

PHYSICS, CHEMISTRY & MATHEMATICS**QP CODE: 100881****Common Test – 6****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 (05–07)** contains (3) 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 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: –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 (01-06)** This section contains **SIX (06)** questions. The answer to each question is a **NON-NEGATIVE INTEGER**. For each question, enter the correct integer corresponding to the answer. Each question carries **+4 marks** for correct answer. **There is no negative marking.**
- (iv) **Part-B (07-10)** This section contains Two paragraphs. Each paragraph having TWO questions Numerical answer type with answer XXXX.XX. For each question, enter the correct numerical value. If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places. Each question carries **+3 marks** for the correct answer. **There is no negative marking.**

Name of the Candidate: _____

Batch: _____ Date of Examination: _____

Enrolment Number: _____

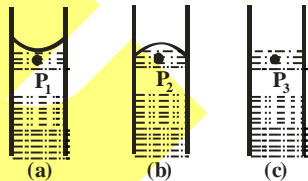
BATCH – NWCMSW425A1

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**.

- A fixed mass of helium gas is made to undergo a process in which its pressure varies linearly from 1 kPa to 2 kPa, in relation to its volume as the latter varies from 0.2 m^3 to 0.4 m^3 . The heat absorbed by the gas will be
(A) 300 J (B) 900 J (C) 1200 J (D) 1500 J
 - Two cylinders A and B fitted with piston contain equal amounts of an ideal diatomic gas at 300 K. The piston of A is free to move while that of B is held fixed. The same amount of heat is given to the gas in each cylinders. If the rise in temperature of the gas in A is 30 K, then the rise in temperature of the gas in B is
(A) 30 K (B) 18 K (C) 50 K (D) 42 K
 - Compare the pressure at the point P in the three tubes shown in the figure:
(A) $P_2 > P_1 > P_3$ (B) $P_3 > P_1 > P_2$
(C) $P_1 > P_3 > P_2$ (D) $P_2 > P_3 > P_1$
- 
- Two rods of length l_1 and l_2 are made of materials whose co-efficient of linear expansions are α_1 and α_2 . If the difference between twice of length of rod-1 and the thrice of the length of rod-2 is independent of temperature, then
(A) $\frac{2l_1}{l_2} = \frac{3\alpha_1}{\alpha_2}$ (B) $\frac{2l_1}{l_2} = \frac{3\alpha_2}{\alpha_1}$ (C) $l_2^2 \alpha_1 = \frac{3}{2} l_1^2 \alpha_2$ (D) $\frac{3l_1^2}{l_2} = \frac{2\alpha_2}{l_1}$

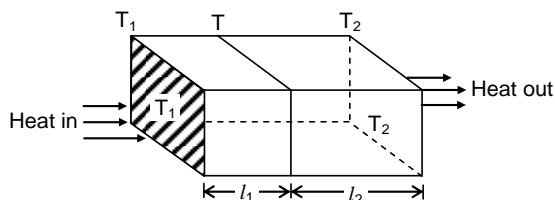
(One or More Than One Options Correct Type)

This section contains **3 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE or MORE THAN ONE is correct**.

- A large wooden plate of area 10 m^2 floating on the surface of a river is made to move horizontally with a speed of 2 m/s by applying a tangential force. River is 1 m deep and the water in contact with the bed is stationary. Then choose correct statements.
(Coefficient of viscosity of water = 10^{-3} N-s/m^2)
(A) velocity gradient is 2s^{-1} .
(B) velocity gradient is 1s^{-1} .
(C) force required to keep the plate moving with constant speed is 0.02 N.
(D) force required to keep the plate moving with constant speed is 0.01 N.

Space For Rough Work

6. Two plates thickness l_1 and l_2 with thermal conductivities K_1 and K_2 respectively are kept in thermal contact as shown in the figure. If A is area of each face, then mark the correct options.



