

FIITJEE COMMON TEST – III**PHYSICS, CHEMISTRY & MATHEMATICS****CODE: 122860****Time Allotted: 3 Hours****Maximum Marks: 186**

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.

A. General Instructions

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains Three Section.
3. **Section-I** is Physics, **Section-II** is Chemistry and **Section-III** is Mathematics.
4. Each section is further divided into two parts: **Part-A & Part-C**
5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
6. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

B. Filling of OMR Sheet

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
2. On the OMR sheet, darken the appropriate bubble with HB pencil for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.

C. Marking Scheme For All Three Parts.

- (i) **Part-A (01 – 05)** contains 5 multiple choice questions which have only one correct answer. Each question carries **+3 marks** for correct answer and **– 1 mark** for wrong answer.

PART – A (06 – 13) contains 8 Multiple Choice Questions which have **One or More Correct** answer.

For each question in the group **Q. 6 – 13** of **PART – A** you will be awarded

Full Marks: +4 If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.

Partial Marks: +1 For darkening a bubble corresponding to **each correct option**, provided NO incorrect option is darkened.

Zero Marks: 0 If none of the bubbles is darkened.

Negative Marks: –2 In all other cases.

For example, if **(A), (C) and (D)** are all the correct options for a question, darkening all these three will result in **+4 marks**; darkening only **(A) and (D)** will result in **+2 marks**; and darkening **(A) and (B)** will result in **–2 marks**, as a wrong option is also darkened.

- (iii) **Part-C (01 – 05)** contains 5 Numerical based questions with single digit integer as answer, ranging from 0 to 9 and each question carries **+3 marks** for correct answer. There is no negative marking.

Name of the Candidate: _____

Batch: _____ **Date of Examination:** _____

Enrolment Number: _____

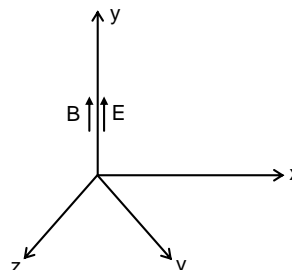
BATCHES – NWCM820X1R-X4R, NWTR820C01, D01, CAMP820, NWCM820G1W, NWCM820X1W - X11W, NWTW820D01-D02, PANINI820-XII G1, PANINI820-XII G1, PANINI820-XII1 - XII7, PIN820-XII B

PART – I: PHYSICS**SECTION – A****(Single Correct Choice Type)**

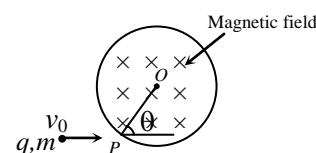
This section contains **5 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

1. A charge particle of mass 'm', charge 'q' has velocity $\vec{v} = v(\hat{i} + \hat{k})$ in the magnetic field at the origin. Its speed as the function of y is:

- (A) $\sqrt{v^2 + \frac{qE}{2m}y}$
 (B) $\sqrt{\left(\frac{B}{E}\right)^2 + v^2 + \frac{qE}{2m}y}$
 (C) $\sqrt{v^2 + \frac{2qE}{m}y}$
 (D) None of the above



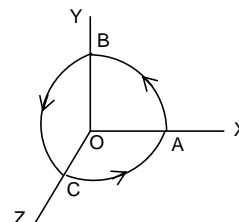
2. A particle charge q and mass m is projected with a velocity v_0 towards a circular region having uniform magnetic field B perpendicular and into the plane of paper from point P as shown in the figure. R is the radius and O is the centre of the circular region. If the line OP makes an angle θ with the direction of v_0 then the value of v_0 so that particle passes through O is



- (A) $\frac{qBR}{m \sin \theta}$ (B) $\frac{qBR}{2m \sin \theta}$ (C) $\frac{2qBR}{m \sin \theta}$ (D) $\frac{3qBR}{2m \sin \theta}$

3. A wire is bent into three successive quadrants. The quadrant AB lies in the xy plane, BC in yz plane and CA in xz plane. What is the magnetic moment of this system if a current I flows through it? Given : r = radius of each quadrant.

