. In which one of the pairs of ion given, there is an ion that forms a co-ordination compound with both aqueous sodium hydroxide and ammonia and an other ion that forms a co-ordination compound only with aqueous sodium hydroxide ?

(1) Zn^{+2}, Al^{+3} (2) Al^{+3}, Cu^{+2}

(3) Pb^{+2}, Cu^{+2} (4) Cu^{+2}, Zn^{+2}

51. A crystalline solid X reacts with dil. HCl to liberate a gas Y. Y decolourises acidified $KMnO_4$. When a gas 'Z' is slowly passed into an aqueous solution of Y, colloidal sulphur is obtained. X and Z could be, respectively

(1) Na_2SO_4, H_2S (2) Na_2SO_4, SO_2

(3) Na_2S, SO_3 (4) Na_2SO_3, H_2S

Space For Rough Work

52. An aromatic compound 'A' (C_7H_9N) on reacting with $NaNO_2/HCl$ at 0 °C forms benzyl alcohol and nitrogen gas. The number of isomers possible for the compound 'A' is

(1) 7 (2) 6

(3) 5 (4) 3

53. The statement that is NOT correct is

(1) Collectors enhance the wettability of mineral particles during froth flotation.

(2) Copper from its low grade ores is extracted by hydrometallurgy.

(3) A furnace lined with Haematite is used to convert cast iron to wrought iron.

(4) In vapour phase refining, metal should form a volatile compound.

54. A solution of 1.25 g of 'P' in 50 g of water lowers freezing point by 0.3 °C. Molar mass of 'P' is 94. $K_{f(water)} = 1.86$ K kg mol^{-1}. The degree of association of 'P' in water is

(1) 60 % (2) 75 %

(3) 80 % (4) 65 %

55. Volume occupied by single CsCl ion pair in a crystal is 7.014×10^{-23} cm^3. The smallest Cs – Cs internuclear distance is equal to length of the side of the cube corresponding to volume of one CsCl ion pair. The smallest Cs to Cs internuclear distance is nearly

(1) 4.3 Å (2) 4.5 Å

(3) 4.4 Å (4) 4 Å

56. For $Cr_2O_7^{-2} + 14H^+ + 6e^- \rightarrow 2Cr^{+3} + 7H_2O$; $E^\circ = 1.33$ V At $[Cr_2O_7^{-2}] = 4.5$ millimole, $[Cr^{+3}] = 15$ millimole, E is 1.067 V. The pH of the solution is nearly equal to

(1) 3 (2) 4

(3) 2 (4) 5

Space For Rough Work

57. 1.78 g of an optically active L-amino acid (A) is treated with $NaNO_2/HCl$ at 0 °C. 448 cm^3 of nitrogen was at STP is evolved. A sample of protein has 0.25% of this amino acid by mass. The molar mass of the protein is

(1) 34,500 g mol^{-1} (2) 35,600 g mol^{-1}

(3) 36,500 g mol^{-1} (4) 35,400 g mol^{-1}

58. 10 g of a mixture of BaO and CaO requires 100 cm^3 of 2.5 M HCl to react completely. The percentage of calcium oxide in the mixture is approximately

(Given : molar mass of BaO = 153)

(1) 55.1 (2) 47.4

(3) 52.6 (4) 44.9

59. The ratio of heats liberated at 298 K from the combustion of one kg of coke and by burning water gas obtained from kg of coke is

(Assume coke to be 100% carbon.)

(Given enthalpies of combustion of CO_2, CO and H_2 as 393.5 kJ, 285 kJ, 285 kJ respectively all at 298 K.)

