

FIITJEE - JEE (Mains)

Batches: Two Yr CRP(1820)
PHYSICS, CHEMISTRY & MATHEMATICS

QP Code:
CTY – PHASE - 4

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:

1. Immediately fill in the particulars on this page of the Test Booklet with *Blue / Black Ball Point Pen*. Use of pencil is strictly prohibited.
2. 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.
3. The test is of **3 hours** duration.
4. The Test Booklet consists of **90** questions. The maximum marks are **360**.
5. 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.
6. *Candidates will be awarded marks as stated above in instruction No.5 for correct response of each question. One mark 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.*
7. 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.
8. 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.**
9. 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.
10. 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.**
11. **Do not fold or make any stray marks on the Answer Sheet.**

Name of the Candidate (in Capital Letters) : _____

Enrolment Number : _____

Batch : _____

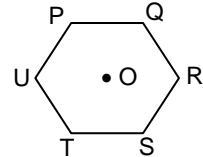
Date of Examination : _____

Physics

1. An electron of mass m_e , initially at rest, moves through a certain distance in a uniform electric field in time t_1 . A proton of mass m_p , also, initially at rest, takes time t_2 to move through an equal distance in this uniform electric field. Neglecting the effect of gravity, the ratio t_2/t_1 is nearly equal to

- (A) 1
- (B) $(m_p / m_e)^{1/2}$
- (C) $(m_e / m_p)^{1/2}$
- (D) 1936

2. Six charges, three positive and three negative of equal magnitude are to be placed at the vertices of a regular hexagon such that the electric field at O is double the electric field when only one positive charge of same magnitude is placed at R. Which of the following arrangements of charge is possible for P, Q, R, S, T and U respectively?



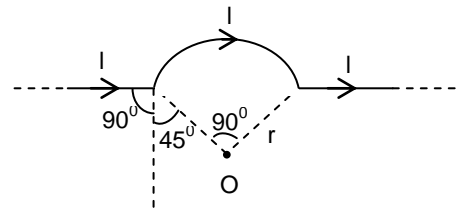
- (A) +, -, +, -, -, +
- (B) +, -, +, -, +, -
- (C) +, +, -, +, -, -
- (D) -, +, +, -, +, -

3. Two identical rings P and Q of radius 0.1 m are mounted coaxially at a distance 0.5m apart. The charge on the two rings are 2 and 4 μC respectively. The work done in transferring a charge of 5 μC from the center of P to that of Q is

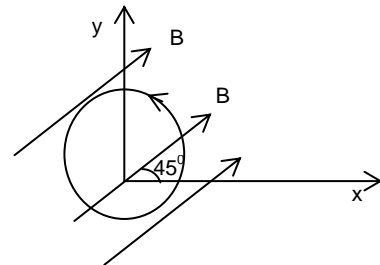
- (A) 1.28 J
- (B) 0.72 J
- (C) 0.144 J
- (D) 2.24 J

4. The magnetic field at the centre O of the arc in figure is (r is the radius of circular arc)

- (A) $\frac{\mu_0 I}{4\pi \times r} [\sqrt{2} + \pi]$
- (B) $\frac{\mu_0 I}{2\pi r} \left[\frac{\pi}{4} + 1(\sqrt{2} - 1) \right]$
- (C) $\frac{\mu_0}{4\pi} \times \frac{I}{r} [\sqrt{2} + r]$
- (D) $\frac{\mu_0}{4\pi} \times \frac{I}{r} \left[\sqrt{2} + \frac{\pi}{4} \right]$



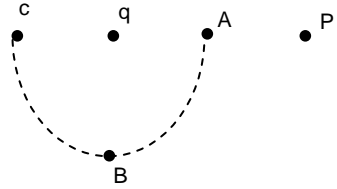
5. A circular loop of radius $R = 20$ cm is placed in a uniform magnetic field $\vec{B} = 2\text{T}$ in x-y plane as shown in figure. The loop carries a current $i = 1.0$ A in the direction shown in figure. Find the magnitude of the torque acting on the loop.



- (A) 0.35 N-m
- (B) 0.25 N-m
- (C) 0.55 N-m
- (D) 2.5 N-m

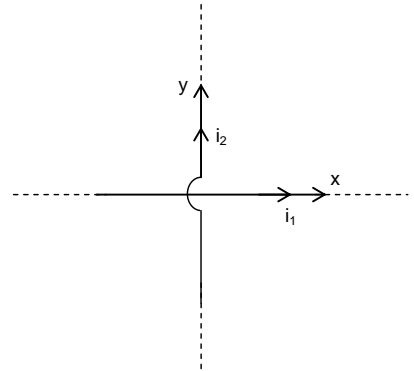
6. The net work done in carrying a point charge from P to A is W_A from P to B is W_B and from P to C is W_C then