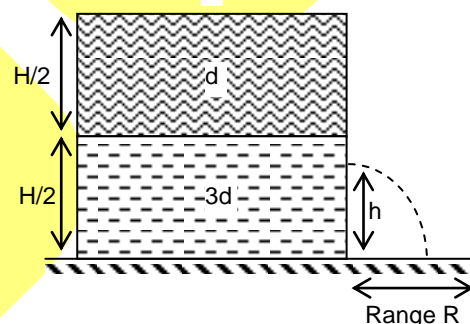
(A) Thermal resistance of combination is $R = \frac{l_1}{AK_1} + \frac{l_2}{AK_2}$

(B) Heat flow rate through the combination is $H = \frac{A(T_1 - T_2)}{\left(\frac{l_1}{K_1} + \frac{l_2}{K_2}\right)}$

(C) Temperature of joint of slabs is $T = \frac{T_1 \frac{l_2}{K_2} + T_2 \frac{l_1}{K_1}}{\left(\frac{l_1}{K_1} + \frac{l_2}{K_2}\right)}$

(D) Equivalent thermal conductivity; of combination will be $K_{eq} = \frac{l_1 + l_2}{\left(\frac{l_1}{K_1} + \frac{l_2}{K_2}\right)}$

7. A container of large uniform cross sectional area A resting on a horizontal surface holds two immiscible non viscous and incompressible liquids of density d and $3d$, each of height $H/2$. The lower density liquid is open to the atmosphere having pressure P_0 . A tiny hole of area a ($a \ll A$) is punched to the vertical side of lower container at a height h ($0 < h < H/2$) for which range is maximum.



(A) $h = H/3$

(B) Range $R = \frac{2H}{3}$

(C) Range $R = \frac{3H}{2}$

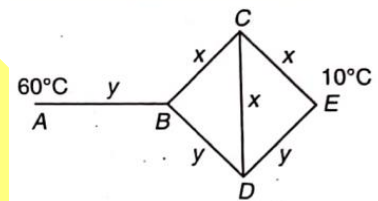
(D) Velocity of efflux $v = \sqrt{\frac{2}{3}gH}$

Space For Rough Work

(PART – B)
(Non – Negative Integer)

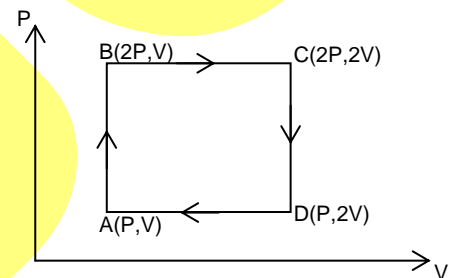
- 2 kg of ice at -15°C is mixed with 2.5 kg of water at 25°C in an insulating container. If the specific heat capacities of ice and water are $0.5 \text{ cal/g}^{\circ}\text{C}$ and $1 \text{ cal/g}^{\circ}\text{C}$, find the amount of water present in the container? (in kg nearest integer)
- A large tank is filled with water to a height H . A small hole is made at the base of the tank. It takes T_1 time to decrease the height of water to $H/9$ and it takes T_2 time to take out the rest of water. Find T_1 / T_2 .

- Three rods of material x and three rods of material y are connected as shown in figure. All the rods are of identical length and cross sectional area. If the end A is maintained at 60°C and the junction E at 10°C , calculate temperature of junctions B , in $^{\circ}\text{C}$. The thermal conductivity of x is $0.92 \text{ cal/cm-s}^{\circ}\text{C}$ and that of y is $0.46 \text{ cal/cm-s}^{\circ}\text{C}$,

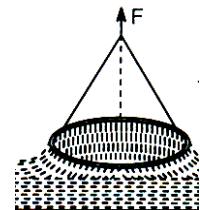


- A long cylindrical glass vessel has a small hole of radius r at its bottom. If the depth upto to which the vessel can be lowered vertically in a deep water bath (surface tension ' T ' and density of water ' ρ ') without any water entering inside is, $d = \frac{xT}{\rho g}$ then find ' x '.

- An ideal monoatomic gas is taken round the cycle ABCDA as shown in the $P - V$ diagram (see figure).
The work done during the cycle is $\frac{PV}{n}$ then $n = ?$



- A ring is cut from a platinum tube of 8.5 cm internal and 9.5 cm external diameter. It is supported horizontally from a pan of a balance so that it comes in contact with the water in a glass vessel. The surface tension (in CGS unit) of water if an extra 9π weight is required to pull it away from water ($g = 1000 \text{ cm/s}^2$) is $100 K$. Find K



Space For Rough Work

(PART – B)

This section contains Two paragraphs. Each paragraph having TWO questions Numerical answer type with answer XXXX.XX. For each question, enter the correct numerical value. If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.

