Test Booklet Code

01

Answers & Solutions

Time : 2 hrs. **M.M. : 80**

for

GUJCET-2018

(Physics, Chemistry)

Important Instructions :

1. The physics and Chemistry test consists of 80 question. Each question carries 1 marks. For correct response, the candidate will get 1 marks. 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 Bookle 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 Superindent or Invigilator, should leave his/her seat.
12. Use of 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)

PART–A : PHYSICS

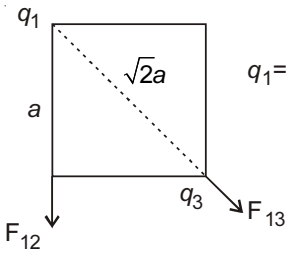
1. Three identical charges are placed on three vertices of a square. If the force acting between q_1 and q_2 is F_{12} and between q_1 and q_3 is F_{13} then $\frac{F_{13}}{F_{12}}$ =

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

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

Answer (C)

Sol.



$q_1 = q_2 = q_3$ (=q, say)

$$F_{12} = \frac{kq_1q_2}{a^2} = \frac{kq^2}{a^2}$$

$$F_{13} \quad \frac{kq_1q_3}{(\sqrt{2}\ )^2} \quad \frac{kq^2}{2^{\ 2}}$$

$$\frac{F_{13}}{F_{12}} = \frac{1}{2}$$

2. When a 10μC charge is enclosed by a closed surface, the flux passing through the surface is ϕ. Now another 10 μC charge is placed inside the closed surface, then the flux passing through the surface is ____

(A) 2ϕ (B) ϕ

(C) 4ϕ (D) Zero

Answer (A)

Sol. $\phi = \frac{q}{\varepsilon_0}$

$\Rightarrow \quad \phi \propto q$

$\therefore \quad \frac{\phi'}{\phi} = \frac{q'}{q} = \frac{20\mu C}{10\mu C}$

$= \quad \phi' = 2\phi$

3. The electric force acting between two point charges kept at a certain distance in vacuum is 16N. If the same two charges are kept at the same distance in a medium of dielectric constant 8. The electric force acting between them is ____

(A) 16 (B) 128

(C) 1024 (D) 2

Answer (D)

Sol. In medium $F' = \frac{F}{K} = \frac{16}{2}$

= 8N

4. The unit of polarizabity of the molecule is ___

(A) $C^{-2}m^1N^{-1}$ (B) $C^{-2}m^1N^1$

(C) $C^2m^1N^{-1}$ (D) $C^2m^{-1}N^{-1}$

Answer (C)

5. On the axis and on the equator of an electric dipole for all points ____

(A) On the axis V = 0 and on equator V ≠ 0

(B) On both of them V = 0

(C) On both of them V ≠ 0

(D) On the axis V ≠ 0 and on equator V = 0

Answer (D)

Sol. Potential due to dipole

$$V = \frac{kp\cos\theta}{r^2}$$

on axis,

θ = 0

$\therefore \quad V = \frac{kp}{r^2} \neq 0$ on equator

θ = 90° V = 0

6. When the temperature of a conductor increases the ratio of conductivity and resistivity ___

(A) decrease (B) increase

(C) remain constant (D) increase or decrease

Answer (A)

Sol. $\frac{\sigma}{\rho} = \frac{1}{\rho^2}$

ρ increases when temperature is increased. Thus, the given ratio decreases.

First they are connected to obtain possible minimum resistance. Then they are connected to obtain possible maximum resistance. The ratio of maximum and minimum resistance is ___

(A) 2.5 (B) 10

(C) 100 (D) 25

Answer (C)

Sol. Minimum possible resistance is obtained when all resistors are connected in parallel

$$R_{min} = \frac{2}{10} = 0.2\Omega$$

Maximum possible resistance is obtained when all resistors are connected in series.

$R_{max} = 2 \times 10 = 20\Omega$

8. The dimensional formula of mobility is ___

(A) $M^1L^{-1}T^{-2}A^{-1}$ (B) $M^1L^0T^{-2}A^{-1}$

(C) $M^{-1}L^1T^2A^1$ (D) $M^{-1}L^0T^2A^1$

Answer (D)

Sol. $\mu = \frac{V_d}{E}$

$$[\mu] = \frac{[V_d]}{[E]} = \frac{[V_d][q]}{[F]}$$

$$= \frac{[LT^{-1}][AT]}{[MLT^{-2}]}$$

$= [M^{-1}L^0T^2A]$

9. An electron having mass 9.1×10^{-31} kg, charge 1.6×10^{-19} C and moving with the velocity of 10^6 m/s enters a region where magnetic field exists. If it describes a circle of radius 0.2 m then intensity of magnetic field must be _____ $\times 10^{-5}$ T.

(A) 2.84 (B) 5.65

(C) 14.4 (D) 1.32

Answer (A)

Sol. $r = \frac{mv}{qB}$

$$= B = \frac{mv}{qr} = \frac{9.1\times10^{-31}\times10^6}{1.6\times10^{-19}\times0.2}$$

$= 2.84 \times 10^{-5}$ T

10. A galvanometer of resistance 50Ω giving full scale deflection for a current of 10 milliampere is to be changed into a voltmeter of range 100V.

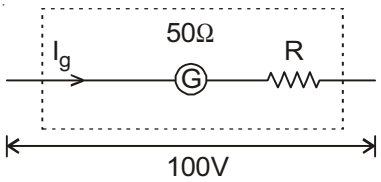
A resistance of _____ Ω has to be connected in series with the galvanometer.

(A) 10000 (B) 10025

(C) 9950 (D) 9975

Answer (C)

Sol.



