FIITJEE Phase Test (JEE-Advanced)

BATCH – Two Yr CRP(2022) X&A Lot_PT-III

PHYSICS, CHEMISTRY & MATHEMATICS

Pattern - CPT-1 | **QP Code:** | **PAPER - 1**

Time Allotted: 3 Hours **Maximum Marks: 183**

- 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. Each **Section** is further divided into **Two Parts**: **Part-A & B** in the 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 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 Two Parts.

(i) **Part-A (01-07) –** Contains seven (07) multiple choice questions which have **One or More** 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.

(i) **Part-A (08-13) –** Contains six (06) 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-B (01-05)** contains five (05) Numerical based questions, the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries **+3 marks** for correct answer and **there will be no negative marking.**

Name of the Candidate :_____

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

Enrolment Number :_____

SECTION-1 : PHYSICS

PART – A

(Multi Correct Choice Type)

This section contains 7 **multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

1. Sounds from two identical sources S_1 and S_2 reach a point P. when the sounds reach directly and in the same phase the intensity at P is I_0. The power of S_1 in now reduced by 64% and the phase difference between S_1 and S_2 is varied continuously. the maximum and minimum intensities recorded at P are now I_{max} and I_{min}

   (A) $I_{max} = 0.64\ I_0$ (B) $I_{min} = 0.36\ I_0$

   (C) $I_{max} / I_{min} = 16$ (D) $I_{max} / I_{min} = 1.64 / 0.36$

1. **AC**

2. Two bodies A and B have thermal emissivity of 0.01 and 0.81 respectively. The outer surface areas of the two bodies are equal. The two bodies emit total radiant power at the same rate. The wavelength λ_B corresponding to maximum spectral radiancy in the radiation from B to shifted from the wavelength corresponding to maximum spectral radiancy in the radiation from A by 1 μm. If the temperature of A is 5802 K,

   (A) The temperature of B is 1934 K (B) $\lambda_B = 1.5\mu m$

   (C) The temperature of B is 1160 K (D) The temperature of B is 2901 K

2. **AB**

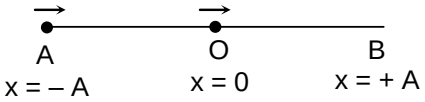
3. Two identical straight wires are stretched so as to produce 6 beats per second when vibrating simultaneously. On changing the tension slightly in one of them, the beat frequency remains unchanged. Denoting by T_1 and T_2 the higher and lower initial tension in the strings then it could be said that while making the above changes in tension

   (A) T_2 was decreased (B) T_2 was increased

   (C) T_1 was increased (D) T_1 was decreased

3. **BD**

4. Two particles undergo SHM along the same line with the same time period (T) and equal amplitudes (A). At a particular instant one particle is at x = –A and the other is at x = 0. They move in the same direction. They will cross each other at time t and at position x then



   (A) $t = \frac{4T}{3}$ (B) $t = \frac{3T}{8}$ (C) $x = \frac{A}{2}$ (D) $x = \frac{A}{\sqrt{2}}$

4. **BD**

5. A bimetallic strip is formed out of two identical strips one of copper and the other of brass. The coefficients of linear expansion of the two metals are α_C and α_β. On heating the temperature of the strip goes up by ΔT and the strip bends to form an arc of radius of curvature R. Then R is

   (A) Proportional to ΔT (B) Inversely proportional to Δ T

   (C) proportional to $|\alpha_B - \alpha_C|$ (D) Inversely proportional to $|\alpha_B - \alpha_C|$

5. **BD**

6. A metal wire of length L area of cross section A and young's modulus Y is stretched by a variable force F such that F is always slightly greater than the elastic forces of resistance in the wire when the elongation of the wire is l.