(1) 0.69 : 1 (2) 0.96 : 1

(3) 0.79 : 1 (4) 0.86 : 1

60. Impure copper containing Fe, Au, Ag as impurities is electrolytically refined. A current of 140 A for 482.5 s decreased the mass of the anode by 22.26 g and increased the mass of cathode by 22.011 g. Percentage of iron in impure copper is

(Given molar mass Fe = 55.5 g mol^{-1}, molar mass Cu = 63.54 g mol^{-1})

(1) 0.85 (2) 0.90

(3) 0.95 (4) 0.97

Space For Rough Work

A-1

SEAL

2014

SUBJECT : MATHEMATICS	DAY–1
SESSION : AFTERNOON	TIME : 02.30 P.M. TO 03.50 P.M.

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER					QUESTION BOOKLET DETAILS	
					VERSION CODE	SERIAL NUMBER
					A - 1	348481

DOs :

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the **2nd Bell i.e., after 2.30 p.m.**
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS :

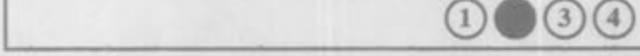
1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. The **3rd Bell rings at 2.40 p.m., till then;**
   - Do not remove the paper seal present on the right hand side of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

SEAL

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have one statement and four distracters. (Four different options / choices.)
2. After the **3rd Bell is rung at 2.40 p.m.,** remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
   - Read each question carefully.
   - Choose the correct answer from out of the four available distracters (options / choices) given under each question / statement.
   - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

Correct Method of shading the circle on the OMR answer sheet is as shown below :



4. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the **last bell is rung at 3.50 p.m.,** stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the **OMR ANSWER SHEET** to the room invigilator as it is.
8. After separating the top sheet (Our Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

1. Let S be the set of all real numbers. A relation R has been defined on S by $aRb \Leftrightarrow |a - b| \leq 1$, then R is

(1) reflexive and transitive but not symmetric

(2) an equivalence relation

(3) symmetric and transitive but not reflexive

(4) reflexive and symmetric but not transitive

2. For any two real numbers, an operation $*$ defined by $a * b = 1 + ab$ is

(1) commutative but not associative

(2) associative but not commutative

(3) neither commutative nor associative

(4) both commutative and associative

3. Let $f : N \to N$ defined by $f(n) = \begin{cases} \frac{n+1}{2} & \text{if n is odd} \\ \frac{n}{2} & \text{if n is even} \end{cases}$

then f is

(1) one-one and onto

(2) one-one but not onto

(3) onto but not one-one

(4) neither one-one nor onto

4. Suppose $f(x) = (x + 1)^2$ for $x \geq -1$. If $g(x)$ is a function whose graph is the reflection of the graph of $f(x)$ in the line $y = x$, then $g(x) =$

(1) $-\sqrt{x-1}$

(2) $\sqrt{x-1}$

(3) $\frac{1}{(x+1)^2}\ x > -1$

(4) $\sqrt{x}+1$

Space For Rough Work

5. The domain of the function $f(x) = \sqrt{\cos x}$ is

(1) $\left[0, \frac{\pi}{2}\right]$ (2) $\left[0, \frac{\pi}{2}\right] \cup \left[\frac{3\pi}{2}, 2\pi\right]$

(3) $\left[\frac{3\pi}{2}, 2\pi\right]$ (4) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$

6. In a class of 60 students, 25 students play cricket and 20 students play tennis, and 10 students play both the games, then the number of students who play neither is

(1) 0 (2) 35

(3) 45 (4) 25

7. Given $0 \leq x \leq \frac{1}{2}$ then the value of

$$\tan\left[\sin^{-1}\left\{\frac{x}{\sqrt{2}} + \frac{\sqrt{1-x^2}}{\sqrt{2}}\right\} - \sin^{-1}x\right] \text{ is}$$

