DATE : 10/05/2017

Test Booklet Set No.

03

Aakash

Medical | IIT-JEE | Foundations

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Answers & Solutions

for

GUJCET-PCE - 2017

Important Instructions :

1. The Physics and Chemistry test consists of 80 questions. Each question carries **1** mark. For each correct response, the candidate will get **1** mark. For each incorrect response ¼ mark will be deducted. The maximum marks are **80**.
2. This Test is of **2 hours** duration.
3. Use **Black Ball Point Pen only** for writing particulars on OMR **Answer** Sheet and marking answers by darkening the circle '●'.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must handover the Answer Sheet to the Invigilator in the Room / Hall. The candidates are allowed to take away this Test Booklet with them.**
6. Use of White fluid for correction is not permissible on the **Answer** Sheet.
7. Each candidate must show on demand his / her Admission Card to the Invigilator.
8. No candidate, without special permission of the Superintendent or Invigilator, should leave his / her seat.
9. Use of Manual Calculator is permissible.
10. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
11. No part of the Test Booklet and **Answer** Sheet shall be detached under any circumstances.
12. The candidates will write the Correct Test Booklet Set No. as given in the Test Booklet / **Answer** Sheet in the Attendance Sheet. (Patrak - 01)

PHYSICS

1. Half life of radioactive element is 5 min. At the end of 20 min its _____% quantity is disintegrated.

(A) 6.25 (B) 75

(C) 25 (D) 93.75

Answer (D)

Sol. Half life $t_{1/2}$ = 5 min

Total time t = 20 min

Number of half lives = $\frac{20}{5} = 4$

$$\Rightarrow \frac{N}{N_0} = \left[\frac{1}{2}\right]^n = \left[\frac{1}{2}\right]^4$$

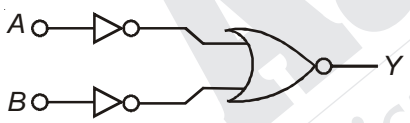
$$\Rightarrow \frac{N}{N_0} = \frac{1}{16}$$

$$N = \frac{N_0}{16}$$

Disintegrated $y \Rightarrow \left[\frac{N_0 - N}{N_0}\right] \times 100 = \left[1 - \frac{N}{N_0}\right] \times 100$

$$\Rightarrow \left[1 - \frac{1}{16}\right] \times 100 = 93.75\%$$

2. Which logic gate is represented by the following logic gates?



(A) NOR

(B) NAND

(C) AND

(D) OR

Answer (C)

Sol. Truth table

This belongs to AND gate

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

3. In CE NPN transistor 10^{10} electrons enter the emitter in 10^{-6} s when it is connected to battery. About 5% electrons recombine with holes in the base. The current gain of the transistor is _____

($e = 1.6 \times 10^{-19}$ C)

(A) 0.98 (B) 19

(C) 49 (D) 0.95

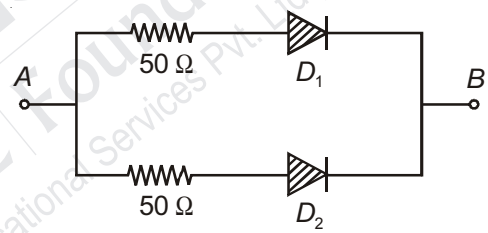
Answer (B)

Sol. Current gain common emitter $B = \frac{i_C}{i_B}$

$$B = \frac{95\% \text{ of } i_E}{5\% \text{ of } i_E}$$

$$B = \frac{95}{5} = 19$$

4. For the circuit shown in the figure. The equivalent resistance between point A & B for the two cases (i) $V_A > V_B$, (ii) $V_B > V_A$ respectively is _____ Ω and _____ Ω respectively. (D_1 and D_2 are ideal diodes)



(A) 25, ∞

(B) 50, ∞

(C) ∞, 25

(D) 25, 25

Answer (A)

Sol. For $V_A > V_B$

Both diodes are forward biased so equivalent resistance $R_1 = \frac{50 \times 50}{50 + 50} = 25\ \Omega$

$V_A < V_B$

Both diodes are reverse biased so equivalent resistance is infinity

5 The amplitude of carrier wave is 12 V. For modulation index of 50%, the amplitude of modulating signal is _____ V.

(A) 3 (B) 6

(C) 12 (D) 9

Answer (B)

Sol. Modulation index $\mu = \frac{A_m}{A_c}$

$$A_m = \mu.A_c = \left(\frac{50}{100}\right) \times 12$$

$\Rightarrow A_m$ = 6 volt

6. Height of T.V. tower is h_T. The area of transmission of T.V. waves is $\propto$ _____.

(A) h_T^2 (B) $h_T^{1/2}$

(C) $h_T^{1/3}$ (D) h_T

Answer (D)

Sol. Height of T.V. tower = h_T

Range $\propto \sqrt{h_T}$

and area $\propto$(Range)^2

so Area $\propto h_T$

7. The shape of wave front at a very large distance from source is _____.

(A) Circular (B) Spherical

(C) Cylindrical (D) Plane

Answer (D)

8. The total energy of an electron in the first excited state of H -atom is – 3.4 eV, then its potential energy is in this state is _____ eV.

(A) 6.8 (B) 3.4

(C) – 6.8 (D) – 3.4

Answer (C)

Sol. Total energy of electron E = – 3.4 eV

Potential energy $U = 2E$

$\Rightarrow U$ = – 6.8 eV

9. Electric field intensity at points in between and outside two thin separated parallel sheets of infinite dimension with like charges of same surface charge density (σ) are _____ and _____ respectively.

(A) σ/ϵ_0, σ/ϵ_0 (B) 0, σ/ϵ_0

(C) 0, 0 (D) σ/ϵ_0, 0

Answer (B)

Sol. $E_1 = E_2 = \frac{\sigma}{2\epsilon_0}$

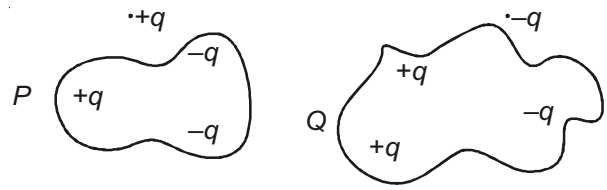
Between plates $E = E_1 - E_2$

$\Rightarrow E = 0$

Outside plates $E = E_1 + E_2$

$\Rightarrow E = \frac{\sigma}{\epsilon_0}$

10. Arrangement of charges are shown in the figure. Flux linked with the closed surface P and Q respectively are ____ and _____.



(A) Zero, zero (B) $\frac{q}{\epsilon_0}, \frac{-q}{\epsilon_0}$

(C) $-q/\epsilon_0$, q/ϵ_0 (D) q/ϵ_0, zero

Answer (C)

$$\text{Flux} = \frac{\text{Total enclosed charge}}{\epsilon_0}$$

$$\phi_1 = \frac{-q}{\epsilon_0}, \quad \phi_2 = \frac{q}{\epsilon_0}$$

11. The dimensional formula of capacitance is ____. Take Q as the dimension formula of charge.

(A) $M^1L^{-2}T^{-2}Q^{-2}$ (B) $M^1L^2T^{-2}Q^{-2}$

(C) $M^1L^{-2}T^2Q^2$ (D) $M^{-1}L^{-2}T^2Q^2$

Answer (D)

Sol. Capacitance $C = \frac{Q}{V}$

but $V = \frac{W}{Q}$

$$C = \frac{Q^2}{W}$$

$$C = \frac{[Q^2]}{[ML^2T^{-2}]} = [M^{-1}L^{-2}T^2Q^2]$$

12. A uniform electric field is prevailing in X - direction in certain region. The co-ordinates of points P, Q, and R are (0, 0), (2, 0) and (0, 2) respectively. Which of the following alternatives is true for the potentials at these points?

(A) $V_P = V_Q$, $V_Q > V_Q$ (B) $V_P > V_Q$, $V_P = V_R$

(C) $V_P < V_R$, $V_Q = V_R$ (D) $V_P = V_Q$, $V_P > V_R$

Answer (B)

13. An electric dipole of dipole moment $\vec{P}$ is placed parallel to the uniform electric field of intensity $\vec{E}$. On rotating it through 180°, the amount of work done is _____.

(A) $2PE$ (B) Zero

(C) PE (D) $-2PE$

Answer (A)

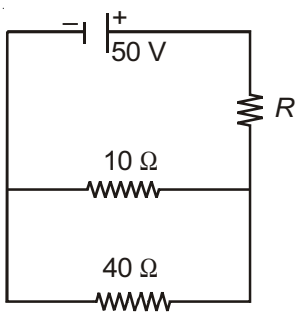
Sol. Work done by external agent in rotating the dipole

$W = PE\,[\cos\theta_1 - \cos\theta_2]$

$\theta_1 = 0$ and $\theta_1 = 180°$

$\Rightarrow W = 2PE$

14.



In above circuit if current through 10 Ω resistor is 2.5 A, value of R is _____.

(A) 50 Ω (B) 40 Ω

(C) 8 Ω (D) 10 Ω

Answer (C)

Sol. $i_1 = 2.5$ A

so $i = i_1 + i_2$

So voltage across 10 Ω = $i \times R = 25$

Voltage across $40\ \Omega = 10 \times 2.5 = 25$ V

$$R = \frac{25}{i_1 + i_2}$$

$$i_2 = \frac{25}{40}\text{A}$$

$\therefore R = 8\ \Omega$

15. Brown, Red and Orange coloured bands on a Carbon resistor are followed by silver band. The value of resistor is _____

(A) 320 Ω ± 5% (B) 12 kΩ ± 5%

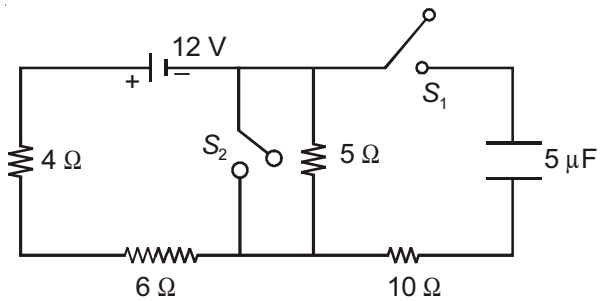
(C) 320 Ω ± 10% (D) 12 kΩ ± 10%

Answer (D)

Sol. Brown Red Orange

$\Rightarrow 12\ \text{k}\Omega \pm 10\%$

16. What is the current in the 4 Ω resistor when switch S_1 is open and switch S_2 is closed in the given circuit?



A) 3.0 A (B) 0.8 A

(C) 1.5 A (D) 1.2 A

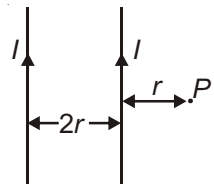
Answer (D)

Sol. S_1 is open and S_2 is closed

So $i = \dfrac{12}{10}$

$\Rightarrow i = 1.2$ A

17. Two very long straight wires are set parallel to each other. Each carries a current I in the same direction and the separation between them is $2r$. The intensity of magnetic field at point P as shown in figure is _____.



