

# 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.** Distance =  $\lambda \frac{D}{d} = \frac{500 \times 10^{-9} \times 2}{3 \times 10^{-3}} \text{ m}$   
= 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.**  $z_f = \frac{a^2}{\lambda} = \frac{16 \times 10^{-6}}{500 \times 10^5} = 32 \text{ m}$

3. Resolving power of microscope is

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

**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.**  $d = \frac{12.27}{\sqrt{V}} \text{ \AA}$

5. The threshold frequency of cesium is  $5.16 \times 10^{14}$  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  $\alpha$ -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)  $9 \times 10^{13} \text{ J}$                       (B)  $4 \times 10^{12} \text{ J}$   
(C)  $6 \times 10^{11} \text{ J}$                       (D)  $7 \times 10^{12} \text{ J}$

**Answer (A)**

**Sol.**  $E = mc^2$

10. In which process neutron is converted into proton?

(A)  $\beta^+$  decay                      (B)  $\alpha$  - decay  
(C)  $\beta^-$  decay                      (D)  $\gamma$  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  $5 \times 10^{28}$  atom  $\text{m}^{-3}$ . It is doped by 1 PPM concentration of pentavalent As. Calculate the number of electron & holes.

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

- (A)  $5.4 \times 10^9 \text{ m}^{-3}$  (B)  $4.5 \times 10^9 \text{ m}^{-3}$   
(C)  $4.5 \times 10^{-9} \text{ m}^{-3}$  (D)  $5.4 \times 10^{-9} \text{ m}^{-3}$

**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)  $\frac{q}{\epsilon_0}$  (B)  $\frac{q}{6\epsilon_0}$   
(C)  $\frac{q}{24\epsilon_0}$  (D) None of these

**Answer (C)**

**Sol.**  $\phi_{\text{total}} = \frac{Q}{8\epsilon_0}$

$$\phi_{\text{one surface}} = \frac{\phi_{\text{total}}}{3} = \frac{Q}{24\epsilon_0}$$

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

- (A)  $3.6 \times 10^4 \text{ NC}^{-1}$  (B)  $7.2 \times 10^4 \text{ NC}^{-1}$   
(C) Zero (D)  $12.96 \times 10^4 \text{ NC}^{-1}$

**Answer (B)**

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

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

$$q = 10^{-8} \text{ C}$$

$$d = 0.1 \text{ m}$$

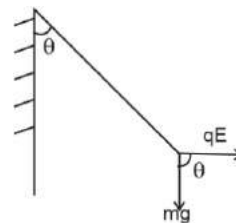
17. The charge density of uniformly charged infinite plane is  $\sigma$ . A simple pendulum is suspended vertically downward near it. Charge  $q_0$  is placed on metallic bob. If the angle made by the string is  $\theta$  with vertical direction then .....

- (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.**  $E = \frac{\sigma}{2\epsilon_0}$

$$\tan \theta = \frac{qE}{mg} = \frac{q\sigma}{2\epsilon_0 mg}$$



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

- (A)  $\text{M}^1 \text{L}^{-2} \text{A}^1 \text{T}^1$   
(B)  $\text{L}^{-2} \text{A}^{-1} \text{T}^{-1}$   
(C)  $\text{L}^2 \text{A}^{-1} \text{T}^{-1}$   
(D)  $\text{L}^{-2} \text{A}^1 \text{T}^1$

**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)  $7 \times 10^{-10}$  (B)  $7 \times 10^{-9}$   
(C) 79 (D)  $81 \times 10^{-10}$

**Answer (C)**

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

20. 2  $\mu\text{F}$  capacitor is connected with 50 V supply & 3  $\mu\text{F}$  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.**  $V_C = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2} = \frac{2 \times 50 + 3 \times 100}{2 + 3} = 80 \text{ volts}$

21. The emf of a car battery is 12 V. If internal resistance of battery is 0.4  $\Omega$ , 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  $\Omega$  & at steam point is 5.23  $\Omega$ . When the thermometer is inserted in a hot bath, the resistance of a platinum wire is 5.795  $\Omega$ . Calculate the temperature of the bath.

