

FIITJEE - JEE (Main)

PHYSICS, CHEMISTRY & MATHEMATICS JEE Main 2019 Mock Test (Code-100379.1)

Time Allotted: 3 Hours

Maximum Marks: 360

- Do not open this Test Booklet until you are asked to do so.
- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

Important Instructions:

- Immediately fill in the particulars on this page of the Test Booklet with *Blue / Black Ball Point Pen*. Use of pencil is strictly prohibited.
- The Answer Sheet is kept inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars carefully.
- The test is of **3 hours** duration.
- The Test Booklet consists of **90** questions. The maximum marks are **360**.
- There are **three** parts in the question paper A, B, C consisting of **Physics, Chemistry and Mathematics** having 30 questions in each part of equal weightage. Each question is allotted **4 (four)** marks for correct response.
- Candidates will be awarded marks as stated above in instruction No.5 for correct response of each question. $\frac{1}{4}$ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
- There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instruction 6 above.
- Use **Blue / Black Ball Point Pen only** for writing particulars / marking responses on **Side-1** and **Side-2** of the Answer Sheet. **Use of pencil is strictly prohibited.**
- No candidate is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. except the Admit Card inside the examination hall / room.
- On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room / Hall. **However, the candidates are allowed to take away this Test Booklet with them.**
- Do not fold or make any stray marks on the Answer Sheet.**

Atomic No.: H=1, He=2, Li=3, Be=4, B=5, C=6, N=7, O=8, F=9, Na=11, Mg=12, Al = 13, Si = 14, P = 15, S = 16, Cl = 17, Ar =18, K=19, Ca=20, Cr=24, Mn=25, Fe=26, Co=27, Ni=28, Cu=29, Zn=30, As=33, Br = 35, Ag = 47, Si = 21, Sn = 50, Ti = 22, I = 53, Xe = 54, Ba = 56, Pb = 82, U = 92, V = 50.

Atomic masses: H =1, He=4, Li=7, Be=9, B=11, C=12, N=14, O=16, F=19, Na=23, Mg=24, Al=27, Si=28, P=31, S=32, Cl=35.5, K=39, Ca=40, Cr=52, Mn=55, Fe=56, Co=59, Ni=58.7, Cu=63.5, Zn = 65.4, As = 75, Br = 80, Ag = 108, Sn = 118.7, I = 127, Xe = 131, Ba = 137, Pb = 207, U = 238.

Name of the Candidate (in Capital Letters) : _____

Enrolment Number : _____

Batch : _____ Date of Examination : _____

PART - I : PHYSICS

(Single Correct Answer Type)

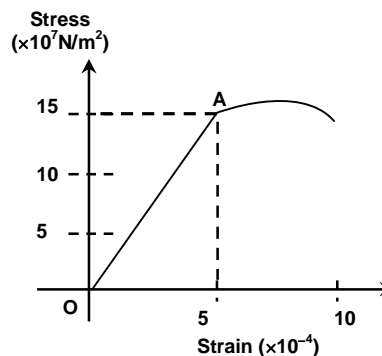
This part contains **30 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. The frequency of the output current a half wave and a full wave rectifier for an input frequency of 50 Hz are
 (A) 50 Hz and 50 Hz (B) 25 Hz and 50 Hz
 (C) 50 Hz and 100 Hz (D) 25 Hz and 100 Hz

2. The ratio of free electron densities in copper and gold is given by $\frac{n_{Cu}}{n_{Au}} = 1.4$, and the ratio of the mean free times of their free electrons is given by $\frac{\tau_{Cu}}{\tau_{Au}} = \frac{50}{49}$. The ratio of their conductivities is
 (A) $\frac{10}{7}$ (B) $\frac{7}{10}$
 (C) $\frac{250}{343}$ (D) $\frac{343}{250}$

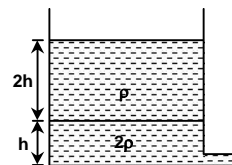
3. A simple pendulum having its natural frequency f has a metal bob. If the bob is charged negatively and is allowed to oscillate with a positively charged plate placed under it, frequency will be
 (A) f (B) $<f$
 (C) $>f$ (D) 0

4. A graph plotted between longitudinal stress and longitudinal strain subjected on a uniform elastic wire is as given in the diagram. Then the Young's modulus of elasticity of that wire is
 (A) $5 \times 10^{11} \text{ N/m}^2$
 (B) $10 \times 10^{10} \text{ N/m}^2$
 (C) $15 \times 10^{11} \text{ N/m}^2$
 (D) $3 \times 10^{11} \text{ N/m}^2$

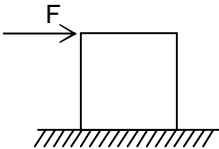
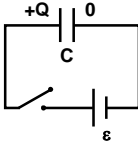