Using Ohm's law

$100 = I_g(50 + R)$

$100 = 10 \times 10^{-3}$ (R + 50)

$= R + 50 = 10000$

$= R = 9950\Omega$

11. Two parallel very long straight wires carrying current of 5A each are kept at a separation of 1m. If the currents are in the same direction, the force per unit length between them is ___ N/m. ($\mu_0 = 4\pi \times 10^{-7}$ SI)

(A) 5×10^{-5}, repulsive (B) 5×10^{-6}, attractive

(C) 5×10^{-5}, attractive (D) 5×10^{-6}, repulsive

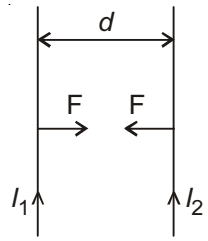
Answer (B)

Sol. Force per unit length is given by

$$F = \frac{\mu_o I_1 I_2}{2\pi d}$$

$$= \frac{4\pi\times10^{-7}\times5\times5}{2\pi\times1}$$

$= 5 \times 10^{-6}$ N



12. A very long straight wire of radius *r* carries current I. Intensity of magnetic field B at a point, lying at a perpendicular distance '*a*' from the axis is $\propto$ ___ .

(where $a < r$)

(A) $1/a$ (B) $1/a^2$

(C) a^2 (D) a

Answer (D)

Sol. Magnetic field inside a wire is given by

$$B = \frac{\mu_0 ia}{2\pi r^2}$$

$\Rightarrow B \propto a$

13. A substance is placed in a non uniform magnetic field. It experience weak force towards the strong field. The substance is _____ type.

(A) Ferromagnetic (B) Diamagnetic

(C) Paramagnetic (D) None of these

Answer (C)

Sol. Paramagnetic material is weakly attracted towards strong magnetic field.

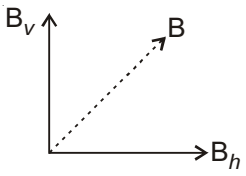
$_v$, B_h and B is ____

(A) $B = \frac{B_v}{B_h}$ (B) $B = B_h \cdot B_v$

(C) $B = \sqrt{B_h^2 + B_v^2}$ (D) $B = \frac{B_h}{B_v}$

Answer (C)

Sol. From the diagram



$B = \sqrt{B_h^2 + B_v^2}$

15. Two thin lenses of focal length f_1 and f_2 are in contact and coaxial. The power of the combination is ____

(A) $\frac{f_1 f_2}{f_1 + f_2}$ (B) $\frac{f_1 + f_2}{2}$

(C) $\frac{1}{\sqrt{f_1 f_2}}$ (D) $\frac{f_1 + f_2}{f_1 f_2}$

Answer (D)

Sol. Power of combination of lenses is given by

$P = P_1 + P_2 = \frac{1}{f_1} + \frac{1}{f_2}$

$= P = \frac{f_1 + f_2}{f_1 f_2}$

16. On decreasing the wavelength of incident light from 8000 Å to 4000 Å. the intensity of the scattered light in Rayleih scattering will become ____ times the initial scattered intensity.

(A) 16 (B) 4

(C) 2 (D) 8

Answer (A)

Sol. Intensity in raylength scattering depends on wavelength as

$I \propto \frac{1}{\lambda^4}$

$\frac{I'}{I} = \left(\frac{\lambda}{\lambda'}\right)^4$

$= \left(\frac{8000\,\text{Å}}{4000\,\text{Å}}\right)^4 = 16$

17. A small angled prism of refractive index 1.6 gives a deviation of 3.6°. The angle of prism is ___

(A) 5° (B) 6°

(C) 7° (D) 8°

Answer (B)

Sol. $\delta = (\mu - 1)A$

$\Rightarrow 3.6 = (1.6 - 1)A$

$\Rightarrow A = 6°$

18. A plano convex lens is made of material having refractive index 1.5. The radius of curvature of curved surface is 60 cm. The focal length of the lens is ____ cm

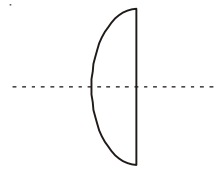
(A) 60 (B) 120

(C) –60 (D) –120

Answer (B)

Sol. $\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

$= \frac{1}{f} = (1.5 - 1)\left(\frac{1}{60} - \frac{1}{\infty}\right)$



$= f = 120$ cm

19. If the uncertainty in the position of an electron is 10^{-10} m, then the value of uncertainty in its momentum will be ___ kgms^{-1}. ($h = 6.62 \times 10^{-34}$ J^{-s})

(A) 1.06×10^{-24} (B) 1.03×10^{-24}

(C) 1.05×10^{-24} (D) 1.08×10^{-24}

Answer (C)

Sol. As per principle of uncertainty

$\Delta p \cdot \Delta x \simeq \frac{h}{2\pi}$

$\Rightarrow \Delta p = \frac{h}{2\pi\Delta x} = \frac{6.626 \times 10^{-34}}{2 \times 3.14 \times 10^{-10}}$

$= 1.05 \times 10^{-24}$ kg-m/s

20. If the energy of photons corresponding to wavelength of 6000 Å is 3.2×10^{-19} J. The photon energy for wavelength of 4000 Å will be ___

(A) 1.11×10^{-19} J (B) 2.22×10^{-19} J

(C) 4.44×10^{-19} J (D) 4.80×10^{-19} J

Answer (D)

Sol. $E = \frac{hC}{\lambda}$

$E \propto \frac{1}{\lambda}$

$\therefore \frac{E_2}{E_1} = \frac{\lambda_1}{\lambda_2}$

$= \frac{E_2}{3.2\times10^{-19}} = \frac{6000Å}{4000Å}$

$= E_2 = \frac{3}{2}\times3.2\times10^{-19}$

$= 4.8 \times 10^{-19}$ J

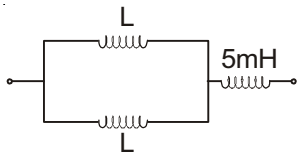
21. Two inductors each of inductance L are connected in parallel. One more inductor of value 5 mH is connected in series of this configuration then the effective inductance is 15 mH. The value of L is ___ mH.