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

(3) 1 (4) -1

8. The value of $\sin(2 \sin^{-1} 0.8)$ is equal to

(1) $\sin 1.2°$ (2) 0.96

(3) 0.48 (4) $\sin 1.6°$

9. If A is 3×4 matrix and B is a matrix such that A'B and BA' are both defined, then B is of the type

(1) 3×4 (2) 3×3

(3) 4×4 (4) 4×3

Space For Rough Work

10. The symmetric part of the matrix $A = \begin{pmatrix} 1 & 2 & 4 \\ 6 & 8 & 2 \\ 2 & -2 & 7 \end{pmatrix}$ is

(1) $\begin{pmatrix} 1 & 4 & 3 \\ 2 & 8 & 0 \\ 3 & 0 & 7 \end{pmatrix}$ (2) $\begin{pmatrix} 1 & 4 & 3 \\ 4 & 8 & 0 \\ 3 & 0 & 7 \end{pmatrix}$

(3) $\begin{pmatrix} 0 & -2 & -1 \\ -2 & 0 & -2 \\ -1 & -2 & 0 \end{pmatrix}$ (4) $\begin{pmatrix} 0 & -2 & 1 \\ 2 & 0 & 2 \\ -1 & 2 & 0 \end{pmatrix}$

11. If A is a matrix of order 3, such that A (adj A) = 10 I, then |adj A| =

(1) 10 (2) 10 I

(3) 1 (4) 100

12. Consider the following statements :

(a) If any two rows or columns of a determinant are identical, then the value of the determinant is zero.

(b) If the corresponding rows and columns of a determinant are interchanged, then the value of the determinant does not change.

(c) If any two rows (or columns) of a determinant are interchanged, then the value of the determinant changes in sign.

Which of these are correct ?

(1) (a) and (b) (2) (b) and (c)

(3) (a) and (c) (4) (a), (b) and (c)

Space For Rough Work

13. The inverse of the matrix $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is

(1) $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ (2) $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{4} \end{bmatrix}$

(3) $\frac{1}{24}\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ (4) $\frac{1}{24}\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

14. If a, b and c are in A.P., then the value of $\begin{vmatrix} x+2 & x+3 & x+a \\ x+4 & x+5 & x+b \\ x+6 & x+7 & x+c \end{vmatrix}$ is

(1) $x-(a+b+c)$ (2) $9x^2+a+b+c$

(3) 0 (4) $a+b+c$

15. The local minimum value of the function f' given by $f(x) = 3 + |x|, x \in R$ is

(1) 3 (2) 0

(3) -1 (4) 1

16. A stone is dropped into a quiet lake and waves move in circles at the speed of 5 cm/sec. At that instant, when the radius of circular wave is 8 cm, how fast is the enclosed area increasing ?

(1) 8π cm^2/s (2) 80π cm^2/s

(3) 6π cm^2/s (4) $\frac{8}{3}$ cm^2/s

Space For Rough Work

17. A gardener is digging a plot of land. As he gets tired, he works more slowly. After 't' minutes he is digging at a rate of $\frac{2}{\sqrt{t}}$ square metres per minute. How long will it take him to dig an area of 40 square metres ?

(1) 10 minutes (2) 40 minutes
(3) 100 minutes (4) 30 minutes

18. The area of the region bounded by the lines $y = mx$, $x = 1$, $x = 2$, and x axis is 6 sq. units, then 'm' is

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

19. Area of the region bounded by two parabolas $y = x^2$ and $x = y^2$ is

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

20. The order and degree of the differential equation $y = x\frac{dy}{dx} + \frac{2}{\frac{dy}{dx}}$ is

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

21. The general solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = 3x$ is

(1) $y = x + \frac{c}{x}$ (2) $y = x^2 + \frac{c}{x}$
(3) $y = x - \frac{c}{x}$ (4) $y = x^2 - \frac{c}{x}$

Space For Rough Work

22. The distance of the point P(a, b, c) from the x-axis is

(1) $\sqrt{b^2 + c^2}$ (2) $\sqrt{a^2 + c^2}$

(3) $\sqrt{a^2 + b^2}$ (4) a

23. Equation of the plane perpendicular to the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and passing through the point (2, 3, 4) is