Space for rough work

5. A particle is describing S.H.M with displacement amplitude A . At time $t = 0$ its speed is half of the maximum speed. At time $t = 0$ its displacement w.r.t. the mean position is
- (A) $\frac{3}{2} A$ (B) $2A$
 (C) $\frac{\sqrt{3}}{2} A$ (D) $\sqrt{\frac{3}{2}} A$.
6. Two adiabatic containers have volume V_1 and V_2 respectively. The first container has mono atomic gas at pressure P_1 and temperature T_1 . The second container has another mono atomic gas at pressure P_2 and temperature T_2 . When the two containers are connected by a narrow tube, the final temperature and pressure of the gases in the containers are P and T respectively. Then
- (A) $T = \frac{P_1 V_1 T_2 + P_2 V_2 T_1}{P_1 V_1 + P_2 V_2}$ (B) $T = \frac{P_1 V_1 T_2 + P_2 V_2 T_1}{P_1 V_2 + P_2 V_1}$
 (C) $P = \frac{P_1 V_2 + P_2 V_1}{V_1 + V_2}$ (D) $P = \frac{P_1 V_1 + P_2 V_2}{V_1 + V_2}$
7. A magnet is taken towards a conducting ring in such a way that a constant current of 10 mA is induced in it. The total resistance of the ring is 0.5Ω . In 5 seconds, the magnetic flux through the ring changes by
- (A) 0.25 mWb (B) 25 mWb
 (C) 50 mWb (D) 15 mWb
8. 600 J of heat is added to a monatomic gas in a process in which the gas performs a work of 150 J. The molar heat capacity of the gas for the process is
- (A) $3R$ (B) $4R$
 (C) $2R$ (D) $6R$
9. The velocity of the liquid coming out of a small hole of a vessel containing two different liquids of densities 2ρ and ρ as shown in figure is
- (A) $\sqrt{6gh}$ (B) $2\sqrt{gh}$
 (C) $2\sqrt{2gh}$ (D) \sqrt{gh}



Space for rough work

10. To find the value of 'g' using simple pendulum. $T = 2.00 \pm 0.01$ sec; $\ell = 50.0 \pm 0.2$ cm was measured. The maximum permissible error in 'g' is:
 (A) 1.4% (B) 1.1%
 (C) 1.5% (D) 1.2%
11. In a transistor, the size of collector is largest due to the reason.
 (A) That maximum number of carriers move in collector.
 (B) That electrons take maximum time in collector.
 (C) That large surface area is favorable condition for releasing heat
 (D) That it has to generate charge carriers
12. A force F is applied on the top of a cube as shown in the figure. The coefficient of friction between the cube and ground is μ . If F is gradually increased the cube will topple before sliding if
 (A) $\mu > 1$ (B) $\mu < \frac{1}{2}$
 (C) $\mu > \frac{1}{2}$ (D) $\mu < 1$
- 
13. At $t = 0$, light of intensity 10^{12} photons/s- m^2 of energy 6eV per photon start falling on a plate with work function 2.5 eV. If area of the plate is 2×10^{-4} m^2 and for every 10^5 photons one photoelectron is emitted, charge on the plate at $t = 25$ s is
 (A) 8×10^{-15} C (B) 4×10^{-15} C
 (C) 12×10^{-15} C (D) 16×10^{-15} C.
14. For a certain organ pipe open at both ends, the successive resonance frequencies are obtained at 510, 680 and 850 Hz. The velocity of sound in air is 340 m/s. The length of the pipe must be
 (A) 2 m (B) 0.5 m
 (C) 1 m (D) 0.25 m
15. The left plate of the capacitor shown in the figure above carries a charge $+Q$ while the right plate is uncharged at $t = 0$. The total charge on the right plate after closing the switch will be
 (A) $\frac{Q}{2} + C\varepsilon$ (B) $\frac{Q}{2} - C\varepsilon$
 (C) $-\frac{Q}{2}$ (D) $-C\varepsilon$
- 

Space for rough work

16. An equilateral triangular loop having a resistance R and length of each side ' ℓ ' is placed in a magnetic field which is varying at $\frac{dB}{dt} = 1 \text{ T/s}$. The induced current in the loop will be