(A) $\dfrac{3}{8}\dfrac{\mu_0 I}{\pi r}$ (B) $\dfrac{2\mu_0 I}{\pi r}$

(C) $\dfrac{2}{3}\dfrac{\mu_0 I}{\pi r}$ (D) $\dfrac{\mu_0 I}{2\pi r}$

Answer (C)

Sol. Magnetic field due to first wire $B_1 = \dfrac{\mu_0 i}{2\pi r}$

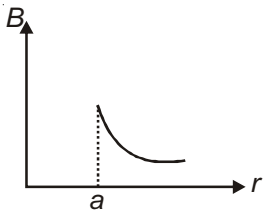
Magnetic field due to second wire $B_2 = \dfrac{\mu_0 i}{6\pi r}$

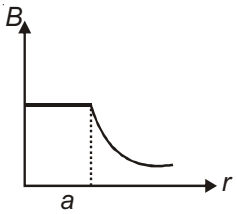
Net Magnetic field at P, $B = B_1 + B_2$

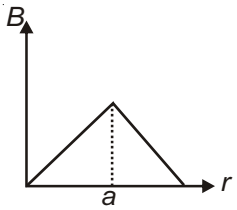
$$B = \frac{\mu_0 I}{2\pi r} + \frac{\mu_0 I}{6\pi r}$$

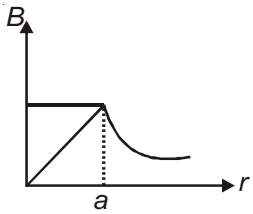
$$= \frac{2}{3}\frac{\mu_0 i}{\pi r}$$

18. The magnetic field due to a straight long conductor of uniform cross-section of radius *a* and carrying a steady current is represented by

(A)


(B)


(C)


(D)


Answer (D)

Sol. Magnetic field inside the wire $B_{in} \propto r$

and out side the wire $B_{out} \propto \frac{1}{r}$

So option (D) is correct

19. A proton is moving perpendicular to a uniform magnetic field of 2.5 tesla with 2 MeV kinetic energy. The force on proton is _____ N. (Mass of proton = 1.6 × 10^{-27} kg. Charge of proton = 1.6 × 10^{-19} C)

(A) 8 × 10^{-12}

(B) 8 × 10^{-11}

(C) 3 × 10^{-11}

(D) 3 × 10^{-10}

Answer (A)

Sol. Force on moving charge in magnetic field

$F = qvB\sin\theta$

but $\theta = 90$

$F = qvB$

Hence velocity $v = \sqrt{\frac{2E}{m}}$ { E is kinetic energy of proton}

putting the values we get

$F = 5.6 \times 10^{-12}$N

20. A particle of mass *m* and charge *q* is incident on *XZ* plane with velocity *v* in a direction making angle θ with a uniform magnetic field applied along X-axis. The nature of motion performed by the particle is

(A) Circular (B) Helical

(C) Parabola (D) Straight line

Answer (B)

Sol. Due to parallel component of velocity to the field particle moves in direction of field and due to perpendicular component of velocity particle follows circular path so combined path is helical.

21. Select the dimensional formula of $B^2/2\mu_0$.

(A) $M^1L^1T^2$

(B) $M^{-1}L^1T^2$

(C) $M^{-1}L^{-1}T^{-2}$

(D) $M^1L^{-1}T^{-2}$

Answer (D)

Sol. $\frac{B^2}{2\mu_0} = \text{Energy density} = \frac{\text{Energy}}{\text{Volume}}$

$\Rightarrow \frac{[ML^2T^{-2}]}{[L^3]} = [ML^{-1}T^{-2}]$

22. μ_0 is permeability of vacuum, χ_m is susceptibility then permeability of material is

(A) $\mu = \mu_0 1 + \chi_m$ (B) $\mu = \mu_0(\chi_m - 1)$

(C) $\mu = \mu_0(1 - \chi_m)$ (D) $\mu = \mu_0(1 + \chi_m)$

Answer (D)

Sol. $\mu = \mu_0[1 + \chi_m]$

23. In Raman scattering, Stokes and Antistokes lines respectively represents lines with _____ and _____ wavelength.

(A) Low, High (B) High, High

(C) High, Low (D) Low, Low

Answer (C)

Sol. High Low

24. For the astronomical telescope, the focal length of objective lens is f_0 and the eye piece lens is f_e. Then the tube length of the telescope is _____.

(A) $L \geq f_0 - f_e$ (B) $L \geq f_0 + f_e$

(C) $L < f_0 + f_e$ (D) $L \leq f_0 - f_e$

Answer (B)

Sol. For astronomical telescope

$|v_1| = f_0$

$|u_2| \leq f_e$

Probable answer would be (C) conceptually correct.

25. Time taken by the sunlight to pass through a slab of 4 cm and refractive index 1.5 is _____ s.

(A) 2×10^{10} (B) 2×10^{-8}

(C) 2×10^{8} (D) 2×10^{-10}

Answer (D)

Sol. d = 4 cm

$\mu = 1.5$

$$\mu = \frac{c}{v} \Rightarrow v = \frac{c}{\mu} = \frac{3\times10^8}{1.5} = 2\times10^8 \text{m/s}$$

Time $t = \frac{d}{v} = \frac{4\times10^{-2}}{2\times10^8} = 2\times10^{-10}$ second.

26. A convex lens of focal length 12.5 cm is used as a simple microscope. When the image is formed at infinite, Magnification is _____ (Near point for the normal vision is 25 cm).

(A) 25 (B) 2.5

(C) 2.0 (D) 1.0

Answer (C)

Sol. Magnifying power $M = \frac{D}{f} = \frac{25}{12.5}$ M = 2

27. In experiment of Davisson-Germer, emitted electron from filament is accelerated through voltage V then de-Broglie wavelength of that electron will be _____ m.

(A) $\frac{2Vem}{\sqrt{h}}$ (B) $\frac{\sqrt{h}}{2Vem}$

(C) $\frac{\sqrt{2Vem}}{h}$ (D) $\frac{h}{\sqrt{2Vem}}$

Answer (D)

Sol. Kinetic energy $\frac{1}{2}mv^2 = eV$

$$v = \sqrt{\frac{2eV}{m}}$$

Wavelength $\lambda = \frac{h}{mv}$

$$\lambda = \frac{h}{m\sqrt{\frac{2eV}{m}}} = \frac{h}{\sqrt{2eVm}}$$

28. Photons of energy 1 eV and 2.5 eV successively illuminated a metal whose work function is 0.5 eV. The ratio of maximum speeds of emitted electron is

(A) 1 : 3 (B) 1 : 2

(C) 3 : 1 (D) 2 : 1

Answer (B)

Sol. Energy of photon $E = \phi + \frac{1}{2}mv^2$

$$V_{max} = \sqrt{\frac{2(E-\phi)}{m}}$$

So putting values

$$\frac{v_{max1}}{v_{max2}} = \sqrt{\frac{1-0.5}{2.5-0.5}}$$

$$\frac{v_{max1}}{v_{max2}} = \frac{1}{2}$$

29. The number of turns in the coil of an A.C. generator are 100 and its cross-sectional area is 2.5 m^2. The coil is revolving in a uniform magnetic field of strength 0.3 T with the uniform angular velocity of 60 rad/s. The value of maximum value produced is _____ kV.

(A) 1.25 (B) 4.50

(C) 6.75 (D) 2.25

Answer (B)

Sol. Induced emf $e = NBA\omega \sin\omega t$

for e_{max} $\sin\omega t = 1$

So $e_{max} = NBA\omega$

putting values

$e_{max} = 4.5 \times 10^3$ volt

$e_{max} = 4.5$ kV

30. If R and L denote resistance and inductance respectively which of the following has dimension of time?

(A) $\sqrt{\frac{L}{R}}$ (B) $\frac{L}{R}$

(C) $\sqrt{\frac{R}{L}}$ (D) $\frac{R}{L}$

Answer (B)

Sol. Time constant has the dimension same as that of time.

Time constant $= \frac{L}{R}$

31. In an AC circuit, current is 3 A and voltage 210 V and power is 63 W. The power factor is

(A) 0.11 (B) 0.09

(C) 0.08 (D) 0.10

Answer (D)

Sol. Power P = I.V. cosθ

$\therefore \quad \cos\theta = \frac{P}{IV} = \frac{63}{3 \times 210} = 0.1$

32. For an A.C given by $I = 50 \cos (100t + 45°)$A. The value of I_{rms} = _____ A.

(A) Zero (B) $50\sqrt{2}$

(C) 25 (D) $25\sqrt{2}$

Answer (D)

Sol. Comparing the equation by $I = I_0 \cos(\omega t + \phi)$

$I_0 = 50$ A so $I_{rms} = \frac{I_0}{\sqrt{2}} = 25\sqrt{2}$ A

33. An A.C voltage $V = 5 \cos (1000t)$ V is applied to a L-R series circuit of inductance 3 mH and resistance 4 Ω. The value of maximum current in the circuit is _____ A.

(A) 0.8 (B) 1.0

(C) $\frac{5}{7}$ (D) $\frac{5}{\sqrt{7}}$

Answer (B)

Sol. V = 5 cos 1000t volt

$V = V_0 \cos \omega t$

$V_0 = 5$ volt $\quad \omega = 1000$ rad/s

$L = 3 \times 10^{-3}$ H, $R = 4\Omega$

Maximum current $10 = \frac{V_0}{Z}$

$$10 = \frac{5}{\sqrt{\omega^2 L^2 + R^2}} = \frac{5}{5} = 1\,A$$

34. In medicine, to destroy cancer cells _____ rays are used.

(A) Ultraviolet (B) Visible

(C) Gamma (D) Infrared

Answer (C)

35. For a radiation of 9 GHz passing through air. The number of waves passing through 1 m length is

(A) 30 (B) 5

(C) 20 (D) 3

Answer (A)

Sol. $f = 9\text{ GHz} = 9 \times 10^9$ Hz

$c = 3 \times 10^8$ m/s

$$\lambda = \frac{c}{f} = \frac{3 \times 10^8}{9 \times 10^9} = \frac{10^{-1}}{3}\text{m}$$

Number of waves in a given length

$$N = \frac{\text{length}}{\lambda} = \frac{1}{\frac{10^{-1}}{3}} = 30$$

36. In Young's double slit experiment, if the distance between two slits is equal to the wavelength of used light. Then the maximum number of bright fringes obtained on the screen will be

(A) Infinite (B) 3

(C) 7 (D) 5

Answer (B)

Sol. We know

$d \sin\theta = \pm m\lambda$

but $d = \lambda$

so $\sin\theta = \pm m$

for max. $\Rightarrow \sin\theta = 1$

$m = \pm 1$

so maximum number of bright fringes = 3

Central maxima + either side of central maxima

37. If the wavelength of light used is 6000 Å. The angular resolution of telescope of objective lens having diameter 10 cm is _____ rad.