- (A) $\frac{\sqrt{3}\pi r^2 I}{4}$ (B) $\frac{\sqrt{2}\pi r^2 I}{4}$
 (C) $\frac{\pi r^2 I}{4}$ (D) $\frac{3\pi r^2 I}{4}$

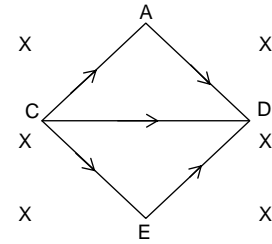


4. In non-uniform diverging magnetic field is in certain direction, a current carrying loop is placed
 (A) net force and net torque on loop is zero.
 (B) net force may be zero but net torque is non zero.
 (C) net torque may be zero but net force is non zero.
 (D) neither net force nor net torque is zero.

Space for rough work

COMMON TEST # 3 – C-XII-3

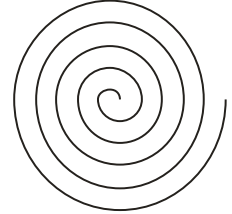
5. Constant current of 1A flows along all the three branches of wire frame as shown. The frame is a combination of two equilateral triangles ACD and CDE of side 1m. It is placed in uniform magnetic field $B = 4\text{T}$ acting perpendicular to the plane of paper. The magnitude of magnetic force acting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



(Multi Correct Choice Type)

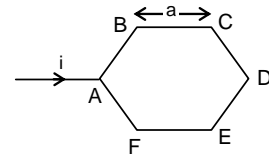
This section contains **8 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

6. A charged particle enters a region which offers some resistance against its motion and a uniform magnetic field exists in the region. The particle traces a spiral path as shown. Then:
 (A) angular velocity of particle remains constant
 (B) speed of particle decreases continuously
 (C) total mechanical energy of the particle remains conserved
 (D) net force on the particle is always perpendicular to its direction of motion

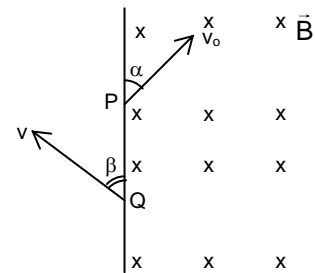


7. Work done by a magnetic field
 (A) is always zero (B) may not be zero
 (C) will be zero in at least one case (D) none of these
8. A charged particle moves in a gravity-free space without change in velocity. Which of the following is/are possible?
 (A) $E = 0, B = 0$ (B) $E = 0, B \neq 0$ (C) $E \neq 0, B = 0$ (D) $E \neq 0, B \neq 0$

9. As situation shown in figure the magnitude of magnetic field at the centre will be
 (A) Zero, if the current exit in the long wire from the B and along EB
 (B) $\frac{\mu_0 i}{8\pi a}$, if the current exit in the long wire from the D and along CD
 (C) $\frac{\mu_0 i}{4\sqrt{3}\pi a}$, if the current exit in the long wire from the E and along DE
 (D) None of these



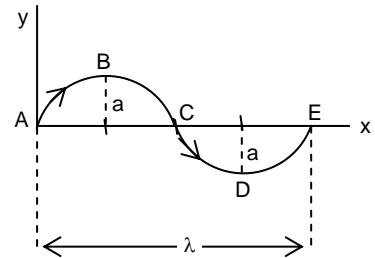
10. A particle of charge $-q$ and mass m enters a uniform magnetic field \vec{B} (perpendicular to paper inwards) at P with a velocity v_0 at an angle α and leaves the field at Q with velocity v at angle β as shown in figure. Then
 (A) $\alpha = \beta$
 (B) $v = v_0$
 (C) $PQ = \frac{2mv_0 \sin \alpha}{Bq}$
 (D) particle remains in the field for time $t = \frac{2m(\pi - \alpha)}{Bq}$



