FIITJEE INTERNAL TEST

PHYSICS, CHEMISTRY & MATHEMATICS

QP CODE: 101004 | **Common Test-2**

Time Allotted: 3 Hours | **Maximum Marks: 180**

- 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 Sections.**
3. **Section-I** is Physics, **Section-II** is Chemistry and **Section-III** is Mathematics.
4. All the section can be filled in **PART-A & B** of OMR.
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 ***Blue/Black Ball Point Pen*** 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 Two Parts.

(i) **Part-A (01-04) –** Contains Four (04) multiple choice questions which have ONLY ONE CORRECT answer Each question carries **+3 marks** for correct answer and **-1 marks** for wrong answer.

(ii) **PART–A** (**05–08)** contains **(4**) Multiple Choice Questions which have **One or More Than One Correct** answer.
Full Marks: **+4** If only the bubble(s) corresponding to all the correct options(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*: –1 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 **–1** marks, as a wrong option is also darkened.

(iii) **Part-B –** This section contains Eight **(08)** questions numerical based questions. The answer to each question is a **NUMERICAL VALUE.** If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places. Each question carries **+4 marks** for correct answer. **There is no negative marking.**

Name of the Candidate: _____

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

Enrolment Number: _____

BATCHES – PANINI426-G1 & PANINI426XII-1

SECTION – I: PHYSICS

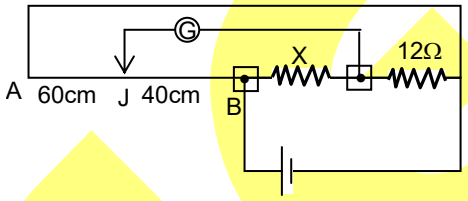
(PART – A)

(Single Correct Answer Type)

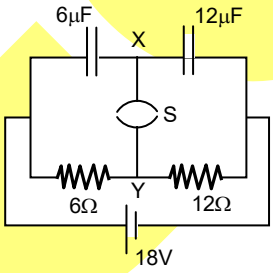
This section contains **4 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. A lamp rated 220 V, 100 W is connected to 110 V supply. Then its power reduces to
(A) 25 W (B) 50 W (C) 75 W (D) remains same

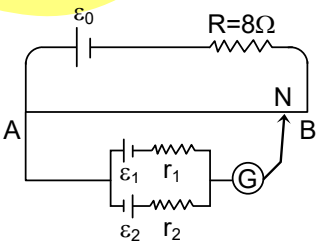
2. If reading of galvanometer is 0 then value of unknown resistance x is
(A) 8 Ω (B) 18 Ω
(C) data insufficient (D) 12 Ω



3. A circuit is connected as shown in the figure with the switch S open. When the switch is closed, the total amount of charge that flows from Y to X is
(A) 0 (B) 54 μC
(C) 27 μC (D) 108 μC



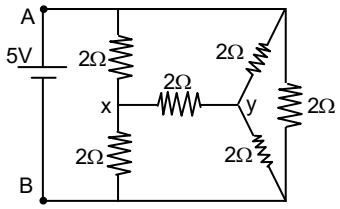
4. A battery of emf $\varepsilon_0 = 12V$ is connected across a 4m long uniform wire having resistance 4Ω/m. The cells of small emfs $\varepsilon_1 = 2V$ and $\varepsilon_2 = 4V$ having internal resistance 2Ω and 6Ω respectively, are connected as shown in the figure. If galvanometer shows no deflection at the point N, the distance of point N from the point A is equal to :
(A) $\frac{1}{6}$m (B) $\frac{1}{3}$m
(C) 25 cm (D) 50 cm



(One or More Than One Options Correct Type)

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

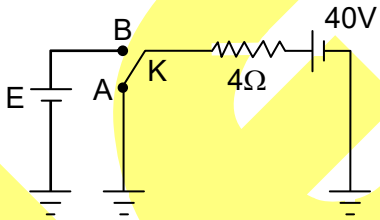
5. For the circuit shown in the adjacent figure, select the correct statements from the following.
(A) x and y are equipotential points
(B) effective resistance between A and B is 2 Ω.
(C) effective resistance between A and B is 1 Ω
(D) none of the above



Space For Rough Work

6. Capacitor C_1 of capacitance 1 μF and capacitor C_2 of capacitance 2 μF are separately charged fully by a common battery. The two capacitors are then separately allowed to discharge through equal resistors at time t = 0.
(A) The current in each of the two discharging circuits is zero at t = 0
(B) The current in two discharging circuits at t = 0 are equal but not zero
(C) The current in two discharging circuits at t = 0 are unequal
(D) Capacitor C_1 loses 50% of its initial charge sooner than C_2 loses 50% of its initial charge.