   (A) the work done by F is $\frac{YAl^2}{2L}$

(B) the work done by F is $\frac{YAl^2}{L}$

(C) the elastic potential energy stored in the wire is $\frac{YAl^2}{2L}$

(D) the elastic potential energy stored in the wire is $\frac{YAl^2}{L}$

6. **AC**

7. If α, β and γ are coefficients of linear superficial and volume expansion respectively, then

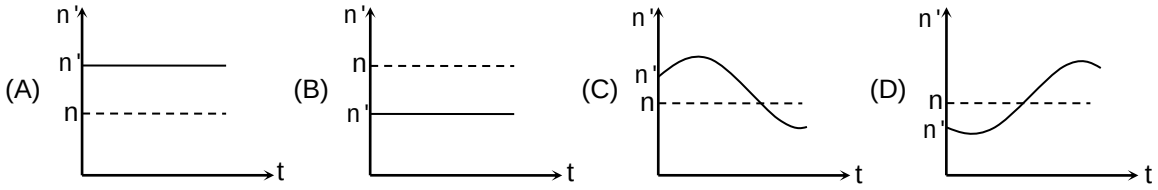
(A) $\frac{\beta}{\alpha}=\frac{1}{2}$ (B) $\frac{\beta}{\gamma}=\frac{2}{3}$ (C) $\frac{\gamma}{\alpha}=\frac{3}{1}$ (D) $\frac{\beta}{\alpha}=\frac{\gamma}{\beta}$

7. **BC**

(Single Correct Choice Type)

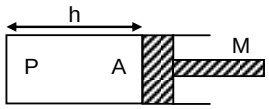
This section contains **6 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

8. Source and observer both start moving simultaneously from origin, one along x-axis and the other along y-axis with speed of source equal to twice the speed of observer and time t would be



8. **B**

9. A cylindrical piston of mass M slides smoothly inside a long cylinder closed at one end, enclosing a certain mass of a gas. The cylinder is kept with its axis horizontal. If the piston is slightly compressed isothermally from its equilibrium position, it oscillates simple harmonically, the period of oscillation will be

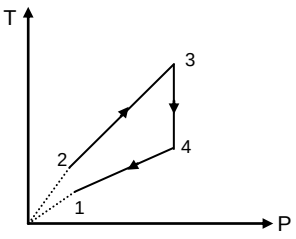


(A) $T=2\pi\sqrt{\frac{Mh}{PA}}$ (B) $T=2\pi\sqrt{\frac{MA}{Ph}}$

(C) $T=2\pi\sqrt{\frac{M}{PAh}}$ (D) $T=2\pi\sqrt{MPhA}$

9. **A**

10. Two moles of an ideal monoatomic gas undergoes a cyclic process as shown in the figure. The temperatures in different states are given as $6T_1 = 3T_2 = 2T_4 = T_3 = 1800$ K. Determine the work done by the gas during the cycle.

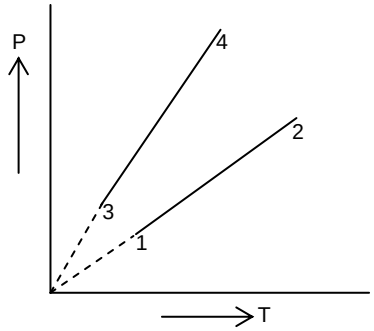


(A) –10 kJ (B) –20 kJ

(C) –15 kJ (D) –30 kJ

10. **A**

11. Pressure versus temperature graph of an ideal gas to equal number of moles of different volumes are plotted as shown in figure. Choose the correct alternative



(A) $V_1 = V_2 = V_3 = V_4$

(B) $V_4 > V_3 > V_2 > V_1$

(C) $V_1 = V_2; V_3 = V_4$ and $V_2 > V_3$

(D) $V_1 = V_2, V_3 = V_4$ and $V_2 < V_3$

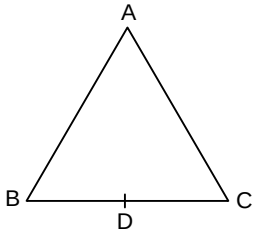
11. **C**

12. A particle executes SHM with an amplitude of 2 cm. When the particle is at 1 cm from the mean position the numerical value of its velocity is equal to that of its acceleration. Then its time period in second is