Space for rough work

COMMON TEST # 3 – C-XII-4

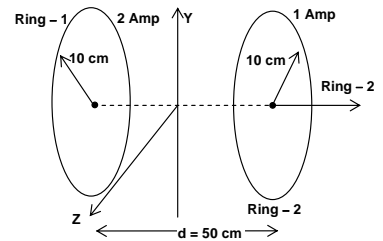
11. H^+ , He^+ and O^{++} ions having same kinetic energy pass through a region of space filled with uniform magnetic field B directed perpendicular to the velocity of ions. The masses of the ions H^+ , He^+ and O^{++} are respectively in the ratio 1 : 4 : 16. As a result
 (A) H^+ ions will be deflected most (B) only O^{++} ions will be deflected least
 (C) He^+ and O^{++} ions will suffer same deflection (D) All ions will suffer the same deflection
12. A conductor ABCDE, shaped as shown, carries current I . It is placed in the xy -plane with the ends A and E on the x -axis. A uniform magnetic field of magnitude B exists in the region. The force acting on it will be
 (A) zero, if B is in the x -direction
 (B) λBI in the z -direction, if B is in the $+y$ -direction
 (C) λBI in the negative y -direction, if B is in the $+z$ -direction
 (D) λaBI , if B is in the x -direction
13. A proton is fired from origin with velocity $\vec{v} = v_0\hat{j} + v_0\hat{k}$ in a uniform magnetic field $\vec{B} = B_0\hat{j}$. In the subsequent motion of the proton
 (A) its z coordinate can never be negative
 (B) its x coordinate can never be positive
 (C) its x and z coordinates cannot be zero at the same time
 (D) its y coordinate will be proportional to its time of flight.



**SECTION – C
(Integer Type)**

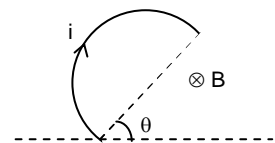
This section contains **5 questions**. The answer to each question is a **single-digit integer**, ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled.

1. Two co-axial rings of same radius $R=10$ cm are placed parallel to the $y-z$ plane, such that x -axis coincides with axis of the rings. Ring 1 carries a current of 2 Amp and Ring 2 carries a current of 1 Amp in opposite sense as shown in the figure. The separation between the



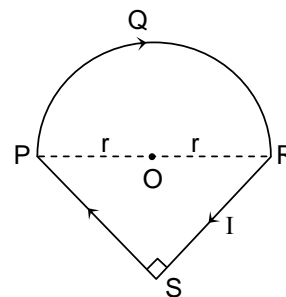
rings is $d = 50$ cm. Find the magnitude of $\int_{-\infty}^{+\infty} \vec{B} \cdot d\vec{x}$, where \vec{B} is the net magnetic field due to both the rings at any point on the axis.

2. A semicircular ring of radius R carrying current i is placed in a magnetic field of intensity B so that plane of wire is perpendicular to magnetic field as shown. Net force acting on the ring is $KBiR$. Find the value of K .

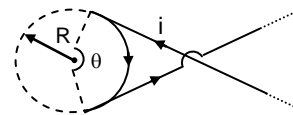


Space for rough work

3. A steady current $I = 10$ A goes through a wire loop PQRS. Part PQR is semi-circle of radius $r = 1$ m. $RS = SP$ and $\angle RSP = 90^\circ$. Find the magnetic field at O in 10^{-6} T to the nearest integer.



4. A wire carrying current i has the configuration shown in figure. Two semi-infinite straight section, each tangent to the same circle, are connected by a circular arc, of angle θ , along the circumference of the circle, with all sections lying in the same plane. What must θ (in rad) be in order for B to be zero at the centre of circle?



5. A square loop of side $a = 6$ cm carries a current $I = 1$ A. Calculate magnetic induction B (in μ T) at point P, lying on the axis of loop and at a distance $x = \sqrt{7}$ cm from the centre of loop.