(A) 2.5 (B) 5.0

(C) 10 (D) 20

Answer (D)

Sol.



Equivalent inductance is given by

$L_{eq} = \left(\frac{L\times L}{L+L}\right) + 5 = 15$ (in mH)

$= \frac{L}{2} = 10$

$= L = 20$ mH

22. A lamp consumes only 50% of maximum power in an A.C. circuit. What is the phase difference between the applied voltage and the circuit current?

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

Answer (B)

Sol. $P = VI\cos\phi$

$P_{max} = VI$

Given

$P = \frac{P_{max}}{2}$

$\Rightarrow VI\cos\phi = \frac{VI}{2}$

$\Rightarrow \cos\phi = \frac{1}{2}$

$\Rightarrow \phi = \frac{\pi}{3}$

23. A capacitor 'C' is connected across a D.C. source, the reactance of capacitor will be ___

(A) LOW (B) HIGH

(C) ZERO (D) INFINITE

Answer (D)

Sol. For D.C. source

$\omega = 0$,

Capacitive reactance

$X_C = \frac{1}{\omega C} = \infty$

24. The dimensional formula of $\mu_0\in_0$ is ___

(A) $M^0L^1T^{-1}$ (B) $M^0L^2T^{-2}$

(C) $M^0L^{-2}T^2$ (D) $M^0L^{-1}T^1$

Answer (C)

Sol. Speed of light

$c = \frac{1}{\sqrt{\mu_0\varepsilon_0}}$

$c^2 = \frac{1}{\mu_0\varepsilon_0}$

$= \mu_0\varepsilon_0 = \frac{1}{c^2}$

$[\mu\ \varepsilon\ ] = \frac{1}{[c]^2} = \frac{1}{[LT^{-1}]^2}$

$= [L^{-2}T^2] = [M^0L^{-2}T^2]$

25. Match Column I and Column II

Column I	Column II
(i) Interference	(P) Coherent sources
(ii) Brewster's Law	(Q) $\mu = \frac{1}{\sin C}$
(iii) Malus Law	(R) $\mu = \tan\theta_p$
(iv) Total Internal reflection	(S) $I = I_0\cos^2\theta$

(A) i→Q, ii→S, iii→R, iv→P

(B) i→P, ii→R, iii→S, iv→Q

(C) i→P, ii→S, iii→R, iv→Q

(D) i→R, ii→Q, iii→S, iv→P

Answer (B)

Sol. (i) Interference patterns can be observed only when coherent sources are used.

(ii) Brewster's Law gives angle of polarization $\tan\theta_p = \mu$

(iii) Malus law gives intensity of light after passing through polarizer

$I = I_0 \cos^2\theta$

(iv) Critical angle for total internal reflection is given by relation

$$\sin C = \frac{1}{\mu}$$

26. Frequencies of various radiations are given as

$f_v \rightarrow$ Visible light

$f_r \rightarrow$ Radio waves

$f_{UV} \rightarrow$ Ultra Violet waves

Then which of following is true?

(A) $f_v < f_r < f_{UV}$ (B) $f_r < f_v < f_{UV}$

(C) $f_{UV} < f_v < f_r$ (D) $f_{UV} < f_r < f_v$

Answer (B)

Sol. -

27. Wavelength of characteristic X-ray depends on which property of target?

(A) A (B) Z

(C) Melting point (D) All of these

Answer (B)

Sol. $E = \frac{hC}{\lambda}$

$E \propto Z^2$

$\therefore \frac{1}{\lambda} \propto Z^2$

$= \lambda \propto \frac{1}{\sqrt{Z}}$

28. The energy of the fast neutrons emitted in a nuclear fission reactor is approximately ___

(A) 10 MeV (B) 2 KeV

(C) 2 MeV (D) 20 MeV

Answer (C)

29. In radioactive reaction

$${}^{A}_{Z}X \rightarrow {}^{A}_{Z+1}X_1 \rightarrow {}^{A}_{Z+2}X_2 \rightarrow {}^{A-4}_{Z}X_3 \rightarrow {}^{A-4}_{Z+1}X_4$$

(A) $\beta^-,\beta^-,\alpha,\alpha$ (B) $\beta^-,\beta^-,\beta^+,\alpha$

(C) $\beta^-,\beta^-,\beta^-,\alpha$ (D) $\beta^-,\beta^-,\alpha,\beta^-$

Answer (D)

Sol. In α-decay $({}^{4}_{2}He)$ mass number decreases by 4 and atomic no. decreases by 2.

In β^- - decay ($n \rightarrow p^+ + e^-$) mass number remains same while atomic no. increases by 1.

$${}^{A}_{Z}X \xrightarrow{\beta^- \text{decay}} {}^{A}_{Z+1}X \xrightarrow{\beta^- \text{decay}}$$

$${}^{A}_{Z+2}X_2 \xrightarrow{\alpha-\text{decay}} {}^{A-4}_{Z}X_3 \xrightarrow{\beta^- -\text{decay}} {}^{A-4}_{Z+1}X_4$$

30. In CE transistor amplifier, the collector junction has ____ bias and emitter junction has ____ bias.

(A) reverse, forward (B) forward, forward

(C) reverse, reverse (D) forward, reverse

Answer (A)

Sol. -

31. When carrier wave of 2.5 MHz frequency is amplitude modulated, the resulting AM wave has maximum amplitude of 15 V and minimum amplitude of 10 V. The modulation index is ____ .