(A) $\frac{1}{2\pi\sqrt{3}}$ (B) $2\pi\sqrt{3}$ (C) $\frac{2\pi}{\sqrt{3}}$ (D) $\frac{\sqrt{3}}{2\pi}$

12. **C**

13. Three metal rods of the same length and area of cross-section form an equilateral triangle as shown in figure D is the mid-point of side BC. If AD is independent for small change in temperature, then (α_1 is the coefficient of linear expansion for rod BC and α_2 for rods AB and AC)



(A) $\alpha_1 = 2\alpha_2$ (B) $\alpha_1 = \frac{\alpha_2}{2}$

(C) $\alpha_2 = \alpha_1$ (D) $\alpha_1 = 4\alpha_2$

13. **D**

PART – B
(Numerical based)

1. An organ pipe P_1 closed at one end vibrating in its first overtone and another pipe P_2 open at the both ends vibrating in its third overtone are in resonance with a given tuning fork. The ratio of the length of P_1 to that of P_2 is $\frac{3}{n}$ then n = ?

1. **8**

2. Three particles, each of mass m, are situated at the vertices of an equilateral triangle of side length a. The only forces acting on the particles are their mutual gravitational forces. It is desired that each particle moves in a circle while maintaining the original mutual separation a. Find the initial velocity that should be given to each particle. $\left(\text{take a} = \frac{GM}{16}\right)$

2. **4**

3. A bus is moving towards a huge wall with a velocity of 5 m/s. The driver sounds a horn of frequency 200 Hz. The frequency of the beats heard by a passenger of the bus will be (In Hz) nearly (velocity of sound in air = 338 m/s)

3. **6**

4. The maximum acceleration and maximum velocity of simple harmonically oscillating system are 8 m/sec^2 and 8 m/s respectively. What is the angular frequency?

4. **1**

5. A body cools in a surrounding of a constant temperature 30^0C. Its heat capacity is 2 J/C^0. Initial temperature of the body is 40^0C. Assume Newton's law of cooling is valid. The body cools to 38^0C in 10 minutes when the body temperature has reached 38^0C, it is heated again so that it reaches to 40^0C in 10 minutes. Find the total heat required (in J) from heater by the body.

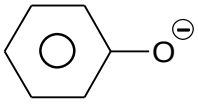
5. **4**

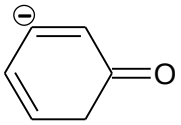
SECTION-2 : CHEMISTRY

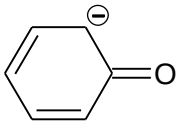
PART – A

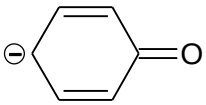
(Multi Correct Choice Type)

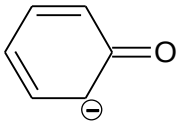
This section contains 7 **multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

1. The resonating structure(s) of  is/are

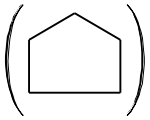
(A) 

(B) 

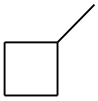
(C) 

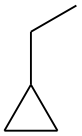
(D) 

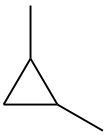
1. **BCD**

2. The isomer(s) of cyclopentane  is/are:

(A) 

(B) 

(C) 

(D) 

2. **BCD**

3. Which is/are more reactive towards HBr than HC ≡ CH?
(A) $CH_2 = CH_2$ (B) $CH_3CH = CH_2$
(C) $CH_3CH = CHCH_3$ (D) $(CH_3)_2C = CHCH_3$

3. **ABCD**

4. Which of the following compound(s) form(s) an aldehyde upon acidic hydrolysis or hydrolysis in presence of $H_2SO_4/HgSO_4$?
(A) $CH_3CH = CH_2$ (B) HC ≡ CH
(C) $CH_2 = CH_2$ (D) $CH_3 – C \equiv CH$

4. **B**

5. $CH_3CH = CHCH_3 \longrightarrow CH_3\underset{\diagdown\,O\,\diagup}{CH - CH}CH_3$