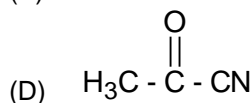
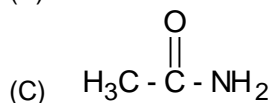
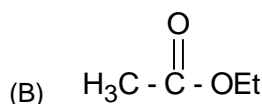
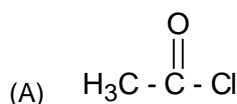
PART – II: CHEMISTRY

SECTION – A

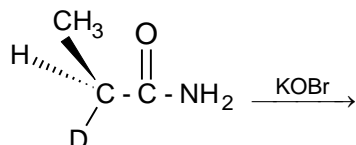
(Single Correct Choice Type)

This section contains **5 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

1. Which of the following is least reactive towards nucleophilic substitution?



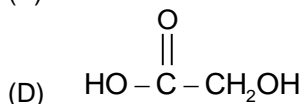
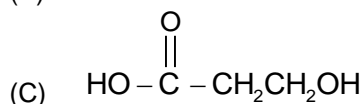
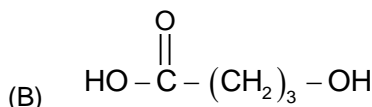
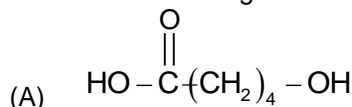
- 2.



What is the configuration of chiral C in the final product?

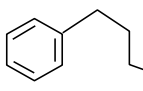
- (A) R (B) S (C) Both (D) can't defined

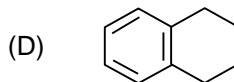
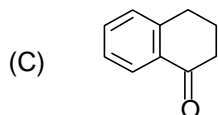
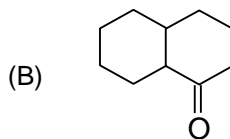
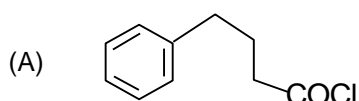
3. Which of the following on heating can't form cyclic ester?



Space for rough work

COMMON TEST # 3 – C-XII-6

4.  on reaction with SOCl_2 and then AlCl_3 forms



5. The structure of glycine (amino acid) is $\text{H}_3\text{N}^+\text{CH}_2\text{COO}^-$ (Zwitter ion)

Select the correct statement of the following.

(A) Glycine, as well as other amino acids are amphoteric.

(B) The acidic functional group in amino acids is $-\text{NH}_3^+$

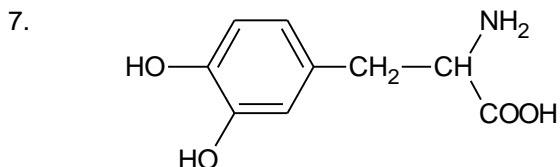
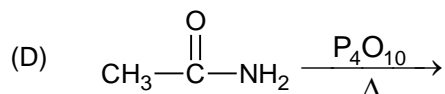
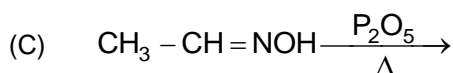
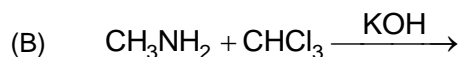
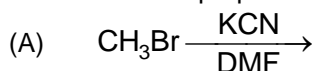
(C) The basic functional group in amino acids is $-\text{CO}_2^-$

(D) All the statements are correct

(Multi Correct Choice Type)

This section contains **8 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

6. CH_3CN can be prepared by the reaction of



Which of the following statement(s) is/are correct for the above compound?