Paragraph for Question no. 7 to 8

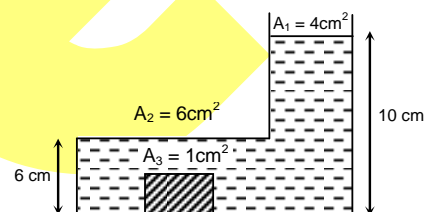
The latent heat of fusion of ice is 80 cal/gram and latent heat of steam is 540 cal/gram. Change of state occurs only at melting point or boiling point of the substance. There is no change in temperature during the entire change of state. For rise in temperature (ΔT), heat required,

$\Delta Q = c.m \Delta T$, where c is specific heat of substance

7. Find Heat required to melt 10g of ice at 0°C to water at 0°C (in Kcal).
8. Find Heat required to convert 1gm of ice at -5°C to water at 0°C in Cal. (sp. Heat of ice = 0.5 cal/g $^{\circ}\text{C}$)

Paragraph for Question no. 9 to 10

Pressure at point in a static fluid depends only on the depth of point below liquid surface. Force on any surface can be calculated by pressure on surface and applied by area of surface. Vessel is filled with water as shown in figure and block of cross section area 1 cm^2 , height 2 cm and density 4 g/c.c is placed at bottom of vessel ($g = 1000\text{ cm/s}^2$)



9. Force per unit width exerted by liquid on 6 cm wall is $a \times 10^3$ dynes. Find the value of 'a' is _____.
10. Force exerted by liquid on block is $a \times 10^3$ dynes. Find the value of 'a' is _____.

Space For Rough Work

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**.

- The first ionisation enthalpies of Na, Mg, Al and Si are in the order:
 (A) $\text{Na} < \text{Mg} > \text{Al} < \text{Si}$ (B) $\text{Na} > \text{Mg} > \text{Al} > \text{Si}$
 (C) $\text{Na} < \text{Mg} < \text{Al} < \text{Si}$ (D) $\text{Na} > \text{Mg} > \text{Al} < \text{Si}$
- $\text{Mg} + \text{N}_2 \xrightarrow{\Delta} \text{A} \xrightarrow{\text{H}_2\text{O}} \text{B}(\text{g}) \uparrow + \text{C}$
 B is
 (A) NO_2 (B) N_2O_3 (C) NH_3 (D) N_2H_4
- Which molecule/ion out of the following does not contain unpaired electrons?
 (A) N_2^+ (B) O_2 (C) O_2^{2-} (D) B_2
- Which of the following substance forms a white colour product when reacts with H_2O_2 ?
 (A) $\text{K}_2\text{Cr}_2\text{O}_7$ (B) FeSO_4 (C) PbS (D) Na_2SO_4

(One or More Than One Options Correct Type)

This section contains **3 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE or MORE THAN ONE is correct**.

- Which of the following properties of compounds is correctly matched?
 (A) Hydration energy: $\text{Li}^+ > \text{Na}^+ > \text{K}^+ > \text{Rb}^+ > \text{Cs}^+$
 (B) Solubility in water: $\text{LiOH} < \text{NaOH} < \text{KOH} < \text{RbOH} < \text{CsOH}$
 (C) Lattice energy: $\text{RbF} < \text{KF} < \text{NaF} < \text{LiF}$
 (D) Stability: $\text{RbH} < \text{KH} < \text{NaH} < \text{LiH}$
- Which of the following is/are true statement(s)?
 (A) BH_3 is not a stable compound
 (B) Boron hydrides are formed when dilute HCl reacts with Mg_3B_2
 (C) All the B – H bond distance in B_2H_6 are equal
 (D) The boron hydrides are readily hydrolysed
- Which of the following substance(s) is/are thermally less stable than CaCO_3 ?
 (A) BeCO_3 (B) MgCO_3 (C) SrCO_3 (D) BaCO_3