7. For the circuit as shown, find the correct options :



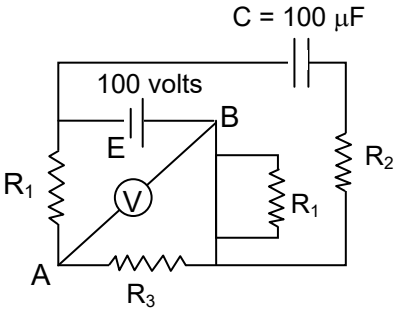
(A) The emf of battery E will be 20 V so that ratio of currents flowing through 4Ω resistor in position A to position B of the key K is 2
(B) The emf of battery E will be 32 V so that ratio of currents flowing through 4Ω resistor in position A to position B of the key K is 2
(C) The emf of battery E will be 24 V so that ratio of currents flowing through 4Ω resistor in position A to position B of the key K is 2.5
(D) The emf of battery E will be 30 V so that ratio of currents flowing through 4Ω resistor in position A to position B of the key K is 4.

8. A microammeter has a resistance of 100Ω and a full scale range of 50μA. It can be used as a voltmeter or as a higher range ammeter provided a resistance is added to it. Pick the correct range and resistance combinations
(A) 50 V range with 10 kΩ resistance in series
(B) 10 V range with 200 kΩ resistance in series
(C) 5 mA range with 1 Ω resistance in parallel
(D) 10 mA range with 1 Ω resistance in parallel

(PART – B)

This section contains **Eight (08)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

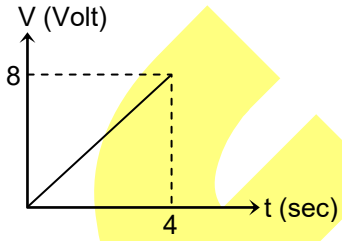
1. In the circuit shown in figure E is a battery of emf 100 volts. Resistance R_1 = 100 ohms, R_2 = 200 ohms, R_3 = 200 Ω. The voltmeter resistance is 200 ohms. The reading of the voltmeter is 4n volt. The value of 'n' is:



Space For Rough Work

2. A battery of emf 1.4 volt and internal resistance 2Ω is connected to a resistor of 100 Ω through an ammeter. The resistance of the ammeter is $\frac{4}{3}\Omega$. A voltmeter has also been connected to find the potential difference across the resistor. If the ammeter reads 0.02 A and the resistance of voltmeter is (16 K)Ω then find the value of K.

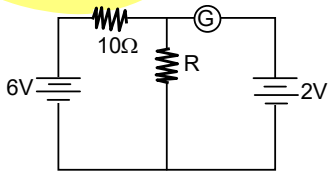
3. Voltage versus time graph of a circuit element is shown in the figure. If capacitance C = 2F, find the current (in Amp).



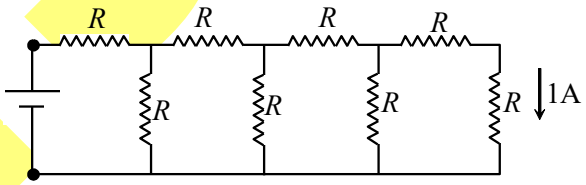
4. A wire of length L and 3 identical cells of negligible internal resistance are connected in series, when the temperature of the wire is raised by (ΔT) in time t due to the current. The same temperature rise is observed in the same time when N similar cells are connected in series with a wire of length 2L but of same material and cross-section. Find the value of $\frac{N}{4}$.