The reagent(s) used in the above change is/are?
(A) CF_3COOH (B) $O_2/Ag/\Delta$
(C) MCPBA(meta chloro per benzoic acid) (D) $KMnO_4/OH^-$/Cold

5. **ABC**

6. The heat of hydrogenation of which alkene(s) is/are higher than that of $CH_3CH = CHCH_3$?
(A) $CH_2 = CH_2$ (B) $CH_3CH = CH_2$
(C) $(CH_3)_2C = CHCH_3$ (D) $(CH_3)_2C = C(CH_3)_2$

6. **AB**

7. Which of the following reaction(s) form acetylene?

(A) $ClCH_2CH_2Cl \xrightarrow{NaNH_2}$ (B) $CHCl_3 + CHCl_3 \xrightarrow{Ag/\Delta}$

(C) $Cl_2CHCHCl_2 \xrightarrow{Zn/C_2H_5OH/\Delta}$ (D) $CH_3CHCl_2 \xrightarrow{NaNH_2}$

7. **ABCD**

(Single Correct Choice Type)

This section contains **6 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

8. The most stable free radical out of the following is:

(A) $CH_3CH_2CH_2\overset{\odot}{C}H_2$ (B) $CH_3CH_2\overset{\odot}{C}HCH_2CH_3$

(C) $CH_3CH_2\overset{\odot}{C}HCH_3$ (D) $CH_2 = \overset{\odot}{C}H - CH_3$

8. **C**

9. $CH_3CH = CHCH_2CH = CHCH_3 \xrightarrow[h\nu]{NBS}$ Major product

The major product of above reaction is:

(A) $CH_3CH = CH - \underset{\displaystyle Br}{\underset{|}{CH}} - CH = CH - CH_3$ (B) $BrCH_2CH = CHCH_2CH = CHCH_3$

(C) $CH_3CH = \underset{\displaystyle Br}{\underset{|}{C}} - CH_2CH = CHCH_3$ (D) $CH_3CH = CH - CH_2CH = \underset{\displaystyle Br}{\underset{|}{C}}CH_3$

9. **A**

10. $CH_2 = CH_2$ does not react with

(A) HCl (B) Br_2/H_2O

(C) $Cl_2/h\nu$ (D) Cl_2/CCl_4

10. **C**

11. Which reaction produces the lowest boiling organic product with formula C_5H_{12}?

(A) $CH_3MgBr + (CH_3)_3C - CH_2OH \longrightarrow$

(B) $(CH_3)_2CHCH_2CH_2MgBr + C_2H_5OH \longrightarrow$

(C) $(CH_3)_3CCH_2MgBr + C_2H_5OH \longrightarrow$

(D) $CH_3CH_2CH_2CH_2CH_2MgBr + C_2H_5OH \longrightarrow$

11. C

12. The formula of an organic compound is $C_{12}H_{26}$. One isomer of this compound has the highest heat of combustion. Therefore, this isomer contains

(A) highest number of primary carbon atoms

(B) lowest number of primary carbon atoms

(C) highest number of C – H bonds

(D) lowest number of C – H bonds

12. B

13. $CH_3COCH_3 + XX' \longrightarrow CH_3 - \underset{\displaystyle X'}{\overset{\displaystyle OX}{\overset{|}{\underset{|}{C}}}} - CH_3$

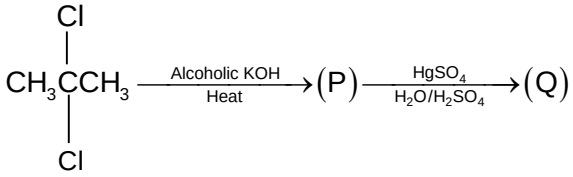
In above reaction XX′ is:

(A) $CH_2 = CH_2$ (B) $CH_3 - CH_3$

(C) $HC \equiv CH$ (D) CH_4

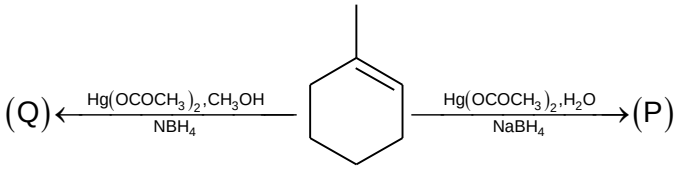
13. C

PART – B
(Numerical based)

1. 