(A) 7.52×10^{-6} (B) 6.10×10^{-6}

(C) 6.55×10^{-6} (D) 7.32×10^{-6}

Answer (D)

Sol. Limit of resolution $\sin\theta = \theta = \frac{1.22\lambda}{D}$

putting values we get option (B)

38. In the discharge tube as the density of atom increases, the intensity of spectral lines

(A) Decreases continuously

(B) Increases continuously

(C) Remains constant

(D) None of these

Answer (B)

Sol. Intensity increases with density of atoms.

39. The ionization potential of hydrogenic ions P and Q are V_P and V_Q respectively. If $V_Q < V_P$ then radii

(A) $r_P > r_Q$ (B) $r_P < r_Q$

(C) $r_P = r_Q$ (D) None of these

Answer (B)

Sol. Ionisation potential $V \propto \frac{1}{r}$

So $r_P < r_Q$ because $V_P > V_Q$

40. In the given nuclear reaction

$${}^{9}_{4}Be + {}^{4}_{2}He \longrightarrow {}^{12}_{6}C + X$$

X represents

(A) Neutron (B) Proton

(C) Positron (D) Electron

Answer (A)

Sol. Balancing atomic number and mass number on both sides ${}^{1}_{0}n$ (neutron)

CHEMISTRY

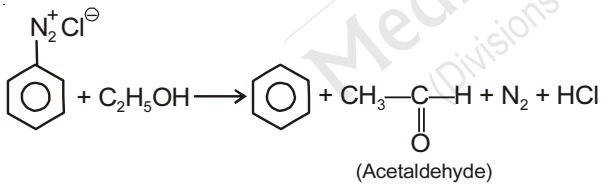
41. Which oxidised product is obtained when benzene diazonium chloride reacts with ethanol?

(A) Acetaldehyde (B) Phenol

(C) Benzaldehyde (D) Benzene

Answer (A)

Sol.



42. Which amino acid contain secondary amino group in its structure?

(A) Proline (B) Glycine

(C) Alanine (D) Lysine

Answer (A)

Sol. Fact.

43. Which of the following protein is present in silk?

(A) Insulin (B) Keratin

(C) Albumin (D) Myosin

Answer (B)

Sol. Fact.

44. Which of the following polymer is condensation as well as cross-linked polymer?

(A) Bakelite (B) Nylon 6,6

(C) Nylon-2, Nylon-6 (D) Dacron

Answer (A)

Sol. Bakelite is condensation as well as cross linked polymer.

45. Which polymer is used in the preparation of hose-pipe?

(A) Orlon (B) Polystyrene

(C) Teflon (D) Neoprene

Answer (D)

Sol. Fact.

46. From the following substances, which carbohydrate has the maximum sweetness?

(A) Sucrolose (B) Saccharin

(C) Aspartame (D) Alitame

Answer (A)

Sol. Fact.

47. Which type of drug is veronal?

(A) Antihistamine

(B) Antifertility

(C) Tranquilizer

(D) Antimicrobial

Answer (C)

Sol. Veronal is Tranquilizer.

48. In which of the following pair of complexes, the experimental magnetic moment and the geometric shapes are same?

(A) $K[MnO_4]$ and $K_2[NiCl_4]$

(B) $K_2[Ni(CN)_4]$ and $K_4[Ni(CN)_4]$

(C) $K_2[Ni(CN)_4]$ and $[Ni(NH_3)_2 Cl_2]$

(D) $K_3[Fe(CN)_6]$ and $K_4[Fe(CN)_6]$

Answer (C)

Sol. $K_2[Ni(CN)_4] \Rightarrow Ni^{+2} \Rightarrow 3d^8 4s^0$

With cyanide, Ni^{+2} form square planar and diamagnetic complex.

$K_2[Ni(NH_3)_2 Cl_2] \rightarrow$ Diamagnetic and square planar complex.

49. A crystalline solid is made up of X and Y atoms, X atoms possesses CCP structure and Y atoms are arranged in tetrahedral voids. If all the atoms situated on a diagonal of one side are removed, what will be the molecular formula of the crystalline solid?

(A) X_3Y_2 (B) X_4Y_3

(C) X_2Y_3 (D) X_3Y_4

Answer (Delete)

50. In which crystal system, the length of each edge (edge length) is same?

(A) $BaSO_4$

(B) HgS

(C) $CaSO_4$

(D) ZnO

Answer (B)

Sol. HgS is Rhombohedral

Hence, a = b = c.

51. The depression in freezing point for 0.01 m aqueous solution of $K_x[Fe(CN)_6]$ is 0.0744 K. The molal depression constant for solvent is 1.86 K kg mol^{-1}. If the solute undergoes complete dissociation, what is the correct molecular formula for the solute?

(A) $K_2[Fe(CN)_6]$ (B) $K_3[Fe(CN)_6]$

(C) $K[Fe(CN)_6]$ (D) $K_4[Fe(CN)_6]$

Answer (B)

Sol. $\Delta T_b = iK_f m$

$0.0744 = i \times 1.86 \times 0.01$

$\Rightarrow$ i = 4

So, n = 4

Formula is $K_3[Fe(CN)_6]$

52. At certain temperature 1.6% solution of an unknown substance is isotonic with 2.4% solution of Urea. If both the solutions have the same solvent and both the solutions have same density 1 gm/cm^3, what will be the molecular mass of unknown substance in gm/mol.

[Molecular mass of urea = 60 gm/mol]

(A) 30 (B) 40

(C) 80 (D) 90

Answer (B)

Sol. $\frac{1.6}{M} = \frac{2.4}{60}$

$\Rightarrow M = \frac{1.6}{2.4} \times 60 = 40$ g/mol

53. Which of the following aqueous solution will have the boiling point 102.2°C? The molal elevation constant for water is 2.2 K kg mol^{-1}.

(A) 1 m CH_3COOH (B) 1 m NaCl

(C) 1 M NaCl (D) 1 m glucose

Answer (D)

Sol. $\Delta T_b = 2.2 = i \times 2.2 \times 1$

$\Rightarrow$ i = 1

54. The graph of $\sqrt{C} \rightarrow \wedge_m$ for an aqueous solution of which substance is not obtained as a straight line?

(A) HCl (B) NaCN

(C) NaCl (D) HCN

Answer (D)

Sol. HCN is weak electrolyte.

55. Which option is incorrect for the working cell?

$$Pt\left|\underset{1\,bar}{Cl_{2(g)}}\right|Cl^-_{(C_1)}\left\|Cl^-_{(C_2)}\right|\underset{1\,bar}{Cl_{2(g)}}\left|Pt\right.$$

(A) $\Delta G = -ve$ (B) $C_2 > C_1$

(C) $E^\circ_{cell} = 0$ (D) $C_1 > C_2$

Answer (B)

Sol. $\underset{c_1}{Cl^\ominus} \longrightarrow \underset{c_2}{Cl^\ominus}$

$E_{cell} = -0.059\log\frac{c_2}{c_1}$

$= 0.059\log\left(\frac{c_1}{c_2}\right)$

$c_1 > c_2$

For spontaneous process so incorrect is B.

56. The pH of the solution _____ during the electrolysis of dilute aqueous solution of $CuSO_4$.

(A) First increases then decreases

(B) Decreases

(C) Remains constant

(D) Increases

Answer (B)

Sol. During electrolysis H_2SO_4 form, so pH decrease.

57. Which of the following process is for purification of metals?

(A) Froath floatation

(B) Leaching

(C) Liquidation

(D) Washing

Answer (C)

Sol. Liquation is method of purification.

58. Which of the following is the Ore of Cu?

(A) Ciderite (B) Magnetite

(C) Calamine (D) Malachite

Answer (D)

Sol. Malachite $CuCO_3.Cu(OH)_2$

59. How many gm of the oxidising agent gets reduced in the reaction of 65.4 gm of Zn with concentrated nitric acid?

[Atomic mass : Zn = 65.4, N = 14, H = 1, O = 16 gm mol^{-1}]

(A) 65.4 (B) 126

(C) 130.8 (D) 252

Answer (B)

Sol. $Zn + 4HNO_{3(conc.)} \longrightarrow Zn(NO_3)_2 + 2H_2O + 2NO_2$

60. In which of the following acid, the maximum number of hydrogen atoms are joined directly with phosphorous?

(A) Phosphoric acid

(B) Phosphorous acid

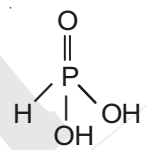
(C) Pyrophosphoric acid

(D) Phosphonic acid

Answer (D)

Sol. Phosphonic acid

H_3PO_3



61. The reaction of $(CH_3)_3$ CONa with ____ reagent is the most easy?

(A) C_6H_5Br (B) $(CH_3)_2CHBr$

(C) $(CH_3)_3CBr$ (D) CH_3CH_2Br

Answer (D)

Sol. S_N2 reaction

62. The organic product of which reaction from the following is used as anaesthetic?

(A) $CS_2 + 3Cl_2 \xrightarrow{Anh.AlCl_3}$

(B) Chloral + $Ca(OH)_2 \rightarrow$

(C) Chloral + Chlorobenzene $\rightarrow$

(D) $CHCl_3 \xrightarrow{H_2/Ni}$

Answer (B)

Sol. $Chloral + Ca(OH)_2 \longrightarrow \underset{Anaesthetic}{CHCl_3} + (HCOO)_2Ca$

63. Which of the following compound gives only one monochloro product on its chlorination in presence of sunlight?

(A) n - butane (B) Iso pentane

(C) Neo pentane (D) n - pentane

Answer (C)

Sol. $CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH_3$, all H are same

64. Which products are obtained when phenyl ethanoate reacts in presence of Anh.$AlCl_3$?

(A) o-Ethoxy acetophenone and p-Ethoxy acetophenone

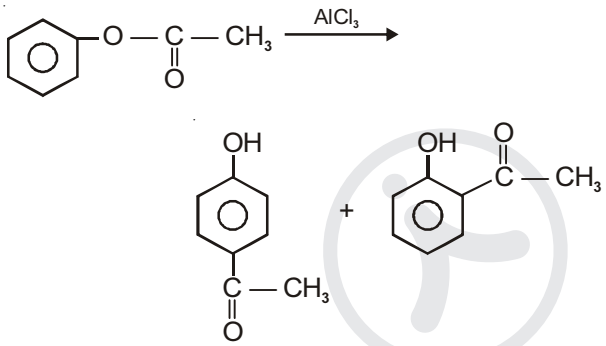
(B) o-Hydroxy acetophenone and p-Hydroxy acetophenone

(C) o-Methyl acetophenone and p-Methyl acetophenone

(D) o-Methoxy acetophenone and p-Methoxy acetophenone

Answer (B)

Sol.