5. When two identical batteries of internal resistance 1Ω each are connected in series across a resistor R, the rate of heat produced in R is J_1. When the same batteries are connected in parallel across R, the rate is J_2. If $J_1 = 2.25\ J_2$ then the value of $\frac{R}{16}$ in Ω is

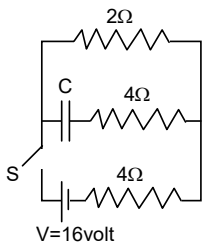
6. In the circuit, the galvanometer G reads zero. If the internal resistance of 6V battery is zero and the resistance of R(In Ω) is 4x, then the value of 'x' is:



7. A finite chain of resistors is shown in the figure. All the resistors in the chain are of the same value. A current of 1A flows through the last resistor. The current supplied by the battery in ampere is 2x. The value of 'x' is



8. In the circuit shown the capacitor is initially uncharged. The switch S is closed at time t = 0. The internal resistance of the battery is negligible and the capacitance of the capacitor C is 2μF. If Initial current (in Ampere) through 2Ω resistance is 8x. Then the value of 'x' is:



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SECTION – II: CHEMISTRY

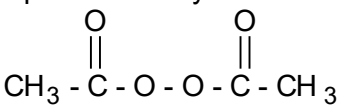
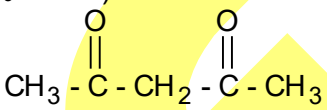
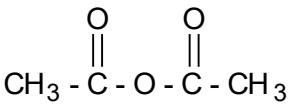
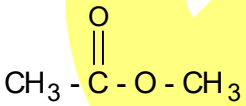
(PART – A)

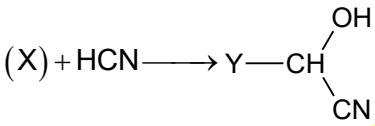
(Single Correct Answer Type)

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

1. Which compound forms the most basic amine when reduced with $LiAlH_4$?
(A) CH_3CN (B) CH_3NC (C) $CH_3CH_2NO_2$ (D) $CH_3CH = NOH$

2. The most acidic carboxylic acid out of the following is
(A) HOOC – COOH (B) HOOC – CH_2 – COOH
(C) HOOC – CH_2 – CH_2 – COOH (D) HOOC – CH_2 – CH_2 – CH_2 – COOH

3. Which produces only two moles of acetic acid(CH_3COOH) when reacts with acidified water?
(A) 
(B) 
(C) 
(D) 

4. 
The most reactive reactant(X) and the species Y in the product are respectively
(A) CH_3COCH_3 and CH_3CO (B) CH_3CHO and CH_3
(C) CH_3CH_2CHO and CH_3CH_2 (D) $CH_3COC_2H_5$ and $C_2H_5C(CH_3)$

(One or More Than One Options Correct Type)

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

5. Which reaction(s) produce primary(1°) alcohols?
(A) $CH_3COCH_3 \xrightarrow{NaBH_4}$ (B) $HCHO + CH_3MgBr \xrightarrow{H_3O^+}$
(C) $CH_3CH_2CHO \xrightarrow[2.LiAlH_4]{1.\ KMnO_4/H^+}$ (D) $C_6H_5 - CH = CH - CHO \xrightarrow{LiAlH_4}$

Space For Rough Work

6. $CH_3COOH \xrightarrow{NH_3} (P) \xrightarrow{Heat} (Q) \xrightarrow{P_4O_{10}} (R)$, $(R) \rightarrow (S) \rightarrow CH_3COOH$

In above reaction sequence the unknown substance(s) is/are

(A) (Q) is CH_3CONH_2 (B) (S) is H_2O/H^+

(C) (P) is CH_3COONH_4 (D) (R) is CH_3CH_2CN

7. Which substance(s) undergo(es) dehydration(loss of H_2O) on heating?

(A) $CH_3\underset{OH}{\underset{|}{C}}HCH_2CHO$ (B) $CH_3 - \overset{O}{\overset{\|}{C}} - CH_2COOH$

(C) $CH_3\underset{OH}{\underset{|}{C}}HCOOH$ (D) $CH_3 - \overset{O}{\overset{\|}{C}} - O - C_2H_5$

8. Acetone(CH_3COCH_3) is produced by

(A) heating calcium acetate

(B) hydrolysis of $H_3C\underset{Cl}{\overset{Cl}{C}}CH_3$

(C) mild oxidation of $H_3C-\underset{OH}{CH}-CH_3$

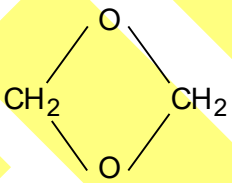
(D) dehydration of $H_3C-\underset{OH}{CH}-CH_3$ with conc. H_2SO_4