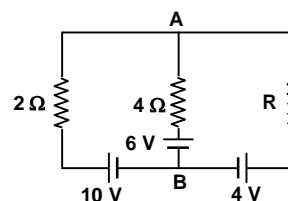


- (A) $\frac{\sqrt{3}}{4} \frac{\ell^2}{R}$ (B) $\frac{4}{\sqrt{3}} \frac{\ell^2}{R}$
 (C) $\frac{\sqrt{3}}{4} \frac{R}{\ell^2}$ (D) $\frac{4}{\sqrt{3}} \frac{R}{\ell^2}$
17. In the given circuit the reading of ideal voltmeter is $E/2$. The internal resistance of the battery is
- (A) 1Ω (B) $\frac{2}{3} \Omega$
 (C) $\frac{2}{5} \Omega$ (D) $\frac{5}{2} \Omega$
-
18. The specific heat capacity of a monoatomic gas for the process $TV^2 = \text{constant}$ is (where R is gas constant)
- (A) R (B) $2R$
 (C) $\frac{R}{3}$ (D) $\frac{R}{4}$
19. The power factor of a circuit in which a box having unknown electrical devices connected in series with a resistor of resistance 3Ω is $3/5$. The reactance of the box is
- (A) 5Ω (B) $5/3 \Omega$
 (C) 4Ω (D) $4/3 \Omega$
20. During an adiabatic process, the density of a gas is found to be proportional to cube of temperature. The degree of freedom of gas molecule is
- (A) 6 (B) 5
 (C) 4 (D) 3
21. When temperature of block of metal is changed from 40°C to 60°C , then the volume of block changes by 0.12% . The linear expansion coefficient of the metal is
- (A) $1 \times 10^{-5}/^\circ\text{C}$ (B) $1.5 \times 10^{-5}/^\circ\text{C}$
 (C) $2 \times 10^{-5}/^\circ\text{C}$ (D) $2.5 \times 10^{-5}/^\circ\text{C}$

Space for rough work

22. In the given circuit, find the value of R (in Ω) for which current through $4\ \Omega$ resistor is zero:

(A) $1\ \Omega$ (B) $2\ \Omega$
 (C) $3\ \Omega$ (D) $4\ \Omega$

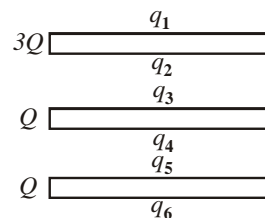


23. When a dielectric slab of thickness $d/2$ is inserted between the plates of a capacitor (with d as the separation between the plates), capacitance of a capacitor becomes $4/3$ times the original value. Find the dielectric constant of the slab.

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

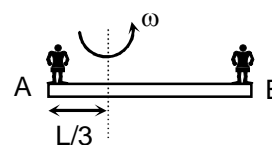
24. A charged plate of charge Q is kept in between two plates. Both the plates have an initial charge of Q and $3Q$ respectively. The final values of charges q_3 and q_5 on surfaces of the plates are

(A) $-\frac{Q}{2}, -\frac{3Q}{2}$ (B) $-\frac{Q}{2}, -\frac{5Q}{2}$
 (C) $-\frac{3Q}{2}, -\frac{5Q}{2}$ (D) $-\frac{3Q}{2}, -\frac{3Q}{2}$

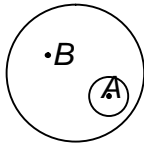
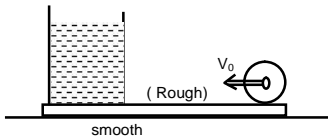


25. Two men A and B are sitting at the end of a plank of length L , if plank is rotating with angular velocity ω about an axis perpendicular to its length and passing through a point at a distance of $L/3$ from A. The angular velocity of B with respect to A is

(A) ω (B) $\omega L/3$
 (C) $2\omega/3$ (D) 2ω



Space for rough work

26. In an interference experiment the separation between the 1st and the 11th bright fringe on a screen is 2.5 mm. The screen is at a distance of 3 m from the interfering sources. If $\lambda = 5000\text{\AA}$, Then ratio of intensity at 0.1 mm from central max and maximum intensity is
- (A) $\sin^2 \frac{4\pi}{5}$ (B) $1 - \cos \frac{\pi}{5}$
 (C) $1 - \sin \frac{\pi}{5}$ (D) $\cos^2 \frac{2\pi}{5}$
27. There is an air bubble of radius R inside a drop of water of radius 3R. Find the ratio of gauge pressure at point B to that at point A.
- (A) $\frac{1}{2}$ (B) $\frac{1}{4}$
 (C) $\frac{1}{3}$ (D) 1
- 
28. A point charge is placed at a distance r from center of a conducting neutral sphere of radius R ($r > R$). The potential at any point P inside the sphere at a distance r_1 from point charge due to induced charge of the sphere is given by [$k = \frac{1}{4\pi\epsilon_0}$]
- (A) kq/r_1 (B) kq/r
 (C) $kq/r - kq/r_1$ (D) $-kq/R$
29. A beaker containing liquid is fixed on a long plank which is placed on a smooth ground. A disk is given a velocity V_0 on upper rough surface of plank. When pure rolling starts the surface of liquid is
- (A) horizontal
 (B) curved
 (C) inclined
 (D) None of the above
- 
30. The half life of a radioactive substance A is 2 hour and that of B 4 hour. What fraction of the original activity of an equi-molar mixture of A and B remains after 12 hour?
- (A) $\frac{9}{64}$ (B) $\frac{5}{96}$
 (C) $\frac{1}{16}$ (D) $\frac{1}{16\sqrt{2}}$