(1) $x + 2y + 3z = 9$ (2) $x + 2y + 3z = 20$

(3) $2x + 3y + z = 17$ (4) $3x + 2y + z = 16$

24. The line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ is parallel to the plane

(1) $3x + 4y + 5z = 7$ (2) $x + y + z = 2$

(3) $2x + 3y + 4z = 0$ (4) $2x + y - 2z = 0$

25. The angle between two diagonals of a cube is

(1) 30° (2) 45°

(3) $\cos^{-1}\left(\frac{1}{3}\right)$ (4) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

26. Lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-K}$ and $\frac{x-1}{K} = \frac{y-4}{2} = \frac{z-5}{1}$ are coplanar if

(1) $K = 0$ (2) $K = -1$

(3) $K = 2$ (4) $K = 3$

Space For Rough Work

27. A and B are two events such that $P(A) \neq 0$, P(B/A) if

(i) A is a subset of B

(ii) $A \cap B = \Phi$ are respectively

(1) 0 and 1 (2) 1, 0

(3) 1, 1 (4) 0, 0

28. Two dice are thrown simultaneously. The probability of obtaining a total score of 5 is

(1) $\frac{1}{18}$ (2) $\frac{1}{12}$

(3) $\frac{1}{9}$ (4) $\frac{1}{36}$

29. If the events A and B are independent if $P(A') = \frac{2}{3}$ and $P(B') = \frac{2}{7}$, then $P(A \cap B)$ is equal to

(1) $\frac{5}{21}$ (2) $\frac{3}{21}$

(3) $\frac{4}{21}$ (4) $\frac{1}{21}$

30. A box contains 100 bulbs, out of which 10 are defective. A sample of 5 bulbs is drawn. The probability that none is defective is

(1) $\left(\frac{1}{10}\right)^5$ (2) $\left(\frac{1}{2}\right)^5$

(3) $\frac{9}{10}$ (4) $\left(\frac{9}{10}\right)^5$

31. The area of the parallelogram whose adjacent sides are $\hat{i} + \hat{k}$ and $2\hat{i} + \hat{j} + \hat{k}$ is

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

(3) 3 (4) 4

Space For Rough Work

32. If $\vec{a}$ and $\vec{b}$ are two unit vectors inclined at an angle $\frac{\pi}{3}$, then the value of $|\vec{a} + \vec{b}|$ is

(1) greater than 1 (2) less than 1

(3) equal to 1 (4) equal to 0

33. The value of $[\vec{a} - \vec{b} \quad \vec{b} - \vec{c} \quad \vec{c} - \vec{a}]$ is equal to

(1) 1 (2) 2

(3) 0 (4) $2[\vec{a} \ \vec{b} \ \vec{c}]$

34. If $x + y \leq 2, x \geq 0, y \geq 0$ the point at which maximum value of $3x + 2y$ attained will be

(1) $(0, 0)$ (2) $\left(\frac{1}{2}, \frac{1}{2}\right)$

(3) $(0, 2)$ (4) $(2, 0)$

35. If $\sin\theta = \sin\alpha$, then

(1) $\frac{\theta + \alpha}{2}$ is any odd multiple of $\frac{\pi}{2}$ and $\frac{\theta - \alpha}{2}$ is any multiple of π.

(2) $\frac{\theta + \alpha}{2}$ is any even multiple of $\frac{\pi}{2}$ and $\frac{\theta - \alpha}{2}$ is any odd multiple of π.

(3) $\frac{\theta + \alpha}{2}$ is any multiple of $\frac{\pi}{2}$ and $\frac{\theta - \alpha}{2}$ is any odd multiple of π.

(4) $\frac{\theta + \alpha}{2}$ is any multiple of $\frac{\pi}{2}$ and $\frac{\theta - \alpha}{2}$ is any even multiple of π.