(A) It contains asymmetric carbon atom

(B) One mole of it can react with three mole of NaOH

(C) It can form zwitter ion in aqueous solution

(D) It gives oxime with NH_2OH

8. Lassaigne's test is used for the detection of the following element.

(A) O

(B) N

(C) S

(D) Cl

Space for rough work

COMMON TEST # 3 – C-XII-7

9. Which of the following method can't be used to prepare carboxylic acids?

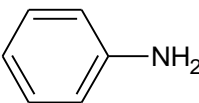
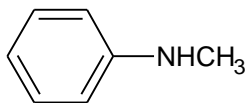
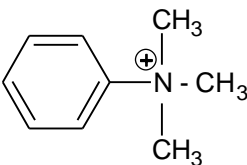
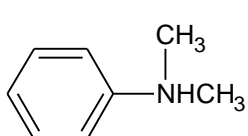
- (A) HCN, OH^- (B) $\text{CH}_3 - \text{C} \equiv \text{N}, \text{H}_3\text{O}^+$
 (C) $\text{CH}_3 - \text{C} \equiv \text{N}, \text{CH}_3\text{MgX}/\text{H}_3\text{O}^+$ (D) $\text{CO}_2, \text{CH}_3\text{Li}/\text{H}_3\text{O}^+$

10. $\text{RCOOAg} \xrightarrow[\text{Reflux}]{\text{X}_2(\text{CCl}_4)} \text{RX}$

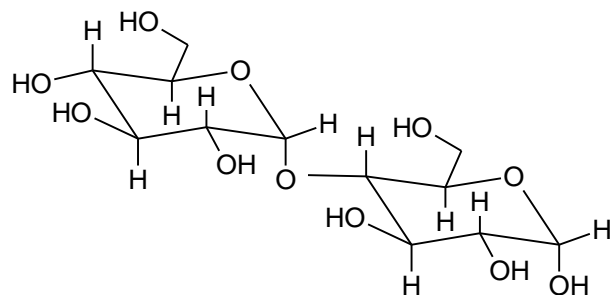
Which of the following halogens(X_2) can be used in the above reaction?

- (A) Cl_2 (B) Br_2 (C) I_2 (D) All of these

11. In which of the following N, N diazo coupling can take place

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

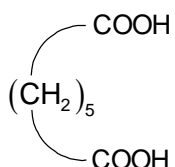
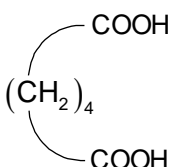
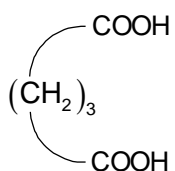
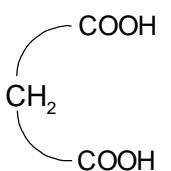
12.



Which of the following statement/s is/are correctly stated about the given compound?

- (A) Glycosidic linkage is ' β ' (B) reducing disaccharide
 (C) Compound can undergo mutarotation (D) compound can exist in two anomeric forms in solution

13. Which of the following carboxylic acids give CO_2 on heating?

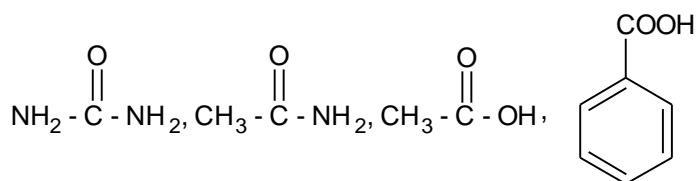
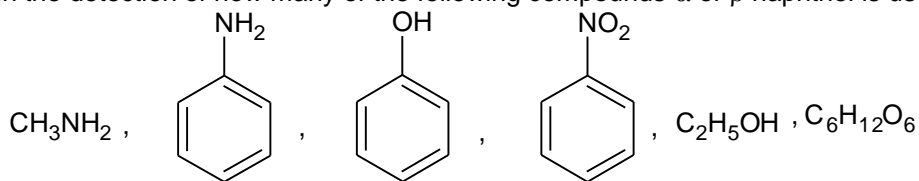
- (A)  (B) 
 (C)  (D) 

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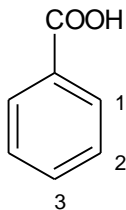
SECTION – C
(Integer Type)

This section contains **5 questions**. The answer to each question is a **single-digit integer**, ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled.

