GUJCET 2020 Question Paper

Gujarat Common Entrance Exam (GUJCET)

Date : 24/08/2020

Test Booklet Set No.

09

Gujarat

Questions & Solutions

for

GUJCET 2020 (PCE)

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you open the question booklet.

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 **1/4 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. The Set No. for this Booklet is 09. Make sure that the Set No. Printed on the Answer Sheet is the same as that on this booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidate should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet.
8. Do not write your Seat No. anywhere else, except in the specified space in the Test Booklet/Answer Sheet.
9. Use of White fluid for correction is not permissible on the Answer Sheet.
10. Each candidate must show on demand his/her Admission Card to the Invigilator.
11. No candidate, without special permission of the Superintendent or Invigilator, should leave his/her seat.
12. Use of simple (manual) Calculator is permissible.
13. The candidate should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and must sign the Attendance Sheet (Patrak-01). Cases where a candidate has **not** signed the Attendance Sheet (Patrak-01) will be deemed not to have handed over the Answer Sheet and will be dealt with as an unfair means case.
14. 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.
15. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
16. 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. The distance between two slits is 3 mm & screen is placed at 2 m distance. When blue-green light of wavelength 500 nm is used then distance between two fringes will be?

(A) 0.43 mm (B) 0.33 mm

(C) 0.5 mm (D) 0.4 mm

Answer (B)

Sol. $\text{Distance} = \lambda\frac{D}{d} = \frac{500\times10^{-9}\times2}{3\times10^{-3}}\ \text{m}$

= 0.33 mm

2. For what distance is ray optics a good approximation when the aperture is 4 mm wide & the wavelength is 500 nm?

(A) 32 m (B) 18 m

(C) 8 m (D) 6 m

Answer (A)

Sol. $z_f = \frac{a^2}{\lambda} = \frac{16\times10^{-6}}{500\times10^5} = 32\ \text{m}$

3. Resolving power of microscope is

(A) $\frac{2\lambda}{1.22n\sin\beta}$ (B) $\frac{1.22n}{2\lambda\sin\beta}$

(C) $\frac{1.22n\sin\beta}{2n\lambda}$ (D) $\frac{1.22\lambda}{2n\sin\beta}$

Answer (None of above)

Sol. $\frac{2n\ \sin\beta}{1.22\lambda}$

4. How much is the De-Broglie wavelength for an electron accelerated by an 100 V potential difference?

(A) 123 nm (B) 0.123 nm

(C) 12.3 nm (D) 0.123 cm

Answer (B)

Sol. $d = \frac{12.27}{\sqrt{V}}\ \text{Å}$

5. The threshold frequency of cesium is 5.16×10^{14} Hz. Then its work function is ..... eV.

(A) 2.14 (B) 1.14

(C) 1.12 (D) 4.12

Answer (A)

Sol. $\phi = hf$

6. The nucleus of gold is about ..... times heavier than an α-particle.

(A) 50 (B) 10

(C) 100 (D) 200

Answer (A)

Sol. $\frac{M_{Au}}{M_\alpha} = \frac{197}{4} = 50$

7. The ground state energy of hydrogen atom is –13.6 eV. What is the kinetic energy of electron in this state?

(A) –13.6 eV (B) +13.6 eV

(C) –27.2 eV (D) +27.2 eV

Answer (B)

Sol. |TE| = |KE|

8. The minimum wavelength for Balmer series is .....

(A) $\frac{9}{R}$ (B) $\frac{4}{R}$

(C) $\frac{36}{5R}$ (D) $\frac{R}{4}$

Answer (B)

Sol. $\frac{1}{\gamma} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right) = R\left(\frac{1}{2^2} - \frac{1}{\infty^2}\right)$

9. Calculate the energy equivalent of 1g of substance

(A) 9×10^{13} J (B) 4×10^{12} J

(C) 6×10^{11} J (D) 7×10^{12} J

Answer (A)

Sol. $E = mc^2$

10. In which process neutron is converted into proton?

(A) β^+ decay (B) α - decay

(C) β^- decay (D) γ decay

Answer (C)

Sol. $n \rightarrow p + e^-$

11. The Forbidden gap between conduction band & valance band is maximum for .....

(A) Insulator (B) Metal

(C) Semiconductor (D) Superconductor

Answer (A)

12. The below truth table is for which gate?

Input		Output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(A) AND (B) OR

(C) NOR (D) NAND

Answer (D)

13. For a pure Si crystal has 5×10^{28} atom m^{-3}. It is doped by 1 PPM concentration of pentavalent As. Calculate the number of electron & holes.

(Given that $n_i = 1.5 \times 10^{16}$ m^{-3})

(A) 5.4×10^{9} m^{-3} (B) 4.5×10^{9} m^{-3}

(C) 4.5×10^{-9} m^{-3} (D) 5.4×10^{-9} m^{-3}

Answer (B)

Sol. Each As atom will provide 1 free electron total no. of free electrons

$$n_e = \frac{1}{10^6} \times 5 \times 10^{28} = 5 \times 10^{22}$$

$$n_e n_h = n_i^2$$

$$\Rightarrow n_h = \frac{n_i^2}{n_e}$$

14. In diode, increasing the forward voltage, the thickness of depletion layer .....

(A) Does not change (B) Increases

(C) Decreases (D) Cannot be decided

Answer (C)

15. If charge q is placed on one of the vertex of a cube. Then flux passing through any one surface of cube is .....

(A) $\frac{q}{\varepsilon_0}$ (B) $\frac{q}{6\varepsilon_0}$

(C) $\frac{q}{24\varepsilon_0}$ (D) None of these

Answer (C)

Sol. $\phi_{total} = \frac{Q}{8\varepsilon_0}$

$$\phi_{one\ surface} = \frac{\phi_{total}}{3} = \frac{Q}{24\varepsilon_0}$$

16. Two point electric charges $+10^{-8}$ C and -10^{-8} C are placed 0.1 m apart. Find the magnitude of Total Electric field at the center of the line joining the two charges.

(A) 3.6×10^4 NC^{-1} (B) 7.2×10^4 NC^{-1}

(C) Zero (D) 12.96×10^4 NC^{-1}

Answer (B)

Sol. Both charges will give their respective field in same direction

$$\therefore E = \frac{2kq}{(d/2)^2}$$

$q = 10^{-8} C$

$d = 0.1$ m

17. The charge density of uniformly charged infinite plane is σ. A simple pendulum is suspended vertically downward near it. Charge q_0 is placed on metallic bob. If the angle made by the string is θ with vertical direction then .....

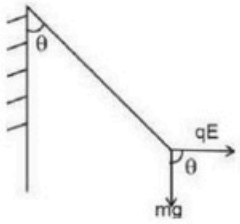
(A) $\sigma \propto \frac{\tan\theta}{q_0}$ (B) $\sigma \propto \frac{\cot\theta}{q_0}$

(C) $\sigma \propto \tan\theta$ (D) $\sigma \propto \frac{q_0}{\tan\theta}$

Answer (A)

Sol. $E = \frac{\sigma}{2\varepsilon_0}$

$$tan\theta = \frac{qE}{mg} = \frac{q\sigma}{2\varepsilon_0 mg}$$



18. The dimensional formula of Polarization P is .....

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

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

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

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

Answer (D)

Sol. Polarization $= \frac{\text{dipole moment}}{\text{volume}}$

$$[P] = \frac{[AT][L]}{L^3}$$

19. If relative permittivity for any substance is 80 then its electric susceptibility is .....

(A) 7×10^{-10} (B) 7×10^{-9}

(C) 79 (D) 81×10^{-10}

Answer (C)

Sol. $\varepsilon_r = 1 + \chi_e \Rightarrow \chi_e = 80 - 1 = 79$

20. 2 μF capacitor is connected with 50 V supply & 3 μF capacitor is connected with 100 V supply. Now after removing battery if two plates of same type of charges are placed to form new capacitor then potential difference is ..... V.

(A) 333 (B) 80

(C) 200 (D) 75

Answer (B)

Sol. $V_C = \frac{C_1V_1+C_2V_2}{C_1+C_2} = \frac{2\times50+3\times100}{2+3} = 80 \text{ volts}$

21. The emf of a car battery is 12 V. If internal resistance of battery is 0.4 Ω, then maximum power drawn from battery is ..... W.

(A) 360

(B) 30

(C) 4.8

(D) Zero

Answer (A)

Sol. $P = \frac{V^2}{r}$

22. The resistance of the platinum wire of a platinum resistance thermometer at an ice point is 5 Ω & at steam point is 5.23 Ω. When the thermometer is inserted in a hot bath, the resistance of a platinum wire is 5.795 Ω. Calculate the temperature of the bath.

(A) 365.65 °C

(B) 354.56 °C

(C) 345.65 °C

(D) 245.65 °C

Answer (C)

Sol. $R = R_0 (H \alpha \Delta T)$

$$t = \frac{Rt-R_0}{R_{100}-R_0} \times 100 = \frac{5.795-5}{5.23-5} \times 100$$

23. One electric cell (having emf of 2V & internal resistance of 0.1Ω) and other electric cell (having emf of 4V & internal resistance of 0.2Ω) are connected in parallel to each other. Then its equivalent emf will be V

(A) 2.57

(B) 2.67

(C) 1.33

(D) 0.38

Answer (B)

Sol. $E_{net} = \frac{\frac{E_1}{r_1}+\frac{E_2}{r_2}}{\frac{1}{r_1}+\frac{1}{r_2}}$

24. The source of magnetic field is ..... & source of electric field is .....

(A) scalar, scalar

(B) vector, vector

(C) scalar, vector

(D) vector, scalar

Answer (D)

25. A coil having 10 Am^2 magnetic moment is placed in a vertical plane & is free to rotate about its horizontal axis coincides with its diameter. A uniform magnetic field of 2T in the horizontal direction exists such that initially the axis of the coil is in the direction of the field. The coil rotates through an angle of 90° under the influence of magnetic field. The moment of inertia of coil is 0.1 kg m^2. What will be its angular speed?

(A) 10 rad/s

(B) 5 rad/s

(C) 20 rad/s

(D) 40 rad/s

Answer (C)

Sol. $\Delta U + \Delta K = 0$

$$\frac{1}{2} I\omega^2 = MB$$

$$\omega = \sqrt{\frac{2MB}{I}}$$

26. 10 A current is passing through a very long wire of radius 5 cm. Then magnetic field at a distance of 2 cm insider from its curved surface is ..... × 10^{-5} T.