- (A) $W_A < W_B < W_C$ (B) $W_A > W_B > W_C$
 (C) $W_A = W_B = W_C$ (D) $W_A = W_B + W_C$



7. Two infinite wires carrying current i_1 and i_2 are lying along x and y axes, as shown in the x – y plane. Then

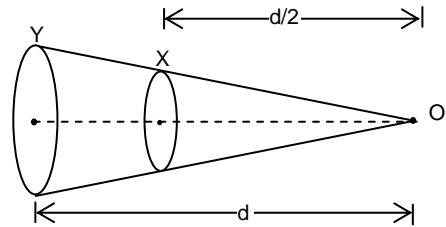
- (A) Locus of points where magnetic field B is zero is a circle
 (B) Locus of points where magnetic field B is zero is a straight line
 (C) Magnetic field B decays hyperbolically along any line parallel x axis
 (D) Magnetic field B decays hyperbolically along any line parallel to y axis



8. A proton, a deuteron and an α - particle having the same kinetic energy are moving in circular trajectories in a constant magnetic field. If r_p , r_d and r_α denote respectively the radii of the trajectories of these particles, then

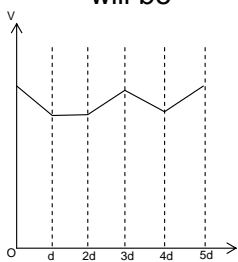
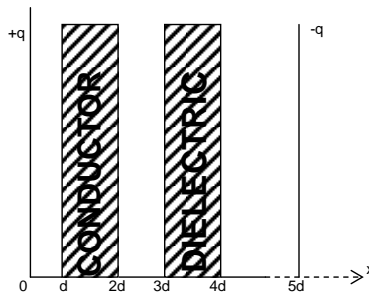
- (A) $r_\alpha = r_p < r_d$ (B) $r_\alpha > r_d > r_p$
 (C) $r_\alpha = r_p > r_d$ (D) $r_\alpha = r_d = r_\alpha$

9. Two circular coils X and Y have equal number of turns and carry equal currents in the same sense and subtend same angle at point O. If the smaller coil X is midway between O and Y and we represent the magnetic field due to coil Y at O as B_y and that due to smaller coil X at O as B_x , then :

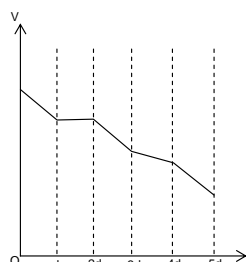


- (A) $\frac{B_y}{B_x} = 1$ (B) $\frac{B_y}{B_x} = 2$
 (C) $\frac{B_y}{B_x} = \frac{1}{2}$ (D) $\frac{B_y}{B_x} = \frac{1}{4}$

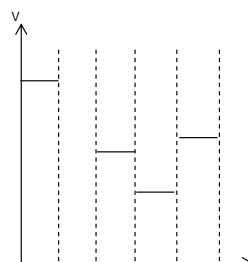
10. The distance between plates of parallel plate capacitor is $5d$. The positively charged plate is at $x = 0$ and negatively charged plate is at $x = 5d$. Two slabs one of conductor and the other of a dielectric of same thickness d are inserted between the plates as shown in figure. Potential (V) versus distance x graph will be



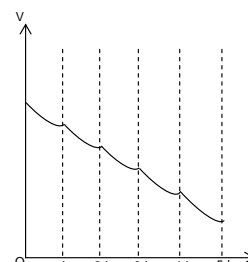
(A)



(B)

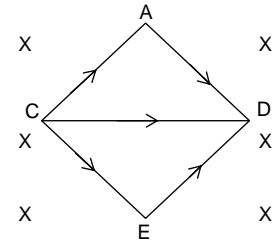


(C)



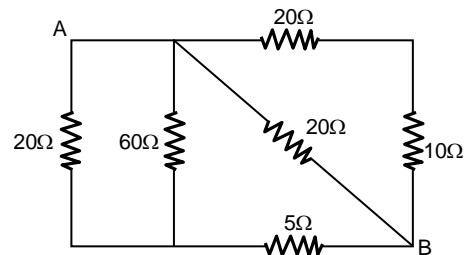
(D)

11. Constant current of 1A flows along all the three branches of wire frame as shown. The frame is a combination of two equilateral triangles ACD and CDE of side 1m. It is placed in uniform magnetic field $B = 4T$ acting perpendicular to the plane of paper. The magnitude of magnetic force acting on the frame is
- (A) 12 N (B) 24 N
(C) 36 N (D) Zero

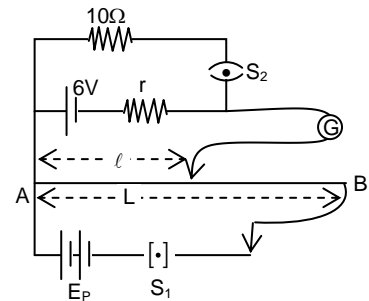


12. A cell of emf E and internal resistance ' r ' is connected in series with an external resistance $5r$. Then the ratio of the terminal potential difference to emf is
- (A) $\frac{1}{5}$ (B) $\frac{1}{6}$
(C) $\frac{5}{6}$ (D) $\frac{6}{5}$

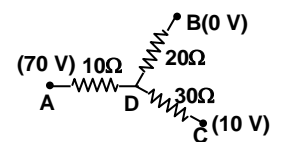
13. Equivalent resistance of the given circuit between points A and B is
- (A) 36.5Ω (B) 24.5Ω
(C) 10.5Ω (D) 7.5Ω