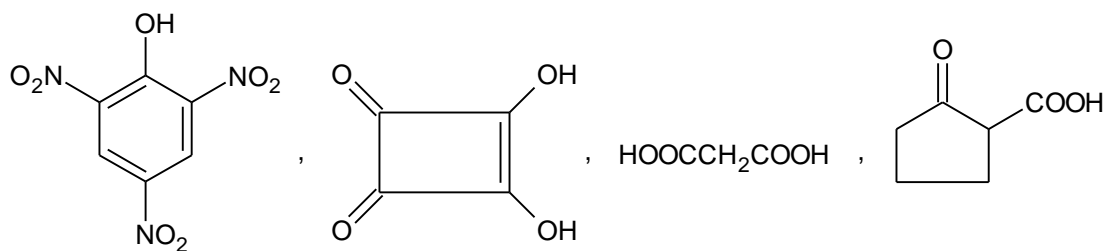
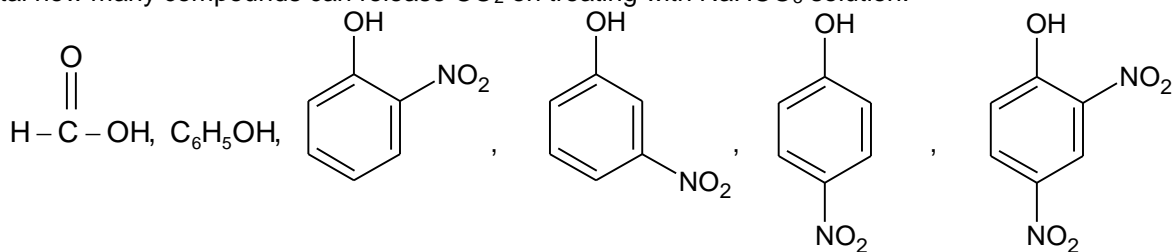
1. In the detection of how many of the following compounds α or β naphthol is used.



2. How many of the given amino acid can yield N_2 gas on treatment with HNO_2 .
Lysine, Valine, Tyrosine, Proline, Leucine, Tryptophane, Phenylalanine, Serine, Aspartic acid
3. Determine (a + b), where a is the position of OH group in the isomer which is most acidic and b is the position of OH group in the isomer which has maximum boiling point.



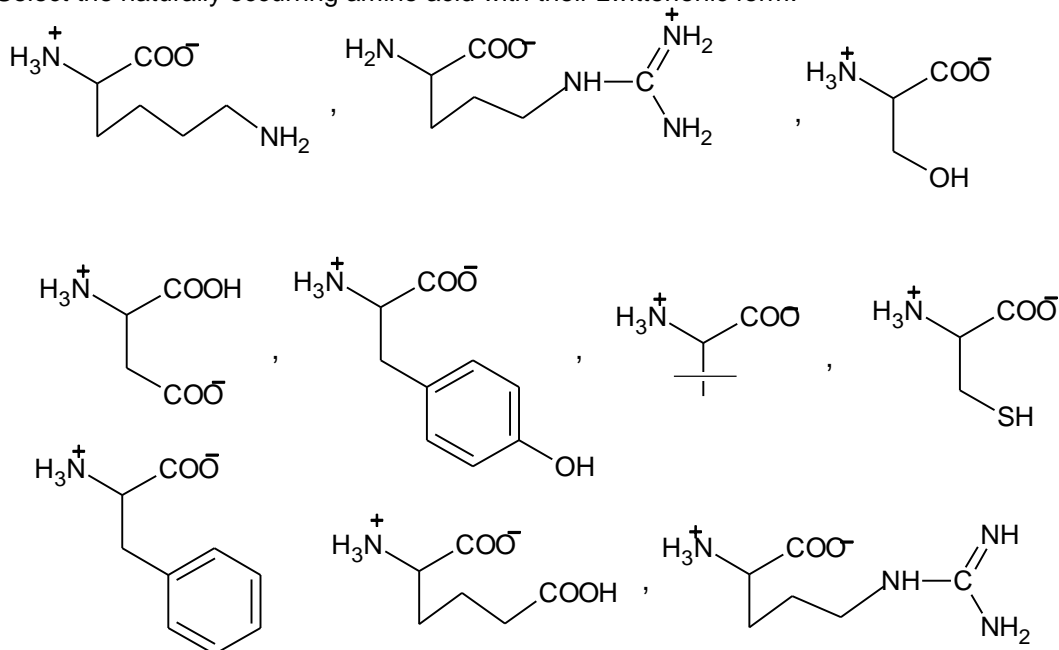
4. Total how many compounds can release CO_2 on treating with NaHCO_3 solution.