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PART - II : CHEMISTRY

(Single Correct Answer Type)

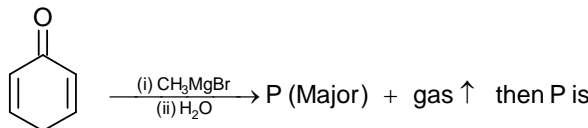
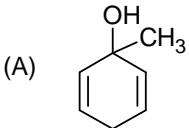
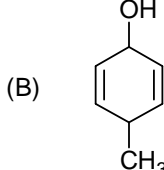
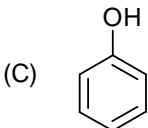
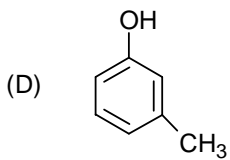
This part contains **30 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

- The inner orbital complex which exhibits both geometrical as well as optical isomerism.
(A) $[\text{Cr}(\text{en})_3]^{4+}$ (B) $[\text{IrF}_3(\text{H}_2\text{O})_2(\text{NH}_3)]$
(C) $[\text{NiCl}_4]^{2-}$ (D) $[\text{Co}(\text{CN})_2(\text{ox})_2]^{3-}$
- Which of the following is correctly matched ?
(A) $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{CN})_6]^{3-}$ - both are octahedral and diamagnetic with d^2sp^3 -hybridisation
(B) $\text{Ni}(\text{CO})_4$ and $[\text{Ni}(\text{CN})_4]^{2-}$ - both are tetrahedral and diamagnetic with sp^3 -hybridisation
(C) $\text{Ni}(\text{CO})_4$ and $[\text{Co}(\text{CO})_4]^-$ - both are tetrahedral and diamagnetic
(D) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ - both are paramagnetic and metal is d^2sp^3 -hybridised
- Consider the following metallurgical processes :
(I) Heating impure metal with CO and distilling the resulting volatile carbonyl (b.p. 43°C) and finally decomposition at 150°C - 200°C to get the pure metal
(II) Heating the sulphide ore in air until a part is converted to oxide and then further heating in the absence of air to let the oxide react with unchanged metal sulphide
(III) Electrolysis of the molten electrolyte containing approximately equal amounts of the metal chloride and NaCl to obtain the metal.
The processes used for obtaining magnesium, nickel and copper are respectively :
(A) I, II and III (B) II, III and I
(C) III, I and II (D) II, I and III
- Which of the following metal does not react with N_2 ?
(A) Mg (B) Ca
(C) K (D) Li
- Among the carbonates of alkali metals which one has highest thermal stability ?
(A) Cs_2CO_3 (B) Rb_2CO_3
(C) K_2CO_3 (D) Na_2CO_3

Space for rough work

6. Which of the following orders regarding thermal stability of hydrides MH_3 of group 15 is correct ?
(A) $NH_3 > PH_3 > AsH_3$ (B) $NH_3 < PH_3 < AsH_3$
(C) $NH_3 > PH_3 < AsH_3$ (D) $NH_3 < PH_3 > AsH_3$
7. The products formed by complete hydrolysis of PCl_3 are
(A) H_3PO_3 and HCl (B) $POCl_3$ and HCl
(C) H_3PO_4 and HCl (D) $H_4P_2O_7$ and HCl
8. If 30 ml of a gaseous hydrocarbon requires 90 ml of O_2 for complete combustion and 60 ml of CO_2 is formed in the process, the molecular formula of hydrocarbon will be
(A) C_2H_2 (B) CH_4
(C) C_2H_4 (D) C_2H_6
9. Which one of the following constitutes a group of the isoelectronic species ?
(A) C_2^{2-} , O_2^{2-} , CO , NO (B) NO^+ , C_2^{2-} , CN^- , N_2
(C) CN^- , N_2 , O_2^{2-} , C_2^{2-} (D) N_2 , O_2^{2-} , NO^+ , CO
10. Calculate the wavelength (in nanometer) associated with a proton moving at $1.0 \times 10^3 \text{ ms}^{-1}$ (mass of proton = $1.67 \times 10^{-27} \text{ kg}$ and $h = 6.63 \times 10^{-34} \text{ J s}$)
(A) 0.032 nm (B) 0.40 nm
(C) 2.5 nm (D) 14.0 nm
11. The charge/size ratio of a cation determines its polarizing power. Which one of the following sequence represents the increasing order of the polarizing power of the cationic species, K^+ , Ca^{2+} , Mg^{2+} and Be^{2+} ?
(A) $Ca^{2+} < Mg^{2+} < Be^{2+} < K^+$ (B) $Mg^{2+} < Be^{2+} < K^+ < Ca^{2+}$
(C) $Be^{2+} < K^+ < Ca^{2+} < Mg^{2+}$ (D) $K^+ < Ca^{2+} < Mg^{2+} < Be^{2+}$
12. Which one of the following pairs of species have the same bond order ?
(A) CN^- and NO^+ (B) CN^- and CN^+
(C) O_2^- and CN^- (D) NO^+ and CN^+