(A) 10% (B) 20%

(C) 30% (D) 40%

Answer (B)

Sol. $A_{max} = 15$ V

$= A_c + A_m = 15$ V .... (A)

A_{min}

$_c - A_m = 10$ V .... (B)

from (A) - (B)

$2A_m = 5$

from (A) + (B)

$2A_c = 25$

modulation index,

$$\mu = \frac{A_m}{A_c} = \frac{5}{25} = \frac{1}{5}$$

$$= \frac{1}{5} \times 100\% = 20\%$$

32. Which of the following is wrong for interference fringes?

(A) Distance between two consecutive fringes is constant

(B) All bright fringes are equally bright

(C) Fringes are due to limited portion of wave front

(D) Fringes are due to the use of coherent sources

Answer (C)

Sol. -

33. A ray of light travelling in impure water is incident on a glass plate immersed in it. When the angle of incidence is 51°, the reflected ray is totally plane polarized. Given that refractive index of impure water is 1.4. The refractive index of glass should be ____ (tan51° = 1.235)

(A) 1.53 (B) 1.34

(C) 1.64 (D) 1.73

Answer (D)

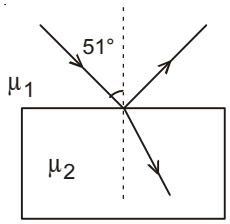
Sol. Using Brewster's law

$$\tan\theta_p = \mu_{21} = \frac{\mu_2}{\mu_1}$$

$$= \tan 51° = \frac{\mu_2}{1.4}$$

$$= \mu_2 = 1.4 \times 1.235$$

$$= 1.73$$



34. A coil having 200 turns has a surface area of 0.15 m^2. A magnetic field of strength 0.2 T applied perpendicular to this changes to 0.6 T in 0.4 s, then the induced emf in the coil is ___ V.

(A) 15 (B) 30

(C) 45 (D) 60

Answer (B)

Sol. $E = \frac{\Delta\phi}{\Delta t} = \frac{N(\Delta B)A}{\Delta t}$

$$= \frac{200 \times (0.6 - 0.2) \times 0.15}{0.4} = 30V$$

35. A sinusoidal A.C. current flows through a resistor of resistance 10Ω. If the peak current is 2A flowing through the resistor then the power dissipated in ____ W.

(A) 10 (B) 20

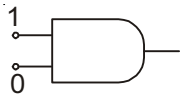
(C) 30 (D) 40

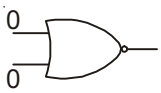
Answer (B)

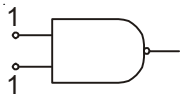
Sol. $P = i^2_{rms}R = \left(\frac{i_{max}}{\sqrt{2}}\right)^2 R = \left(\frac{2}{\sqrt{2}}\right)^2 \times 10$

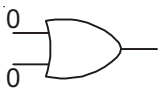
= 20 W

36. Which of following gates produces output of 1?

(A) 

(B) 

(C) 

(D) 

Answer (B)

Sol. (A) Output of AND gate is 0

(B) Output of NOR gate is 1

(C) Output of NAND gate is 0

(D) Output of OR gate is 0

37. The value of β of a transistor is 19. The value of α will be ___

(A) 0.99 (B) 0.98

(C) 0.93 (D) 0.95

Answer (D)

Sol. $\frac{1}{\alpha} = 1 + \frac{1}{\beta} = 1 + \frac{1}{19}$

$= \alpha = 0.95$

38. If the half-life of a radioactive element is 10 hr, its average life = ____ hr.

(A) 14.4 (B) 6.93

(C) 1.44 (D) 0.693

Answer (A)

Sol. Average life

$$\tau = \frac{t_{1/2}}{\ln 2} = \frac{10}{0.693}$$

$\simeq 14.4$ hrs.

39. ____ is the wavelength of photon of energy 35 KeV.

$h = 6.625 \times 10^{-34}$ J^{-2}, $c = 3 \times 10^8$ m/s,

1 eV = 1.6 x 10^{-19} J.

(A) 3.5 mm (B) 35 Å

(C) 35×10^{-12} mm (D) 3.5 Å

Answer (C)

Sol. $E = \frac{hc}{\lambda}$

$$\Rightarrow \lambda = \frac{hc}{E} = \frac{1242 \text{ eV} - \text{nm}}{35 \times 10^3 \text{ eV}}$$

$\simeq 35 \times 10^{-3}$ nm

$= 35 \times 10^{-12}$ m

40. The band gaps of an insulator, conductor and semi conductor are respectively E_{g1}, E_{g2} and E_{g3}. The relationship between them is given as ___

(A) $E_{g1} < E_{g2} > E_{g3}$ (B) $E_{g1} > E_{g2} > E_{g3}$

(C) $E_{g1} > E_{g2} < E_{g3}$ (D) $E_{g1} < E_{g2} < E_{g3}$

Answer (C)

Sol. Band gap is largest in insulators while it is smallest in conductors.

PART–B : CHEMISTRY

41. If the edge length of a body centred unit cell is 400pm, what will be the approximate radius of the atom present in it? (in pm)

(A) 173 (B) 141

(C) 200 (D) 924

Answer (A)

Sol. a = 400pm

For Body centered unit cell ;

$\sqrt{3}a = 4r$

$\therefore \frac{\sqrt{3}(400)}{4} = r$ r = 173.2 pm

42. Which of the following is Ferromagnetic?

(A) MnO (B) CrO_2

(C) O_2 (D) Fe_3O_4

Answer (B)

Sol. Fe, Co, Ni and CrO_2 are ferromagnetic in nature

43. What is the normality of aqueous solution of H_2SO_4 having pH = 1.

(A) 0.1 N (B) 0.05 N

(C) 1 N (D) 0.5 N

Answer (A)

Sol. $H_2SO_4 \rightarrow 2H_{(aq)} \quad SO^2_{4(aq)}$

$^+] = 0.1M$; the $p^H = 1$

Molarity of H_2SO_4 = 0.05 M

$\therefore$ Normality of $H_2SO_4 = M_{H_2SO_4} \times n_f$

= 0.05 x 2

= 0.1 N

44. Which of the following mixture is non-ideal solution?

(A) Chlorobenzene and bromobenzene

(B) Benzene and toluene

(C) Chloroform and acetone

(D) Bromoethane and chloroethane

Answer (C)

Sol. $(CHCl_3 + H_3C - \overset{O}{\overset{\|}{C}} - CH_3)$ forms a non-ideal solution showing negative deviation