(A) 6.7×10^{-5}

(B) 2.4×10^{-5}

(C) 2.4×10^{5}

(D) 2.4

Answer (D)

Sol. $B = \frac{\mu_0}{4\pi}\frac{2I}{R^2}r = \frac{10^{-7}\times 2\times 10}{25\times 10^{-4}} \times 3 \times 10^{-2}$

27. In India, declination at Delhi is .....

(A) 0°41′ W

(B) 0°41′ E

(C) 0°58′ E

(D) 0°58′ W

Answer (B)

28. The relative permeability in a core of a solenoid is 400. The windings of a solenoid are insulated from the core and carry a current of 2 A. If the number of turns is 1000 per meter. Then magnetic intensity inside the core of solenoid is ..... A/m

(A) 2×10^{3}

(B) 2.5×10^{-3}

(C) 2.5×10^{3}

(D) 2×10^{-3}

Answer (A)

Sol. $H = ni = 1000 \times 2$

29. The coil having 1000 turns & Area of 0.10 m^2 rotates at half a revolution per second & it is placed in a uniform magnetic field of 0.01 T perpendicular to the axis of rotation of coil. Then max. emf voltage generated in coil is V

(A) 5.0

(B) 0.5

(C) 3.14

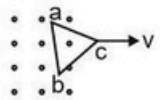
(D) 0.314

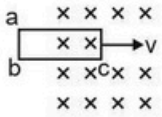
Answer (C)

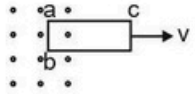
Sol. $E_{max} = NAB\omega$

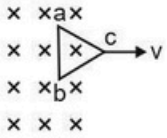
$= 1000 \times 0.01 \times 0.1 \times \pi$

30. Out of the following given loops in which loop, the direction of induced current is from $a \to c \to b$.

(A) 

(B) 

(C) 

(D) 

Answer (D)

Sol. Using Lenz's law, current will be in clockwise direction.

31. Which is not the unit of Inductance?

(A) $V.s.A^{-1}$

(B) WbA^{-1}

(C) H

(D) $Wb.s.A^{-1}$

Answer (D)

Sol. $\phi = Li$

$\therefore$ Unit = $Wb.A^{-1}$

$e = -L\frac{dI}{dt} \Rightarrow$ unit of $L \Rightarrow V.s.A^{-1}$

32. A bulb of 100 W rating is connected with 220 V supply. The resistance of bulb is .....

(A) $484\ \Omega m^{-1}$

(B) $484\ \Omega$

(C) $2.2\ \Omega$

(D) $2.2 \times 10^{-3}\ \Omega\ m^{-1}$

Answer (B)

Sol. $R = \frac{V^2}{P} = \frac{220 \times 220}{100} = 484\ \Omega$

33. A sine voltage having maximum value of 283 V & frequency of 50 Hz is applied to LCR series connection where R = 3 Ω, L = 25.48 mH & C = 796 μF. Then impedance is ..... at resonance condition.

(A) 5 Ω

(B) 15 Ω

(C) 3 Ω

(D) 4 Ω

Answer (A)

Sol. $Z = \sqrt{R^2 + (X_C - X_L)^2}$

$R = 3\ \Omega$

$X_C = \frac{1}{\omega C} = \frac{1}{2\pi fC} = 4\ \Omega$

$X_L = \omega L = 2\pi fL = 8\ \Omega$

34. What is correct for real transformer?

(A) $P_i > P_0$

(B) $P_i < P_0$

(C) $P_i = P_0$

(D) All are correct

Answer (A)

Sol. $n = \frac{P_{out}}{P_{in}} < 1$

35. The source of displacement current is .....

(A) Changing Electric Field

(B) Static Electric Field

(C) Changing Magnetic Field

(D) Static Magnetic Field

Answer (A)

36. The range of wavelength for Ultraviolet is from ..... to .....

(A) 0.1 m to 1 mm

(B) 700 nm to 400 nm

(C) 1mm to 700 nm

(D) 400 nm to 1.0 nm

Answer (D)

37. The earth rotates on its axis takes 24 hours to complete one revolution. How much time it takes at sun from earth to have shift of 1°?

(A) 4 hrs.

(B) 4 min.

(C) 4 sec.

(D) 24 hrs.

Answer (C)

Sol. $\Delta t = \frac{24 \times 60}{360} = 4$ second

38. For glass lens f = +50 cm. Then power of lens is .....

(A) –2 D

(B) +0.02 D

(C) +2 D

(D) –0.02 D

Answer (C)

Sol. $P = \frac{100}{f_{(cm)}} = +2\ D$

39. A lens (n = 1.5) is placed in a liquid. To make it disappear, the value of n of liquid should be .....

(A) $n < 1.5$

(B) $n = 1.5$

(C) $n > 1.5$

(D) Any n

Answer (B)

Sol. Lens should be kept in liquid having same refractive index as that of lens.

40. What is the type of nature of image formed for an object placed an axis of concave mirror between pole & centre?

(A) Virtual, erect & diminished

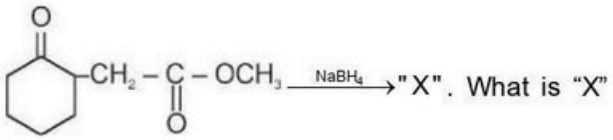
(B) Real, inverted & diminished

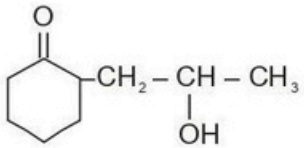
(C) Real, inverted & magnified

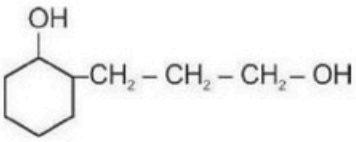
(D) Virtual, erect & magnified

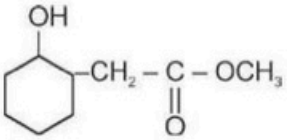
Answer (C, D)

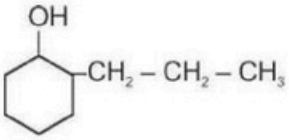
Sol. C & D both possible

41.  "X". What is "X" in the reaction?

(A) 

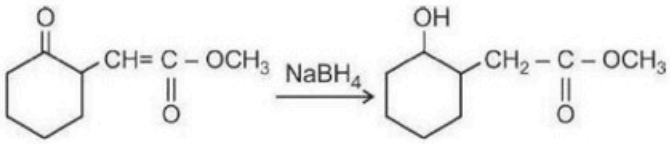
(B) 

(C) 

(D) 

Answer (C)

Sol. As we know $NaBH_4$ is a weak reducing agent and reduce only aldehyde, ketone into alcohol and doesn't reduce carboxylic acid derivative into alcohol except acid halide.



42. Which of the following has highest boiling point?

(A) Ethoxy ethane

(B) n-Butane

(C) Pentanal

(D) Pentan-1-ol

Answer (D)

Sol. N – Butane = –1°C

Pentanal = 103°C

Ethoxy ethane = 34.6°C

Pentanol = 138°C

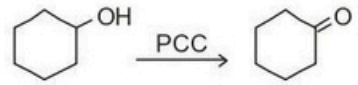
43. Which reagent is required to convert cyclohexanol to cyclohexanone?

(A) O_3 / H_2O – Zn dust (B) PCC

(C) Anhydrous CrO_3 (D) DIBAL - H

Answer (B)

Sol.



Cyclohexanol Cyclohexanone

44. Which of the following acid has highest pKa value?

(A) O_2NCH_2COOH (B) $NCCH_2COOH$

(C) FCH_2COOH (D) $C_6H_5CH_2COOH$

Answer (D)

Sol. Acidic strength $\propto \frac{1}{pKa} \propto$ stability of conjugate base.

$C_5H_5CH_3COOH$ is weakest acid among all so has highest pKa value.

45. $C_6H_5CH_2 - MgBr \xrightarrow[(2)H_3O^+]{(1)CO_2/ether} 'X' \xrightarrow[\Delta]{NaOH+CaO} 'Y'$?

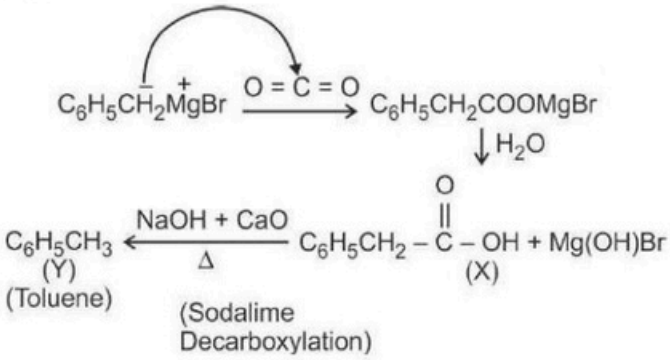
What is the final product in this reaction?

(A) $C_6H_5CH_2CH_3$ (B) $C_6H_5CH_3$

(C) C_6H_6 (D) $C_6H_5CH_2OH$

Answer (B)

Sol.



46. Which of the following compound has least Basic strength?

(A) $C_6H_5NH_2$

(B) NH_3

(C) $(C_2H_5)_2NH$

(D) $C_2H_5NH_2$

Answer (A)

Sol. Basic strength $\propto$ Lone pair Availability. In Aniline ($C_6H_5NH_2$) as the lone pair is in conjugation so it is least basic among all given.

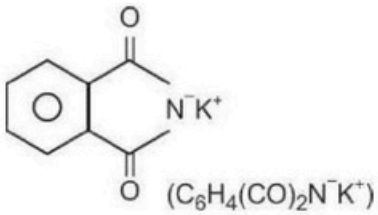
47. The source of nitrogen in Gabriel synthesis of amines is .....

(A) NaN_3 (B) KCN

(C) $C_6H_4(CO)_2N^-K^+$ (D) $NaNO_2$

Answer (C)

Sol.



$(C_6H_4(CO)_2N^-K^+)$

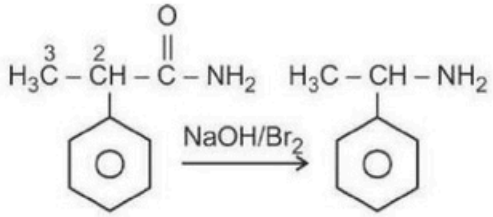
48. The best reagent for converting 2-phenyl propanamide into 1-Phenyl ethanamine is ....

(A) $NaBH_4$ (B) H_2/Pt

(C) $LiAlH_4$ (D) $NaOH/Br_2$

Answer (D)

Sol.



(2-Phenyl Proponamide) (1-Phenyl Ethanamine)

49. Giving 'T' Symbol for true statement and 'F' symbol for false statement, select correct option.

(i) Most naturally occurring amino acids have L-configuration

(ii) β-D ribose sugar is present in RNA

(iii) Amylose is water insoluble component made up of α-D-(+) glucose units

(iv) All monosaccharides are non-reducing sugars.