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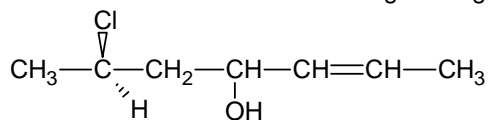
13. In the conversion of limestone to lime, $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$, the values of ΔH° and ΔS° are $179.1 \text{ kJ mol}^{-1}$ and 160.2 J K^{-1} , respectively, at 198 K and 1 bar. Assuming that ΔH° and ΔS° do not change with temperature, the temperature above which conversion of limestone to lime is
 (A) 1118 K (B) 1008 K
 (C) 1200 K (D) 845 K
14. The entropy change involved in the isothermal reversible expansion of 2 mol of an ideal gas from a volume of 10 dm^3 to a volume of 100 dm^3 at 27°C is
 (A) $35.8 \text{ J mol}^{-1} \text{ K}^{-1}$ (B) $32.3 \text{ J mol}^{-1} \text{ K}^{-1}$
 (C) $42.3 \text{ J mol}^{-1} \text{ K}^{-1}$ (D) $38.3 \text{ J mol}^{-1} \text{ K}^{-1}$
15.  $\xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) CH}_3\text{MgBr}}$ P (Major) + gas \uparrow then P is
 (A)  (B) 
 (C)  (D) 
16. If sodium sulphate is considered to be completely dissociated into cations and anions in aqueous solution, the change in freezing point water (ΔT_f) when 0.01 mol of sodium sulphate is dissolved in 1 kg of water is (Given $K_f = 1.86 \text{ K mol}^{-1}$)
 (A) 0.0186 K (B) 0.0372 K
 (C) 0.0558 K (D) 0.0744 K
17. $\text{Ag}^+ + \text{NH}_3 \rightleftharpoons [\text{Ag}(\text{NH}_3)]^+ ; K_1 = 3.5 \times 10^{-3}$
 $[\text{Ag}(\text{NH}_3)]^+ + \text{NH}_3 \rightleftharpoons [\text{Ag}(\text{NH}_3)_2]^+ ; K_2 = 1.7 \times 10^{-3}$ then the formation constant of $[\text{Ag}(\text{NH}_3)_2]^+$ is
 (A) 6.08×10^{-6} (B) 6.08×10^6
 (C) 6.08×10^{-9} (D) None of these