65. How many gram of ethanol is required in the reaction with Na metal in order to give 560 ml. dihydrogen gas at STP?

(A) 11.5 (B) 1.15

(C) 4.6 (D) 2.3

Answer (D)

Sol. $C_2H_5OH + Na \rightarrow C_2H_5O^{\ominus}Na^{(+)} + \frac{1}{2}H_2$

66. The IUPAC name of the product obtained by the oxidation of phenol with the help of chromic acid is

(A) Cyclo hexa-2,4-diene-1,4-diol

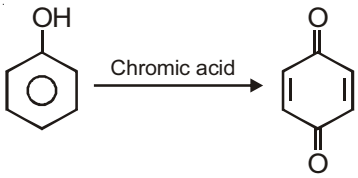
(B) Cyclo hexa-2,4-diene-1,4-dione

(C) Cyclo hexa-2,5-diene-1,4-diol

(D) Cyclo hexa-2,5-diene-1,4-dione

Answer (D)

Sol.



67. At 298 K temperature the activation energy for the reaction $x_2 + y_2 \rightarrow 2xy + 20$ kJ is 15 kJ. What will be the activation energy for the reaction $2xy \rightarrow x_2 + y_2$?

(A) – 15 kJ (B) + 35 kJ

(C) – 5 kJ (D) – 35 kJ

Answer (B)

Sol. $\Delta_R H$ = activation energy of forward reaction – activation energy of backward reaction.

$\Rightarrow$ – 20 = 15 – ?

So, +35 kJ.

68. The half-life period for a radioactive substance is 15 minutes. How many grams of this radioactive substance is decayed from 50 gram of substance after one hour?

(A) 37.5 (B) 25

(C) 43.75 (D) 46.875

Answer (D)

Sol. $A_0 \xrightarrow{15} \frac{A_0}{2} \xrightarrow{30} \frac{A_0}{4} \xrightarrow{45} \frac{A_0}{8} \xrightarrow{60} \frac{A_0}{16}$

3.125 g remain

Decayed = 46.875

69. The rate constant value for a reaction is $1.75 \times 10^2\ L^2\ mol^{-2}\ sec^{-1}$. The half-life period $t_{1/2} \propto$ ____ .

(A) $[R_0]^{-1}$ (B) $[R_0]^{-2}$

(C) $[R_0]^2$ (D) $[R_0]$

Answer (B)

Sol. 3rd order reaction

$t_{1/2} \propto (R_0)^{1-n}$

So $(R_0)^{-2}$

70. The values of slope and intercept in the graph of Freundlich adsorption isotherm at 25°C temperature are 0.5 and 0.4771 respectively. What will be the proportion of adsorption at 4 bar pressure?

(A) 12 (B) 6

(C) 24 (D) 3

Answer (B)

Sol. $\log(x/m) = \log k + \frac{1}{n}\log p$

$\log k = 0.4771, k \simeq 3$

$\Rightarrow \frac{1}{n} = 0.5$

$\frac{x}{m} = (3)(4)^{0.5} \simeq 6$

71. In which emulsion coloured droplets are obtained when oil soluble dye is added to it?

(A) Cod liver oil (B) Cold cream

(C) Hair cream (D) Milk

Answer (D)

72. Which of the following is the correct order for the theoretical magnetic moment?

(A) $Cr^{3+} > Mn^{2+} = Fe^{3+}$

(B) $Cr^{3+} = Mn^{2+} < Fe^{3+}$

(C) $Cr^{3+} < Mn^{2+} = Fe^{3+}$

(D) $Cr^{3+} < Mn^{2+} < Fe^{3+}$

Answer (C)

Sol. $Cr^{+3} = 3d^3$ 3 unpaired electron.

$Mn^{+2} = 3d^5$ 5 unpaired electron.

$Fe^{+3} = 3d^5$ 5 unpaired electron.

73. Which statement is incorrect with reference to inner transition elements?

(A) The oxides of lanthanoids are basic

(B) Pm is radioactive element among actinoids

(C) The values of ionisation enthalpy of actinoids are less than the values of ionisation enthalpy of lanthanoids

(D) Only in the electronic configuration of lanthanoids like Ce, Gd, Lu the electrons are filled in 5*d* orbitals

Answer (B)

Sol. Pm is not actinoids

74. Which of the following complex ions absorbs the light of minimum wavelength?

(A) $[Co(H_2O)_6]^{3+}$ (B) $[CoF_6]^{3-}$

(C) $[Co(CN)_6]^{3-}$ (D) $[Co(NH_3)_6]^{3+}$

Answer (C)

Sol. Wavelength of light absorb $\propto \dfrac{1}{\text{stability of complex}}$

75. Which of the following pairs of complexes whose aqueous solutions gives pale yellow and white precipitates respectively with 0.1 M $AgNO_3$?

(A) $[Pt(NH_3)_4Br_2]Cl_2$ and $[Pt(NH_3)_4Cl_2]Br_2$

(B) $[Co(NH_3)_5NO_3]Br$ and $[Co(NH_3)_5Br]NO_3$

(C) $[Pt(NH_3)_4Cl_2]Br_2$ and $[Pt(NH_3)_4Br_2]Cl_2$

(D) $[Co(NH_3)_5NO_3]Cl$ and $[Co(NH_3)_5Cl]NO_3$

Answer (C)

Sol. AgBr → Pale yellow

AgCl → White

76. Which of the following is the disproportionation redox reaction?

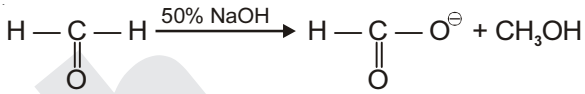
(A) $2CH_3COOH \xrightarrow{P_2O_5/\Delta}$

(B) $2CH_3CHO \xrightarrow{\text{dil NaOH}}$

(C) $2CH_3COCH_3 \xrightarrow[H_2O]{\text{Mg-Hg}}$

(D) $2HCHO \xrightarrow{\text{50\% NaOH(aq)}}$

Answer (D)

Sol. 

77. Which compound does not give Benedict test?

(A) $(CH_3)_3C{\cdot}CHO$

(B) C_6H_5CHO

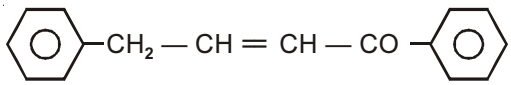
(C) CH_3CHO

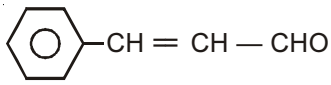
(D) $(CH_3)_2{\cdot}\ CHCHO$

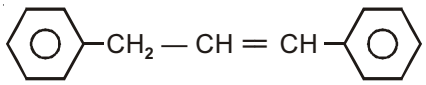
Answer (B)

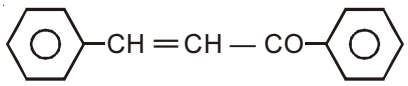
Aromatic aldehyde not give Benedict test.

78. What is the main product obtained by the cross-aldol condensation of benzene carbaldehyde and 1-Phenyl-Ethane - 1-one?

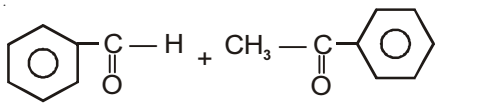
(A) 

(B) 

(C) 

(D) 

Answer (D)

Sol. 

79. The main product of which of the following reactions gives tertiary sulphonamide with benzene sulphonyl chloride?

(A) $C_6H_5Cl + 2NH_3 \xrightarrow[\substack{473k \\ 60bar}]{[Cu_2O]}$

(B) $CH_3CH_2NO_2 \xrightarrow{LiAlH_4}$

(C) $CH_3CH_2NC \xrightarrow{LiAlH_4}$

(D) $CH_3CONH_2 \xrightarrow[\Delta]{Br_2/NaOH}$

Answer (C)

Sol. $CH_3 - CH_2 - NC \xrightarrow{LiAlH_4} CH_3 - CH_2 - \underset{\underset{H}{|}}{N} - CH_3$

80. Which order is improper for amine compounds?

(A) Order of basicity in aq. medium:

$CH_3 - NH - CH_3 > CH_3NH_2 > CH_3 - \underset{\underset{CH_3}{|}}{N} - CH_3$

(B) Order of boiling point:

$CH_3 - \underset{\underset{CH_3}{|}}{N} - CH_3 > CH_3 - CH_2 - NH - CH_3 > CH_3 - CH_2 - CH_2 - NH_2$

(C) Order of basicity in gaseous state:

$CH_3 - \underset{\underset{CH_3}{|}}{N} - CH_3 > CH_3 - NH - CH_3 > CH_3NH_2$

(D) The order of aqueous solubility:

$CH_3 - \underset{\underset{CH_3}{|}}{N} - CH_3 < CH_3 - CH_2 - NH - CH_3 < CH_3 - CH_2 - CH_2 - NH_2$

Answer (B)

❑ ❑ ❑

Test Date
10-05-2017

Test Booklet Set No.

16

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Answers & Solutions

for

GUJCET-BE - 2017

Important Instructions :

1. The Biology test consists of 40 questions. Each question carries **1** mark. For each correct response, the candidate will get **1** mark. For each incorrect response, ¼ mark will be deducted. The maximum marks are **40**.
2. This Test is of **1 hour** duration.
3. Use **Black Ball Point Pen only** for writing particulars on OMR Answer Sheet and marking answers by darkening the circle '●'.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must handover the Answer Sheet to the Invigilator in the Room / Hall. The candidates are allowed to take away this Test Booklet with them.**
6. Use of White fluid for correction is not permissible on the Answer Sheet.
7. Each candidate must show on demand his / her Admission Card to the Invigilator.
8. No candidate, without special permission of the Superintendent or Invigilator, should leave his / her seat.
9. Use of Manual Calculator is permissible.
10. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
11. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
12. The candidates will write the Correct Test Booklet Set No. as given in the Test Booklet / Answer Sheet in the Attendance Sheet. (Patrak - 01)

BIOLOGY

1. **Assertion A :** In Bt cotton *B. thuringiensis* produces a toxic insecticidal crystalline protein which destroys bollworms.