(A) TTFF (B) TFTF

(C) TTFT (D) FTTF

Answer (A)

Sol. Fact

50. Which amino acids are used in the preparation of Nylon-2-Nyon 6?

(A) Phenol and Formaldehyde

(B) Phthalic acid and glycine

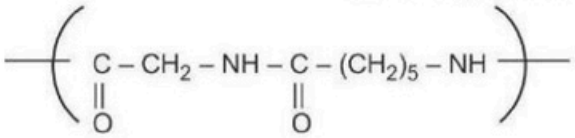
(C) Amino Caproic acid and glycine

(D) Ethylene glycol and Phthalic acid

Answer (C)

Sol. $nH_2N\text{-}CH_2\text{-}COOH + nNH_2\text{-}(CH_2)_5 - COOH$

Glycine Amino Caproic Acid



51. Zeiglar Natta catalyst is a mixture of.....

(A) $TiCl_4$ & $(C_2H_5)_2Al$ (B) $TiCl_2$ & $(C_2H_5)_3Al$

(C) $TiCl_3$ & $(C_2H_5)_4Al$ (D) $(C_2H_5)_3Al$ & $TiCl_4$

Answer (D)

Sol. Zeigler Natta catalyst = Al $(C_2H_5)_3$ & $TiCl_4$

52. Which antihistamine drug is used to prevent acidity?

(A) Phenelzine (B) Cimetidine

(C) Morphine (D) Equanil

Answer (B)

Sol. Fact

53. Name the sweetner which is a trichloro derivative of Sucrose?

(A) Sucralose (B) Saccharin

(C) Alitame (D) Aspartame

Answer (A)

Sol. Sucralose is a trichloro derivative of sucrose.

54. The deficiency of which vitamin causes scurvy?

(A) Riboflavin

(B) Thiamine

(C) Ascorbic acid

(D) Pyriodoxine

Answer (C)

Sol. The deficiency of Ascorbic acid (Vitamin C) causes scurvy.

55. Which of the following statement is correct?

(A) Amorphous solids are anisotropic in nature

(B) Silicon doped with Arsenic impurity is a p-type semiconductor

(C) In the unit cell of rhombic Sulphur, the axial distance are equal and the value of each axial angle is 90°

(D) In MnO, all the domains are aligned in the same direction

Answer (None is correct)

Sol. Fact

56. What are the fractions of Fe^{2+} and Fe^{3+} in $Fe_{0.93}O$ respectively?

(A) 0.85, 0.15

(B) 0.93, 0.07

(C) 0.75, 0.25

(D) 0.80, 0.20

Answer (A)

Sol. Let $Fe^{2+} = x$ & $Fe^{3+} = (0.93-x)$

By charge conservation,

$+2(x) + 3(0.93-x) - 2(1) = 0$

$2x + 2.79 - 3x - 2 = 0$

$-x + 0.79 = 0 \Rightarrow x = 0.79$

$$\text{Fraction of } Fe^{2+} = \frac{0.79}{0.93} = 0.85$$

Fraction of $Fe^{3+} = (1-0.85) = 0.15$

57. Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon .....

(i) Temperature

(ii) Nature of Solute

(iii) Pressure

(iv) Nature of Solvent

(A) (ii)

(B) (i) & (iii)

(C) (ii) & (iv)

(D) (iii)

Answer (D)

Sol. As the solute is solid so solubility does not depend on pressure in this case.

58. The molality of aqueous solution of any solute having mole fraction 0.25 is .....

(A) 16.67 m (B) 18.52 m

(C) 33.33 m (D) 9.26 m

Answer (B)

Sol. $n_{solute} = 0.25$; $nH_2O = 0.75$

Mass of $H_2O = 0.75 \times 18 = 13.5g$

$$\text{Molality} = \frac{n_{solute}}{\text{mass of } H_2O(kg)}$$

$$= \frac{0.25}{13.5} \times 1000 = 18.51m$$

59. The osmotic pressure of 0.5 M aqueous solution of CH_3COOH having 2pH at temperature T is .....

(A) 1.02 RT (B) 0.051 RT

(C) 0.51 RT (D) 0.102 RT

Answer (C)

Sol. $CH_3COOH \rightleftharpoons CH_3COO(ag) + H^+$

$t = 0$, 0.5 M

$0.5(1-\alpha)$ 0.5α 0.5α

$$i = \frac{0.5(1-\alpha)+0.5\alpha+0.5\alpha}{0.5}$$

$i = (1+\alpha)$

$pH = 2 \Rightarrow 0.5\alpha = 10^{-2}$

$$\alpha = \frac{0.01}{0.5} = 0.02$$

$\pi = icRT$

$\pi = (1.02)(0.5)RT$

$\pi = 0.51\ RT$

60. On the basis of the given following electrode potential, which one is the strongest reducing agent?

$E^\circ_{Cr_2O_7^{2-}|Cr^{3+}} = 1.33\ V$

$E^\circ_{MnO_4^-|Mn^{2+}} = 1.51V$

$E^\circ_{Br_2|Br^-} = 1.09\ V$

$E^\circ_{Zn^{2+}|Zn} = -0.76\,V$

(A) Mn^{2+} (B) Cr^{3+}

(C) Br^- (D) Zn

Answer (D)

Sol. Reducing power $\propto$ SOP value $\propto \frac{1}{\text{SRP Value}}$

61. For which of the following electrolytes the graph of Λ_m against $\sqrt{C}$ gives negative slope.
    (A) Sodium acetate
    (B) Acetic acid
    (C) Ammonium hydroxide
    (D) Water

Answer (A)

Sol. λ_m v/s $\sqrt{c}$ is a straight line with negative slope for strong electrolyte sodium Acetate.

62. One electrolysis of aqueous solution of a halide of a metal 'M' by passing 1.5 ampere current for 10 minutes deposits 0.2938 g of metal. If the atomic mass of the metal is 63 gm/mole, then what will be the formula of the metal halide?
    (A) MCl_3 (B) MCl_2
    (C) MCl (D) MCl_4

Answer (B)

Sol. From Faraday's 1st Law of electrolysis, m = Zit.

$$0.2938 = \frac{63}{n \times 96500} \times 1.5 \times 10 \times 60$$

$$n = \frac{63 \times 1.5 \times 600}{96500 \times 0.2938}$$

$n = 2$

$\therefore$ Formula = MCl_2

63. In the presence of a catalyst, the heat evolved or absorbed during the reaction .....
    (A) Increases
    (B) Decreases
    (C) May decrease or increases
    (D) Remains unchanged

Answer (D)

Sol. Remains unchanged

64. Which of the following graph has intercept equal to zero?
    (A) $\log\frac{[R]_0}{[R]} \rightarrow t$ (B) $\log[R] \rightarrow t$
    (C) $\log K \rightarrow \frac{1}{T}$ (D) $[R] \rightarrow t$

Answer (A)

Sol. From the integrated Rate equation.

65. Time required to decompose SO_2Cl_2 to half of its initial amount is 40 minutes. If the decomposition is a first order reaction, what will be the rate constant of the reaction?
    (A) $2.88 \times 10^{-2}\ s^{-1}$ (B) $1.73 \times 10^{-2}\ s^{-1}$
    (C) $2.88 \times 10^{-4}\ s^{-1}$ (D) $1.73 \times 10^{-4}\ s^{-1}$

Answer (C)

Sol. For 1st order Reaction,

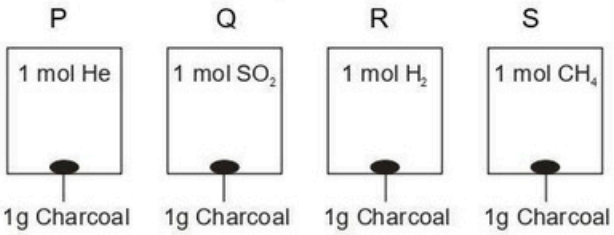
$$K = \frac{\ln 2}{t_{1/2}} = \frac{\ln 2}{40 \times 60} = 2.88 \times 10^{-4}\ s^{-1}$$

66. Which of the following is a reversible sol?
    (A) As_2S_3 sol (B) Gelatin sol
    (C) $Fe(OH)_3$ sol (D) Gold sol

Answer (B)

Sol. Gelatin sol is a reversible sol.

67. From the figure, in which of the following vessel, the pressure of the gas is the highest. [Temperature and volume of the gases are the same in each vessel].



    (A) P (B) Q
    (C) R (D) S

Answer (A)

Sol. As He gas will not adsorbed so the pressure of the gas will be highest in P.

68. Which soluble complex is formed in the leaching process of Gold?
    (A) $[Au(CN)_4]^{2-}$ (B) $[Au(OH)_2]^-$
    (C) $[Au(OH)_4]^{2-}$ (D) $[Au(CN)_2]^-$

Answer (D)

Sol. $[Au(CN)_2]^-$ is formed in the leaching process of Gold.

69. Which of the following slag is formed during the extraction of iron in the blast furnace?
    (A) $FeCO_3$ (B) $CaCO_3$
    (C) $CaSiO_3$ (D) $FeSiO_3$

Answer (C)

Sol. In the extractive metallurgy of Iron,

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

$CaO + SiO_2 \rightarrow CaSiO_3$

(Flux) (Slag)

70. Which of the following is the correct order?

(A) Stability: HI < HBr < HCl < HF

(B) Acidic strength: $HClO_4 < HClO_3 < HClO_2 < HClO$

(C) Ionic character: MF < MCl < MBr < MI

(D) Electron gain enthalpy: I < Br < Cl < F

Answer (A)

Sol. Since order o fBDE $\propto$ stability ....

stability order = HF > HCl > HBr > HI

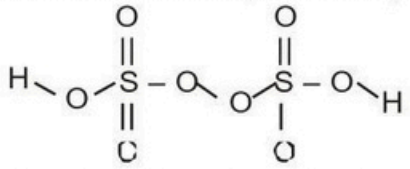
71. In which of the following oxoacid of Sulphur, S-O-O-S bond is present?

(A) $H_2S_2O_8$ (B) $H_2S_2O_7$

(C) $H_2S_2O_4$ (D) $H_2S_2O_3$

Answer (A)

Sol. $H_2S_2O_8$: Marshall's acid or peroxo-disulphuric acid



72. Concentrated HNO_3 oxidise white phosphorus into which substance?

(A) $H_4P_2O_7$ (B) H_3PO_2

(C) H_3PO_4 (D) H_3PO_3

Answer (C)

Sol. $P_4 + 20HNO_3 \rightarrow 4H_3PO_4 + 20NO_2 + 4H_2O$

(Phosphoric acid)

73. The divalent ion of which of the following element in aqueous solution has magnetic moment 5.92 BM?

(A) Cr (B) Co

(C) Fe (D) Mn

Answer (D)

Sol. For Magnetic Moment of 5.92 BM

$\mu = \sqrt{n(n+2)} = 5.92 \Rightarrow n = 5$

Co^{2+} : $[Ar]3d^7 \Rightarrow n=3$

Fe^{2+} : $[Ar]3d^6 \Rightarrow n=4$

Cr^{2+} : $[Ar]3d^4 \Rightarrow n=4$

Mn^{2+} : $[Ar]3d^5 \Rightarrow n = 5$

74. Although Zirconium belongs to 4d-transition series and Hafnium belongs to 5d transition series, even then they show similar physical and chemical properties because .....