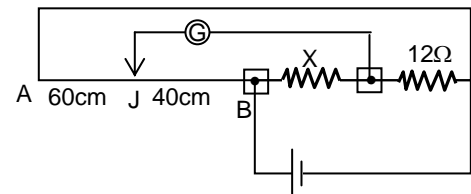
14. In the arrangement shown in the figure when the switch S_2 is open, the galvanometer shows no deflection for $\ell = L/2$. When the switch S_2 is closed, the galvanometer shows no deflection for $\ell = \frac{5}{12}L$. The internal resistance (r) of 6 V cell,
- (A) 3Ω (B) 2Ω
(C) 4Ω (D) 5Ω



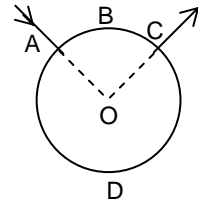
15. In the network shown, points A, B and C are at potentials of 70 V, zero and 10 V respectively.
- (A) Point D is at a potential of 20 V.
(B) The currents in the sections AD, DB, DC are in the ratio 3 : 2 : 1.
(C) The currents in the sections AD, DB, DC are in the ratio 1 : 2 : 3.
(D) The network draws a total power of 400 W.



16. If reading of galvanometer is 0 then value of unknown resistance x is
- (A) 8Ω (B) 18Ω
(C) data insufficient (D) 12Ω



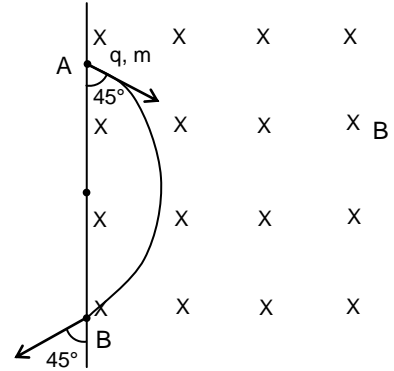
17. A uniform wire is bent in the form of a circle of radius R. A current I enters at A and leaves at C as shown in figure. If the length ABC is half of the length ADC, the magnetic field at the centre O will be



- (A) zero
 (B) $\frac{\mu_0 I}{2R}$
 (C) $\frac{\mu_0 I}{4R}$
 (D) $\frac{\mu_0 I}{6R}$

18. Find out time taken by particle in going from A to B

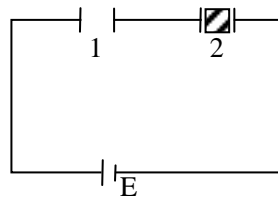
- (A) $\frac{2\pi m}{qB}$
 (B) $\frac{\pi m}{qB}$
 (C) $\frac{\pi m}{2qB}$
 (D) $\frac{\pi m}{4qB}$



19. Two concentric coils each of radius equal to 2π cm are placed at right angles to each other. 3 ampere and 4 ampere are the currents flowing in each coil respectively. The magnetic induction in weber/m² at the center of the coils will be ($\mu_0 = 4\pi \times 10^{-7}$ Wb/A – m)

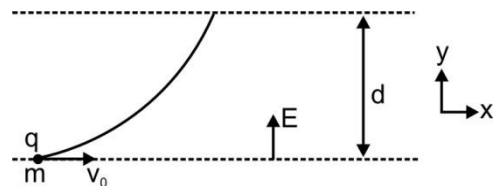
- (A) 5×10^{-5}
 (B) 7×10^{-5}
 (C) 12×10^{-5}
 (D) 10^{-5}

20. Two identical capacitors 1 and 2 are connected in series to a battery as shown in figure. Capacitor 2 contains a dielectric slab of dielectric constant k as shown. Q_1 and Q_2 are the charges stored in the capacitors. Now the dielectric slab is removed and the corresponding charges are Q'_1 and Q'_2 . Then –



- (A) $\frac{Q'_1}{Q_1} = \frac{k+1}{k}$
 (B) $\frac{Q'_2}{Q_2} = \frac{k+1}{2}$
 (C) $\frac{Q'_2}{Q_2} = \frac{k+1}{2k}$
 (D) $\frac{Q'_1}{Q_1} = \frac{k}{2}$

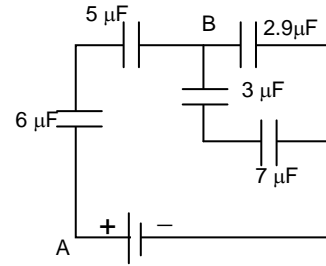
21. Charge q of mass m is projected with velocity v_0 along x-axis in uniform electric field E along y-axis. Radius of curvature of charge when it has travelled distance d along y-axis is? Neglect gravity and it is given that $\frac{qEd}{m} = 2v_0^2$



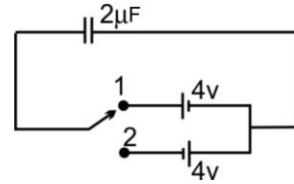
- (A) $\frac{v_0^2 m}{qE} \sqrt{5}$
 (B) $\frac{v_0^2 m}{2qE} \sqrt{5}$
 (C) $\frac{5 v_0^2 m}{2 qE} \sqrt{5}$
 (D) $\frac{5 v_0^2 m}{qE} \sqrt{5}$