   Reason R : *B. thuringiensis* produces this toxic protein in an inactive form, but when an insect ingests this inactive protein, it is converted into active form of toxin due to the alkaline pH of gut which solubilises the crystals, which is responsible for the death of bollworm.

   (A) A is correct and R is wrong

   (B) A is wrong and R is correct

   (C) A and R both are correct but R is not the explanation of A

   (D) A and R both are correct and R is the correct explanation of A

Answer (B)

Sol. Specific Bt toxin gene are isolated from *B. thuringiensis* and incorporated in plants.

2. How many number of barr body will be present in female suffering from Turner's syndrome?

   (A) Zero

   (B) One

   (C) Two

   (D) Three

Answer (A)

Sol. • Turner's syndrome = 44 A + XO.

• Number of barr bodies

= number of X chromosomes(nx) – 1.

= 1 – 1

= 0 (Zero)

3. What does 'R' indicate in EcoRI?

   (A) Enzyme isolated from species of bacteria

   (B) Genus of bacteria

   (C) Sequence of enzyme

   (D) Species of bacteria

Answer (*)

Sol. Indicate strain-R-13 of *E.coli* bacteria.

4. Which is the motile zoospore of *Chlamydomonas* in the given figure?

(A) 

(B) 

(C) 

(D) 

Answer (C)

Sol. Zoospores of *Chlamydomonas* are biflagellated, haploid and asexual spores.

5. Which is the correct order for the development of embryo sac?

   (A) Megaspore → Megaspore mother cell → Embryo sac

   (B) Megaspore → Embryo sac → Megasporangium

   (C) Megaspore mother cell → Embryo sac → Megaspores

   (D) Megaspore mother cell → Megaspore → Embryo sac

Answer (D)

Sol. $\underset{(2n)}{\text{MMC}} \xrightarrow{\text{Meiosis}} \underset{(n)}{\text{Megaspore}} \longrightarrow \underset{(n)}{\text{Embryo sac / female gametophyte}}$

6. Which of the following statement is correct for pituitary gland?

   (i) Melenocyte stimulating hormone secretes from intermediate lobe of pituitary gland

   (ii) The pituitary gland is located below the hypothalamus

   (iii) Oxytocin produces from posterior lobe of pituitary gland

   (iv) Somatotropic hormone secretes from intermediate lobe of pituitary gland.

   (A) (i), (ii), (iii) (B) (i), (iv), (iii)

   (C) (i), (ii), (iv) (D) (i), (ii), (iii), (iv)

Answer (A)

Sol. Posterior pituitary secretes oxytocin and vasopressin melanocyte stimulating from intermediate pituitary somatotropic hormone from anterior lobe of pituitary.

7. Which is not the symptom of Cushing's syndrome, out of the following?
   (A) Increased blood sugar level
   (B) Decrease in weight
   (C) Rise in blood pressure
   (D) Rise in blood volume

Answer (B)

Sol. It occurs due to hypersecretion of adrenal hormone.

8. Which of the following sentence is correct for cranial nerve?
   (A) It is only connected with parasympathetic path
   (B) It is associated with sympathetic pathway
   (C) Originates from spinal cord
   (D) It transports both motor and sensory impulses

Answer (A)

Sol. Parasympathetic path is craniosaccral in origin.

9. The person is suffering from which disease having the symptoms like aging and tremor?
   (A) Sciatica (B) Diabetes
   (C) Parkinson's (D) Multiple sclerosis

Answer (C)

Sol. Parkinson is due to deficiency of dopamine. Sciatica is due to compression of spinal nerve root and pain radiates from back, hip to outer side of legs.

10. Match the column-I and II, choose the correct option.

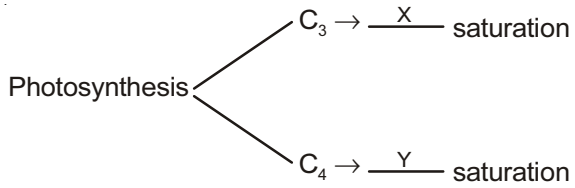
	Column I		Column II
P.	Silicon	(i)	In structure of coenzymes
Q.	Nickel	(ii)	Required for nitrogen fixation in leguminous plants
R.	Sulphur	(iii)	As a component of cell walls
S.	Cobalt	(iv)	Required for iron absorption

   (A) P(iii), Q(iv), R(ii) S(i)
   (B) P(ii), Q(iv), R(ii) S(i)
   (C) P(iii), Q(iv), R(i) S(ii)
   (D) P(ii), Q(iii), R(i) S(iv)

Answer (C)

Sol. Factual

11. CO_2 concentration factor affecting photosynthesis process, which statement is **correct** for C_3 and C_4 plant?



   (A) X = 450 ML^{-1}, Y = 350 ML^{-1}
   (B) X = 360 ML^{-1}, Y = 350 ML^{-1}
   (C) X = 450 ML^{-1}, Y = 360 ML^{-1}
   (D) X = 350 ML^{-1}, Y = 450 ML^{-1}

Answer (C)

Sol. Factual

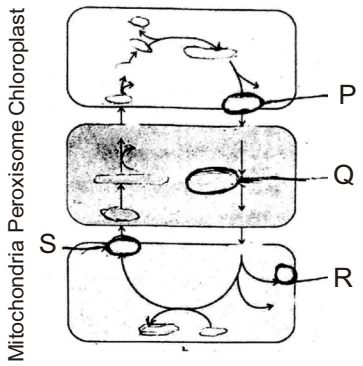
12. If 4 molecules of glucose are synthesized during photosynthesis, how many ATP molecules are released and how many molecules of ATP are utilized respectively?
   (A) 8 ATP, 72 ATP
   (B) 2 ATP, 18 ATP
   (C) 8 ATP, 36 ATP
   (D) 4 ATP, 36 ATP

Answer (A)

Sol. Number of ATP molecules released = 2 × 4 = 8

Number of ATP molecules utilised = 18 × 4 = 72

13. In the given figure, what are the substances labelled as P, Q, R and S?



   (A) P-PGA, Q-Glyoxylate, R-NH_3, S-Serine
   (B) P-Glycolate, Q-Glyoxylate, R-NH_3, S-Serine
   (C) P-Glycolate, Q-Glycerate, R-CO_2, S-Serine
   (D) P-RuBP, Q-Glycerate, R-CO_2, S-Serine

Answer (B)

Sol. C_2 Cycle / Photorespiration

14. How many ATP molecules are synthesized in complete aerobic respiration of dipeptide molecule during Amphibolic pathway?

(A) 30 ATP

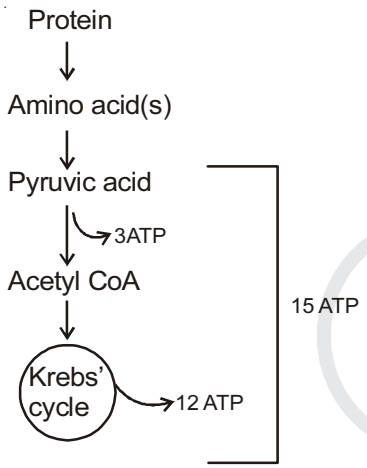
(B) 60 ATP

(C) 15 ATP

(D) 36 ATP

Answer (A)

Sol.



Oxidation of 1 amino acid leads to synthesis of 15 ATP molecules, so oxidation of dipeptide protein leads to synthesis of 30 ATP molecules.

15. What is the end product of Glycolysis process?

(A) CH_3CH_2OH

(B) $CH_3CO{\cdot}COOH$

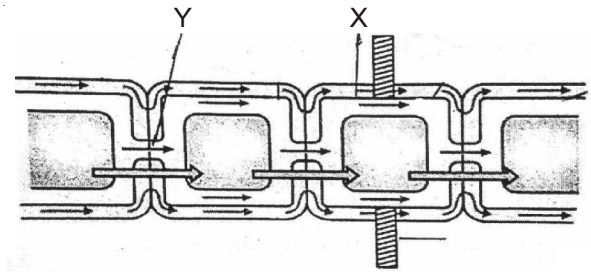
(C) $CH_3HCOH–COOH$

(D) CH_3CH_2COOH

Answer (B)

Sol. End product of glycolysis is pyruvate / pyruvic acid ($CH_3COCOOH$).

16. What indicate X, Y in the given diagram?



(A) X-Cell surface membrane Y-Plasmodesma

(B) X-Plasmodesma Y-Tonoplast

(C) X-Cell surface membrane Y-Cytoplasm

(D) X-Plasmodesma Y-Cell surface membrane

Answer (A)

Sol. Symplastic water movement.

17. In a garden, the gardner cut the apical bud of *Lawsonia* (Mehandi) because _____

(A) The length should be limited in *Lawsonia*

(B) Due to the cutting of apical bud the effect of Auxins decreases and lateral bud grows and forms dense appearance that is why it can give a definite shape

(C) Other apical bud grows quickly due to cut of apical bud

(D) Due to the cutting of apical bud effect of Ethylene decreases and plant grows rapidly

Answer (B)

Sol. Lateral dominance.

18. When spermatogonia accumulates large amount of nutrient and chromatin material and increase in size, now it is known as _____.

(A) Spermatids

(B) Spermatogonium

(C) Sperm

(D) Primary spermatocytes

Answer (D)

Sol. Primary spermatocyte form spermatogonia by increasing theri size due to synthesising new protoplasm.

19. Alkaptonuria (aa) is which type of error?

(A) Lethal mutation

(B) Metabolism error

(C) Error in number of chromosome

(D) Induced error

Answer (B)

Sol. Alkaptonuria is an autosomal recessive genetic disorder as well as a metabolic error.

20. Due to _____ therapy changes would be heritable.

(A) Magnetic therapy

(B) Somatic cell gene therapy

(C) Germ line gene therapy

(D) Chemotherapy

Answer (C)

Sol. Only change in genetic composition or gene structure is heritable.

21. Human insulin contains how many amino acids on B chain?

(A) 51 (B) 21

(C) 30 (D) 31

Answer (C)

Sol. Human insulin consist of two polypeptide chain which are linked together by disulphide bonds. Total 51 amino acid present in two polypetide, out of which chain (polypeptide) A contains 21 amino acid and B contains 30 amino acid.