(A) Both have same number of electrons

(B) Both belongs to d-block

(C) Both have similar atomic radius

(D) Both belongs to the same group of the periodic table

Answer (C)

Sol. Due to lanthanoid contraction, Zr & Hf shows similar properties and also have similar atomic radius due to which also they show similar Physical and chemical properties.

75. Which isomerism is possible in hexa ammine cobalt (III) hexacyanido chromate (III) complex?

(A) Co-ordination isomerism

(B) Linkage isomerism

(C) Ionistion isomerism

(D) Solvate isomerism

Answer (A)

Sol. Since the complex is $\overset{III}{[Co(NH_3)_6]^{+3}}\overset{III}{[Cr(CN)_6]^{-3}}$

So, co-ordination Isomerisation is possible in the above complex

76. Which of the following complex will absorb maximum wavelength of light?

(A) $[Co(NH_3)_5(H_2O)]^{3+}$ (B) $[CoCl(NH_3)_5]^{2+}$

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

Answer (B)

Sol. CFSE $\propto$ strength of ligand $\propto 1/\lambda$

$\because$ complex $[CoCl(NH_3)_5]^{2+}$ has minimum charge among all the complex so has lower CFSE so will absorb maximum wavelength of light.

77. The complex having highest electrical conductivity in aqueous solution under similar conditions is .....

(A) Triaqua trichlorido cobalt (III)

(B) Penta aqua chlorido cobalt (III) chloride

(C) Tetra aqua dichlorido cobalt (III) chloride

(D) Hexa aqua cobalt (III) chloride

Answer (D)

Sol. Since, electrical conductivity $\propto$ Number of ions produced in aqueous solution

In complex $(Co(H_2O)_6)Cl_3$; the total number of ions produced in aqueous solution is equal to 4.

78. How many optically active isomers are possible in the compound having formula C_4H_9Br?

(A) 2

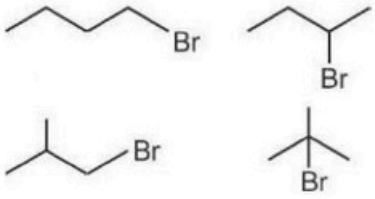
(B) 3

(C) 1

(D) 4

Answer (A)

Sol. In C_4H_9Br, the possible structural isomers are:-



$\therefore$ Two optically active isomers (d + l) of C_4H_9Br are possible.

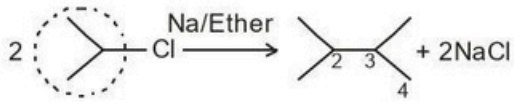
79. R' – Cl $\xrightarrow{Na/ether}$ 2, 3-dimethyl butane. What is R' in the above reaction?

(A) isobutyl (B) isopropyl

(C) sec-butyl (D) n-propyl

Answer (B)

Sol.



80. 1 mole of metal 'M' reacts completely with alcohol to give 1.5 moles of H_2. Then what will be the valency of metal 'M'?

(A) 3 (B) 4

(C) 2 (D) 1

Answer (A)

Sol. $M^n + R\text{-}OH \rightarrow (R\text{-}O)_nM + 1/2H_2(g)$

If 1 mole of metal gives 3/2 moles of H_2 with alcohol that means,

$M \longrightarrow M^{3+} + 3e^-$

$3H^+ + 3e^- \longrightarrow 3/2\ H_2(g)$

❑ ❑ ❑

Date: 24/08/2020

Test Booklet Set No.

12

Gujarat

Questions & Solutions

for

GUJCET 2020 (MATHEMATICS)

INSTRUCTIONS TO CANDIDATES

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 **1/4 mark** will be deducted. The maximum marks are **40**.
2. This test is of 1hour 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. The Set No. for this Booklet is 01. Make sure that the Set No. Printed on the Answer Sheet is the same as that on this booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidate should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet.
8. Do not write your Seat No. anywhere else, except in the specified space in the Test Booklet/Answer Sheet.
9. Use of White fluid for correction is not permissible on the Answer Sheet.
10. Each candidate must show on demand his/her Admission Card to the Invigilator.
11. No candidate, without special permission of the Superintendent or Invigilator, should leave his/her seat.
12. Use of simple (manual) Calculator is permissible.
13. The candidate should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and must sign the Attendance Sheet (Patrak-01). Cases where a candidate has **not** signed the Attendance Sheet (Patrak-01) will be deemed not to have handed over the Answer Sheet and will be dealt with as an unfair means case.
14. 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.
15. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
16. 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 $|\vec{a}|=3$ then value of

$|\vec{a}\times\hat{i}|^2+|\vec{a}\times\hat{j}|^2+|\vec{a}\times k|^2=$ _____.

(A) 9 (B) 18

(C) 27 (D) 36

Answer (B)

Sol. Let $\vec{a}=x\hat{i}+y\hat{j}+z\hat{k}$

Then $|\vec{a}|=x^2+y^2+z^2$

Now, $|\vec{a}\times\hat{i}|^2=y^2+z^2$, $|\vec{a}\times\hat{j}|^2=x^2+z^2$

and $|\vec{a}\times\hat{k}|^2=x^2+y^2$

$\therefore \quad |\vec{a}\times\hat{i}|^2+|\vec{a}\times\hat{j}|^2+|\vec{a}\times\hat{k}|^2=2(x^2+y^2+z^2)$

$=2|\vec{a}|^2=18$

2. The co-ordinates of the foot of perpendicular drawn from origin to the plane $2x-3y+4z-6=0$ is _____

(A) $\left(\frac{12}{29},-\frac{18}{29},\frac{24}{29}\right)$ (B) $\left(\frac{12}{29},-\frac{18}{29},-\frac{24}{29}\right)$

(C) $\left(\frac{12}{29},\frac{18}{29},\frac{24}{29}\right)$ (D) $\left(-\frac{12}{29},-\frac{18}{29},-\frac{24}{29}\right)$

Answer (A)

Sol. Let (x_1, y_1, z_1) be foot of perpendicular from origin to plane $2x - 3y + 4z - 6 = 0$.

$\therefore \quad \frac{x_1-0}{2}=\frac{y_1-0}{-3}=\frac{z_1-0}{4}=-\frac{(-6)}{2^2+3^2+4^2}$

$\therefore \quad \frac{x_1}{2}=\frac{y_1}{-3}=\frac{z_1}{4}=\frac{6}{29}$

$\therefore \quad (x_1,y_1,z_1)=\left(\frac{12}{29},\frac{-18}{29},\frac{24}{29}\right)$

3. The angle between the line $\frac{x+1}{2}=\frac{y}{3}=\frac{z-3}{6}$ and the plane $10x+2y-11z=3$ is _____.

(A) $\cos^{-1}\frac{8}{21}$ (B) $\tan^{-1}\frac{8}{\sqrt{377}}$

(C) $\sin^{-1}\frac{8}{\sqrt{377}}$ (D) $\sin^{-1}\left(\frac{21}{8}\right)$

Answer (B)

Sol. Let angle between line and plane be θ.

Line is $\frac{x+1}{2}=\frac{y-0}{3}=\frac{z-3}{6}$

with direction ratios (2, 3, 6)

And plane is $10x+2y-11z-3=0$ direction ratios of normal to plane is $(10, 2, -11)$

$\therefore \quad \sin\theta=\left|\frac{20+6-66}{\sqrt{4+9+36}\sqrt{100+4+121}}\right|$

$\sin\theta=\left|\frac{-40}{7\times15}\right|$

$\sin\theta=\frac{8}{21}$ or $\tan\theta=\frac{8}{\sqrt{377}}$

$\therefore \quad \theta=\tan^{-1}\left(\frac{8}{\sqrt{377}}\right)$

4. If the points (1, 1, p) and (–3, 0, 1) be equidistant from the plane $\vec{r}\cdot\left(3\hat{i}+4\hat{j}-12k\right)+13=0$ then the values of p are _____.

(A) $1,\frac{7}{3}$ (B) $1,\frac{4}{3}$

(C) $2,\frac{4}{3}$ (D) $\frac{7}{3},2$

Answer (A)

Sol. Equation of plane is $3x+4y-12z+13=0$

Now as $(1,1,p)$ and $(-3,0,1)$ are equidistant from the plane

$\left|\frac{3+4-12P+13}{\sqrt{9+16+144}}\right|=\left|\frac{-9+0-12+13}{\sqrt{9+16+144}}\right|$

$|20 - 12p| = -8 \Rightarrow 20 - 12p = 8 \Rightarrow p = 1$

and $20 - 12p = -8 \Rightarrow 12p = 28 \Rightarrow p = \frac{7}{3}$

5. The maximum value of $Z=3x+4y$ subject to constraints $x+y\le4, x\ge0, y\ge0$ is _____.

(A) 16 (B) 12

(C) 0 (D) not possible

Answer (A)

Sol. $z = 3x + 4y$

At $(0, 0)$; $z = 0$

At $(4, 0)$; $z = 12$

At $(0, 4)$; $z = 16$

$\therefore$ Maximum value = 16

6. If A and B are independent events such that $P(A) = p$, $P(B) = 2p$ and P(Exactly one of A and B) = $\frac{5}{9}$, then $p =$ _____.

(A) $\frac{1}{3}, \frac{5}{12}$ (B) $\frac{1}{2}, \frac{3}{4}$

(C) $\frac{1}{12}, \frac{5}{3}$ (D) $\frac{2}{15}, \frac{5}{12}$

Answer (A)

Sol. As A and B are independent events

$$P(A \cap B) = P(A) \cdot P(B)$$

$P(A \cap B) = 2p^2$

and P(exactly one of A and B)

$= P(A \cup B) - P(A \cap B)$

$= P(A) + P(B) - 2P(A \cap B) = \frac{5}{9}$

$\Rightarrow \quad p + 2p - 2 \cdot 2p^2 = \frac{5}{9}$

$\Rightarrow \quad 36p^2 - 27p + 5 = 0$

$\Rightarrow \quad (12p - 5)(3p - 1) = 0$

$\therefore \quad p = \frac{5}{12}, \frac{1}{3}$

7. For the probability distribution

X	1	2	3	4
$P(X)$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{2}{5}$

$E(X^2) =$ _____.