(PART – B)

(Non – Negative Integer)

- How many sodium atoms are present in sodium pyrosilicate?
- According to molecular orbital theory, the number of electrons present in the antibonding molecular orbitals of N_2^- is (are)

Space For Rough Work

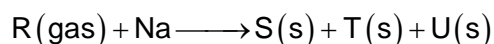
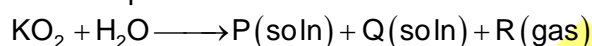
- Borax contains x number of B – OH bonds, y number of sp^2 -hybridized boron atoms and z number of O – H bonds. If the number of oxygen atoms present in borax is (P) . What is the value of $(x + y + z) - (P)$?
- An alkyl chlorosilane $(R)_xSi(Cl)_y$ forms cyclic silicones upon hydrolysis. What is the value of x ?
- Reaction of KH with water forms a gas and an alkaline solution. What is the molar mass of the gas in $g\ mol^{-1}$ unit?
- How many total number of atoms of different elements are present in washing soda?

(PART – B)

This section contains Two paragraphs. Each paragraph having TWO questions Numerical answer type with answer XXXX.XX. For each question, enter the correct numerical value. If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.

Paragraph for Question no. 7 to 8

Consider the sequence of reactions



The solids S, T and U contain sodium and oxygen atoms in different ratios.

- If the order of molar masses of S, T and U is $S > T > U$, then determine the mass of 1.4 moles of T in gram?
- If $Q(\text{soln})$ is used for bleaching, what is the value of $\frac{x}{10}$ where x is the molar mass of $P(\text{soln})$ in $g\ mol^{-1}$ unit?

Paragraph for Question no. 9 to 10

$B_3N_3H_6$ called inorganic benzene which is formed by the reaction between B_2H_6 and (X). $B_3N_3H_6$ contains both sigma and pi-electrons. The number of pi-electrons in it is (Y). The total number of covalent bonds present in the molecule is 15.

- If the molar mass of (X) is $M\ g\ mol^{-1}$, what is the value of $\frac{M}{10}$?
- What is the value of $\left(\frac{Y}{5}\right)$?

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 $f(x) = \begin{vmatrix} 1 & x-1 & x \\ 2(x-1) & (x-1)(x-2) & x(x-1) \\ 3(x-1)(x-2) & (x-1)(x-2)(x-3) & x(x-1)(x-2) \end{vmatrix}$ and $D = \begin{vmatrix} 1 & 10 & 2r \\ 70 & 17 & 3r+1 \\ 1 & 1 & 1 \end{vmatrix}$

then $f(50)$ is equal to:

- (A) D_5 (B) $\frac{D_5}{9}$ (C) $D_5 + 9$ (D) $9D_5$
2. If letters of the word 'KUBER' are written in all positive orders and arranged as in dictionary, then rank of the word 'KUBER' will be
 (A) 67 (B) 68 (C) 65 (D) 69
3. 6 married couples are standing in a room. If 4 people are chosen at random, then the chance that exactly one married couple is among the 4 is:
 (A) $\frac{16}{33}$ (B) $\frac{8}{33}$ (C) $\frac{17}{33}$ (D) $\frac{24}{33}$
4. The coefficient of x^{11} in the expression $(1+x)^5(3+x)^4(7+x)^3$ equals
 (A) 42 (B) 40 (C) 38 (D) 36

(One or More Than One Options Correct Type)

This section contains **3 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 of the following values of α satisfying the equation

$$\begin{vmatrix} (1+\alpha)^2 & (1+2\alpha)^2 & (1+3\alpha)^2 \\ (2+\alpha)^2 & (2+2\alpha)^2 & (2+3\alpha)^2 \\ (3+\alpha)^2 & (3+2\alpha)^2 & (3+3\alpha)^2 \end{vmatrix} = -684\alpha$$