22. If 2% of the main current is to be passed through the galvanometer of resistance G, the resistance of shunt required is
 (A) $\frac{G}{49}$ (B) $\frac{G}{50}$
 (C) 49 G (D) 50 G

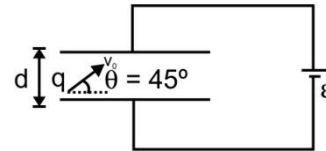
23. In the circuit shown if in steady state the potential difference between points A and B is 11V, find potential difference across 7 μ F capacitor.
 (A) 1.8 V (B) 18 V
 (C) 9 V (D) 1V



24. Heat generated in the circuit when switch is shifted from 1 to 2 is
 (A) 32 μ J
 (B) 16 μ J
 (C) 48 μ J
 (D) 64 μ J

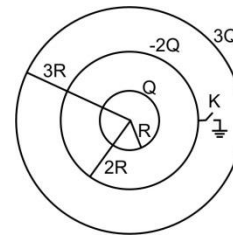


25. A point charge q of small mass m is projected with velocity v_0 from one end of a parallel plate capacitor with plate area $\ell \times \ell$ and separation d between them. For what value of v_0 q will just miss upper plate.



- (A) $2\sqrt{\frac{mgd + q\epsilon}{m}}$ (B) $\sqrt{\left(\frac{q\epsilon}{md} - g\right)\ell}$
 (C) $\sqrt{\left(\frac{q\epsilon}{md} + g\right)\ell}$ (D) $\sqrt{\frac{2(mgd - q\epsilon)}{m}}$

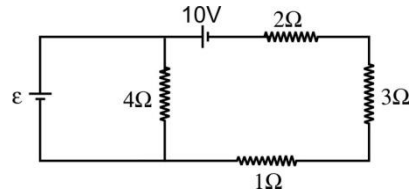
26. Find charge flown from earth when K is switch on.
 (A) -Q
 (B) Q
 (C) 2Q
 (D) -3Q



27. A charged particle is projected in a magnetic field $\vec{B} = (3\hat{i} + 4\hat{j}) \times 10^{-2} \text{ T}$. The acceleration of the particle is found to be $\vec{a} = \left(-\frac{8}{3}\hat{i} + y\hat{j}\right) \text{ m/s}^2$. Find the value of y.
 (A) 2 (B) 3
 (C) 4 (D) 5

28. A parallel plate condenser is charged by a battery. The battery is removed and a thick glass slab is placed between the plates. Now-
 (A) the capacity of the condenser is increased
 (B) the electrical energy stored in the condenser is decreased
 (C) the potential across the plates is decreased
 (D) All of the above

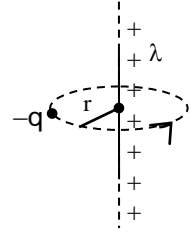
29. For what value of ε power across 4Ω will be 100 w ?
 (A) 20 V (B) 10 V
 (C) 15 V (D) 25 V



30. A point charge $-q$ (of mass m) is revolving in a circle of radius r , around a long positive line of charge with charge density λ , as shown in diagram. Its angular velocity is $\left(k = \frac{1}{4\pi\epsilon_0}\right)$

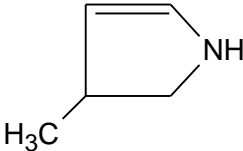
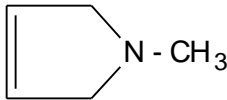
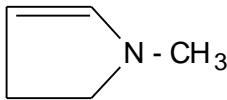
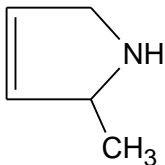
(A) $\sqrt{\frac{2kq\lambda}{mr^2}}$
 (C) $\sqrt{\frac{kq\lambda}{2mr^2}}$

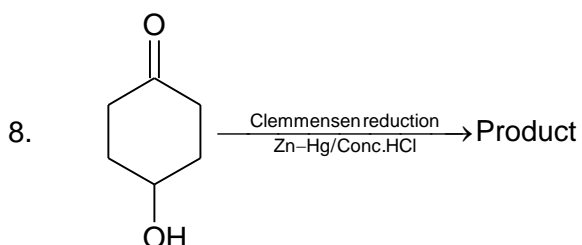
(B) $\sqrt{\frac{kq\lambda}{mr^2}}$
 (D) $\sqrt{\frac{kq\lambda}{4mr^2}}$



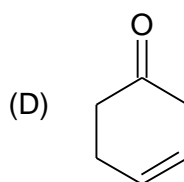
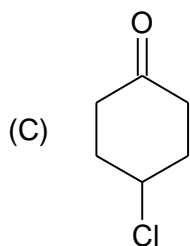
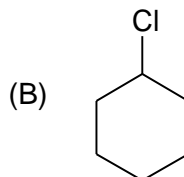
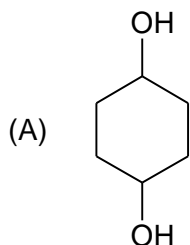
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CHEMISTRY