(A) 7 (B) 5

(C) 3 (D) 10

Answer (D)

Sol. $E(X^2) = 1 \times \frac{1}{10} + 4 \times \frac{1}{5} + 9 \times \frac{3}{10} + 16 \times \frac{2}{5}$

$= \frac{1}{10} + \frac{4}{5} + \frac{27}{10} + \frac{32}{5}$

$= \frac{1 + 8 + 27 + 64}{10}$

$= \frac{100}{10} = 10$

8. If A and B are any two events such that $P(A) + P(B) - P(A \cap B) = P(A)$ then _____.

(A) $P\left(\frac{B}{A}\right) = 1$ (B) $P\left(\frac{A}{B}\right) = 0$

(C) $P\left(\frac{B}{A}\right) = 0$ (D) $P\left(\frac{A}{B}\right) = 1$

Answer (D)

Sol. $P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)} = \frac{P(B)}{P(B)} = 1$

9. Let $f : R \to R$ be defined by $f(x) = 2x^2 - 5$ and $g : R \to R$ by $g(x) = \frac{x}{x^2 + 1}$, then gof is _____.

(A) $\frac{2x^2 - 5}{4x^4 + 20x^2 + 26}$ (B) $\frac{2x^2 - 5}{4x^4 - 20x^2 + 26}$

(C) $\frac{2x^2}{x^4 + 2x^2 - 4}$ (D) $\frac{2x^2}{4x^4 - 20x^2 + 26}$

Answer (B)

Sol. $g(f(x)) = \frac{f(x)}{(f(x))^2 + 1}$

$= \frac{2x^2 - 5}{(2x^2 - 5)^2 + 1}$

$= \frac{2x^2 - 5}{4x^4 - 20x^2 + 26}$

10. Let $f : [2, \infty) \to R$ be the function defined by $f(x) = x^2 - 4x + 5$. Then the range of f is _____.

(A) $[1, \infty)$ (B) $[4, \infty)$

(C) R (D) $[5, \infty)$

Answer (A)

Sol. $f(x)=(x-2)^2+1$

As $x\in[2,\infty)$

$0\le x-2<\infty$

$1\le (x-2)^2+1<\infty$

$\therefore$ Range is $[1,\infty)$

11. On R, binary operation $*$ is defined by $a*b=a+b+ab$ then identity and inverse of $*$ are ..... respectively.

(A) $0, \frac{a}{1-a}$ (B) $1, \frac{a}{1+a}$

(C) $0, -\frac{a}{1+a}$ (D) $1, \frac{a}{1-a}$

Answer (C)

Sol. If $a*e=e*a=a$ then e is identity

$a+e+ae=a$

$e(1+a)=0$

$e=0$ (Identity)

Now if $a*b=e$ then b is inverse of a

$a+b+ab=0$

$a=-b(1+a)$

inverse $b=\frac{-a}{1+a}$

12. $\sin^{-1}\left(\frac{3}{5}\right)-\sin^{-1}\left(\frac{8}{17}\right)=$ _____.

(A) $\cos^{-1}\left(\frac{84}{85}\right)$ (B) $\cos^{-1}\left(\frac{24}{85}\right)$

(C) $\sin^{-1}\left(\frac{24}{85}\right)$ (D) $\sin^{-1}\left(\frac{84}{85}\right)$

Answer (A)

Sol. $\sin^{-1}\left(\frac{3}{5}\right)-\sin^{-1}\left(\frac{8}{17}\right)$

$=\sin^{-1}\left(\frac{3}{5}\times\frac{15}{17}-\frac{4}{5}\times\frac{8}{17}\right)$

$=\sin^{-1}\left(\frac{13}{85}\right)$

$=\cos^{-1}\left(\frac{84}{85}\right)$

13. $\tan^2\left(\sec^{-1}3\right)+\operatorname{cosec}^2\left(\cot^{-1}2\right)+\cos^2\left(\cos^{-1}\frac{2}{3}+\sin^{-1}\frac{2}{3}\right)=$ _____.

(A) 15 (B) 16

(C) 14 (D) 13

Answer (D)

Sol. $\tan^2(\sec^{-1}3)+\operatorname{cosec}^2(\cot^{-1}2)+\cos^2\left(\cos^{-1}\frac{2}{3}+\sin^{-1}\frac{2}{3}\right)$

$=\tan^2(\tan^{-1}(2\sqrt{2}))+\operatorname{cosec}^2(\operatorname{cosec}^{-1}\sqrt{5})+\cos^2\left(\frac{\pi}{2}\right)$

$=8+5=13$

14. If $A=\begin{bmatrix}a & b\\ c & -a\end{bmatrix}$ is such that $A^2=I$ then _____.

(A) $1-a^2+bc=0$ (B) $1+a^2+bc=0$

(C) $1+a^2-bc=0$ (D) $1-a^2-bc=0$

Answer (D)

Sol. $A^2=I$

$\begin{bmatrix}a & b\\ c & -a\end{bmatrix}\begin{bmatrix}a & b\\ c & -a\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

$\Rightarrow\begin{bmatrix}a^2+bc & ab-ab\\ ac-ac & bc+a^2\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

$\Rightarrow a^2+bc=1$

$\Rightarrow 1-a^2-bc=0$

15. If A is a square matrix such that $A^2=I$ then $(A-I)^3+(A+I)^3-7A$ is equal to _____.

(A) $I+A$ (B) $I-A$

(C) A (D) $3A$

Answer (C)

Sol. $(A-I)^3+(A+I)^3-7A$

$=A^3-I-3A^2+3A+A^3+I+3A^2+3A-7A$

$=2A^3-A$

$=A(2A^2-I)$

$=A(2I-I)=A$

16. If $A=\begin{bmatrix}0&1&2\\1&2&3\\3&1&1\end{bmatrix}$ and inverse of A is $\frac{1}{2}\begin{bmatrix}1&-1&1\\-8&6&-2\\x&-3&1\end{bmatrix}$ then x = _____.

(A) 5 (B) 3

(C) 2 (D) 4

Answer (A)

Sol. We Know that $A\,A^{-1}=I$

Solving, we get $x = 5$

17. Let $f(t)=\begin{vmatrix}\cos t&t&1\\2\tan t&t&2t\\\tan t&t&t\end{vmatrix}$. Then $\lim\limits_{t\to0}\frac{f(t)}{t^2}$ is equal to _____.

(A) 3 (B) 1

(C) –1 (D) 0

Answer (D)

Sol. $f(t)=\begin{vmatrix}cost&t&1\\2\tan&t&2t\\\tan t&t&t\end{vmatrix}$

$\Rightarrow f(t)=t\left[-t\cos t-(2t\tan t-2t\tan t)+1(\tan t)\right]$

$\Rightarrow f(t)=-t^2\cos t+t\tan t$

$\therefore \lim\limits_{t\to0}\frac{f(t)}{t^2}\lim\limits_{t\to0}\left(-\cos t+\frac{\tan t}{t}\right)=0$

18. If $x, y\in R$ and $\begin{vmatrix}\left(a^x+a^{-x}\right)^2&\left(a^x-a^{-x}\right)^2&1\\\left(b^x+b^{-x}\right)^2&\left(b^x-b^{-x}\right)^2&1\\\left(c^x+c^{-x}\right)^2&\left(c^x-c^{-x}\right)^2&1\end{vmatrix}$ $=2y+6$, then y = _____.

(A) 0 (B) 3

(C) –3 (D) 6

Answer (C)

Sol. Applying $C_1\to C_1-C_2$, we get

$\begin{vmatrix}4&(a^x-a^{-x})^2&1\\4&(b^y-b^{-x})^2&1\\4&(c^x-c^{-x})^2&1\end{vmatrix}=2y+6$

$\Rightarrow 2y+6=0$

$\Rightarrow y=-3$

19. For ΔABC, the value of $\begin{vmatrix}0&\sin A&\tan B\\-\sin(B+C)&0&\cos C\\\tan(A+C)&-\cos C&0\end{vmatrix}$ = _____.

(A) –1 (B) 0

(C) 1 (D) sin*A*cos*C*

Answer (B)

Sol. Given determinant is of skew symmetric matrix of odd order so value = 0

20. If function $f(\alpha)=\begin{cases}\frac{1-\cos6\alpha}{36\alpha^2} & \text{if } \alpha\neq0\\ k & \text{if } \alpha=0\end{cases}$ is continuous at $\alpha = 0$ then k = _____.

(A) $-\frac{1}{2}$ (B) 1

(C) $\frac{1}{2}$ (D) 0

Answer (C)

Sol. $k=\lim\limits_{\alpha\to0}\frac{1-\cos6\alpha}{36\alpha^2}=\frac{1}{2}$

21. If $y=\sin^{-1}\left(\frac{2^{x+1}}{1+4^x}\right)$ and $\frac{dy}{dx}=\frac{2^{x+1}\log2}{f(x)}$ then $f(0)$ = _____.

(A) 0 (B) –2

(C) 2 (D) 2 log 2

Answer (C)

Sol. Now $y=\sin^{-1}\left(\frac{2\cdot2^x}{\left(2^x\right)^2+1}\right)$

Let $2^x=\tan\theta$

$=\sin^{-1}\left(\frac{2\tan\theta}{1+\tan^2\theta}\right)$

$\Rightarrow \sin^{-1}(\sin2\theta)=2\theta$

$\Rightarrow y=2\tan^{-1}\left(2^x\right)$

$\therefore \frac{dy}{dx}=\frac{2.2^x\log2}{1+4^x}=\frac{2^{x+1}\log2}{4^x+1}$

$\therefore f(x)=4^x+1$

$\Rightarrow f(0)=2$

22. For function $f(x) = x + \frac{1}{x}$, $x \in [1, 2]$, the value of C for mean value theorem is _____.

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

(C) 1 (D) $\sqrt{3}$

Answer (B)

Sol. We know

$$f'(C) = \frac{f(b) - f(a)}{b - a}$$

$$\Rightarrow 1 - \frac{1}{C^2} = \frac{f(2) - f(1)}{2 - 1}$$

$$\Rightarrow 1 - \frac{1}{C^2} = \frac{1}{2}$$

$$\Rightarrow \frac{1}{C^2} = \frac{1}{2} = C = \pm\sqrt{2}$$

Now as $C \in (1, 2)$

$$\Rightarrow C = \sqrt{2}$$

23. The interval in which $y = x^2 e^{-x}$ is increasing is _____.

(A) $(0, 2)$

(B) $(2, \infty)$

(C) $(-\infty, \infty)$

(D) $(-2, 0)$

Answer (A)

Sol. The interval in which $y = x^2 \cdot e^{-x}$ is increasing

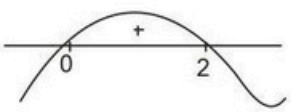
$$y = x^2 \cdot e^{-x}$$

$$\Rightarrow \frac{dy}{dx} = 2xe^{-x} + x^2(-e^{-x})$$

$$= e^{-x}[2x - x^2]$$

$$= -xe^{-x}[x - 2]$$

For increasing function $\frac{dy}{dx} > 0$



$\therefore$ Increasing in interval (0, 2).

24. The rate of change of volume of sphere with respect to its radius r at $r = 2$ is _____.

(A) 24π

(B) 32π

(C) 16π

(D) 8π

Answer (C)

Sol. $V = \frac{4}{3}\pi r^3$

$$\Rightarrow \frac{dV}{dr} = \frac{4}{3} \times 3\pi r^2$$

$$= 4\pi r^2$$

Now at $(r = 2) = 16\pi$

25. The tangent to the curve given by $x = e^{\theta} \cdot \cos\theta, y = e^{\theta} \cdot \sin\theta$ at $\theta = \frac{\pi}{4}$ makes an angle with X-axis is _____.