45. Which solution is isotonic with 6% w/v aqueous solution of urea? [Mole mass of Urea = 60 gm. mol^{-1}]

(A) 0.1 M NaCl (B) 0.5 M NaCl

(C) 0.25 M NaCl (D) 1 M NaCl

Answer (B)

Sol. Isotonic solution means $(\pi_1 = \pi_2)$

Isotonic presure for 6% w/v aqueous soltuion of area (π_1) = icRT

6 gms of area is present in 100ml solution

$\therefore C = \frac{6}{60} \times \frac{1000}{100} = 1$

$\therefore \pi_1 = (1)(1)RT$ ($\because$ i of area = 1)

$\pi_1 = RT$

$\therefore$ For 0.5 M NaCl solution, i = 2

so $\pi_2 = (2)(0.5\,RT)$

$\boxed{\pi_2 = RT}$

46. In which metal container, the aqueous solution of $CuSO_4$ can be stored?

$E^0_{Cu^{3+}/Cu} = 0.34V$

$E^0_{Fe/Fe^{2+}} = 0.44V, E^0_{Al/Al^{3+}} = 1.66V$

$E^0_{Ni/Ni^{2+}} = 0.25V, E^0_{Ag^+/Ag} = 0.80V$

(A) Fe (B) Ni

(C) Ag (D) Al

Answer (C)

Sol. Since the SRP value of Ag^+/Ag = 0.80 V

$\therefore$ aq solution of $CuSO_4$ can be stored in Ag as

$E^0_{Cu^{2+}/Cu} = 0.34V$

47. For how much time, 10 ampere electric current should be passed through a dilute aqueous $NiSO_4$ solution during electrolysis using inert electrode, in order to get 5.85 gm Nickel? [At. mass of Ni = 58.5gm]

(A) 1930 sec. (B) 3860 sec.

(C) 965 sec. (D) 9650 sec.

Answer (A)

Sol. By Faraday's Ist law of electrolysis m = zit

$5.85 = \frac{E}{F}(i)(t)$

($\because$ E = Equivalent mass of Ni)

$E = \frac{58.5}{2}$ $5.85 = \frac{58.5}{2}\frac{(10)}{(96500)}(t)$

$\therefore$ t = 1930 sec.

48. What will be the oxidation potential for the following hydrogen half cell at 1 bar pressure and 25°C temperature?

$$Pt\left|H_{2(g)}\right|_{1\,bar}\left|HCl_{(aq)}\right. pH = 3$$

(A) 0.177 V (B) 0.188 V
(C) 0.059 V (D) 0.000 V

Answer (A)

Sol. For the half cell; $Pt\left|H_{2(g)}\right|_{1\,bar}\left|HCl_{(aq)}\right. pH = 3$

$H_{2(g)} \rightarrow 2H^{+}_{(ag)} + 2e^{-}$ by Nernst equation

$$E_{cell} = E^{\circ}_{Cell} - \frac{0.0591}{n}\log\frac{[H^{+}]^2}{p_{H_2}}$$

$$E_{cell} = 0 - \frac{0.0591}{2}\log\frac{(10^{-3})^2}{1} \quad [\because [H^{+}] = 10^{-3}M]$$

$$E_{cell} = -\frac{0.0591}{2}(-6)$$

$E_{cell} = 0.177$ V

49. Which ore does not contain carbonate?
(A) Malachite (B) Ciderite
(C) Calamine (D) Zincite

Answer (D)

Sol. Zincite is ZnO, so does not contain carbonate

50. Which is the correct order of metallurgy for the extraction of copper metal?
(A) Concentration $\rightarrow$ roasting $\rightarrow$ smelting $\rightarrow$ bessimerisation
(B) Concentration $\rightarrow$ smelting $\rightarrow$ roasting $\rightarrow$ bessimerisation
(C) Concentration $\rightarrow$ smelting $\rightarrow$ bessimerisation $\rightarrow$ roasting
(D) Concentration $\rightarrow$ roasting $\rightarrow$ bessimerisation $\rightarrow$ smelting

Answer (A)

Sol. In the extraction of copper metal; the correct order is
Concentration $\rightarrow$ Roasting $\rightarrow$ Smelting $\rightarrow$ Bessimerisation

51. How many grams of Cl_2 gas will be obtained by the complete reaction of 31.6 gm of potassium permanganate with hydrochloric acid?
[Mole mass of $KMnO_4$ = 316 gm/mol]
(A) 35.5 (B) 17.75
(C) 71 (D) 142

Answer (B)

Sol. $2KMnO_4 + 16HCl \rightarrow 2MnCl_2 + 5Cl_2 + 2KCl + 8H_2O$

2 moles $KMnO_4$ produces 5 moles of Cl_2

1 mole of $KMnO_4$ will produce $\frac{5}{2}$ molles of Cl_2

$\therefore$ $\frac{31.6}{316}$ moles of KMnO4 will produce $\frac{1}{4}$ moles of Cl_2

$\therefore$ Mass of Cl_2 gas = $\frac{71}{4}$ = 17.75 gms.

52. What is the structure of $XeOF_4$?
(A) Pyramidal (B) Trigonal bipyramidal
(C) Square pyramidal (D) Square bipyramidal

Answer (C)

Sol. $XeOF_4$

Hybridisation of Xe = $5 + \frac{1}{2}[8-6]$
= 5 + 1
= sp^3d^2

Hence by the VSEPR theory, due to 5 bond pair & 1 lone pair of e^{-} The shape of $XeOF_4$ is square pyramidal

53. Which one is not an allylic halide?
(A) 1 – Chloro but – 2 – ene
(B) 1 – Chloro but – 1 – ene
(C) 3 – Chloro cyclo hex – 1 – ene
(D) 3 – Chloro prop – 1 – ene.