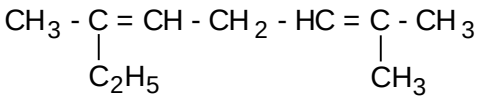
How many hydrogen atom(s) is/are present in one molecule of (Q)?

1. 6

2. 

What is the molar mass difference between (Q) and (P) in g mol^{-1} unit i.e., (Q - P)?

2. 14

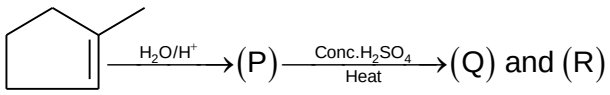
3. 

How many geometrical isomers is/are possible for the above compound?

3. 2

4. One mole of an alkyl polychloride(X) reacts with two moles of benzene in presence of anhy.$AlCl_3$ to form product(Y). (Y) is a hydrocarbon containing fourteen carbon atoms. What is the molar mass of (X) in g mol^{-1} unit?

4. 99

5. 

If Q and R are subjected to reductive ozonolysis $\left(O_3, {}^{Zn}/_{H_2O}\right)$, what will be the molar mass of the product in g mol^{-1} unit which contains the least number of carbon atoms?

5. 30

SECTION-3 : MATHEMATICS

PART – A

(Multi Correct Choice Type)

This section contains 7 **multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

1. Let $(1+x^2)^2\,(1+x)^n = A_0 + A_1x + A_2x^2 + \ldots$. If A_0, A_1, A_2 are in A.P. then the value of n is
   (A) 2 (B) 3
   (C) 5 (D) 7

1. A,B

1. $(1+x^2)^2\,(1+x)^n = A_0 + A_1x + A_2x^2 + \ldots$.
   Hence $A_0 = 1$, $A_1 = n$, $A_2 = 2 + {}^nC_2$
   Given A_0, A_1, A_2 are in A.P.
   $$\therefore n - 1 = 2 + \frac{n(n-1)}{2} - n$$
   $$\Rightarrow n = 2, 3$$

2. If $\frac{2}{1!13!} + \frac{2}{3!11!} + \frac{2}{5!9!} + \frac{1}{7!7!} = \frac{2^m}{n!}$ then
   (A) m + n =27 (B) m = 1 + n
   (C) $m^2 + n^2 = 2$ (D) n = 1 + m

2. A,D

2. $$\frac{2}{1!13!} + \frac{2}{3!11!} + \frac{2}{5!9!} + \frac{1}{7!7!} = \frac{1}{14!}(2^{14}C_1 + 2^{14}C_3 + 2^{14}C_5 + {}^{14}C_7) = \frac{1}{14!}2^{14-1} = \frac{2^{13}}{14!}$$
   $\Rightarrow$ m = 13,n = 14

3. The sum of the series $1 + \frac{2}{x} + \frac{4}{x^2} + \frac{8}{x^3} + \ldots.\text{to}\ \infty$ is a finite number if
   (A) $x = \frac{3}{2}$ (B) x < –3
   (C) x > 1 (D) x > 2

3. B, D

3. Common ratio $\left|\frac{2}{x}\right| < 1 \Rightarrow x > 2$ or x < –2

4. $\sum_{r+5=0}^{10} (-1)^{r+5} \cdot {}^{10}C_{r+5} \cdot 2^{5-r}$ is greater than
   (A) –2 (B) –1
   (C) 0 (D) 1

4. A,B,C

4. Put, $r + 5 = t; \sum_{t=0}^{10} (-1)^t \cdot {}^{10}C_t \cdot 2^{10-t}$
   $$= 2^{10}\sum_{t=0}^{10} (-1)^t \cdot {}^{10}C_t \times \frac{1}{2^t} = 2^{10}\left(1 - \frac{1}{2}\right)^{10} = 1$$