(A) $\frac{\pi}{2}$ (B) 0

(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

Answer (A)

Sol. $x = e^{\theta}\cos\theta$

$$\Rightarrow \frac{dx}{d\theta} = e^{\theta}\cos\theta - e^{\theta}\sin\theta$$

$$= e^{\theta}(\cos\theta - \sin\theta)$$

$$y = e^{\theta}\sin\theta$$

$$\Rightarrow \frac{dy}{d\theta} = e^{\theta}\sin\theta + e^{\theta}\cos\theta$$

$$= e^{\theta}(\sin\theta + \cos\theta)$$

$$= \frac{dy}{dx} = \frac{\sin\theta + \cos\theta}{\cos\theta - \sin\theta}$$

Not defined at $\theta = \frac{\pi}{4}$

$\therefore$ $\theta = \frac{\pi}{2}$ (Angle formed by tangent with X-axis)

26. The minimum value of $f(x) = x \log x$ is _____.

(A) 0 (B) $-\frac{1}{e}$

(C) $\frac{1}{e}$ (D) e

Answer (B)

Sol. $y = x\log x$

$\Rightarrow \frac{dy}{dx} = \log x + \left(x \times \frac{1}{x}\right)$

$\Rightarrow \frac{dy}{dx} = 1 + \log x$

$\therefore$ Minima at $x = \frac{1}{e}$

$\therefore f\left(\frac{1}{e}\right) = \frac{-1}{e}$

27. If $\int \frac{x^4 + x^2 + 1}{x^2 + 1} dx = \frac{x^3}{3} + f(x) + C$, then $f(1)$ = _____.

(A) 0

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

(C) $\frac{\pi}{2}$

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

Answer (B)

Sol. $\int \frac{x^4 + x^2 + 1}{x^2 + 1} dx$

$\int \left(x^2 + \frac{1}{x^2 + 1}\right) dx$

$\frac{x^3}{3} + \tan^{-1}(x) + c$

$\therefore f(x) = \tan^{-1}(x)$

$f(1) = \tan^{-1}(1)$

$\frac{\pi}{4}$

28. $\int \frac{x + 100}{(x + 101)^2} e^x dx =$ _____ $+ C$.

(A) $\frac{1}{x + 101} e^x$ (B) $\frac{x}{x + 101} e^x$

(C) $\frac{1}{x + 100} e^x$ (D) $(x + 101) e^x$

Answer (A)

Sol. $\int \frac{(x + 101) - 1}{(x + 101)^2} e^x \, dx$

Now we know $\int e^x \left(f(x) + f'(x)\right) dx$

$= e^x f(x) + c$

$= \frac{e^x}{x + 101} + c$

29. $\int \frac{\sqrt{\cot x}}{\cos x \sin x} dx =$ _____ $+ C$.

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

(C) $2\sqrt{\cot x}$ (D) $\frac{1}{\sqrt{\cot x}}$

Answer (A)

Sol. $\int \frac{\sqrt{\cot x}}{\cos x \sin x} dx$

$= \int \frac{\sqrt{\cos x}}{\sqrt{\sin x} \sin x \cos x} dx$

$= \int (\cos x)^{\frac{-1}{2}} (\sin x)^{\frac{-3}{2}} dx$

As $m + n$ negative even integer put

$\therefore \tan x = t$

$= \int (\tan x)^{\frac{-3}{2}} (\cos x)^{-2} dx$

$= \int (t)^{\frac{-3}{2}} dt$

$= \frac{t^{\frac{-3}{2}+1}}{\frac{-3}{2} + 1} + c$

$= \frac{-2}{\sqrt{\tan x}} + c$

$= -2\sqrt{\cot x} + c$

30. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \log\left(\frac{2019-x}{2019+x}\right)dx =$ _____.

(A) π (B) 0

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

Answer (B)

Sol. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \log\left(\frac{2019-x}{2019+x}\right)dx$

as we know $\int_{-a}^{a} f(x) = 0$

if $f(x)+f(-x)=0$ (odd function)

$\therefore$ 0

31. $\int_{4}^{9} \frac{\sqrt{x}}{\left(30-x^{\frac{3}{2}}\right)^2}dx =$ _____.

(A) $\frac{19}{66}$ (B) $\frac{19}{33}$

(C) $\frac{38}{99}$ (D) $\frac{19}{99}$

Answer (D)

Sol. $\int_{4}^{9} \frac{\sqrt{x}}{\left(30-x^{\frac{3}{2}}\right)^2}dx$ ...(1)

Let $30-x^{\frac{3}{2}} = t$

$\Rightarrow \frac{-3}{2}(x)^{\frac{1}{2}}dx = dt$

$\Rightarrow \sqrt{x}dx = \frac{-2}{3}dt$

Now using (1),

$= \frac{-2}{3}\int_{22}^{3} \frac{1}{t^2}dt$

$= \frac{2}{3}\left[\frac{1}{t}\right]_{22}^{3}$

$= \frac{2}{3}\left[\frac{1}{3}-\frac{1}{22}\right]$

$= \frac{19}{99}$

32. If $f(a+b-x)=f(x)$ then $\int_{a}^{b} x\cdot f(x)dx$ is equal to _____.

(A) $\frac{a+b}{2}\int_{a}^{b} f(x)dx$ (B) $\frac{a+b}{2}\int_{a}^{b} f(b+x)dx$

(C) $\frac{a+b}{2}\int_{a}^{b} f(b-x)dx$ (D) $\frac{b-a}{2}\int_{a}^{b} f(x)dx$

Answer (A)

Sol. $I = \int_{a}^{b} x\cdot f(x)dx$

$= \int (a+b-x)\, f(a+b-x) = I$

add both

$\Rightarrow 2I = \int_{a}^{b} (a+b)f(x)dx$

$= \left(\frac{a+b}{2}\right)\int_{a}^{b} f(x)dx$

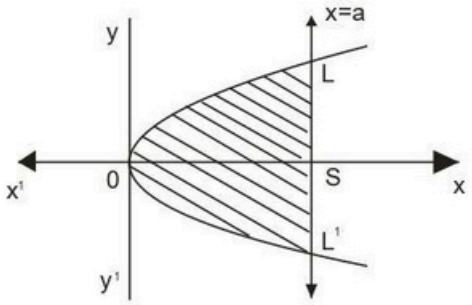
33. The area of the parabola $y^2 = 4ax$ bounded by its latus rectum is _____.

(A) $\frac{16}{3}a^2$ (B) $\frac{4}{3}a^2$

(C) $\frac{8}{3}a^2$ (D) $4a^2$

Answer (C)

Sol. For parabola $y^2 = 4ax$



Area required = area OLSL'

= 2x Area OSL

$= 2\times\int_{0}^{a} ydx$

Now parabola equation is

$y^2 = 4ax$

$\Rightarrow y = \pm\sqrt{4ax}$

Since OSL is in 1st quadrant

$y = \sqrt{4ax}$

Area required $= 2\times\int_0^a \sqrt{4ax}dx$

$= 2\sqrt{4a}\int_0^a \sqrt{x}dx$

$= 4\sqrt{a}\int_0^a \sqrt{x}dx$

$= \frac{8}{3}a^2$

34. The area enclosed by the curve $x = 4\cos\theta, y = 3\sin\theta$ is _____.

(A) 4π (B) 6π

(C) 8π (D) 12π

Answer (D)

Sol. $\left(\frac{x}{4}\right)^2 + \left(\frac{y}{3}\right)^2 = 1$

$\Rightarrow \frac{x^2}{16} + \frac{y^2}{9} = 1$

And area of ellipse = πab

$= \pi\times 4\times 3$

$= 12\pi$

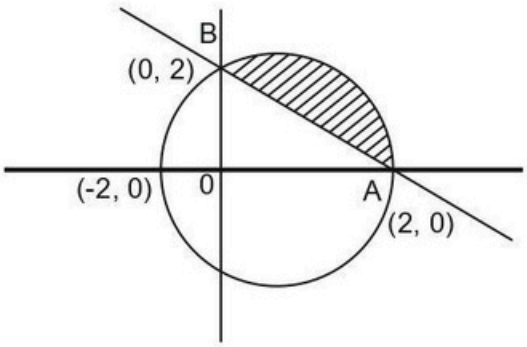
35. The smallest area enclosed by circle $x^2 + y^2 = 4$ and line $x + y = 2$ is _____.

(A) $\pi + 2$ (B) $\pi - 2$

(C) π (D) 2π

Answer (B)

Sol. The Smallest area enclosed by circle $x^2 + y^2 = 4$ and line $x + y = 2$



Required area

$= \frac{1}{4}$ (Area of circle) – area of triangle ΔOAB

$=$ Area $= \frac{\pi}{4}\times(2)^2 - \frac{1}{2}\times 2\times 2 = \pi - 2$

36. The order and degree of differential equation $\left\{1+\left(\frac{dy}{dx}\right)^2\right\}^{\frac{3}{2}} = \frac{d^2y}{dx^2}$ are p and q respectively then $p + q =$ _____.

(A) 6 (B) 4

(C) 2 (D) 5

Answer (B)

Sol. $\left[1+\left(\frac{dy}{dx}\right)^2\right]^3 = \left(\frac{d^2y}{dx}\right)^2$

$\therefore$ Order $= 2 = p$

Degree $= 2 = q$

$\therefore \quad p + q = 4$

37. Integrating factor of differential equation $\left(\tan^{-1}y - x\right)dy = \left(1+y^2\right)dx$ is _____.

(A) e^{1+y^2} (B) e^y

(C) $e^{\tan^{-1}x}$ (D) $e^{\tan^{-1}y}$

Answer (D)

Sol. $\frac{dy}{dx} = \frac{\left(1+y^2\right)}{\left(\tan^{-1}y - x\right)}$

$\Rightarrow \frac{dx}{dy} = \frac{\tan^{-1}y}{1+y^2}\frac{-x}{1+y^2}$

$\Rightarrow \frac{dx}{dy} + \frac{x}{1+y^2} = \frac{\tan^{-1}y}{1+y^2}$

Now integrating factor $= e^{\int\frac{dy}{1+y^2}}$

$e^{\tan^{-1}y}$

38. The differential equation $y\frac{dy}{dx} + x = k$ represents _____.

(A) circles (B) hyperbolas

(C) parabolas (D) ellipses

Answer (A)

Sol. $\frac{dy}{dx}=\frac{k-x}{y}$

$y\,dy=dx(k-x)\quad \frac{y^2}{2}=kx-\frac{x^2}{2}+c$

$x^2+y^2=2kx+2c$

$\therefore$ Circle

39. If $\vec{a}=2\hat{i}-\hat{j}+k, \vec{b}=\hat{i}+\hat{j}-2k, \vec{c}=\hat{i}+3\hat{j}-k$, if $\vec{a}$ is perpendicular to $\lambda\vec{b}+\vec{c}$, then the value of λ is _____.