Space for rough work

COMMON TEST # 3 – C-XII-9

5. Select the naturally occurring amino acid with their zwitterionic form.



PART – III: MATHEMATICS

SECTION – A

(Single Correct Choice Type)

This section contains 5 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

1. $\int (e^x \sin x + e^x \cos x) dx =$

- (A) $e^x \sin x + C$ (B) $e^x \cos x + C$ (C) $-e^x \sin x + C$ (D) $-e^x \cos x + C$

2. If $\int \frac{x}{x^2 - 4x + 8} dx = K \log(x^2 - 4x + 8) + \tan^{-1}\left(\frac{x-2}{2}\right) + C$ then the value of K is

- (A) $\frac{1}{2}$ (B) 1 (C) 2 (D) none of these

3. The value of $\int \frac{\sin \alpha}{\sqrt{1 + \cos \alpha}} d\alpha$ is

- (A) $2\sqrt{2} \cos\left(\frac{\alpha}{2}\right) + C$ (B) $-2\sqrt{2} \cos\left(\frac{\alpha}{2}\right) + C$ (C) $\sqrt{2} \cos\left(\frac{\alpha}{2}\right) + C$ (D) $-\sqrt{2} \cos\left(\frac{\alpha}{2}\right) + C$

Space for rough work

COMMON TEST # 3 – C-XII-10

4. If $f(x) = \int_1^x \sqrt{4-t^2} dt$, then real roots of the equation $x - f'(x) = 0$ are
 (A) ± 1 (B) $\pm\sqrt{2}$ (C) 0 and 1 (D) ± 2

5. If $f(x) = \int_{2x}^{\sin x} \cos(t^3) dt$, then $f'(x)$ is equal to
 (A) $\cos(\sin^3 x) \cos x - 2 \cos(8x^3)$ (B) $\sin(\sin^3 x) \sin x - 2 \sin(8x^3)$
 (C) $\cos(\cos^3 x) \cos x - 2 \cos(x^3)$ (D) $\cos(\sin^3 x) - \cos(8x^3)$

(Multi Correct Choice Type)

This section contains **8 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

6. Let $f(x) = 7 \tan^6 x \sec^2 x - 3 \tan^2 x \sec^2 x$ for all $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$. Then the correct expression(s) is (are)

(A) $\int_0^{\pi/4} x f(x) dx = \frac{1}{12}$ (B) $\int_0^{\pi/4} f(x) dx = 0$ (C) $\int_0^{\pi/4} x f(x) dx = \frac{1}{6}$ (D) $\int_0^{\pi/4} f(x) dx = 1$

7. If $\int \frac{dx}{x\sqrt{5x^2-3}} = K \tan^{-1} f(x) + C$ then

(A) $f(x) = \sqrt{\frac{5}{3}x^2 - 3}$ (B) $K = \frac{1}{\sqrt{3}}$ (C) $f(x) = \frac{1}{2}\sqrt{5x^2-3}$ (D) $K = \frac{1}{\sqrt{5}}$