- (A) -4 (B) 9 (C) -9 (D) 4

Space For Rough Work

6. An urn contains 4 blue, 6 red and 8 green balls. A random sample of 4 balls is drawn. Which of the following hold(s) good?
- (A) The chance that the sample contains two blue balls is $\frac{3}{17}$
- (B) The chance that the sample contains two red balls is $\frac{11}{34}$
- (C) The chance that the sample contains two blue balls if it contains two red balls is $\frac{1}{11}$.
- (D) The chance that the sample contains at least one ball of each colour is more than 50%
7. A bag contains four tickets marked with 112, 121, 211, 222 one ticket is drawn at random from the bag. Let E_i ($i = 1, 2, 3$) denote the event that i^{th} digit on the ticket is 2. Then:
- (A) E_1 and E_2 are independent (B) E_2 and E_3 are independent
- (C) E_3 and E_1 are independent (D) E_1, E_2, E_3 are independent

(PART – B)
(Non – Negative Integer)

1. The system of equations
 $\alpha x + y + z = \alpha - 1,$
 $x + \alpha y + z = \alpha - 1,$
 $x + y + \alpha z = \alpha - 1$
 has no solution, if $|\alpha|$ is
2. The sum $\sum_{i=0}^m {}^{10}C_i {}^{20}C_{m-i}$ is maximum when m is
3. The number of different arrangements (permutations) of the letters of the word 'Banana' is
4. The remainder when 2^{2003} is divided by 17 is
5. The coefficient of t^{50} in $(1+t)^{41}(1-t+t^2)^{40}$ is equal to
6. Let n be the number of ways in which 5 girls and 5 boys can stand in a queue in such a way that all the girls stand consecutively in the queue. Let m be the number of ways in which 5 girls and 5 boys can stand in a queue in such a way that exactly four girls stand consecutively in the queue. Then the value of $\frac{m}{n}$ is

Space For Rough Work

(PART – B)

This section contains Two paragraphs. Each paragraph having TWO questions Numerical answer type with answer XXXX.XX. For each question, enter the correct numerical value. If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.

Paragraph for Question no. 7 to 8

In a class of 10 students, probability of exactly i students passing an examination is directly proportional to i^2 . Then, answer the following questions:

7. The probability that exactly five students passing an examination be $\frac{p}{q}$ (where p, q are coprime) then $p + q$ is
8. If a student is selected at random, then the probability that he has passed the examination be $\frac{p}{q}$ (where p, q are coprime) then $p + q$ is

Paragraph for Question no. 9 to 10

Different words are being formed by arranging the letters of the word 'SUCCESS'. All of the words obtained are written in the form of a dictionary.

9. The number of words in which the two C are together but no two S are together is:
10. The number of words in which no two C and no two S are together is:

Space For Rough Work

FIITJEE INTERNAL TEST

BATCH: NWCMSW425A1

COMMON TEST- 6

Code: 100881

JEE ADVANCED LEVEL

ANSWER KEY

ANSWER KEYS

Physics

PART - A

- | | | | |
|-------|---------|--------|------|
| 1. C | 2. D | 3. D | 4. B |
| 5. AC | 6. ABCD | 7. ABD | |

PART - B

- | | | | |
|-------|-------|---------|----------|
| 1. 3 | 2. 2 | 3. 30 | 4. 2 |
| 5. 1 | 6. 5 | 7. 0.80 | 8. 82.50 |
| 9. 42 | 10. 8 | | |

Chemistry

PART - A

- | | | | |
|---------|--------|-------|------|
| 1. A | 2. C | 3. C | 4. C |
| 5. ABCD | 6. ABD | 7. AB | |

PART - B

- | | | | |
|--------|---------|---------|--------|
| 1. 6 | 2. 5 | 3. 9 | 4. 2 |
| 5. 2 | 6. 36 | 7. 86.8 | 8. 5.6 |
| 9. 1.7 | 10. 1.2 | | |

Mathematics

PART - A

- | | | | |
|-------|-------|--------|------|
| 1. C | 2. A | 3. A | 4. C |
| 5. BC | 6. BC | 7. ABC | |

PART - B

- | | | | |
|-------|--------|-------|-------|
| 1. 2 | 2. 15 | 3. 60 | 4. 8 |
| 5. 0 | 6. 5 | 7. 82 | 8. 25 |
| 9. 24 | 10. 96 | | |