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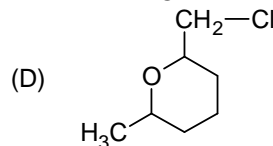
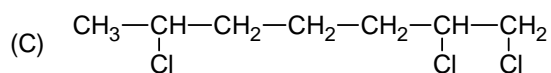
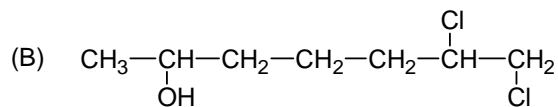
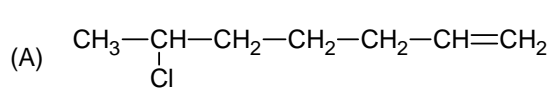
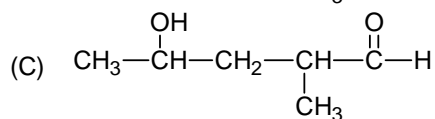
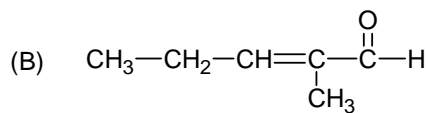
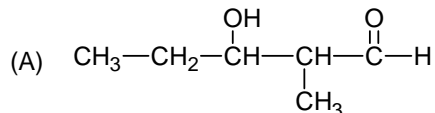
18. Solid $\text{Ba}(\text{NO}_3)_2$ is gradually dissolved in 1.0×10^{-4} M Na_2CO_3 solution. At what concentration of Ba^{2+} will a precipitate begin to form ? (Given K_{sp} for $\text{BaCO}_3 = 5.1 \times 10^{-9}$)
 (A) 8.1×10^{-8} M (B) 8.1×10^{-7} M
 (C) 4.1×10^{-5} M (D) 5.1×10^{-5} M
19. In aqueous solution the ionization constants for carbonic acid are $K_1 = 4.02 \times 10^{-7}$ and $K_2 = 4.8 \times 10^{-11}$. Select the correct statement for the saturated 0.034 M solution of the carbonic acid.
 (A) The concentration of H^+ is double that of CO_3^{2-}
 (B) The concentration of CO_3^{2-} is 0.034 M
 (C) The concentration for CO_3^{2-} is greater than of HCO_3^-
 (D) The concentration for H^+ and HCO_3^- are approximately equal
20. For the cell reaction $\text{Pb} + \text{Sn}^{2+} \rightarrow \text{Pb}^{2+} + \text{Sn}$. Calculate the ratio of cation concentration for which $E=0$. at 298 K [$E_{\text{Pb}^{2+}/\text{Pb}}^0 = 0.13$, $E_{\text{Sn}^{2+}/\text{Sn}}^0 = -0.14$]
 (A) 0.5 (B) 0.7
 (C) 0.2 (D) 0.8
21. For a reaction $2\text{P} + \text{Q} \rightarrow \text{S}$; following data were collected.
- | | P (mol L ⁻¹) | Q (mol L ⁻¹) | Rate (mol L ⁻¹ min ⁻¹) |
|-------|--------------------------|--------------------------|---|
| (I) | 6×10^{-2} | 1×10^{-2} | 0.0012 |
| (II) | 6×10^{-2} | 2×10^{-2} | 0.0024 |
| (III) | 12×10^{-2} | 3×10^{-2} | 0.0024 |
- the reaction rate constant k is
 (A) 2 min⁻¹ (B) 4 min⁻¹
 (C) 5 min⁻¹ (D) 6 min⁻¹
22. Gold number of protective colloids A, B, C and D are 0.50, .001, 0.10 and 0.005, respectively. The correct order of their protective power is
 (A) $D < A < C < B$ (B) $C < B < D < A$
 (C) $A < C < B < D$ (D) $B < D < A < C$
23. Number of geometrical isomerism for the molecule $\text{C}_2(\text{Cl})(\text{Br})(\text{F})(\text{I})$ is
 (A) 2 (B) 6
 (C) 4 (D) G.I not possible

Space for rough work

24. Number of stereo isomers for the given organic molecule is/are

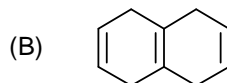
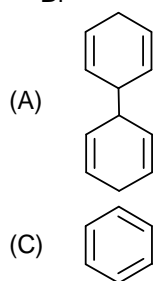
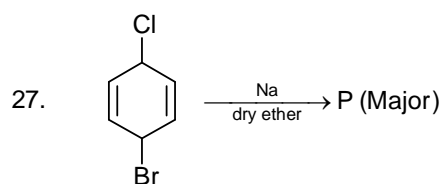

 (A) 8
 (C) 4

 (B) 2
 (D) 6

 25. $\text{CH}_3-\underset{\text{OH}}{\text{CH}}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}=\text{CH}_2 + \text{Cl}_2 \xrightarrow[\text{(1 eq)}]{\text{CCl}_4} \text{P (Major)}$

 26. $\text{CH}_3-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{H} \xrightarrow[\text{(ii) } \Delta]{\text{(i) OH}^-} \text{P (Major)}$


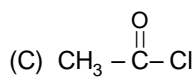
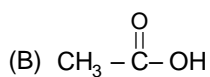
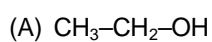
(D) None of these

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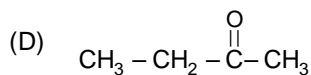
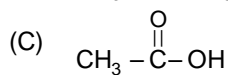
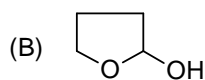
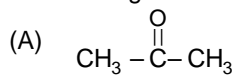
(D) No reaction

28. Which will give haloform test ?

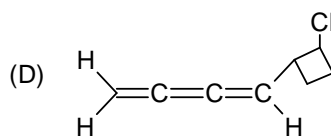
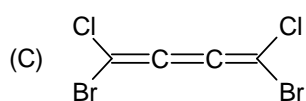
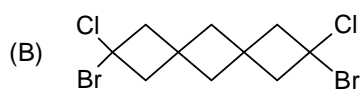
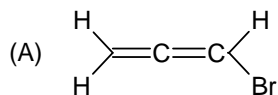