22. Statement-A : A plant *Pentadiplandra brazzeana* produces a protein called brazzein.

Statement-B : This protein is a low caloric sweetner, i.e. it is used in the treatment of diabetes.

(A) A and B both are correct but B is not the explanation of A

(B) A and B both are correct B is the correct explanation of A

(C) A is correct and B is wrong

(D) A is wrong and B is correct

Answer (A)

Sol. Factual

23. Out of the following which is reabsorbed in selective reabsorption?

(A) Urea (B) Creatine

(C) Uric acid (D) Amino acid

Answer (D)

Sol. During selective reabsorption, high throsold substance likes amino acid, glucose etc. are 100% reabsorbed from PCT.

24. Frog excretes _____ whereas tadpole excretes _____.

(A) Ammonia, Urea (B) Urea, Ammonia

(C) Urea, Uric acid (D) Uric acid, Ammonia

Answer (B)

Sol. Frog is uricotelic so it excretes uric acid but tadpole is ammonotelic so it excretes ammonia. During metamorphosis of tadpole this type of change occurs. Also tadpole is aquatic but frog is terestrial in habit.

25. The functional unit of myofibril is made up of

(A) Complete A-band

(B) Complete I-band

(C) Complete I-band and two half A-band

(D) Complete A-band and two half I-band

Answer (D)

Sol. Functional unit of myofibril or muscle constriction is called sarcomere. One sarcomere consist of on complete A-band and two half I-band.

26. Which of the following paired bone is present in the skull?

(A) Frontal bones (B) Parital bones

(C) Occipital bone (D) Sphenoid bone

Answer (B)

Sol. Skull consis of 8 cranial 14 facial, 1-hyoid and 6 ear ossicle. In 8 cranial bone $\rightarrow$ Frontal – 1, Parital – 2, Temporal – 2, Occipital – 1, Sphenoid – 1 and Ethmoid – 1

27. In hydroseric succession, which stage comes just before sedge medow stage?

(A) Rooted submerged stage

(B) Phytoplankton stage

(C) Reed swamp stage

(D) Climax stage

Answer (C)

Sol. Reed swamp stage.

28. The energy which is present in the biomass of plant is known as _____.

(A) Gross primary productivity

(B) Net productivity

(C) Secondary productivity

(D) Net primary productivity

Answer (D)

Sol. Factual

NPP = GPP – Respiratory loss.

29. Match the column-I and II choose the correct option

Column - I	Column - II
(a) Kaziranga National Park	(i) Uttar Pradesh (Uttarakhand)
(b) Tandoba National Park	(ii) Gujarat
(c) Corbett National Park	(iii) Maharashtra
(d) Gir National Park	(iv) Assam

(A) (a - iv) (b - iii) (c - i) (d - ii)

(B) (a - i) (b - ii) (c - iv) (d - iii)

(C) (a - iv) (b - iii) (c - ii) (d - i)

(D) (a - iv) (b - i) (c - iii) (d - ii)

Answer (A)

Sol. Factual

30. What is searched from the patient's blood in ELISA method for the detection of AIDS?

(A) Antigen (B) Antibody

(C) No. of WBC (D) No. of RBC

Answer (B)

Sol. ELISA is based on antigen-antibody reaction. The indirect ELISA is a test for the presence of antibody. In this known antigen is adsorbed to the inside of the well in a microtiter plate then the sample suspected of containing the antibody is added. Development of colour due to antigen antibody reaction indicates the presence of the antibody.

31. What is intrinstic factor-X-activator complex?

(A) XII + FSF + Glycolipid + Ca^{2+}

(B) IX + AHF + Glycolipid + Ca^{2+}

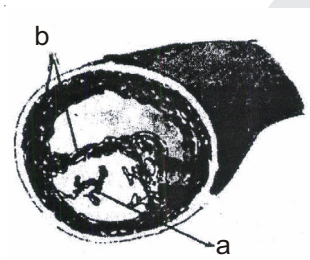
(C) XII + FSF + Phospholipid + Ca^{2+}

(D) IX + AHG + Phospholipid + Ca^{2+}

Answer (D)

Sol. The activation of blood coagulation factor X by factor IX and non enzymatic cofactor. Phospholipid and Ca^{2+}

32. Mention the names of a and b in the given figure.



(A) Cholesterol crystals, smooth muscle cells

(B) Fat, smooth muscle cells

(C) Lumen of vessel, ulcer

(D) Endothelium, fat

Answer (A)

Sol. Factual

33. CO_2, pH and O_2 levels in the blood is detected by which receptors?

(A) Baro receptors

(B) Chemo receptors

(C) Sensory receptors

(D) Baro receptors & Chemo receptors

Answer (B)

Sol. Chemoreceptors present in carotid body, venacava and aortic sinus and responsible for receiving change in chemical composition of blood.

34. Which structure gives us ability to speech?

(A) Epiglottis (B) Vocal cord

(C) Larynx (D) Trachea

Answer (B)

Sol. Vocal cord generate sound during expiration.

35. The largest salivary gland present in human _____.

(A) Submandibular gland (B) Sublingual gland

(C) Parotid gland (D) Gastric gland

Answer (C)

Sol. Parotid gland is a largest salivary gland in human.

36. Match the Column-I and II choose the correct option.

Column - I	Column - II
(a) Secretin	(i) Stimulates gastric gland to release gastric juice
(b) Cholecystokinin	(ii) Stimulates gall bladder to release bile juice
(c) Gastrin	(iii) With coeffect of pancreozymin stimulates secretion of pancreatic juice and intestinal juice
(d) Enterogastrone	(iv) Inhibits gastric juice secretion and stops stomach churning

(A) (a - iii) (b - ii) (c - iv) (d - i)

(B) (a - iii) (b - iv) (c - i) (d - ii)

(C) (a - iii) (b - ii) (c - i) (d - iv)

(D) (a - i) (b - iii) (c - ii) (d - iv)

Answer (C)

Sol. Secretin stimulate pancrease for secretion of more pancreatic juice.

Cholecystokinine - Acts on gall bladder and increase contraction in it.

Gastrin - Secreted from stomach and increase secretion of gastric juice.

Enterogastrone - Inhibit gastric juice secretion.

37. Blood stained clothing of Abraham Lincoln has been analysed for evidence of which genetic disorder?

(A) Marfan's syndrome

(B) Diabetes

(C) Alzheimer's disease

(D) Cardiovascular disease

Answer (A)

Sol. Marfan's syndrome is a genetic disorder of the connective tissue.

38. Which is the correct sequence of ancestors in the path of primates evolution?

(A) Crossopterygian → Cotylosaur → Therapsid → Labyrinthodont → Insectivors → Primates

(B) Labyrinthodont → Cotylosaur → Therapsid → Crossopterygian → Insectivors → Primates

(C) Crossopterygian → Labyrinthodont → Cotylosaur → Therapsid → Insectivors → Primates

(D) Crossopterygian → Therapsid → Cotylosaur → Labyrinthodont → Insectivors → Primates

Answer (C)

Sol. Factual

39. The human genome contains __**a**__ billion nucleotide bases. The average gene consists of __**b**__ bases. Which option is correct for a & b?

(A) a = 3, b = 3000

(B) a = 5, b = 3000

(C) a = 3, b = 2000

(D) a = 4, b = 3000

Answer (A)

Sol. Factual

40. In some viruses the flow of genetic information is in reverse direction. It was brought to light by _____

(A) F.H.C. Crick

(B) H.M. Temin and D. Baltimore

(C) Avery, McCarty and Macleod

(D) Erwin Chargaff

Answer (B)

Sol. $\text{DNA} \underset{\text{Transcription}}{\overset{\text{Reverse transcription (Teminism)}}{\rightleftharpoons}} \text{RNA} \xrightarrow{\text{Translation}} \text{Protein}$

❑ ❑ ❑

DATE : 10/05/2017

Test Booklet Set No.

12

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Mathematics

for

GUJCET-ME - 2017

Important Instructions :

1. The Mathematics test consists of 40 questions. Each question carries **1** mark. For each correct response, the candidate will get **1** mark. For each incorrect response, ¼ mark will be deducted. The maximum marks are **40**.
2. This Test is of **1 hour** duration.
3. Use **Black Ball Point Pen only** for writing particulars on OMR Answer Sheet and marking answers by darkening the circle '●'.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must handover the Answer Sheet to the Invigilator in the Room / Hall. The candidates are allowed to take away this Test Booklet with them.**
6. Use of White fluid for correction is not permissible on the Answer Sheet.
7. Each candidate must show on demand his / her Admission Card to the Invigilator.
8. No candidate, without special permission of the Superintendent or Invigilator, should leave his / her seat.
9. Use of Manual Calculator is permissible.
10. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
11. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
12. The candidates will write the Correct Test Booklet Set No. as given in the Test Booklet / Answer Sheet in the Attendance Sheet. (Patrak - 01)

MATHEMATICS

1. If the length of the subnormal of a curve is constant and if it passes through the origin, then the equation of curve is _____.

(A) $x^2 + y^2 = k^2;\ k \in R$ (B) $y^2 = kx;\ k \in R$

(C) $x^2 = ky^2;\ k \in R$ (D) $x^2 - y^2 = k^2;\ k \in R$

Answer (B)

Sol. $y\dfrac{dy}{dx} = k_1$

$\Rightarrow \int y\,dy = \int k_1 dx$

$\Rightarrow \dfrac{y^2}{2} = k_1 x + c$

at x = 0, y = 0

$\therefore y^2 = 2k_1 x$

$y^2 = kx,\ k \in R$

2. The integrating factor of the differential equation $\dfrac{dy}{dx} = \dfrac{1}{x+y+2}$ is

(A) e^{x+y+2} (B) e^y

(C) e^{-y} (D) $\log|x+y+2|$

Answer (C)

Sol. $\dfrac{dx}{dy} = x + y + 2$

$\dfrac{dx}{dy} - x = y + 2$

$I.F = e^{\int -dy} = e^{-y}$

3. If $\bar{a} + \bar{b} + \bar{c} = \bar{0}$ and $|\bar{a}| = 3, |\bar{b}| = 5, |\bar{c}| = 7$ and $(\widehat{\bar{a}, \bar{b}}) = \alpha$, then α = _____.

(A) $\dfrac{2\pi}{3}$ (B) $\dfrac{\pi}{6}$

(C) $\dfrac{\pi}{3}$ (D) $\dfrac{5\pi}{6}$

Answer (C)

Sol. $|a+b|^2 = |c|^2$

$|\vec{a}| + |\vec{b}| + 2\vec{a}\cdot\vec{b} = |c|^2$

$\cos\alpha = \dfrac{1}{2}$

$\alpha = \dfrac{\pi}{3}$

4. For $A(1, -2, 4)$, $B(5, -1, 7)$, $C(3, 6, -2)$, $D(4, 5, -1)$, the projection of $\overrightarrow{AB}$ on $\overrightarrow{CD}$ is _____.