- (A) 365.65  $^{\circ}\text{C}$   
(B) 354.56  $^{\circ}\text{C}$   
(C) 345.65  $^{\circ}\text{C}$   
(D) 245.65  $^{\circ}\text{C}$

**Answer (C)**

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

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

23. One electric cell (having emf of 2V & internal resistance of 0.1 $\Omega$ ) and other electric cell (having emf of 4V & internal resistance of 0.2 $\Omega$ ) 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.**  $E_{\text{net}} = \frac{\frac{E_1}{r_1} + \frac{E_2}{r_2}}{\frac{1}{r_1} + \frac{1}{r_2}}$

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  $\text{Am}^2$  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 $^{\circ}$  under the influence of magnetic field. The moment of inertia of coil is 0.1  $\text{kg m}^2$ . 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 .....  $\times 10^{-5}$  T.

- (A)  $6.7 \times 10^{-5}$
- (B)  $2.4 \times 10^{-5}$
- (C)  $2.4 \times 10^5$
- (D) 2.4

**Answer (D)**

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

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

- (A)  $0^\circ 41'$  W
- (B)  $0^\circ 41'$  E
- (C)  $0^\circ 58'$  E
- (D)  $0^\circ 58'$  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)  $2 \times 10^3$
- (B)  $2.5 \times 10^{-3}$
- (C)  $2.5 \times 10^3$
- (D)  $2 \times 10^{-3}$

**Answer (A)**

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

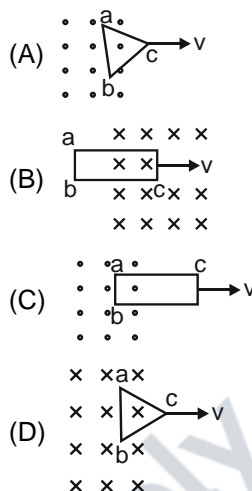
29. The coil having 1000 turns & Area of  $0.10 \text{ m}^2$  rotates at half a revolution per second & it is placed in a uniform magnetic field of 0.01 T perpendicular to the axis of rotation of coil. Then max. emf voltage generated in coil is ..... V

- (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  $a \rightarrow c \rightarrow b$ .



**Answer (D)**

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

31. Which is not the unit of Inductance?

- (A)  $\text{V.s.A}^{-1}$
- (B)  $\text{WbA}^{-1}$
- (C) H
- (D)  $\text{Wb.s.A}^{-1}$

**Answer (D)**

**Sol.**  $\phi = Li$

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

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

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

- (A)  $484 \Omega \text{m}^{-1}$
- (B)  $484 \Omega$
- (C)  $2.2 \Omega$
- (D)  $2.2 \times 10^{-3} \Omega \text{m}^{-1}$

**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  $R = 3 \Omega$ ,  $L = 25.48 \text{ mH}$  &  $C = 796 \mu\text{F}$ . Then impedance is ..... at resonance condition.

- (A)  $5 \Omega$
- (B)  $15 \Omega$
- (C)  $3 \Omega$
- (D)  $4 \Omega$

**Answer (A)**

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

$$R = 3 \Omega$$

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

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

34. What is correct for real transformer?

- (A)  $P_i > P_o$
- (B)  $P_i < P_o$
- (C)  $P_i = P_o$
- (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  $1^\circ$ ?

- (A) 4 hrs.
- (B) 4 min.
- (C) 4 sec.
- (D) 24 hrs.

**Answer (C)**

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

38. For glass lens  $f = +50 \text{ cm}$ . Then power of lens is .....

- (A)  $-2 \text{ D}$
- (B)  $+0.02 \text{ D}$
- (C)  $+2 \text{ D}$
- (D)  $-0.02 \text{ D}$

**Answer (C)**

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

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.