(A) 0 (B) 2

(C) –2 (D) 3

Answer (C)

Sol. As $\vec{a}$ is perpendicular to $\lambda\vec{b}+\vec{c}$

$\Rightarrow \vec{a}.(\lambda\vec{b}+\vec{c})=0$

$\Rightarrow (2\hat{i}-\hat{j}+k).(\lambda[\hat{i}+\hat{j}-2k]+[\hat{i}+3\hat{j}-k])=0$

$\Rightarrow 2(\lambda+1)-(\lambda+3)+1(-2\lambda-1)=0$

$\Rightarrow 2\lambda+2-\lambda-3-2\lambda-1=0$

$\Rightarrow \lambda=-2$

40. For three vectors $\vec{a},\vec{b},\vec{c}$ satisfies $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ and $|\vec{a}|=3,|\vec{b}|=4,|\vec{c}|=2$ then $\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a}$ = _____.

(A) 29

(B) $\frac{29}{2}$

(C) $-\frac{9}{2}$

(D) $-\frac{29}{2}$

Answer (D)

Sol. $(\vec{a}+\vec{b}+\vec{c})^2=$

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

$\Rightarrow (9+16+4)+2(\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a})=0$

$\Rightarrow (\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a})=\frac{-29}{2}$

❑ ❑ ❑

Questions & Solutions

for

GUJCET 2020 (BE)

INSTRUCTIONS TO CANDIDATES

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 **1/4** 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. The Set No. for this Booklet is **05**. Make sure that the Set No. Printed on the Answer Sheet is the same as that on this booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidate should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet.
8. Do not write your Seat No. anywhere else, except in the specified space in the Test Booklet/Answer Sheet.
9. Use of White fluid for correction is not permissible on the Answer Sheet.
10. Each candidate must show on demand his/her Admission Card to the Invigilator.
11. No candidate, without special permission of the Superintendent or Invigilator, should leave his/her seat.
12. Use of Simple (Manual) Calculator is permissible.
13. The candidate should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and must sign the Attendance Sheet (Patrak-01). Cases where a candidate has not signed the Attendance Sheet (Patrak-01) will be deemed not to have handed over the Answer Sheet and will be dealt with as an unfair means case.
14. The candidates are governed by all Rules and Regulations of the Board with regards to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
15. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
16. 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. In 'Lac Operon' concept, the structural genes (z, y and a) will code for the following enzymes respectively:

   (A) β-galactosidase; lipase; transacetylase

   (B) β-galactosidase; carboxylase; transacetylase

   (C) β-galactosidase; permease; transacetylase

   (D) β-galactosidase; permease; acetylase

Answer (C)

Sol. lac Z → β galactosidase

lac y → Permease

lac a → transacetylase

2. Thorns of *Bougainvillea* and tendrils of *Cucurbita* represent which type of examples?

   (A) Homologous organs

   (B) Analogous organs

   (C) Vestigeal organs

   (D) None of these

Answer (A)

Sol. Thorns of *Bougainvillea* = Stem Modification

Function = Protection

Tendrils of *Cucurbita* = Stem Modification

Function = support

In both structure same } Homologous organ

Function different }

3. In β globin chain of haemoglobin of an individual, if the six amino acid composition Glutamic acid (Glu) is replaced by Valine (Val), then the individual will be suffering from:

   (A) Albinism

   (B) Haemophilia

   (C) Sickle-cell anaemia

   (D) Phenylketonuria

Answer (C)

Sol. Sickle cell Anaemia is caused by mutation of the gene controlling β-chain of haemoglobin due to which sixth amino acid composition Glutamic acid is replaced by valine.

4. First transgenic cow 'Rosie' produced which type of human-protein enriched milk?

   (A) Casein (B) Alpha-lactalbumin

   (C) Pacasein (D) Albumin

Answer (B)

Sol. The transgenic cow Rosie developed is 1997 secreted human protein alpha-lactalbumin enriched milk.

5. Which of the following interspecific interaction is represented by (+, 0)?

   (A) Mutualism (B) Commensalism

   (C) Amensalism (D) Competition

Answer (B)

Sol. Commensalism (+, 0)

Mutualism (+, +)

Amensalism (–, 0)

Competition (–, –)

6. In relative contribution of various greenhouse gases to total global warming which gas is having 14% contribution?

   (A) N_2O (B) CFC

   (C) Methane (D) CO_2

Answer (B)

Sol. N_2O - 6% CFC – 14%

Methane – 20% CO_2 – 60%

7. Match the column I with column II and write the correct option.

	Column-I		Column-II
(i)	Cellular barrier	(p)	Saliva in the mouth
(ii)	Physiological barrier	(q)	Interferons
(iii)	Cytokine barrier	(r)	Natural killer (type of lymphocyte)
(iv)	Physical barrier	(s)	Mucus coating of the respiratory tract

   (A) (i – r), (ii – q), (iii – s), (iv – p)

   (B) (i – r), (ii – p), (iii – q), (iv – s)

   (C) (i – p), (ii – s), (iii – r), (iv – q)

   (D) (i – p), (ii – q), (iii – s), (iv – r)

Answer (B)

Sol. Skin and mucus coating of the respiratory tract are physical barriers of innate immunity.

8. Identify the palindromic sequence from the following:

(A) 5'- GAATTC – 3' (B) 5' – GAATTC – 3;
3' – CTTAAG – 5' 3' – CUUAAG – 5'

(C) 5' – TCATCA – 3' (D) 5'- TACCAT – 3'
3' – AGTAGT – 5' 3' – ATGGTA – 5'

Answer (A)

Sol. 5'- GAATTC – 3'

3' – CTTAAG – 5'

This is a palindromic sequence recognised by *EcoRI*.

9. What will be the percentage of affected son, whose father is colour-blind and mother is normal?

(A) 0%

(B) 50%

(C) 25%

(D) 100%

Answer (A)

Sol. $X^cY - XX$

$\downarrow$

$X^cY \rightarrow$ 0%

	X^c	Y
X	X^cX	XY
X	X^cX	XY

10. Which part of the fallopian tube is close to ovary?

(A) Infundibulum (B) Isthmus

(C) Ampulla (D) Fimbriae

Answer (A)

Sol. Fimbriae are projections on the edge of infundibulum part of fallopian tube.

11. Which of the following match pair is the correct one?

(A) *Hydra*: Pseudopodiospores

(B) *Amoeba*: Gemmules

(C) Sponges: Zoospores

(D) Penicillium: Conidia

Answer (D)

Sol. *Hydra* = Budding

Amoeba = Binary fission

Sponges = Gemmule formation

Penicillium = Conidia

12. Isogametes are found in:

(A) Fucus

(B) Homo-sapiens

(C) Cladophora

(D) None of the above

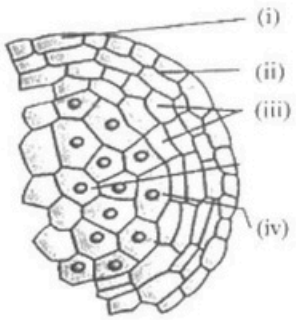
Answer (C)

Sol. *Fucus* → Heterogametes

Homo-sapiens → Heterogametes

Cladophora = Isogametes

13. Which of the following is the correct option for the figure given below?



(A) (i) Epidermis (ii) Endothecium
(iii) Middle layer (iv) Tapetum

(B) (i) Epidermis (ii) Middle layer
(iii) Endothecium (iv) Tapetum

(C) (i) Tapetum (ii) Middle layer
(iii) Endothecium (iv) Epidermis

(D) (i) Epidermis (ii) Tapetum
(iii) Middle layer (iv) Endothecium

Answer (A)

Sol. The given figure is of enlarged view of one microsporangium. Labelled parts are:

(i) Epidermis

(ii) Endothecium

(iii) Middle layer

(iv) Tapetum

14. .....is the region on which, the ovule is connected to funicle.

(A) Chalaza

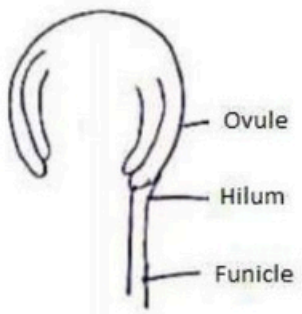
(B) Hilum

(C) Micropylar region

(D) Nucellus

Answer (B)

Sol. Hilum is the junction between funicle and body of ovule.



15. Statement – 'X': Apomixis is seen in few flowering plant such as some species of Asteraceae and grasses.

Statement - 'Y': Apomixis is a form of asexual reproduction that mimics sexual reproduction.

Statement – 'Z': In some species of apomictic seeds, the diploid egg cell is formed without reduction division.

Choose the correct option:

(A) 'X' & 'Y' are correct and 'Z' is incorrect.

(B) 'X' is correct and 'Y' & 'Z' are incorrect.

(C) 'X' is incorrect and 'Y' & 'Z' are correct

(D) All the above X, Y and Z statements are correct

Answer (D)

Sol. All statements X, Y and Z are correct.

16. Which of the following pathway is correct for the transport of spermatozoa?

(A) From seminiferous tubules to → rete testis → vasa efferentia → Epididymis.

(B) From seminiferous tubules to → vas deferens → vasa efferentia → rete testis

(C) From seminiferous tubules to → vasa efferentia → rete testis → vas deferens

(D) From seminiferous tubules to → rete testis → vas deferens → vasa efferentia

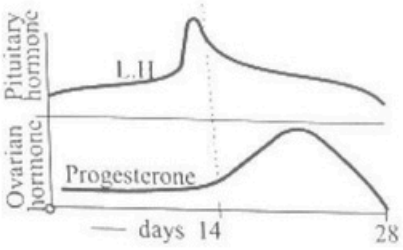
Answer (A)

Sol. The correct route is:

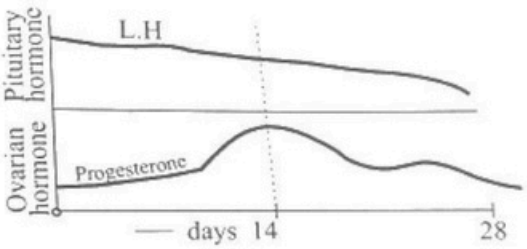
Seminiferous tubules → rete testis → vasa efferentia → epididymis → vasa deferens.

17. Which is the correct graphical representation option of the pituitary hormone and ovarian hormone in menstrual cycle?