(A) $(2\sqrt{3}, -2\sqrt{3}, 2\sqrt{3})$ (B) $\dfrac{3}{13}(4, 1, 3)$

(C) (1, –1, 1) (D) (2, –2, 2)

Answer (D)

Sol. $\overrightarrow{AB} = (4, 1, 3)$

$\overrightarrow{CD} = (1, -1, 1)$

Now projection of $\overrightarrow{AB}$ on $\overrightarrow{CD}$ =

$\left(\dfrac{\overrightarrow{AB}\cdot\overrightarrow{CD}}{|CD|}\right)\cdot\widehat{CD}$

$= \left(\dfrac{4-1+3}{\sqrt{3}}\right)\cdot\dfrac{(1,-1,1)}{\sqrt{3}}$

= (2, –2, 2)

5. The position vector of point A is (4, 2, –3). If p_1 is perpendicular distance of A from XY-plane and p_2 is perpendicular distance from Y-axis, then $p_1 + p_2$ = _____.

(A) 8

(B) 3

(C) 2

(D) 7

Answer (A)

Sol. $p_1 = |z|$

$p_2 = \sqrt{x_1^2 + y_1^2}$

$p_1 + p_2 = 5 + 3 = 8$

6. Plane $ax + by + cz = 1$ intersect axes in A, B, C respectively. If $G\left(\dfrac{1}{6}, -\dfrac{1}{3}, 1\right)$ is a centroid of ΔABC, then $a + b + 3c$ = _____.

(A) $\dfrac{4}{3}$ (B) 4

(C) 2 (D) $\dfrac{5}{6}$

Answer (C)

Sol. $A\left(\frac{1}{a},0,0\right)$ $B\left(0,\frac{1}{b},0\right)$ $C\left(0,0,\frac{1}{c}\right)$

centroid $\Rightarrow \left(\frac{1}{3a},\frac{1}{3b},\frac{1}{3c}\right)=\left(\frac{1}{6},\frac{-1}{3},1\right)$

$\therefore$ a = 2, b = –1, c = 1/3

$\therefore$ a + b + 3c = 2

Only (C) is correct

7. The direction angles of the line $x = 4z + 3$, $y = 2 - 3z$ are α, β and γ, then $\cos\alpha + \cos\beta + \cos\gamma$ = _____.

(A) $\frac{2}{\sqrt{26}}$ (B) $\frac{8}{\sqrt{26}}$

(C) 1 (D) 2

Answer (A)

Sol. $\frac{x-3}{4}=\frac{y-2}{-3}=\frac{z}{1}$

$\cos\alpha=\frac{4}{\sqrt{26}}$ $\cos\beta=\frac{-3}{\sqrt{26}}$ $\cos\gamma=\frac{1}{\sqrt{26}}$

$\therefore \cos\alpha+\cos\beta+\cos\gamma=\frac{2}{\sqrt{26}}$

8. If the normal of the plane makes an angles $\frac{\pi}{4},\frac{\pi}{4}$ and $\frac{\pi}{2}$ with positive X-axis, Y-axis and Z-axis respectively and the length of the perpendicular line segment from origin to the plane is $\sqrt{2}$, then the equation of the plane is _____.

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

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

Answer (C)

Sol. Dirction ratio of normal to the plane is

$\left(\cos\frac{\pi}{4},\cos\frac{\pi}{4},\cos\frac{\pi}{2}\right)$

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

$\therefore \frac{x}{\sqrt{2}}+\frac{y}{\sqrt{2}}=\sqrt{2}$

x + y = 2

9. If $f:R-\left\{\frac{3}{5}\right\}\to R-\left\{\frac{3}{5}\right\};f(x)=\frac{3x+1}{5x-3}$, then _____.

(A) $f^{-1}(x) = 2f(x)$ (B) $f^{-1}(x) = f(x)$

(C) $f^{-1}(x) = -f(x)$ (D) $f^{-1}(x)$ doesnot exists

Answer (B)

Sol. $f(x)=\frac{3x+1}{5x-3}$

we know that if

$f(x)=\frac{ax+b}{cx+d}$

if a + d = 0

$f(x)=f^{-1}(x)$

10. $f:R\to R, f(x)=3x+2$

$g:R\to R, g(x)=6x+5$

for the given functions $(gof^{-1})(10)$ = _____.

(A) 21 (B) 29

(C) 7 (D) $\frac{8}{3}$

Answer (A)

Sol. $g\left(f^{-1}(x)\right)$

$=g\left(\frac{x-2}{3}\right)$

$=6\left(\frac{x-2}{3}\right)+5$

$=2x+1$, at x = 10

= 21

11. Relation S = {(1, 2), (2, 1), (2, 3)} is defined on the set {1, 2, 3} is _____.

(A) not transitive (B) symmetric

(C) reflexive (D) equivalence

Answer (A)

Sol. As (1,1) is not there,

$\therefore$ it is not transitive

12. $\tan^{-1}(\cot x)+\cot^{-1}(\tan x)=$ ____. $\left(\text{where, } 0 < x < \frac{\pi}{2}\right)$

(A) $\frac{\pi}{2}$ (B) $2x$

(C) $\pi - 2x$ (D) $\pi - x$

Answer (C)

Sol. $\frac{\pi}{2} - \cot^{-1}(\cot x) + \frac{\pi}{2} - \tan^{-1}(\tan x)$

$= \pi - 2x$

13. $\cos\left(2\left(\tan^{-1}\frac{1}{5} + \tan^{-1}5\right)\right) =$ _____.

(A) $\frac{1}{\sqrt{2}}$ (B) 0

(C) 1 (D) –1

Answer (D)

Sol. $\tan^{-1}\frac{1}{5} + \tan^{-1}5 = \frac{\pi}{2}$

$\therefore \cos 2 \times \frac{\pi}{2} = \cos\pi = -1$

14. For ΔABC if $A = \tan^{-1} 2$, $B = \tan^{-1} 3$, then $C =$ _____.

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{3}$ (D) $\frac{5\pi}{6}$

Answer (B)

Sol. $A + B + C = \pi$

$A + B = \frac{3\pi}{4}$

$\therefore C = \frac{\pi}{4}$

15. If the area of the triangle with vertices (2, 5), (7, k) and (3, 1) is 10, then find the value of k.

(A) –5 or 35

(B) 5 or –35

(C) 15 or –5

(D) –5 or –25

Answer (B)

Sol. $10 = \frac{1}{2}\begin{vmatrix} 2 & 5 \\ 7 & k \\ 3 & 1 \\ 2 & 5 \end{vmatrix}$

k = 5 or – 35

16. If $k = p + q + r$, then the value of $\begin{vmatrix} k+r & p & q \\ r & k+p & q \\ r & p & k+q \end{vmatrix}$ is _____.

(A) $2k^2$ (B) $2k^3$

(C) k^3 (D) $3k^2$

Answer (B)

Sol. $C_1 \to C_1 + C_2 + C_3$

and taking common

k + p + q + r

$= 2k\begin{vmatrix} 1 & p & q \\ 1 & k+p & q \\ 1 & p & k+q \end{vmatrix}$

$= R_3 \to R_3 - R_1$

$= R_2 \to R_2 - R_1$

$= 2k\begin{vmatrix} 1 & p & q \\ 0 & k & 0 \\ 0 & 0 & k \end{vmatrix}$

$= 2\ k^3$

17. If maximum and minimum values of $D = \begin{vmatrix} 1 & -\cos\theta & -1 \\ \cos\theta & 1 & -\cos\theta \\ 1 & \cos\theta & 1 \end{vmatrix}$ are p and q respectively, then the value of $2p + 3q$ is _____.

(A) 16 (B) 6

(C) 14 (D) 8

Answer (C)

Sol. $D = 1(1+\cos^2\theta) + \cos\theta(\cos\theta + \cos\theta) - 1(\cos^2\theta - 1)$

$D = 1 + \cos^2\theta + 2\cos^2\theta - \cos^2\theta + 1$

$= 2(1+\cos^2\theta)$

$\therefore$ p = 4, q = 2

$\therefore$ 2p + 3q = 14

18. If $A = \begin{bmatrix} 1 & 4 & 4 \\ 4 & 1 & 4 \\ 4 & 4 & 1 \end{bmatrix}$, then $A^2 - 6A =$ _____.

(A) 27 I_3 (B) 5 I_3

(C) 20 I_3 (D) 30 I_3

Answer (A)

Sol. $\begin{bmatrix} 1 & 4 & 4 \\ 4 & 1 & 4 \\ 4 & 4 & 1 \end{bmatrix} \Rightarrow A^2 - 6A = 27\ I_3$

19. If $[2\ 3\ 4]\begin{bmatrix}1 & x & 3\\ 2 & 4 & 5\\ 3 & 2 & x\end{bmatrix}\begin{bmatrix}x\\ 2\\ 0\end{bmatrix}=0$, then x _____.

(A) $\frac{7}{3}$ (B) $\frac{5}{3}$

(C) $-\frac{5}{3}$ (D) $-\frac{7}{3}$

Answer (C)

Sol. $[20 \quad 20+2x \quad 21+4x]\begin{bmatrix}x\\ 2\\ 0\end{bmatrix}=0$

$\Rightarrow$ $24x + 40 = 0$

$\Rightarrow$ $x=-\frac{5}{3}$

20. $\frac{d}{dx}\left(\sqrt{3}\sin\left(2x+\frac{\pi}{3}\right)+\cos\left(2x+\frac{\pi}{3}\right)\right)=$ _____.

(A) 4 cos2x (B) –4 sin2x

(C) 4 sin2x (D) –4 cos2x

Answer (B)

Sol. $\frac{d}{dx}\left(2\sin\left(2x+\frac{\pi}{3}+\frac{\pi}{6}\right)\right)$

$\frac{d}{dx}\left(2\sin\left(2x+\frac{\pi}{2}\right)\right)$

$\frac{d}{dx}(2\cos 2x)$

$\Rightarrow$ –4sin2x

21. For the curve $f(x) = (x - 5)^2$, applying mean value theorem on [4, 6] the tangent at _____ is parallel to the chord joining $A(4, 1)$, $B(6, 1)$.