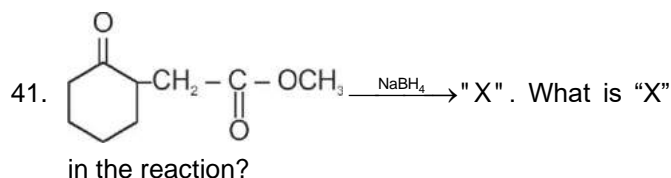
40. What is the type of nature of image formed for an object placed on axis of concave mirror between pole & centre?

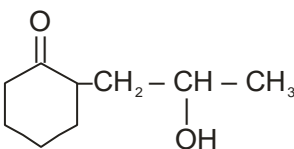
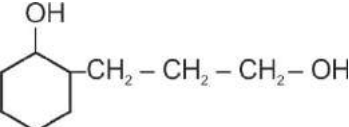
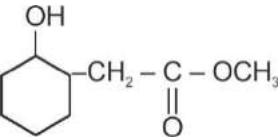
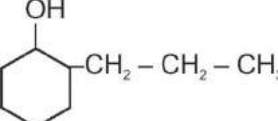
- (A) Virtual, erect & diminished
- (B) Real, inverted & diminished
- (C) Real, inverted & magnified
- (D) Virtual, erect & magnified

**Answer (C, D)**

**Sol.** C & D both possible

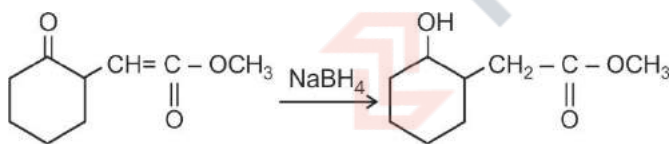
## CHEMISTRY



- (A) 
- (B) 
- (C) 
- (D) 

**Answer (C)**

**Sol.** As we know  $\text{NaBH}_4$  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 =  $-1^\circ\text{C}$

Pentanal =  $103^\circ\text{C}$

Ethoxy ethane =  $34.6^\circ\text{C}$

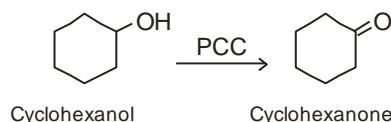
Pentanol =  $138^\circ\text{C}$

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

- (A)  $\text{O}_3 / \text{H}_2\text{O} - \text{Zn dust}$  (B) PCC  
(C) Anhydrous  $\text{CrO}_3$  (D) DIBAL - H

**Answer (B)**

**Sol.**



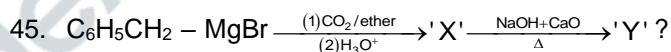
44. Which of the following acid has highest  $\text{pK}_a$  value?

- (A)  $\text{O}_2\text{NCH}_2\text{COOH}$  (B)  $\text{NCCH}_2\text{COOH}$   
(C)  $\text{FCH}_2\text{COOH}$  (D)  $\text{C}_6\text{H}_5\text{CH}_2\text{COOH}$

**Answer (D)**

**Sol.** Acidic strength  $\propto \frac{1}{\text{pK}_a} \propto$  stability of conjugate base.

$\text{C}_6\text{H}_5\text{CH}_2\text{COOH}$  is weakest acid among all so has highest  $\text{pK}_a$  value.

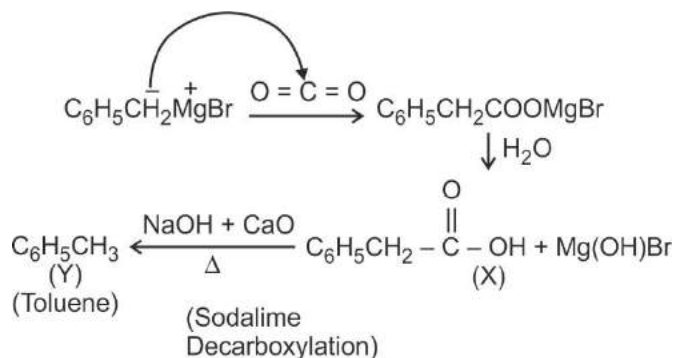


What is the final product in this reaction?