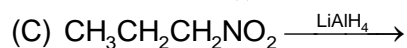
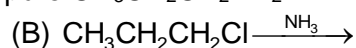
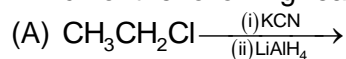
1. Which of the following halide forms a ketone upon hydrolysis?
- (A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHCl}_2$ (B) $\begin{array}{c} \text{Cl} \\ | \\ \text{CH}_3\text{CH}_2\text{CHCH}_3 \end{array}$
- (C) $\begin{array}{c} \text{Cl} \\ | \\ \text{CH}_3\text{CH}_2\text{CCH}_3 \\ | \\ \text{Cl} \end{array}$ (D) $\begin{array}{c} \text{CH}_3\text{CH}_2\text{CHCH}_2\text{Cl} \\ | \\ \text{Cl} \end{array}$
2. $\text{C}_2\text{H}_5\text{OH}$ does not react with
- (A) Na (B) NaCl
(C) $\text{HCl}/\text{ZnCl}_2(\text{anhy})$ (D) $\text{Conc. H}_2\text{SO}_4$
3. CH_3COCH_3 can form a tertiary alcohol when reacts with
- (A) CH_3Cl (B) $\text{CH}_3\text{MgBr}/\text{H}_3\text{O}^+$
(C) $\text{Cu}/300^\circ\text{C}$ (D) (i) PCl_5 /(ii) H_2O
4. Which of the following compound does not react with NaBH_4 ?
- (A) $\text{CH}_3\text{CH}_2\text{CHO}$ (B) $\begin{array}{c} \text{O} \quad \quad \quad \text{O} \\ || \quad \quad \quad || \\ \text{CH}_3 - \text{C} - \text{CH}_2 - \text{C} - \text{CH}_3 \end{array}$
- (C) $\begin{array}{c} \text{O} \\ || \\ \text{CH}_3 - \text{C} - \text{OC}_2\text{H}_5 \end{array}$ (D) $\begin{array}{c} \text{O} \\ || \\ \text{CH}_3 - \text{C} - \text{CH}_2 - \text{CHO} \end{array}$
5. Which is most basic in gaseous state?
- (A)  (B) 
- (C)  (D) 
6. Which will convert $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ to α -chloro butanoic acid?
- (A) $\text{CH}_3\text{CH}_2\text{NH}_2$ (B) $\text{LiAlH}_4/\text{HCl}$
(C) $\text{Cl}_2/\text{red P}$ (D) SOCl_2
7. With which of the following reagent phenol forms the lightest(product with lowest molar mass) product?
- (A) Br_2/CS_2 (B) $\text{Zn dust}/\Delta$
(C) CHCl_3/KOH (D) CH_2N_2



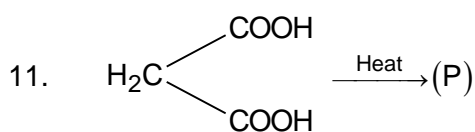
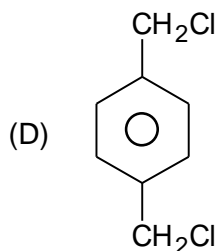
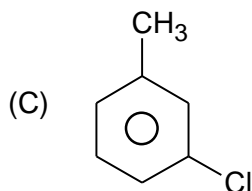
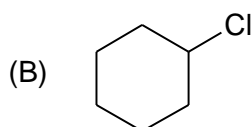
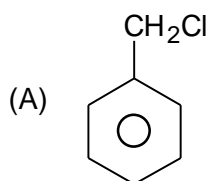
The product of above reaction is:



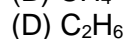
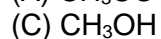
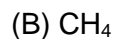
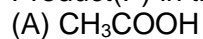
9. Which of the following reaction cannot form pure $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$?

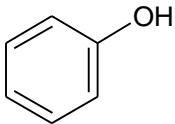
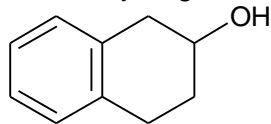
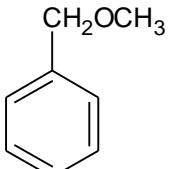
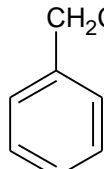
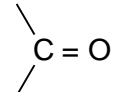


10. Which of the following is called an aryl halide

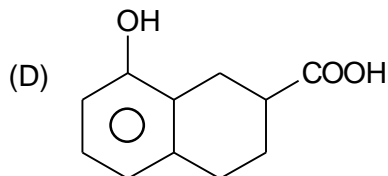
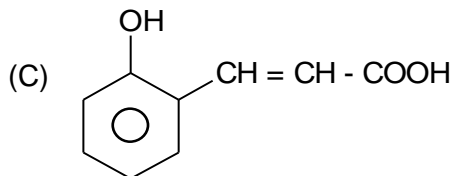
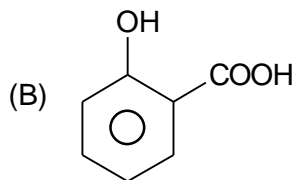
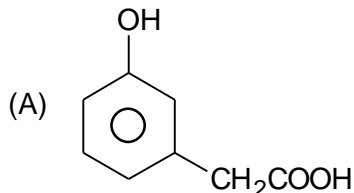


Product(P) in the above reaction is:

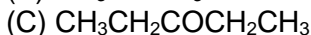
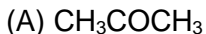


12. Formation of C_2H_5CN from $C_2H_5CONH_2$ is an example of
 (A) addition reaction (B) dehydration reaction
 (C) nucleophilic substitution reaction (D) free radical substitution reaction
13. $2HCHO + Conc.NaOH \longrightarrow CH_3OH + HCOONa$
 Above reaction is called as
 (A) Aldol condensation (B) Wurtz reaction
 (C) Cannizzaro reaction (D) Baeyer Villiger oxidation
14. Which of the following compound contains the most acidic hydrogen?
 (A)  (B) 
 (C)  (D) 
15. Aldehydes form cyanohydrins when react with
 (A) NH_2OH (B) HCN
 (C) $PhNHNH_2$ (D) NH_3
16. How many carbon atom(s) is/are present in the simplest ketone?
 (A) 2 (B) 3
 (C) 4 (D) 5
17. Which of the following substance has maximum acidic strength?
 (A) $HCOOH$ (B) O_2NCH_2COOH
 (C) CH_3COOH (D) $ClCH_2COOH$
18. Which of the following compound on acidic hydrolysis forms an acid and an alcohol?
 (A) Esters (B) Acid anhydrides
 (C) Acid chlorides (D) Amides
19. $CH_3Cl + NH_3 \longrightarrow CH_3NH_2 + HCl$
 Above reaction is an example of
 (A) Electrophilic substitution reaction (B) Nucleophilic substitution reaction
 (C) Electrophilic addition reaction (D) Nucleophilic addition reaction
20. Which functional groups are present in fructose?
 (A) OH and $-CHO$ (B) OH and $-O-$
 (C) OH and  (D) OH and $-COOH$
21. Which of the following ether forms only one type of alkyl iodide on treatment with excess of HI ?
 (A) $CH_3OCH_2CH_3$ (B) $CH_3CH_2OCH_2CH_3$
 (C) $C_6H_5OCH_2C_6H_5$ (D) $C_6H_5OC_6H_5$

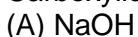
22. Which of the following acid on decarboxylation reaction forms unsubstituted phenol?



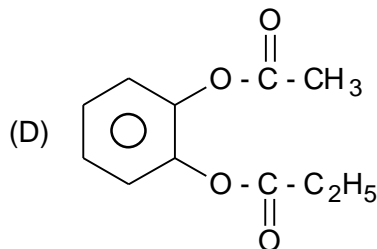
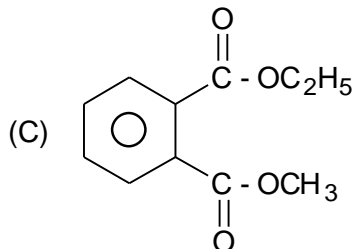
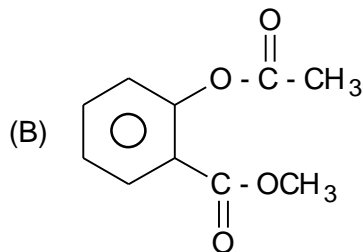
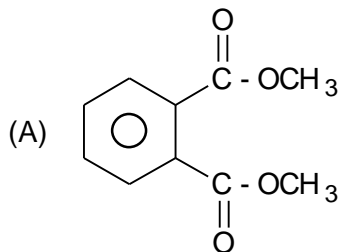
23. Which of the following ketone does not undergo iodoform reaction?



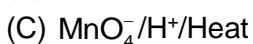
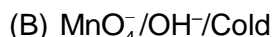
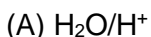
24. Carboxylic acids form CO_2 gas when react with



25. Which of the following compound forms salicylic acid  on acidic hydrolysis?

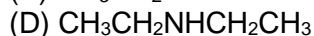
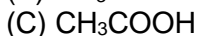
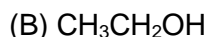
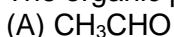


26. Which of the following reagent forms a dihydric alcohol when reacts with ethylene?



27. $\text{CH}_3\text{CH}_2\text{NH}_2 + \text{HNO}_2 \longrightarrow \text{Products}$

The organic product of above reaction is:



28. Which of the following substance can produce H_2 gas when reacts with alcohols?
(A) NaOH (B) Na
(C) $NaHCO_3$ (D) NaCl
29. Which nucleophile forms two functional isomers as products when reacts with CH_3Br ?
(A) NH_2^- (B) CN^-
(C) OH^- (D) CH_3O^-
30. Which reaction produces an alkene?
(A) $CH_3CH_2Br + AqueousKOH \longrightarrow$ (B) $CH_3CH_2Br + Br_2 \xrightarrow{\text{sunlight}}$
(C) $CH_3CH_2Br + AlcoholicKOH \xrightarrow{\text{Heat}}$ (D) $CH_3OH + Conc.H_2SO_4 \xrightarrow{\text{Heat}}$

space for rough work

Mathematics

1. If the tangent to $y = ax^2 + bx + \frac{7}{2}$ at $(1, 2)$ is parallel to the normal to $y = x^2 + 6x + 10$ at $(-2, 2)$ then $a - b$ is equal to
 (A) $-\frac{3}{2}$ (B) $\frac{5}{2}$
 (C) $\frac{7}{2}$ (D) None of these