(A) (4, 6) (B) $\left(\frac{9}{2}, \frac{1}{4}\right)$

(C) (0, 5) (D) (5, 0)

Answer (D)

Sol. $f'(c)=2(c-5)=\frac{f(6)-f(4)}{6-4}=0$

(using LMVT)

$\therefore$ $c = 5$

$\therefore$ (5, 0)

22. Function $f(x)=\begin{cases}(\log_2 2x)^{\log_x 8}; & x\neq 1\\ (k-1)^3; & x=1\end{cases}$ is continuous at $x = 1$, then $k =$ _____

(A) $e + 1$ (B) $e^{1/3}$

(C) e^3 (D) $e - 1$

Answer (A)

Sol. $f(1^-)=f(1^+)=f(1)$

$\lim_{x\to 1} e^{(\log_2 2x-1)\log_x 8}$

$\lim_{x\to 1} e^{(\log_2 2x-1)\frac{\log_2 8}{\log_2 x}}$

$e^3=(k-1)^3$

$k=e+1$

23. $\int\frac{dx}{\cos x\sqrt{1+\cos 2x+\sin 2x}}=$ _____ $+C;\left(0<x<\frac{\pi}{4}\right)$

(A) $2+\sqrt{\cot x}$ (B) $\sqrt{\tan x+1}$

(C) $\sqrt{2+2\tan x}$ (D) $\sqrt{2+2\cot x}$

Answer (C)

Sol. $\int\frac{\sec^2 x dx}{\sqrt{2+2\tan x}}$

$\tan x = t$

$\sec^2 x dx = dt$

$\therefore$ $\sqrt{2+2\tan x}$ + C

24. If $\int\frac{\sin 2x}{\sin 5x\sin 3x}dx=\frac{1}{3}\log|\sin 3x|-\frac{1}{5}\log|f(x)|+C$, then $f(x) =$ ____.

(A) sin 5x (B) sin 4x

(C) sin 2x (D) sin 6x

Answer (A)

Sol. $\int\frac{\sin(5x-3x)}{\sin 5x\sin 3x}dx$

$\int\frac{\sin 5x\cos 3x-\cos 5x\sin 3x}{\sin 5x\sin 3x}dx$

$\int(\cot 3x-\cot 5x)dx$

$\therefore \frac{1}{3}\log|\sin 3x|-\frac{1}{5}\log|\sin 5x|+C$

$\Sigma P(x_i)=1$

25. The probability distribution of a discrete random variable X is given in the following table :

X = x	0	1	2
P(x)	$4C^3$	$4C - 13C^2$	$7C - 1$

; C > 0 then C = ___.

(A) 2

(B) 1

(C) $\frac{1}{4}$

(D) 1 and $-\frac{1}{4}$

Answer (C)

Sol. $4C^3 + 4C - 13C^2 + 7C - 1 = 1$

$\therefore C = \frac{1}{4}$

26. The probability function of a binomial distribution is $P(x) = \binom{6}{x} p^x q^{6-x}$, x = 0, 1, 2, ..., 6. If 2P(2) = 3P(3), then p = _____.

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

(C) $\frac{1}{2}$ (D) $\frac{1}{5}$

Answer (A)

Sol. $2P(2) = 3P(3)$

$2 \times {}^6C_2 p^2 q^4 = 3 \times {}^6C_3 p^3 q^3$

On solving $p = \frac{1}{3}$

(as $p + q = 1$)

27. The mean and standard deviation of random variable X are 10 and 5 respectively, then $E\left(\frac{X-15}{5}\right)^2$ = _____.

(A) 4 (B) 3

(C) 2 (D) 5

Answer (C)

Sol. $v = 5^2 = 25$

$\therefore E(x)^2 = 25 + 10^2 = 125$

$\therefore E\left(\frac{x^2 + 225 - 30x}{25}\right) = \frac{1}{25}\left(E(x)^2 + 225 - 30E(x)\right)$

= 2

28. The corner points of the feasible region determined by the system of linear constraints are (0, 10), (5, 5), (25, 20) and (0, 30). Let $Z = px + qy$, where $p, q > 0$. Condition on p and q so that the maximum of Z occurs at both the points (25, 20) and (0, 30) is _____.

(A) $5p = 2q$ (B) $2p = 5q$

(C) $p = 2q$ (D) $q = 3p$

Answer (A)

Sol. $25p + 20q = 30q$

$5p = 2q$

29. Two curves $a_i x^2 + b_i y^2 = 1$; i = 1, 2 where, $a_1 \neq a_2$, $b_1 \neq b_2$, $a_1, a_2, b_1, b_2 \neq 0$ may intersect orthogonally if _____.

(A) $a_1 a_2 = b_1 b_2$

(B) $a_1^{-1} - a_2^{-1} = b_1^{-1} - b_2^{-1}$

(C) $a_1^{-1} + a_2^{-1} = b_1^{-1} + b_2^{-1}$

(D) $a_1 b_2 = a_2 b_1$

Answer (B)

Sol. If $a_1 x^2 + b_1 y^2 = 1$ and $a_2 x^2 + b_2 y^2 = 1$ are orthogonal to each other

$\frac{1}{a_1} - \frac{1}{a_2} = \frac{1}{b_1} - \frac{1}{b_2}$

30. The sides of two squares are x and y respectively, such that $y = x + x^2$. The rate of change of area of second square with respect to area of first square is _____.

(A) $x^2 + 3x - 1$ (B) $2x^2 - 3x + 1$

(C) $2x^2 + 3x + 1$ (D) $1 + 2x$

Answer (C)

Sol. $\frac{dA_2}{dA_1} = \frac{2y\frac{dy}{dt}}{2x\frac{dx}{dt}}$

$\frac{y}{x}\frac{dy}{dx}$

$\therefore \frac{y}{x} \times (1 + 2x)$

$2x^2 + 3x + 1$

31. The approximate value of $\sqrt[3]{-0.99}$ is _____.

(A) –0.9967 (B) –0.9976

(C) –1.0033 (D) –1

Answer (A)

Sol. – .9967

32. $\int \frac{dx}{\sqrt{x^{10}-x^2}}$; $x > 1 =$ _____ + C.

(A) $\frac{1}{4}\log\left|\sqrt{x^{10}-x^2}+x^2\right|$ (B) $\frac{1}{2}\log\left|x^{10}-x^2\right|$

(C) $-\frac{1}{4}\sec^{-1}(x^4)$ (D) $\frac{1}{4}\sec^{-1}(x^4)$

Answer (D)

Sol. $\int \frac{4x^3dx}{4x^3 \times x\sqrt{x^8-1}}$

$\int \frac{4x^3dx}{4x^4\sqrt{x^8-1}}$

$\begin{pmatrix} x^4 = t \\ 4x^3dx = dt \end{pmatrix}$

$\int \frac{dt}{4t\sqrt{t^2-1}} = \frac{1}{4}\sec^{-1}(x^4)+C$

33. $\int e^{\sin x}(x\cos x - \sec x\tan x)dx =$ _____ + C;

$0 < x < \frac{\pi}{2}$.

(A) $e^{\sin x}(x - \sec x)$ (B) $e^{\sin x}(\sec x - x)$

(C) $e^{\sin x}x\cos x$ (D) $e^{\sin x}(x + \sec x)$

Answer (A)

Sol.

$\int xe^{\sin x}\cos x - \int e^{\sin x}dx - \left[\left(\sec x \cdot e^{\sin x}\right) - \int e^{\sin x}dx\right]$

$e^{\sin x}(x - \sec x) + C$

34. $\int \sin(11x)\cdot\sin^9 x\,dx =$ _____ + C.

(A) $\frac{\sin(10x)\cdot\sin^{10}x}{10}$ (B) $\frac{\sin^{11}x}{11}$

(C) $\frac{\sin(9x)\cdot\sin^9 x}{9}$ (D) $\frac{\cos(10x)\cdot\cos^{10}x}{10}$

Answer (A)

Sol. $\int \sin(10x+x)\sin^9 x\,dx$

$\int \sin 10x\cos x\sin^9 x\,dx + \int \cos 10x\sin^{10}x\,dx$

$\frac{\sin^{10}x}{10}\sin 10x - \frac{10}{10}\int \sin^{10}x\cos 10x\,dx + \int \cos(10x)\sin^{10}x\,dx$

$\frac{\sin^{10}x}{10}\sin(10x) + c$

35. $\int_{-\log 3}^{\log 3} \cot^{-1}\left(\frac{e^x-1}{e^x+1}\right)dx =$ _____

(A) $\frac{\pi}{2}\log 3$ (B) $\pi\log 3$

(C) 0 (D) $\pi\log 9$

Answer (B)

Sol. $I = \int_{-\log 3}^{\log 3} \cot^{-1}\left(\frac{e^x-1}{e^x+1}\right)dx = \int_{-\log 3}^{\log 3} \cot^{-1}\left(\frac{1-e^x}{1+e^x}\right)dx$

adding

$2I = \pi\int_{-\log 3}^{\log 3} dx$

$I = \pi\log 3$

36. $\int_0^{100\pi} |\cos x|\,dx =$ _____.

(A) 200 (B) 100

(C) 50 (D) 0

Answer (A)

Sol. $200\int_0^{\pi/2}\cos x dx = 200$

37. $\int_0^{\pi/2}(x - [\sin x])\,dx =$ _____.

(where [x] = greatest integer not greater than x).

(A) $\frac{\pi^2}{8} - 2$ (B) $\frac{\pi^2}{4} - 1$

(C) $\frac{\pi^2}{8} - 1$ (D) $\frac{\pi^2}{8}$

Answer (D)

Sol. $\int_0^{\pi/2} x dx$

$\frac{\pi^2}{8}$

38. Area bounded between two latus-rectum of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2} = 1$; $a > b$ is _____.

(where, e is eccentricity of the ellipse)

(A) $2b(be + a\sin^{-1} e)$ (B) $8b(be + a\sin^{-1} e)$

(C) $b(be + a\sin^{-1} e)$ (D) $4b(be + a\sin^{-1} e)$

Answer (A)

Sol. $2b\left(be + a\sin^{-1} e\right)$

39. The area of the region bounded by the curves $f(x) = \sin\pi x$ and X-axis is _____ where $x \in [-1, 2]$.

(A) 8π (B) $\frac{8}{\pi}$

(C) $\frac{6}{\pi}$ (D) 6π

Answer (C)

Sol. $3\int_0^1 \sin(\pi x)\,dx$

$\frac{6}{\pi}$

40. The order and degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + 3\frac{dy}{dx} = \sqrt{x}$; $x > 0$ are _____ respectively.

(A) 2 and 6

(B) 3 and 2

(C) 2 and 3

(D) 2 and degree is undefined

Answer (C)

Sol. order $\Rightarrow$ 2

degree $\Rightarrow$ 3

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