Space For Rough Work

36. If $\tan x = \frac{3}{4}, \pi < x < \frac{3\pi}{2}$, then the value of $\cos \frac{x}{2}$ is

(1) $\frac{3}{\sqrt{10}}$ (2) $-\frac{3}{\sqrt{10}}$

(3) $-\frac{1}{\sqrt{10}}$ (4) $\frac{1}{\sqrt{10}}$

37. In a triangle ABC, $a[b \cos C - c \cos B] =$

(1) a^2 (2) b^2

(3) 0 (4) $b^2 - c^2$

38. If α and β are two different comlex numbers with $|\beta| = 1$, then $\left|\frac{\beta - \alpha}{1 - \bar{\alpha}\beta}\right|$ is equal to

(1) 0 (2) 1

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

39. The set $A = \{x : |2x + 3| < 7\}$ is equal to the set

(1) $B = \{x : -3 < x < 7\}$ (2) $C = \{x : -13 < 2x < 4\}$

(3) $D = \{x : 0 < x + 5 < 7\}$ (4) $E = \{x : -7 < x < 7\}$

40. How many 5 digit telephone numbers can be constructed using the digits 0 to 9, if each number starts with 67 and no digit appears more than once ?

(1) 336 (2) 337

(3) 335 (4) 338

Space For Rough Work

41. If 21^{st} and 22^{nd} terms in the expansion of $(1 + x)^{44}$ are equal, then x is equal to

(1) $\frac{21}{22}$ (2) $\frac{23}{24}$

(3) $\frac{8}{7}$ (4) $\frac{7}{8}$

42. Consider an infinite geometric series with first term 'a' and common ratio 'r'. If the sum is 4 and the second term is $\frac{3}{4}$, then

(1) $a = \frac{4}{7}, \quad r = \frac{3}{7}$ (2) $a = 3, \quad r = \frac{1}{4}$

(3) $a = 2, \quad r = \frac{3}{8}$ (4) $a = \frac{3}{2}, \quad r = \frac{1}{2}$

43. A straight line passes through the points (5, 0) and (0, 3). The length of perpendicular from the point (4, 4) on the line is

(1) $\frac{\sqrt{17}}{2}$ (2) $\sqrt{\frac{17}{2}}$

(3) $\frac{15}{\sqrt{34}}$ (4) $\frac{17}{2}$

44. Equation of circle with centre (–a, – b) and radius $\sqrt{a^2 - b^2}$ is

(1) $x^2 + y^2 - 2ax - 2by - 2b^2 = 0$

(2) $x^2 + y^2 - 2ax + 2by + 2a^2 = 0$

(3) $x^2 + y^2 + 2ax + 2by + 2b^2 = 0$

(4) $x^2 + y^2 - 2ax - 2by + 2b^2 = 0$

45. The area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 12y$ to the ends of Latus rectum is

(1) 18 sq. units (2) 19 sq. units

(3) 20 sq. units (4) 17 sq. units

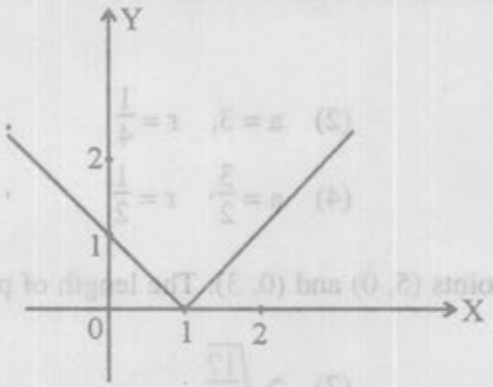
Space For Rough Work

46. If the coefficient of variation and standard deviation are 60 and 21 respectively, the arithmetic mean of distribution is

(1) 30 (2) 21

(3) 60 (4) 35

47. The function represented by the following graph is



(1) Differentiable but not continuous at $x = 1$

(2) Neither continuous nor differentiable at $x = 1$

(3) Continuous but not differentiable at $x = 1$

(4) Continuous and differentiable at $x = 1$

48. If $f(x) = \begin{cases} \dfrac{3 \sin \pi x}{5x} & x \neq 0 \\ 2K & x = 0 \end{cases}$

is continuous at $x = 0$, then the value of K is

(1) $\frac{3\pi}{10}$ (2) $\frac{3\pi}{5}$

(3) $\frac{\pi}{10}$ (4) $\frac{3\pi}{2}$

Space For Rough Work

49. Which one of the following is not correct for the features of exponential function given by $f(x) = b^x$ where $b > 1$?