2. The value of $\lim_{x \rightarrow 0} \frac{\sec x - \cos x}{x^2}$ is
 (A) $\frac{1}{2}$ (B) $\frac{-1}{2}$
 (C) 1 (D) None of these

3. If $f(x) = \begin{cases} x + \alpha, & x < 3 \\ 4, & x = 3 \\ 3x - 5, & x > 3 \end{cases}$ is continuous at $x = 3$, then the value of α is
 (A) 1 (B) 2
 (C) 3 (D) No real values of α is possible

4. If $f: \mathbb{R} - \{3\} \rightarrow \mathbb{R} - \{1\}$, $f(x) = \frac{x-2}{x-3}$ then function $f(x)$ is
 (A) Only one-one (B) one-one into
 (C) Many one onto (D) one-one onto

5. The domain of the function $f(x) = \sin^{-1}\left(\log_2 \frac{x^2}{2}\right)$ is
 (A) $[-2, 2] - (-1, 1)$ (B) $[-1, 2] - \{0\}$
 (C) $[1, 2]$ (D) $[-2, 2] - \{0\}$

6. $\lim_{x \rightarrow 0} \frac{xe^x - \ln(1+x)}{x^2}$ equals
 (A) $1/2$ (B) 1
 (C) $3/2$ (D) 2

7. If $f'(x) = (x-1)^3(x-2)^4$, then $f(x)$ has
 (A) local maximum at $x = 1$ (B) local maximum at $x = 2$
 (C) local minimum at $x = 1$ (D) local minimum at $x = 2$

8. If $f(x) = x^2 + kx + 1$ is increasing function in the interval $[1, 2]$, then least value of k is
 (A) 2 (B) 4
 (C) -2 (D) -4

9. $\int e^x \frac{x}{(x+1)^2} dx$ equals
- (A) $-\frac{e^x}{x+1} + c$ (B) $\frac{e^x}{x+1} + c$
 (C) $\frac{e^x}{(x+1)^2} + c$ (D) $-\frac{e^x}{(x+1)^2} + c$
10. Which value of the constant of integration will make the integral of $\sin 3x \cos 5x$ zero at $x = 0$
 (A) 0 (B) $-3/16$
 (C) $-5/16$ (D) $1/8$
11. If $f(x) = 2x^3 - 21x^2 + 36x - 30$, then which one of the following is correct.
 (A) $f(x)$ has local minimum at $x = 1$ (B) $f(x)$ has local maximum at $x = 6$
 (C) $f(x)$ has local maximum at $x = 1$ (D) $f(x)$ has no local maxima or minima
12. If two positive numbers x and y are such that $x + y = 60$ and xy^3 is maximum, then $(y - x)$ is equal to
 (A) 0 (B) 30
 (C) 60 (D) None of these
13. If curve $y = 1 - ax^2$ and $y = x^2$ intersect orthogonally then the value of a is
 (A) $\frac{1}{2}$ (B) $\frac{1}{3}$
 (C) 2 (D) 3
14. The function $f(x) = x(x+3)e^{-x/2}$ satisfies all the conditions of Rolle's theorem on $[-3, 0]$. The value of c which verifies Rolle's theorem, is
 (A) 0 (B) -1
 (C) -2 (D) 3
15. $\int \frac{e^x(1+x) dx}{\sin^2(xe^x)} =$
 (A) $\cot(xe^x) + c$ (B) $\tan(xe^x) + c$
 (C) $-\cot(xe^x) + c$ (D) $-\tan(xe^x) + c$
16. $\int \frac{3x^2 dx}{1+x^6} =$
 (A) $\log|1+x^6| + c$ (B) $\tan^{-1}(x^3) + c$
 (C) $\cot^{-1}(x^3) + c$ (D) $3 \tan^{-1}(x^3) + c$
17. $\int \sec^{2/3} x \operatorname{cosec}^{4/3} x dx$ is equal to
 (A) $3(\tan x)^{1/3}$ (B) $3(\cot x)^{-1/3}$
 (C) $-3(\tan x)^{-1/3}$ (D) $-3(\cot x)^{-1/3}$