- (A)  $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_3$  (B)  $\text{C}_6\text{H}_5\text{CH}_3$   
(C)  $\text{C}_6\text{H}_6$  (D)  $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$

**Answer (B)**

**Sol.**



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

- (A)  $\text{C}_6\text{H}_5\text{NH}_2$   
(B)  $\text{NH}_3$   
(C)  $(\text{C}_2\text{H}_5)_2\text{NH}$   
(D)  $\text{C}_2\text{H}_5\text{NH}_2$

**Answer (A)**



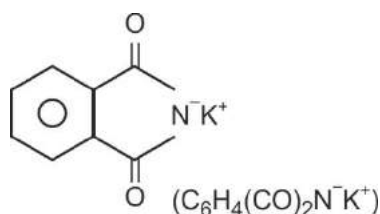
**Sol.** Basic strength  $\propto$  Lone pair Availability. In Aniline ( $C_6H_5NH_2$ ) as the lone pair is in conjugation so it is least basic among all given.

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.**

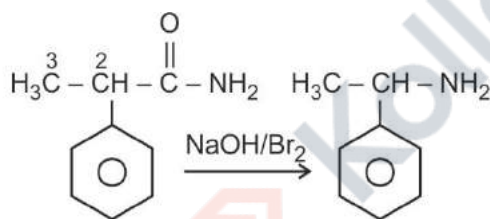


48. The best reagent for converting 2-phenyl propanamide into 1-Phenyl ethanamine is ....

- (A)  $NaBH_4$  (B)  $H_2/Pt$   
(C)  $LiAlH_4$  (D)  $NaOH/Br_2$

**Answer (D)**

**Sol.**



(2-Phenyl Propanamide) (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)  $\beta$ -D ribose sugar is present in RNA  
(iii) Amylose is water insoluble component made up of  $\alpha$ -D-(+) glucose units  
(iv) All monosaccharides are non-reducing sugars.
- (A) TTFF (B) TFTF  
(C) TTFT (D) FTTF

**Answer (A)**

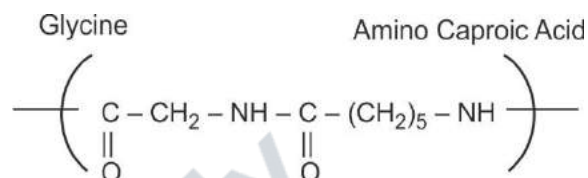
**Sol.** Fact

50. Which amino acids are used in the preparation of Nylon-2-Nylon 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.**  $nH_2N-CH_2-COOH + nNH_2-(CH_2)_5-COOH$



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.** Zeiglar 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) Pyridoxine

**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  $90^\circ$
- (D) In  $\text{MnO}$ , all the domains are aligned in the same direction

**Answer (None is correct)**

**Sol.** Fact

56. What are the fractions of  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$  in  $\text{Fe}_{0.93}\text{O}$  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  $\text{Fe}^{2+} = x$  &  $\text{Fe}^{3+} = (0.93-x)$

By charge conservation,

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

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

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

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

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

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.**  $n_{\text{solute}} = 0.25$  ;  $n_{\text{H}_2\text{O}} = 0.75$

$$\text{Mass of } \text{H}_2\text{O} = 0.75 \times 18 = 13.5\text{g}$$

$$\text{Molality} = \frac{n_{\text{solute}}}{\text{mass of } \text{H}_2\text{O}(\text{kg})}$$

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

59. The osmotic pressure of 0.5 M aqueous solution of  $\text{CH}_3\text{COOH}$  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.**  $\text{CH}_3\text{COOH} \rightleftharpoons \text{CH}_3\text{COO}(\text{ag}) + \text{H}^+$

$$t = 0, 0.5 \text{ M}$$

$$0.5(1-\alpha) \qquad 0.5\alpha \qquad 0.5\alpha$$

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

$$i = (1+\alpha)$$

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

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

$$\pi = icRT$$

$$\pi = (1.02)(0.5) \text{ RT}$$

$$\pi = 0.51 \text{ RT}$$

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

$$E^\circ_{\text{Cr}_2\text{O}_7^{2-}|\text{Cr}^{3+}} = 1.33 \text{ V}$$

$$E^\circ_{\text{MnO}_4^-|\text{Mn}^{2+}} = 1.51\text{V}$$

$$E^\circ_{\text{Br}_2|\text{Br}^-} = 1.09 \text{ V}$$

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

- (A)  $\text{Mn}^{2+}$  (B)  $\text{Cr}^{3+}$
- (C)  $\text{Br}^-$  (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  $\Lambda_m$  against  $\sqrt{C}$  gives negative slope.