(1) The domain of the function is R, the set of real numbers.

(2) The range of the function is the set of all positive real numbers.

(3) For very large negative values of x, the function is very close to 0.

(4) The point (1, 0) is always on the graph of the function.

50. If $y = (1 + x)(1 + x^2)(1 + x^4)$, then $\frac{dy}{dx}$ at $x = 1$ is

(1) 28 (2) 0

(3) 20 (4) 1

51. If $y = (\tan^{-1}x)^2$, then $(x^2 + 1)^2 y_2 + 2x(x^2 + 1)y_1$ is equal to

(1) 0 (2) 1

(3) 4 (4) 2

52. If $f(x) = x^3$ and $g(x) = x^3 - 4x$ in $-2 \le x \le 2$, then consider the statements :

(a) $f(x)$ and $g(x)$ satisfy mean value theorem.

(b) $f(x)$ and $g(x)$ both satisfy Rolle's theorem.

(c) Only $g(x)$ satisfies Rolle's theorem.

Of these statements

(1) (a) alone is correct. (2) (a) and (c) are correct.

(3) (a) and (b) are correct. (4) None is correct.

Space For Rough Work

53. Which of the following is not a correct statement ?

(1) $\sqrt{3}$ is a prime. (2) The sun is a star.

(3) Mathematics is interesting. (4) $\sqrt{2}$ is irrational.

54. If the function f(x) satisfies $\lim_{x \to 1} \frac{f(x) - 2}{x^2 - 1} = \pi$, then $\lim_{x \to 1} f(x) =$

(1) 2 (2) 3

(3) 1 (4) 0

55. The tangent to the curve $y = x^3 + 1$ at (1, 2) makes an angle θ with y axis, then the value of $\tan \theta$ is

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

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

56. If the function f(x) defined by

$f(x) = \frac{x^{100}}{100} + \frac{x^{99}}{99} + \ldots\ldots\ldots + \frac{x^2}{2} + x + 1$, then $f'(0) =$

(1) 100 (2) -1

(3) 100 $f'(0)$ (4) 1

Space For Rough Work

57. If $f(x) = f(\pi + e - x)$ and $\int_e^{\pi} f(x)\,dx = \frac{2}{e+\pi}$, then $\int_e^{\pi} xf(x)\,dx$ is equal to

(1) $\frac{\pi+e}{2}$ (2) $\frac{\pi-e}{2}$

(3) $\pi - e$ (4) 1

58. If linear function $f(x)$ and $g(x)$ satisfy

$\int [(3x-1)\cos x + (1-2x)\sin x]\,dx = f(x)\cos x + g(x)\sin x + C$, then

(1) $f(x) = 3x - 5$ (2) $g(x) = 3 + x$

(3) $f(x) = 3(x-1)$ (4) $g(x) = 3(x-1)$

59. The value of the integral

$\int_{-\pi/4}^{\pi/4} \log(\sec\theta - \tan\theta)d\theta$ is

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{2}$

(3) 0 (4) π

60. $\int \frac{\sin 2x}{\sin^2 x + 2\cos^2 x}\,dx =$

(1) $\log(1 + \cos^2 x) + C$ (2) $\log(1 + \tan^2 x) + C$

(3) $-\log(1 + \sin^2 x) + C$ (4) $-\log(1 + \cos^2 x) + C$

Space For Rough Work

SEAL

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