18. Let $f(x) = \begin{cases} k, & x = 3 \\ \frac{2x^3 + 3x^2 - 32x + 15}{(x-3)}, & x \neq 3 \end{cases}$. The value of k for which $f(x)$ is continuous for all real values of x , is
 (A) 3 (B) 40
 (C) 90 (D) 0
19. If $a + b + c = 0$, then the quadratic equation $3ax^2 + 2bx + c = 0$ has:
 (A) at least one root in $[0, 1]$ (B) one root in $[2, 3]$ and the other in $[-2, -1]$
 (C) imaginary roots (D) none of the above
20. The function f is differentiable with $f(1) = 8$ and $f'(1) = \frac{1}{8}$. If f is invertible and $g(x) = f^{-1}(x)$, then
 (A) $g'(1) = 8$ (B) $g'(1) = \frac{1}{8}$
 (C) $g'(8) = 8$ (D) $g'(8) = \frac{1}{8}$
21. The derivative of $f(x) = \frac{x^4}{3} - \frac{x^5}{5}$ attains its maximum value of x equal to:
 (A) $\frac{4}{3}$ (B) $\frac{5}{3}$
 (C) 1 (D) 0
22. If $g(x)$ is a polynomial satisfying $g(x)g(y) = g(x) + g(y) + g(xy) - 2$ for all real x, y and $g(2) = 5$, then $g(3)$ is equal to
 (A) 10 (B) 24
 (C) 21 (D) none of these
23. If $f(x)$ and $g(x)$ be two given function with all real numbers as their domain, then $h(x) = (f(x) + f(-x))(g(x) - g(-x))$ is
 (A) always an odd function
 (B) an odd function only when both the f and g are odd
 (C) an odd function only when f is even and g is odd
 (D) none of these
24. Range of $f(x) = \ln(3x^2 - 4x + 5)$ is
 (A) $\left[\ln \frac{11}{3}, \infty\right)$ (B) $[\ln 10, \infty)$
 (C) $\left[\ln \frac{11}{6}, \infty\right)$ (D) $\left[\ln \frac{11}{2}, \infty\right)$
25. Which of the following is correct if $x \in \mathbb{R}$?
 (A) $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$ (B) $\sin^{-1}\left(\frac{1}{x}\right) = \operatorname{cosec}^{-1} x$
 (C) $\sin(\sin^{-1} x) = x$ (D) None of these

26. The value of $\cos\left(\frac{1}{2}\cos^{-1}\left(\cos\left(\sin^{-1}\frac{\sqrt{63}}{8}\right)\right)\right)$ is equal to
- (A) $\frac{3}{16}$ (B) $\frac{3}{8}$
 (C) $\frac{3}{4}$ (D) $\frac{3}{2}$
27. If $[.]$ denotes greatest integer function, then the value of $\sum_{n=1}^{40} \left[\frac{n^2}{2}\right]$ is
- (A) 22140 (B) 22130
 (C) 22120 (D) None of these
28. Which one of the following functions is continuous for all real x but has at least one point where it is not differentiable
- (A) $f(x) = \frac{|x|}{x}$ (B) $f(x) = \tan x$
 (C) $f(x) = x^{1/3}$ (D) $f(x) = e^{-x}$
29. Let f be a polynomial function such that $f(f(x)) - 8x^m = \frac{80}{f''(x)} - 64x^2 + 100 \quad \forall x \in \mathbb{R}, m \in \mathbb{N}$ and $f(|x|)$ is differentiable for all $x \in \mathbb{R}$. Then the value of $\left[\frac{f(3)}{m}\right]$ is ($[.] \rightarrow$ G.I.F)
- (A) 1 (B) 2
 (C) 3 (D) None of these
30. Let $f(x)$ be a real valued function such that $f(a) = 0$. If $g(x) = (x-a)f(x)$ is continuous but not differentiable at $x = a$ and $h(x) = (x-a)^2 f(x)$ is continuous and differentiable at $x = a$, then $f(x)$
- (A) must be continuous and differentiable at $x = a$
 (B) must be continuous but not differentiable at $x = a$
 (C) may or may not be continuous at $x = a$
 (D) must be discontinuous at $x = a$

space for rough work

FIITJEE - JEE (Mains)

Batches: Two Yr CRP(1820)
PHYSICS, CHEMISTRY & MATHEMATICS
JEE - MAINS PHASE – IV

CODE:
ANSWER KEYS

PHYSICS

| | | | | | | | |
|-----|---|-----|---|-----|---|-----|---|
| 1. | B | 2. | D | 3. | B | 4. | B |
| 5. | B | 6. | C | 7. | B | 8. | A |
| 9. | C | 10. | B | 11. | A | 12. | C |
| 13. | D | 14. | B | 15. | B | 16. | A |
| 17. | A | 18. | C | 19. | A | 20. | C |
| 21. | D | 22. | A | 23. | A | 24. | D |
| 25. | A | 26. | A | 27. | A | 28. | D |
| 29. | A | 30. | A | | | | |

CHEMISTRY

| | | | | | | | |
|-----|---|-----|---|-----|---|-----|---|
| 1. | C | 2. | B | 3. | B | 4. | C |
| 5. | B | 6. | C | 7. | B | 8. | B |
| 9. | B | 10. | C | 11. | A | 12. | B |
| 13. | C | 14. | A | 15. | B | 16. | B |
| 17. | B | 18. | A | 19. | B | 20. | C |
| 21. | B | 22. | B | 23. | C | 24. | B |
| 25. | B | 26. | B | 27. | B | 28. | B |
| 29. | B | 30. | C | | | | |

MATHEMATICS

| | | | | | | | |
|-----|---|-----|---|-----|---|-----|---|
| 1. | C | 2. | C | 3. | A | 4. | D |
| 5. | A | 6. | C | 7. | C | 8. | C |
| 9. | B | 10. | B | 11. | C | 12. | B |
| 13. | B | 14. | C | 15. | C | 16. | B |
| 17. | C | 18. | B | 19. | A | 20. | C |
| 21. | C | 22. | A | 23. | A | 24. | A |
| 25. | D | 26. | C | 27. | B | 28. | C |
| 29. | B | 30. | D | | | | |