(D) $\text{CH}_3\text{-OH}$

29. Which will give tollen's test ?



30. Optically active isomer is



Space for rough work

PART – III : MATHEMATICS**SECTION – A****Straight Objective Type**

This section contains **30 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which only **ONE option is correct**

- If $a_i > 0$ for $i = 1, 2, \dots, n$ and $a_1 a_2 \dots a_n = 1$, then minimum value of $(1 + a_1)(1 + a_2) \dots (1 + a_n)$ is
(A) $2^{\frac{n}{2}}$ (B) 2^n
(C) 2^{2n} (D) 1
- If z_1, z_2, z_3 and z_4 be the roots of $z^4 + z^3 + 2 = 0$. Then $\prod (2z_r + 1)$ is equal to
(A) 28 (B) 29
(C) 30 (D) 32
- $p(x)$ is a polynomial of least degree such that $p(k) = \frac{1}{k}$ for $k = 1, 2, 3, 4, 5, 6, 7, 8, 9$. Then the value of $p(10)$ is
(A) $\frac{1}{10}$ (B) $\frac{1}{5}$
(C) $\frac{1}{2}$ (D) $\frac{1}{20}$
- If x_1 and x_2 are roots of $x^2 - 6x + 4 = 0$, then $\frac{(x_1 - 2)^{16} + (x_2 - 6)^8}{x_1^8}$ is equal to
(A) 256 (B) 512
(C) 128 (D) 257

Space for rough work

5. In a binomial distribution the probability of getting a success is $\frac{1}{4}$ and standard deviation is 3, then its mean is
(A) 6 (B) 8
(C) 12 (D) 10
6. If r_1 and r_2 are the radii of smallest and largest circle which passes through (5, 6) and touches the circle $(x-2)^2 + y^2 = 4$, then $r_1 \cdot r_2$ is equal to
(A) $\frac{9}{41}$ (B) $\frac{41}{4}$
(C) $\frac{5}{41}$ (D) $\frac{41}{6}$
7. Equation of chord of the circle $x^2 + y^2 - 3x - 4y - 4 = 0$ which passes through origin such that origin divides it in the ratio 4 : 1 is
(A) $x = 0$ (B) $24x + 7y = 0$
(C) $7x + 24y = 0$ (D) $7x - 24y = 0$
8. Number of distinct normal that can be drawn to ellipse $\frac{x^2}{169} + \frac{y^2}{25} = 1$ from point P(0, 6) is
(A) one (B) two
(C) three (D) four
9. $\lim_{x \rightarrow 0} \frac{\sin x^4 - x^4 \cos x^4 + x^{20}}{x^4 (e^{2x^4} - 1 - 2x^4)}$ is equal to
(A) 0 (B) $-\frac{1}{6}$
(C) $\frac{1}{6}$ (D) does not exist

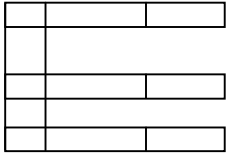
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10. A function 'g' defined for all real $x > 0$ satisfies $g(1) = 1$, $g'(x^2) = x^3$ for $x > 0$, then $g(4)$ equals
- (A) $\frac{13}{3}$ (B) 3
(C) $\frac{67}{5}$ (D) none of these
11. The complete set of values of ' λ ' for which the function $f(x) = \begin{cases} x+1 & ; x < 1 \\ \lambda & ; x = 1 \\ x^2 - x + 3 & ; x > 1 \end{cases}$ is strictly increasing at $x = 1$ is
- (A) (2, 3) (B) [2, 3]
(C) [2, 3] (D) ϕ
12. $\int x^{\frac{2}{3}} \left(1+x^{\frac{1}{2}}\right)^{-\frac{13}{3}} dx$ is equal to
- (A) $\frac{3}{5} \left(1+x^{\frac{1}{2}}\right)^{-\frac{13}{3}} + c$ (B) $\frac{3}{5} \left(1+x^{\frac{1}{2}}\right)^{-\frac{10}{3}} + c$
(C) $-\frac{1}{13} \left(1+x^{\frac{1}{2}}\right) + c$ (D) none of these
13. $\int_0^2 \sqrt{x + \sqrt{x + \sqrt{x + \dots \infty}}} dx$ is equal to
- (A) $\frac{19}{6}$ (B) $\frac{17}{6}$
(C) $\frac{13}{6}$ (D) none of these