8. The value of $\int \frac{x^2 + \cos^2 x}{1+x^2} \operatorname{cosec}^2 x dx$ is equal to :

(A) $\cot x - \cot^{-1} x + C$ (B) $C - \cot x + \cot^{-1} x$
 (C) $-\tan^{-1} x - \frac{\operatorname{cosec} x}{\sec x} + C$ (D) $-e^{\ln \tan^{-1} x} - \cot x + C$

9. The value of integral $\int_0^{\frac{\pi}{2}} \ln \sin x dx$ is equal to

(A) $\int_0^{\frac{\pi}{2}} \ln \cos x dx$ (B) $\int_0^{\frac{\pi}{2}} \ln \sin 2x dx$ (C) $-\frac{\pi}{2} \ln 2$ (D) $\frac{\pi}{2} \ln \frac{1}{2}$

Space for rough work

COMMON TEST # 3 – C-XII-11

10. Which of the following is/are correct?

(A) $\int_0^{\frac{\pi}{2}} \frac{\cos x}{\cos x + \sin x} dx = \frac{\pi}{4}$

(B) $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1 + \sqrt{\tan x}} = \frac{\pi}{6}$

(C) $\int_0^{\frac{\pi}{2}} \cos(\pi \sin^2 x) dx = 0$

(D) $\int_0^a \frac{f(x)}{f(x) + f(a-x)} dx = \frac{a}{2}$

11. Let $I_n = \int_0^{\frac{\pi}{2}} \sin^n x dx$.

(A) $I_n = \int_0^{\frac{\pi}{2}} \cos^n x dx$ (B) $I_n = \left(\frac{n-1}{n}\right) I_{n-2}$ (C) $I_n = \left(\frac{n}{n-1}\right) I_{n-2}$ (D) $I_4 = \frac{3\pi}{16}$

12. The integral $\int_0^{\pi} x f(\sin x) dx$ is equal to

(A) $\frac{\pi}{2} \int_0^{\pi} f(\sin x) dx$ (B) $\frac{\pi}{4} \int_0^{\pi} f(\sin x) dx$ (C) $\pi \int_0^{\pi/2} f(\sin x) dx$ (D) $\pi \int_0^{\pi/2} f(\cos x) dx$

13. Let $f(x)$ be a non – constant twice differentiable function defined on $(-\infty, \infty)$ such that

$f(x) = f(1-x)$ and $f'\left(\frac{1}{4}\right) = 0$. Then

(A) $f'(x)$ vanishes at least twice on $[0,1]$ (B) $f\left(\frac{1}{2}\right) = 0$

(C) $\int_{-1/2}^{1/2} f\left(x + \frac{1}{2}\right) \sin x dx = 0$

(D) $\int_0^{1/2} f(t) e^{\sin \pi t} dt = \int_{1/2}^1 f(1-t) e^{\sin \pi t} dt$

Space for rough work

SECTION – C
(Integer Type)

This section contains **5 questions**. The answer to each question is a **single-digit integer**, ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled.

1. $\int_1^4 \ln[x] dx = \ln k$, then k equal to ([.] represent G.I.F.)

2. $\frac{1}{4} \int_{-3}^3 \sqrt{5^2 - x^2} dx = k + \frac{25}{4} \sin^{-1} \frac{3}{5}$, then k equals

3. $\int_0^{\pi/8} \tan^2(2x) dx = \frac{4 - \pi}{\lambda}$ then λ equal to

4. Let $p(x)$ be a function defined on \mathbb{R} such that $p'(x) = p'(1-x)$, for all $x \in [0,1]$, $p(0) = 1$ and $p(1) = 41$ and $\int_0^1 p(x) dx$ equals p then $\frac{p}{3}$ is ____

5. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a differentiable function such that $f(3) = 3$, $f'(3) = \frac{1}{2}$ and the value of

$$\lim_{x \rightarrow 3} \left(\frac{\int_3^{f(x)} 2t^3 dt}{x-3} \right) \text{ is } k \text{ then } \frac{k}{9}$$

Space for rough work