- (A) Sodium acetate
- (B) Acetic acid
- (C) Ammonium hydroxide
- (D) Water

**Answer (A)**

**Sol.**  $\lambda_m$  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)  $\text{MCl}_3$
- (B)  $\text{MCl}_2$
- (C)  $\text{MCl}$
- (D)  $\text{MCl}_4$

**Answer (B)**

**Sol.** From Faraday's 1<sup>st</sup> Law of electrolysis,  $m = Zit$ .

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

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

$$n = 2$$

$$\therefore \text{Formula} = \text{MCl}_2$$

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  $\text{SO}_2\text{Cl}_2$  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)  $2.88 \times 10^{-2} \text{ s}^{-1}$
- (B)  $1.73 \times 10^{-2} \text{ s}^{-1}$
- (C)  $2.88 \times 10^{-4} \text{ s}^{-1}$
- (D)  $1.73 \times 10^{-4} \text{ s}^{-1}$

**Answer (C)**

**Sol.** For 1<sup>st</sup> order Reaction,

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

66. Which of the following is a reversible sol?

- (A)  $\text{As}_2\text{S}_3$  sol
- (B) Gelatin sol
- (C)  $\text{Fe}(\text{OH})_3$  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].

| P           | Q                   | R                  | S                   |
|-------------|---------------------|--------------------|---------------------|
| 1 mol He    | 1 mol $\text{SO}_2$ | 1 mol $\text{H}_2$ | 1 mol $\text{CH}_4$ |
|             |                     |                    |                     |
| 1g Charcoal | 1g Charcoal         | 1g Charcoal        | 1g Charcoal         |

(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)  $[\text{Au}(\text{CN})_4]^{2-}$
- (B)  $[\text{Au}(\text{OH})_2]^-$
- (C)  $[\text{Au}(\text{OH})_4]^{2-}$
- (D)  $[\text{Au}(\text{CN})_2]^-$

**Answer (D)**

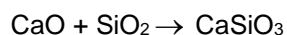
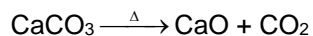
**Sol.**  $[\text{Au}(\text{CN})_2]^-$  is formed in the leaching process of Gold.

69. Which of the following slag is formed during the extraction of iron in the blast furnace?

- (A)  $\text{FeCO}_3$
- (B)  $\text{CaCO}_3$
- (C)  $\text{CaSiO}_3$
- (D)  $\text{FeSiO}_3$

**Answer (C)**

**Sol.** In the extractive metallurgy of Iron,



(Flux) (Slag)

70. Which of the following is the correct order?

- (A) Stability:  $\text{HI} < \text{HBr} < \text{HCl} < \text{HF}$   
 (B) Acidic strength:  $\text{HClO}_4 < \text{HClO}_3 < \text{HClO}_2 < \text{HClO}$   
 (C) Ionic character:  $\text{MF} < \text{MCl} < \text{MBr} < \text{MI}$   
 (D) Electron gain enthalpy:  $\text{I} < \text{Br} < \text{Cl} < \text{F}$

**Answer (A)**

**Sol.** Since order of  $\text{FBDE} \propto \text{stability}$  ....

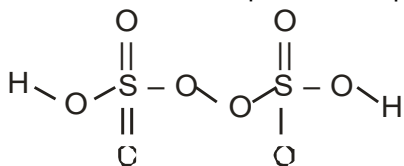
stability order =  $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$