(PART – B)

This section contains **Eight (08)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

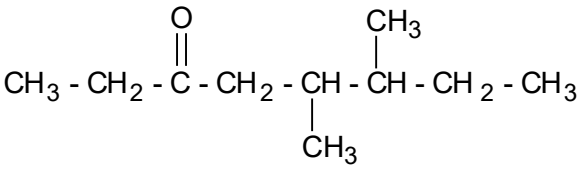
1. $HCHO + Conc.NaOH + HCHO \longrightarrow A + B$

Product(B) reacts with HCl to form a weak acid(C). The pK_a of (C) is 4. What will be the pH of an aqueous solution of (B) and (C) when they are present in 10 : 1 molar ratio?

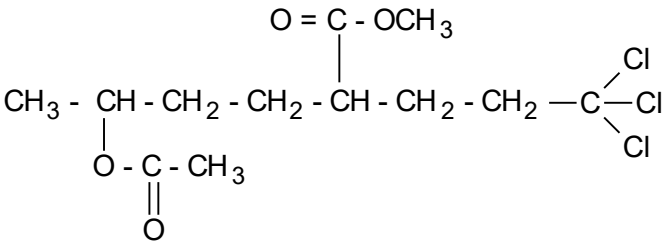
2. 

Acidic hydrolysis of above compound forms two moles of carbonyl compound. What is the molar mass of the compound in g mol^{-1} unit?

Space For Rough Work

3. 

If above ketone forms x number of enols and y number of oximes(reaction with NH_2OH/H^+) considering stereoisomers in both cases, what is the value of (x + y)?

4. 

Hydrolysis of above compound forms more than one product. What is the molar mass of the simplest product in g mol^{-1} unit?

5. $HCOOH + SOCl_2 \longrightarrow (P) + SO_2 + HCl$

$(P) \xrightarrow{\Delta} (Q)\uparrow + HCl$

One mole of (P) gives one mole of (Q) and one mole of HCl on heaing.
The molar mass of (Q) in g mol^{-1} unit is

6. One mole of compound (X) reacts with three moles of CH_3I to form a quaternary salt. Reaction of the salt with aqueous Ag_2O followed by heating forms ethylene and trimethyl amine. If the molar mass of (X) is M g mol^{-1}, what is the value of $\frac{M}{10}$?

7. The reaction of CH_3COCl with reagents X, Y and Z forms HCl as the common side product. The main products are CH_3COOH, $CH_3CONHCH_3$ and CH_3COOCH_3 with the reagents X, Y and Z respectively. If the molar mass difference between Y and X is 'm' and that between Z and X is n then . What is the value of $\frac{m+n}{2}$?.

8. Reaction of CH_3NH_2 with an oxo-acid (X) produces CH_3OH, N_2 and H_2O. if the oxidation state of nitrogen in (X) in +x, what is the value of x?

Space For Rough Work

SECTION – III: MATHEMATICS

(PART – A)

(Single Correct Answer Type)

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

1. Let $g(x)=\begin{cases} 3x^2-4\sqrt{x}+1 & \text{for } x<1 \\ ax+b & \text{for } x\geq 1 \end{cases}$

If $g(x)$ is continuous and differentiable for all numbers in its domain then:

(A) $a=b=4$ (B) $a=b=-4$ (C) $a=4$ and $b=-4$ (D) $a=-4$ and $b=4$

2. Let $f(x)=(x-7)^2(x-2)^7, x\in[2,7]$. The value of $\theta\in(2,7)$ such that $f'(\theta)=0$ is equal to

(A) $\frac{49}{4}$ (B) $\frac{53}{9}$ (C) $\frac{45}{7}$ (D) $\frac{49}{9}$

3. If $y=(1+x)(1+x^2)(1+x^4).....(1+x^{2^n})$, then $\frac{dy}{dx}$ at x = 0 is:

(A) 1 (B) –1 (C) 0 (D) none of these

4. If $y=\cos^{-1}(\cos x)$, then $\frac{dy}{dx}$ at $x=\frac{5\pi}{4}$ is equal to:

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

(One or More Than One Options Correct Type)