Answer (B)

Sol. 1 – Chloro but – 1 – ene $\Rightarrow$ $HC(Cl)=CH-CH_2-CH_3$

Hence the above is not an allylic halide but vinylic halide

54. Which is the main organic product obtained by the reaction of 2, 2, 2 trichloro ethanal with calcium hydroxide?
(A) Chloroform
(B) Carbon tetrachloride
(C) Methylene chloride
(D) Trichloro ethane

Answer (A)

Sol. On reaction of 2,2,2 - trichloro ethanal (Chloral) with $Ca(OH)_2$; chloroform ($CHCl_3$) is the main organic product obtained.

55. Which of the following compound is optically inactive?

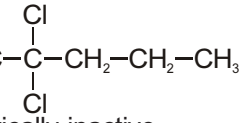
(A) 2 – Hydroxy propanoic acid

(B) 2, 3 – Dichloro butane

(C) 3 – Chloro but – 1 – ene

(D) 2, 2 – Dichloro pentane

Answer (D)

Sol. 2, 2 – Dichloropentane $\Rightarrow$ 

$\therefore$ The above compound is optically inactive

56. Which of the organic products of the following reactions has the least boiling point?

(A) $CH_3 - CH_2 - CHO \xrightarrow[H_2O]{NaBH_4}$

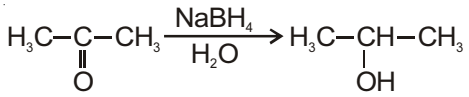
(B) $CH_3 - \underset{\underset{O}{\|}}{C} - CH_3 \xrightarrow[H_2O]{NaBH_4}$

(C) $CH_3 - CH_2 - COOH \xrightarrow[H_2O]{LiAlH_4}$

(D) $CH_3 - CH = CH_2 \xrightarrow[H_2O_2, OH^-]{(BH_3)_2}$

Answer (B)

Sol. In the reaction A,C,D the product formed is propan–1-ol. whereas in the reaction – B



$\therefore$ Due to weaker force of attraction in Propan-2-ol; it has least boiling point.

57. Which is the final product obtained by the reaction of a grignard reagent ethyl Magnesium bromide with propanone?

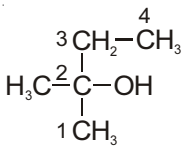
(A) Pentane – 2 – ol

(B) 2 – Methyl – butane – 2 – ol

(C) Pentane –1– ol

(D) 3 – Methyl – butane – 2 – ol

Answer (B)

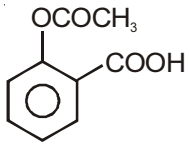
Sol. $C_2H_5MgBr + H_3C-\underset{\underset{O}{\|}}{C}-CH_3 \rightarrow$ 

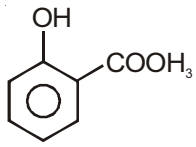
(Final Product)

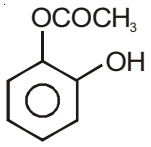
+ Mg(OH)Br

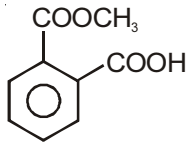
$\therefore$ Final product formed is 2–Methyl - butan-2-ol

58. Which is the correct structural formula of Aspirin?

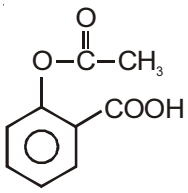
(A) 

(B) 

(C) 

(D) 

Answer (A)

Sol. Aspirin : 

59. The units for the rate constant and the rate of reaction are same for a reaction. What will be the order of the reaction?

(A) First (B) Zero

(C) Second (D) Third

Answer (B)

Sol. Unit of rate constant (k) = $(conc)^{1-n}$ $(s)^{-1}$

n = order of the reaction

The rate law of the reaction is

Rate = K $[Reactant]^n$

For unit of Rate = Rate constant (k); n should be equal to 0

$\therefore$ Order is zero

60. At 27° C temperature, time required for 75% completion of a first order reaction is 20 seconds. What will be its rate constant?

(A) 0.693 sec^{-1} (B) 0.0693 sec^{-1}

(C) 0.693 sec^{-1} $mole^{-1}$ lt (D) 0.0693 sec^{-1} $mole^{-1}$ lt

Answer (B)

Sol. For 1st order reaction ;

$$Kt = \ln\left(\frac{A_o}{A_t}\right)$$

$$K(20) = \ln\left(\frac{A_o}{0.25A_o}\right)$$

$$K(20) = \ln(4)$$

$$K = \frac{2\ln 2}{20} = \frac{0.693}{10} = 0.0693\,s^{-1}$$

61. Which statement is incorrect for a catalyst?
(A) It decreases the activation energy of a reaction
(B) It increases the proportion of products in less time
(C) It does not affect the equilibrium constant
(D) It increases the free energy change for the reaction

Answer (D)

Sol. A Catalyst can,
(i) Increase the rate of reaction by decreasing the activation energy
(ii) Also increase the proportion of products per unit time.
(iii) Does not alter equilibrium established reaction. Hence does not alter equilibrium constant.
(iv) Does not alters the valueof ΔG and ΔH
Hence the correct answer is (D)

62. During electrophoresis of colloidal sol of $Fe(OH)_3$, the colloidal particles
(A) Move towards anode
(B) Move towards cathode
(C) Move towards anode and cathode both
(D) Do not move

Answer (B)

Sol. $Fe(OH)_3$ is a positively charged colloid. Hence under the influence of electricity these particles can migrate towards cathode.

63. In manufacturing of sulphuric acid in presence of platinum catalyst, which metal impurity acts as catalytic poison?
(A) Cu (B) Cr
(C) Fe (D) V

Answer (A)

Sol. In production of sulphuric acid, in the presence of platinum catalyst, the impurity of copper decreases the efficiency of the catalyst. It is called catalytic poison.