Space for rough work

14. A function $f(x)$ which satisfy the relation $f(x) = e^x + \int_0^1 e^x f(t) dt$, then $f(x)$ is
- (A) $\frac{e^x}{2-e}$ (B) $(e-2)e^x$
(C) $2e^x$ (D) $\frac{e^x}{2}$
15. Value of the parameter 'a' such that area bounded by $y = a^2x^2 + ax + 1$, coordinate axes and the line $x = 1$, attains its least value is equal to
- (A) $-\frac{1}{4}$ (B) $-\frac{1}{2}$
(C) $-\frac{3}{4}$ (D) -1
16. The order of the differential equation whose general solution is $y = c_1 \cos 2x + c_2 \cos^2 x + c_3 \sin^2 x + c_4$ is
- (A) 2 (B) 4
(C) 3 (D) none of these
17. For all real values of 'a' one root of $x^2 - 3ax + f(a) = 0$ is double of the other, then $f(x)$ is equal to
- (A) $2x$ (B) x^2
(C) $2x^2$ (D) $2\sqrt{x}$
18. a, b, c and d are four positive real numbers such that $abcd = 1$, then minimum value of $(1+a)(1+b)(1+c)(1+d)$ is
- (A) 4 (B) 1
(C) 16 (D) 18
19. The remainder when 27^{40} is divided by 12 is
- (A) 3 (B) 7
(C) 9 (D) 11

Space for rough work

20. The greatest value of ${}^{40}C_0 \cdot {}^{60}C_r + {}^{40}C_1 \cdot {}^{60}C_{r-1} + \dots + {}^{40}C_{40} \cdot {}^{60}C_{r-40}$ is
 (A) ${}^{100}C_{49}$ (B) ${}^{100}C_{50}$
 (C) ${}^{100}C_{51}$ (D) ${}^{101}C_{51}$
21. A shopkeeper has 10 copies of each of the nine different books, then number of ways in which atleast one book can be selected is
 (A) $9^{11} - 1$ (B) $10^{10} - 1$
 (C) $11^9 - 1$ (D) 10^9
22. Number of ways in which AAABBB can be placed in the square of figure as shown, so that no row remains empty is
 (A) 2430
 (B) 2160
 (C) 1620
 (D) none of these
- 
23. A die is rolled three times, the probability of getting a larger number than the previous number is
 (A) $\frac{5}{216}$ (B) $\frac{5}{54}$
 (C) $\frac{1}{6}$ (D) $\frac{5}{36}$
24. If A and B are two square matrix of order 3×3 which satisfy $AB = A$ and $BA = B$, then $(A + B)^7$ is
 (A) $7(A + B)$ (B) $7I_3$
 (C) $64(A + B)$ (D) $128I_3$
25. If $\vec{a} = \hat{i} + \hat{j}$, $\vec{b} = \hat{j} + \hat{k}$, $\vec{c} = \hat{k} + \hat{i}$, then the reciprocal system of vectors of the vectors \vec{a} , \vec{b} , \vec{c} is \vec{a}' , \vec{b}' , \vec{c}' respectively then \vec{a}' is
 (A) $\frac{\hat{i} + \hat{j} + \hat{k}}{2}$ (B) $\frac{\hat{i} - \hat{j} + \hat{k}}{2}$
 (C) $\frac{-\hat{i} - \hat{j} - \hat{k}}{2}$ (D) $\frac{\hat{i} + \hat{j} - \hat{k}}{2}$

Space for rough work

26. Equation of plane which passes through the point of intersection of lines $\frac{x-1}{3} = \frac{y-2}{1} = \frac{z-3}{2}$ and $\frac{x-3}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ & at greatest distance from the point (0, 0, 0) is
- (A) $4x + 3y + 5z = 25$ (B) $4x + 3y + 5z = 50$
 (C) $3x + 4y + 5z = 49$ (D) $x + 7y - 5z = 2$
27. In ΔABC , if $\sin A \cos B = \frac{1}{4}$ and $3 \tan A = \tan B$, then $\cot^2 A$ is equal to
- (A) 2 (B) 3
 (C) 4 (D) 5
28. In a ΔABC , $\cos A + \cos B + \cos C = \frac{7}{4}$, then $\frac{R}{r}$ is equal to
- (A) $\frac{3}{4}$ (B) $\frac{4}{3}$
 (C) $\frac{2}{3}$ (D) $\frac{3}{2}$
29. The solution of the inequality $\log_{\frac{1}{2}} \sin^{-1} x > \log_{\frac{1}{2}} \cos^{-1} x$ is
- (A) $\left[0, \frac{1}{\sqrt{2}}\right]$ (B) $\left[\frac{1}{\sqrt{2}}, 1\right]$
 (C) $\left(0, \frac{1}{\sqrt{2}}\right)$ (D) none of these
30. Solve for x, of $(\tan^{-1} x)^2 + (\cot^{-1} x)^2 = \frac{5\pi^2}{8}$
- (A) 1 (B) -1
 (C) $\sqrt{3}$ (D) $-\sqrt{3}$

Space for rough work