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

5. The $\lim_{x\to 0} x^8\left[\frac{1}{x^3}\right]$ (where [x] is greatest integer function) is

(A) a nonzero real number (B) a rational number
(C) an integer (D) zero

Space For Rough Work

6. Let $f(x)=\begin{cases}\dfrac{(1-\cos 4x)\tan x}{x^3} & \text{if } x<0\\ 2a^2 & \text{if } x=0\\ \dfrac{\sqrt{x}}{\sqrt{16+\sqrt{x}}-4} & \text{if } x>0\end{cases}$

The possible value of a so that f is a continuous is

(A) 4 (B) 2 (C) –2 (D) not possible

7. Let $f(x)=\dfrac{x-1}{2x^2-7x+5}$. Then:

(A) $\underset{x\to 3}{\text{Limit}}\, f(x)=1$ (B) $\underset{x\to 0}{\text{Limit}}\, f(x)=-\dfrac{1}{5}$

(C) $\underset{x\to \infty}{\text{Limit}}\, f(x)=0$ (D) $\underset{x\to 5/2}{\text{Limit}}$ does not exist

8. If $\lim\limits_{x\to 0}\dfrac{ae^x+b\cos x+ce^{-x}}{e^{2x}-2e^x+1}=4$, then

(A) a = 2 (B) b = –4

(C) c = 2 (D) a + b + c = –8

(PART – B)

This section contains **Eight (08)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

1. Let $f(x)=\begin{cases}ax+1 & \text{if } x<1\\ 3 & \text{if } x=1\\ bx^2+1 & \text{if } x>1\end{cases}$. If f(x) is continuous at x = 1 then (a – b) is equal to:

2. Consider the function $f(x)=\begin{cases}a^2+e^x, & -\infty<x<0\\ x+2, & 0\le x\le 3\\ c-\dfrac{b^2}{x}, & 3<x<\infty\end{cases}$

If $f(x)$ is differentiable for every $x\in R$, then find the number of ordered triplets (a, b, c) of real numbers.

Space For Rough Work

3. Find the value of $f(0)$ for which $f(x)=\dfrac{64\left(\sqrt{x+4}-2\right)}{\sin 2x}$ is continuous.

4. If $f(x)=\begin{cases}\dfrac{x^3+x^2-16x+20}{(x-2)^2}, & x\neq 2\\ k, & x=2\end{cases}$ is continuous at $x=2$, then the value of k is equal to

5. $\lim\limits_{x\to 0}(1+3x)^{\frac{1}{x}}=e^{2k}$ then 2k =

6. $\lim\limits_{x\to 0}\left(\dfrac{2^x+3^x+4^x}{3}\right)^{\frac{3}{x}}=\lambda$ then $\lambda=$

7. Let $f(x)=\begin{cases}\dfrac{a(1-x\sin x)+b\cos x+5}{x^2}, & x<0\\ 3, & x=0\\ \left\{1+\left(\dfrac{P(x)}{x^2}\right)\right\}^{\frac{1}{x}}, & x>0\end{cases}$ where $P(x)$ is a cubic function and f is continuous at x = 0. The range of function $g(x)=3a\sin x-b\cos x$ is $[m, n]$, then $n-m=$

8. $f(x)=x^2+xg'(1)+g''(2)$ and $g(x)=f(1)x^2+xf'(1)+f''(1)$. The value of $f(3)+g(0)$ is

Space For Rough Work

FIITJEE INTERNAL TEST

BATCHES – PANINI426-G1 & PANINI426XII-1

Common Test – 2

Code: 101004

JEE ADVANCED

ANSWER KEY

ANSWER KEYS

Physics

PART – A

1.	A	2.	A	3.	D	4.	C
5.	AC	6.	BD	7.	AC	8.	AC

PART – B

1.	12.50	2.	12.50	3.	4.00	4.	1.50
5.	0.25	6.	1.25	7.	10.50	8.	0.25

Chemistry

PART – A

1.	B	2.	A	3.	C	4.	B
5.	BCD	6.	ABC	7.	AC	8.	ABC

PART – B

1.	5	2.	30	3.	24	4.	32
5.	28	6.	4.5	7.	13.5	8.	3

Mathematics

PART – A

1.	C	2.	B	3.	A	4.	B
5.	BCD	6.	BC	7.	ABCD	8.	ABC

PART – B

1.	0	2.	4	3.	8.00	4.	7.00
5.	3.00	6.	24.00	7.	10	8.	9