64. Which ion has the least value of theoretical magnetic moment?
(A) Ti^{3+} (B) Co^{3+}
(C) Cr^{3+} (D) V^{3+}

Answer (A)

Sol. Magnatic moment $\mu = \sqrt{n(n+2)}$ BM
where n = no. of unpaired electrons
As the number of unpaired electrons increases, magnetic moment also increases.
In the given options.
Ti^{+3} = $[Ar]3d^1 4s^o$; n=1
Co^{+3}= $[Ar]3d^6 4s^o$;n=4
Cr^{+3} = $[Ar]3d^3 4s^o$;n=3
V^{+3}= $[Ar]3d^2\ 4s^o$;n=2
Hence the correct answer is (A)

65. Which of the following mixture can form an alloy?
(A) Fe, Mn, Mg
(B) Cr, Co, Na
(C) Fe, Ni, Cr
(D) Ni, Mg, Na

Answer (C)

Sol. Alloy is the combination of two or more metals.
According to Hume-Rothery ratio, metals which have
(i) Similar electronic structure in the valence shell
(ii) Similar crystal structure and
(iii) Difference in the radius should be less than 15% can form alloy.
Hence Fe, Ni, Cr – belongs to 3d – series can form alloy.

66. Which of the following statements is incorrect?
(A) K_4 $[Ni(CN)_4]$ is square planar while $K_2[Ni(CN)_4]$ is paramagnetic.
(B) K_2 $[Ni(CN)_4]$ is diamagnetic while $K_2[NiCl_4]$ is paramagnetic.
(C) K_4 $[Ni(CN)_4]$ and $K_2[Ni(CN)_4]$ both have same magnetic moment
(D) K_2 $[NiCl_4]$ and K_4 $[Ni(CN)_4]$ both have same geometrical shapes

Answer (A)

Sol. Incorrect option is (A) where
$K_4[Ni(CN)_4]$ sp^3 Tetrahedran (Diamagnetic)
$K_2[Ni(CN)_4]$ dsp^2 square planar (Diamagnetic)
$K_2[NiCl_4]$ sp^3 Tetrahedran (Paramagnetic)

67. The aqueous solution of which of the following complex has the leaste conductivity under identical conditions.
(A) Hexa aqua chromium (III) chloride
(B) Tetra aqua dichlorido chromium (III) chloride
(C) Penta aqua chlorido chromium (III) chloride
(D) Tri aqua trichlorido chromium (III)

Answer (D)

Sol. The complex which produce least number of ions in aqueous solution will show least conductivity.
(A) $[Cr(H_2O)_6]Cl_3$; 4 ions
(B) $[Cr(H_2O)_4Cl_2]Cl$; 2 ions
(C) $[Cr(H_2O)_5Cl]Cl_2$; 3 ions
(D) $[Cr(H_2O)_3Cl_3]$; No ions.

68. Which complex possess facial isomer?

(A) $[Co(NH_3)_4CO_3]Cl$

(B) $[Co(NH_3)_3(NO_2)_3]$

(C) $K[Fe(NH_3)_2(CN)_4]$

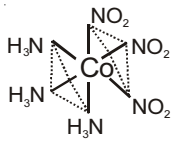
(D) $[Ni(H_2O)_4(NH_3)_2]SO_4$

Answer (B)

Sol. Facial and Meridional isomersm shown by the complex

$[MA_3B_3]$ type

Ex:- $[Co(NH_3)_3(NO_2)_3]$



69. Which of the following is not a final product obtained by cross aldol condensation of ethanal and propanal?

(A) But-2-enal

(B) 2-Methyl-pent-2-enal

(C) 3-Methyl-but-2-enal

(D) Pent-2-enal

Answer (C)

Sol. $H_3C-\overset{O}{\overset{\|}{C}}-H$ Ethanal $\quad H_3C-CH_2-\overset{O}{\overset{\|}{C}}-H$ Propanol

on crossed aldol condensation gives.

$2\ H_3C-\overset{O}{\overset{\|}{C}}-H \xrightarrow{OH^-} H_3C-CH=CH-\overset{O}{\overset{\|}{C}}-H$ but-2-enal

$2\ H_3C-CH_2-\overset{O}{\overset{\|}{C}}-H \xrightarrow{OH^-} H_3C-CH_2-CH=\underset{CH_3}{\overset{}{C}}-\overset{O}{\overset{\|}{C}}-H$

2–methylpent-2-enal

$H_3C-\overset{O}{\overset{\|}{C}}-H \quad H_3C-CH_2-\overset{O}{\overset{\|}{C}}-H \xrightarrow{OH^-} H_3C-CH=\underset{CH_3}{\overset{}{C}}-\overset{O}{\overset{\|}{C}}-H$

2–methylbut-2-enal

$H_3C-CH_2-\overset{O}{\overset{\|}{C}}-H \quad H_3C-\overset{O}{\overset{\|}{C}}-H \xrightarrow{OH^-} H_3C-CH_2-CH=CH-\overset{O}{\overset{\|}{C}}-H$

Pent – 2 – enal

70. Which is the main functional group in Acrolein?

(A) Nitrile (B) Alkene

(C) Aldehyde (D) Ester

Answer (C)

Sol. Acrolein $H_2C=C-\overset{O}{\overset{\|}{C}}-H$ Hence the main functional group is aldehyde

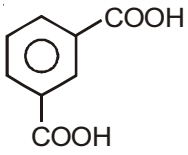
71. Which of the following compound upon oxidation gives isophthalic acid?