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

- (A)  $\text{H}_2\text{S}_2\text{O}_8$  (B)  $\text{H}_2\text{S}_2\text{O}_7$   
 (C)  $\text{H}_2\text{S}_2\text{O}_4$  (D)  $\text{H}_2\text{S}_2\text{O}_3$

**Answer (A)**

**Sol.**  $\text{H}_2\text{S}_2\text{O}_8$ : Marshall's acid or peroxo-disulphuric acid



72. Concentrated  $\text{HNO}_3$  oxidise white phosphorus into which substance?

- (A)  $\text{H}_4\text{P}_2\text{O}_7$  (B)  $\text{H}_3\text{PO}_2$   
 (C)  $\text{H}_3\text{PO}_4$  (D)  $\text{H}_3\text{PO}_3$

**Answer (C)**

**Sol.**  $\text{P}_4 + 20\text{HNO}_3 \rightarrow 4\text{H}_3\text{PO}_4 + 20\text{NO}_2 + 4\text{H}_2\text{O}$   
 (Phosphoric acid)

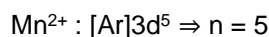
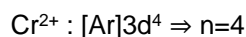
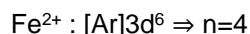
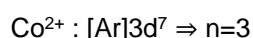
73. The divalent ion of which of the following element in aqueous solution has magnetic moment 5.92 BM?

- (A) Cr (B) Co  
 (C) Fe (D) Mn

**Answer (D)**

**Sol.** For Magnetic Moment of 5.92 BM

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



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) Ionisation isomerism  
 (D) Solvate isomerism

**Answer (A)**

**Sol.** Since the complex is  $[\text{Co}(\text{NH}_3)_6]^{3+} [\text{Cr}(\text{CN})_6]^{3-}$

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

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

- (A)  $[\text{Co}(\text{NH}_3)_5(\text{H}_2\text{O})]^{3+}$  (B)  $[\text{CoCl}(\text{NH}_3)_5]^{2+}$   
 (C)  $[\text{Co}(\text{NH}_3)_6]^{3+}$  (D)  $[\text{Co}(\text{CN})_6]^{3-}$

**Answer (B)**

**Sol.**  $\text{CFSE} \propto \text{strength of ligand} \propto 1/\lambda$

$\therefore$  complex  $[\text{CoCl}(\text{NH}_3)_5]^{2+}$  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) Triqua 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

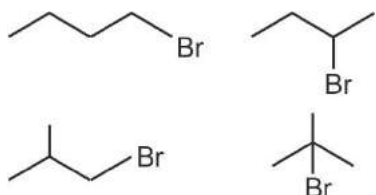
In complex  $(\text{Co}(\text{H}_2\text{O})_6)\text{Cl}_3$ ; the total number of ions produced in aqueous solution is equal to 4.

78. How many optically active isomers are possible in the compound having formula  $\text{C}_4\text{H}_9\text{Br}$ ?

- (A) 2
- (B) 3
- (C) 1
- (D) 4

**Answer (A)**

**Sol.** In  $\text{C}_4\text{H}_9\text{Br}$ , the possible structural isomers are:-



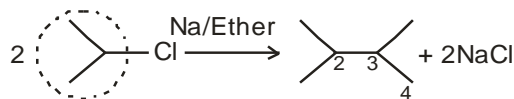
$\therefore$  Two optically active isomers (d + l) of  $\text{C}_4\text{H}_9\text{Br}$  are possible.

79.  $\text{R}' - \text{Cl} \xrightarrow{\text{Na/ether}} 2, 3\text{-dimethyl butane}$ . What is  $\text{R}'$  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  $\text{H}_2$ . Then what will be the valency of metal 'M'?

- (A) 3
- (B) 4
- (C) 2
- (D) 1

**Answer (A)**

**Sol.**  $\text{M}^n + \text{R-OH} \rightarrow (\text{R-O})_n\text{M} + 1/2\text{H}_2(\text{g})$

If 1 mole of metal gives  $3/2$  moles of  $\text{H}_2$  with alcohol that means,