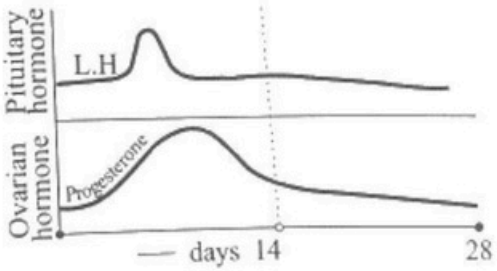
(A)



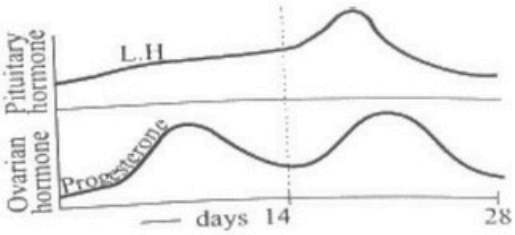
(B)



(C)



(D)



Answer (A)

Sol. Pituitary hormone LH peaks during middle of menstrual cycle. Progesterone secretion declines towards end of luteal phase.

18. Foetus develop its limbs and digits in.....during embryonic development.

(A) Four weeks

(B) Eight weeks

(C) Twelve weeks

(D) Two weeks

Answer (B)

Sol. By the end of second month of pregnancy, the foetus develops limbs and digits.

19. Multiload 375 is .....type of IUDs.

(A) Non-medicated

(B) Hormone releasing

(C) Cu releasing

(D) Mg releasing

Answer (C)

Sol. Multiload 375 and Cu7 are copper releasing medicated IUDs.

20. .....is natural category of contraceptive method:

(A) Sterilisation

(B) Coitus interruptus

(C) Consuming pills

(D) Using Condoms

Answer (B)

Sol. Sterilisation, consuming pills and using condoms are artificial methods of contraception.

21. Yellowish fluid 'colostrum' secreted by mother during the initial days of lactation, is an example of:

(A) Passive immunity

(B) Auto immunity

(C) Active immunity

(D) Cell-mediated immunity

Answer (A)

Sol. Colostrum is rich in IgA and provides natural immunity to newly born.

22. Match the following:

Column-I	Column-II
(i) *Papaver somniferum*	(p) Marijuana
(ii) *Cannabis sativa*	(q) Cocaine
(iii) *Erythroxylum coca*	(r) Hallucinogenic properties
(iv) *Datura*	(s) Opioids

Choose the right option showing the correct match

(A) (i – s), (ii – p), (iii – q), (iv – r)

(B) (i – q), (ii – r), (iii – s), (iv – p)

(C) (i – p), (ii – q), (iii – r), (iv – s)

(D) (i – r), (ii – s), (iii – p), (iv – q)

Answer (A)

Sol. *Papaver somniferum* is the poppy plant and source of opiate narcotics.

(ii) *Cannabis sativa*

(iii) *Erythroxylum coca*

23. A person is suffering from chronic inflammation of lymphatic vessels of lower limbs and gross deformities of genital organs. Identify the disease, the person is suffering from:

(A) Amoebiasis (B) Ascariasis

(C) Filariasis (D) Malaria

Answer (C)

Sol. Infection by *Wuchereria bancrofti* causes blockage in lymphatic circulation leading to filariasis.

24. Pusa Swarnim is [X] type of plant variety which is resistance to [Y] disease.

(A) [X] - Wheat [Y] - Black rot

(B) [X] - Brassica [Y] - White rust

(C) [X] - Cauliflower [Y] - Leaf curl

(D) [X] - Cowpea [Y] - Bacterial blight

Answer (B)

Sol. Pusa Swarnim is *Brassica* type of plant variety bred by hybridisation and selection for disease resistance to white rust.

25. Choose the correct option for X, Y and Z.

Crop	Variety	Insect Pests
(i) Rape seed Mustard	Pusa Gaurav	Z
(ii) X	Pusa Sem 2	Jassids
(iii) Okra	Y	Shoot borer

(A) X- flat bean Y –Pusa A-4 Z-Aphids

(B) X-*Brassica* Y-Pusa A-4 Z-Shoot borer

(C) X-flat bean Y-Pusa Sem 3 Z-Fruit borer

(D) X-*Brassica* Y-Pusa Sawani Z-Fruit borer

Answer (A)

Sol. X → Flat bean, Y → Pusa A-4, Z → Aphids.

26. Which of the following is used as immunosuppressive agent in organ transplant patients?

(A) Statins (B) Streptokinase

(C) Cyclosporin A (D) Lipase

Answer (C)

Sol. Cyclosporin – A produced by *Trichoderma polysporum* and used as Immunosuppressive agent in organ – transplant patients.

27. Choose the correct option for the statements for Mycorrhiza:

(i) It absorbs phosphorus from soli.

(ii) It forms root nodules with the association of Rhizobium

(iii) They are resistance to root-borne pathogens, tolerance to salinity & drought.

(iv) They fix atmospheric nitrogen.

(A) (i) and (ii) (B) (i) and (iii)

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

Answer (B)

Sol. Mycorrhiza absorbs phosphorus from soil and provide resistance to root-borne pathogens, tolerance to salinity & drought.

Statements (ii) and (iv) are correct for *Rhizobium.*

28. In recombinant DNA technology, which dye is used to stain the separated DNA fragments which can be visualised by exposure to UV radiation.

(A) Ethidium bromide (B) Safranine

(C) Leishman's stain (D) Acetocarmine

Answer (A)

Sol. Ethidium bromide is an intercalating agent that stains DNA and RNA.

29. '*Meloidogyne incognita*' infects the root of which plant and causes a great reduction in yield

(A) Tomato

(B) Corn

(C) Cotton

(D) Tobacco

Answer (D)

Sol. *Meloidogyne incognita* is a nematode.

30. Which of the following statement is incorrect for 'Genetically Modified plants'?

(A) Increase the reliance on chemical pesticides

(B) Enhanced nutritional value of good

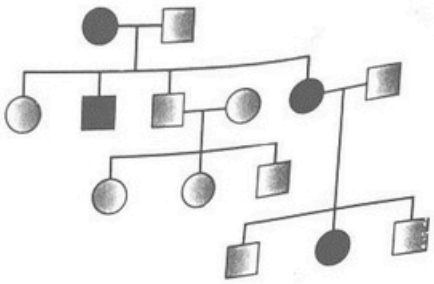
(C) Increase efficiency of mineral uses by plants

(D) Made crops more tolerant to abiotic stresses (cold, drought, salt, heat)

Answer (A)

Sol. GM crops exhibit reduced reliance on pesticides.

31. Choose the correct option for the pedigree analysis given below:



(A) Autosomal dominant pedigree

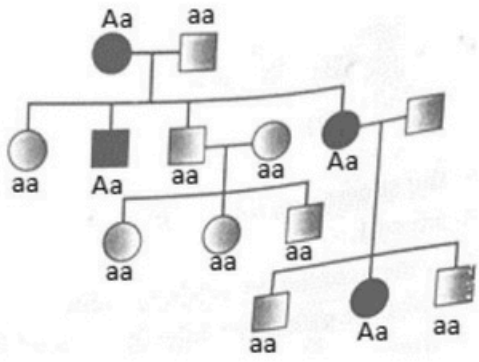
(B) Autosomal recessive pedigree

(C) 'X'- linked dominant pedigree

(D) 'X'- linked recessive pedigree

Answer (A)

Sol.



32. In 'Mendel' dihybrid cross, which of the following result was obtained in F_2 generation?

(A) 9 : 3 : 3 : 1 → genotype

(B) 1 : 1 : 1 : 1 → genotype

(C) 9 : 3 : 3 : 1 → phenotype

(D) 1 : 1 : 1 : 1 → phenotype

Answer (C)

Sol. YYRR x yyrr

↓

F_1 YyRr

F_2 YR : Yr : yR : yr

9 : 3 : 3 : 1

In mendel dihybrid cross, following result was obtained in F_2 generfation.

9 : 3 : 3 : 1 → Phenotype

1 : 2 : 1 : 2 : 4 : 2 : 1 : 2 : 1 → Genotype

33. Which kind of inheritance is show by human blood group?

(i) Incomplete dominance

(ii) Co-dominance

(iii) Multiple allele

(iv) Pleiotropy

(A) (i) and (ii) (B) (ii) and (iv)

(C) (ii) and (iii) (D) (iii) and (iv)

Answer (C)

Sol. Human blood group shows the inheritance of co-dominance as well as Multiple allelism

34. 'Central dogma' was proposed by [X] and these are the processes [Y], [Z] comes in it respectively. Choose the correct option.

(A) [X] - Watson & Crick [Y] - transformation
[Z] - replication

(B) [X] - Francis Crick [Y] - transcription
[Z] - translation

(C) [X] - Frederick Griffith [Y] - transformation
[Z] - transcription

(D) [X] - Hershey & Chase [Y] - replication
[Z] - translation

Answer (B)

Sol. Central dogma is proposed by Francis Crick.

$$DNA \xrightarrow{Transcription} RNA \xrightarrow{Translation} Protein$$

35. Which was having lowest brain capacity during human evolution?

(A) Neanderthal man

(B) *Homo sapiens*

(C) *Homo habilis*

(D) *Homo erectus*

Answer (C)

Sol. *Homo habilis* had cranial capacity of 650-800 c.c.

36. Through 'electrostatic precipitator' which of the following matter is removed?

(A) Particulate

(B) Gaseous

(C) Liquids

(D) None of the above

Answer (A)

Sol. 99% of Particulate matters are removed by 'Electrostatic Precipitator'.

37. Which of the following is called the 'Terror of Bengal'?

(A) Carrot grass

(B) Bloom-forming algae

(C) Lantana

(D) Water hyacinth

Answer (D)

Sol. Water hyacinth was introduced in Bengal because of its beautiful flowers and shape of leaves. Fast growth of water hyacinth (*Eichhornia*) causes death of fishes and food Scarcity that's why it is called 'Terror of Bengal'.

38. The largely tropical Amazonian rain forest in South America has .....numbers of bird species.

(A) 3000 (B) 427

(C) 1300 (D) 378

Answer (C)

Sol. 1300 – Birds

3000 – fishes

427 - Mammals

378 - reptiles

39. Bacterial and fungal enzymes degrade detritus into simpler inorganic substances. This process is called as.....

(A) Catabolism

(B) Mineralisation

(C) Humification

(D) Fragmentation

Answer (A)

Sol. Bacterial and fungi secrete digestive enzyme over the detritus. The enzyme changes complex organic compounds into simple inorganic substances. This process is called as catabolism.

40. Verhulst - Pearl Logistic Growth is described by the following equation:

(A) $dN/dt = rN$

(B) $dN/dt = rN\left(\frac{K-N}{K}\right)$

(C) $dt/dN = rN\left(\frac{K}{K-N}\right)$

(D) $dN/dt = rN\left(\frac{K+N}{K}\right)$

Answer (B)

Sol. Verhulst - Pearl Logistic Growth is described by equation: $dN/dt = rN\left(\frac{K-N}{K}\right)$.

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