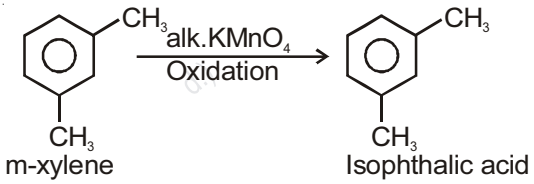
(A) o-Xylene (B) m-Xylene

(C) p-Xylene (D) m-Cresol

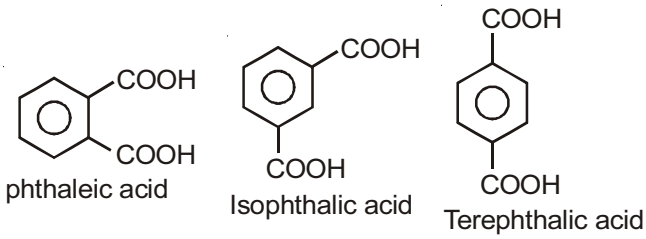
Answer (B)

Sol. Isophthalic acid is





Note :



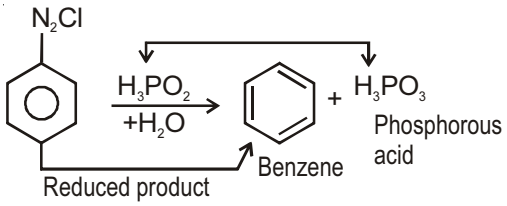
72. Which is the oxidized product obtained when benzene diazonium chloride reacts with phosphonic acid in presence of water?

(A) Benzene (B) Phenol

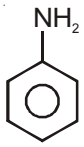
(C) Chloro benzene (D) Phosphorus acid

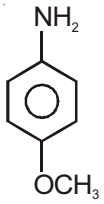
Answer (D)

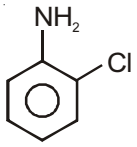
Sol.

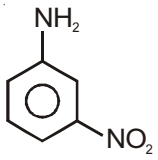


73. Which of the following compound is the most basic?

(A) 

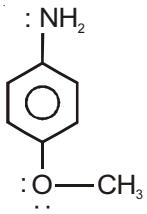
(B) 

(C) 

(D) 

Answer (B)

Sol.

 is most basic among the following because of more pronounced + R effect of $-\ddot{O}-CH_3$ group.

* Basic strength α EDG.

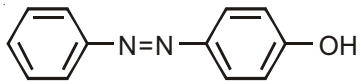
74. The number of σ and π bonds in orange azo dye is _____ and _____ respectively.

(A) 26 and 7 (B) 24 and 7

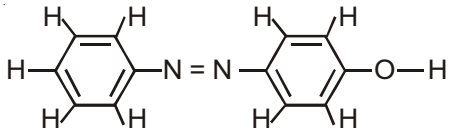
(C) 27 and 7 (D) 26 and 6

Answer (A)

Sol. Orange dye is



It is obtained by the reaction between B.D.C and phenol.



Total σ bonds = 26

Total π bonds = 7

75. Which one is a purine base?

(A) Cytosine (B) Thymine

(C) Uracil (D) Guanine

Answer (D)

Sol. [Guanine and adenine] are purine bases

Cytosine,Uracil,Thymine are pyrimidine bases.

76. Which of the following amino acid has pH greater than 7?

(A) Glycine

(B) Lysine

(C) Glutamic acid

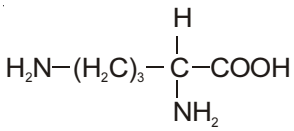
(D) Alanine

Answer (B)

Sol. pH should be more for basic amino acids.

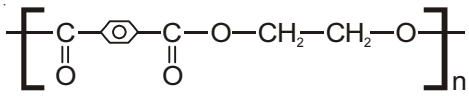
Lysine is basic amino acid.

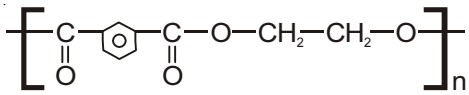
Hence, its pH > 7.

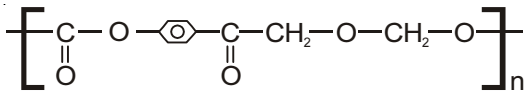


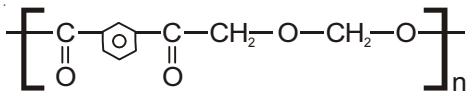
Lysine

77. Which is the correct structural formula for terylene?

(A) 

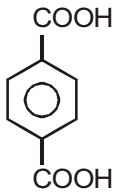
(B) 

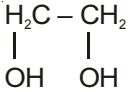
(C) 

(D) 

Answer (A)

Sol. Terylene is the co-polymer of terephthalic acid and Ethylene glycol


Terephthalic Acid


Ethylene Glycol

78. Which are the monomers of Buna – N?

(A) Buta - 1, 3-diene and prop -2-ene-1-nitrile

(B) Buta - 1, 2-diene and acrylonitrile

(C) Buta - 1, 3-diene and prop-1-ene-1-nitrile

(D) Buta - 1, 2-diene and prop-2-ene-1-nitrile

Answer (A)

Sol. Buna – N

Butadiene + Prop – 2 – en – 1 – nitrile

$H_2C = CH - CH = CH_2 + H_2C = CH-C \equiv N$

79. Choose the correct option for the suitable match between Column I and Column II

Column - I	Column - II
(P) Artificial Sweetner	(L) Caramel
(Q) Food Preservative	(M) Ascorbic acid
(R) Anti Oxidants	(N) Alitame
(S) Food colours	

(A) P $\rightarrow$ N, Q $\rightarrow$ O, R $\rightarrow$ M, S $\rightarrow$ L

(B) P $\rightarrow$ N, Q $\rightarrow$ M, R $\rightarrow$ O, S $\rightarrow$ L

(C) P $\rightarrow$ N, Q $\rightarrow$ O, R $\rightarrow$ L, S $\rightarrow$ M

(D) P $\rightarrow$ L, Q $\rightarrow$ O, R $\rightarrow$ M, S $\rightarrow$ N

Answer (A)

Sol. Artificial sweetner – Alitame

Food Preservative - Sorbic acid

Anti oxidant – Ascorbic acid

Food Colour – Caramel.

80. Which of the following drugs gives releif from anxiety and stress?

(A) Luminal (B) Aspirin

(C) Ofloxacin (D) Mestranol

Answer (A)

Sol. Barbiturates can release from stress and anxiety.

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