5. Number of ways in which 200 people can be divided in 100 couples is

(A) $\frac{200!}{2^{100}(100)!}$ (B) 1 × 3 × 5 × ……199

(C) $\left(\frac{101}{2}\right)\left(\frac{102}{2}\right)....\left(\frac{200}{2}\right)$ (D) $\frac{(200)!}{100!}$

5. ABC

5. $\frac{200!}{2^{100}(100)!}=1.3.5.....199=\left(\frac{101}{2}\right)\left(\frac{102}{2}\right).....\left(\frac{200}{2}\right)$

6. The number of ways is which we can arrange the 2n letters $x_1, x_2, ...,x_n; y_1, y_2, ..., y_n$ in a line so that the suffixes of letters x and those of the letters y are respectively in ascending order of magnitude is

(A) $\left({}^{n}C_{o}\right)^2+\left({}^{n}C_{1}\right)^2+.....+\left({}^{n}C_{n}\right)^2$ (B) ${}^{2n}C_n$

(C) $\frac{2^n}{n!}\left[1.3.5.....(2n-1)\right]$ (D) ${}^{2n}C_n-1$

6. ABC

7. If $S_n=\sum_{r=1}^{n}\frac{2r+1}{r^4+2r^3+r^2}$ then

(A) $S_{15}=\frac{255}{256}$ (B) $S_{10}=\frac{120}{121}$

(C) $S_{20}=\frac{439}{221}$ (D) $S_{20}=\frac{440}{441}$

7. A, B, D

7. $S_n=\sum_{r=1}^{n}\left[\frac{1}{r^2}-\frac{1}{(r+1)^2}\right]$

(Single Correct Choice Type)

This section contains **6 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

8. The number of 4-digit natural numbers abcd where $a\le b\le c<d$, is equal to

(A) 126 (B) 84

(C) 246 (D) none of these

8. C

9. Number of arrangements of a, b, c, d so that neither a, b nor c, d come together is

(A) 16 (B) 8

(C) 4 (D) None

9. B

9. □a□b□

$2c_1.2.21=8$

Select one to place in between a and b.

10. Coefficient of x^6 in the expansion of $(1 + x + x^2 + x^3)^{-3}$ is

(A) 6 (B) 9

(C) 5 (D) 4

10. B

10. $(1 + x + x^2 + x^3)^{-3} = \frac{\left\{(1-x)\left(1+x+x^2+x^3\right)\right\}^{-3}}{(1-x)^{-3}}$

$= (1 - x^4)^{-3} (1 - x)^3 = (1 - 3x + 3x^2 - x^3)(1 + 3x^4 + 6x^8 + \ldots\ldots)$
Hence (B) is the correct answer.

11. If H is the harmonic mean between a and b, then $\frac{H+a}{H-a} + \frac{H+b}{H-b} =$

(A) 1 (B) 2
(C) –1 (D) –2

11. B

11. Put $H = \frac{2ab}{a+b}$

$$\frac{H+a}{H-a} + \frac{H+b}{H-b}$$

$$\frac{\frac{2ab}{a+b} + a}{\frac{2ab}{a+b} - a} + \frac{\frac{2ab}{a+b} + b}{\frac{2ab}{a+b} - b}$$

$$\frac{a+3b}{b-a} + \frac{b+3a}{a-b}$$

$$\frac{a+3b-b-3a}{b-a} = 2$$

12. If $C_o, C_1, C_2 \ldots, C_n$ are the binomial coefficient in the expansion of $(1+x)^n$, then $C_o + (C_o + C_1) + (C_o + C_1 + C_2) + \ldots + (C_o + C_1 + C_2 + \ldots + C_{n-1})$ is equal to
(A) $n.2^n$ (B) $n.2^{n-1}$
(C) $n.2^{n-2}$ (D) $n.2^{n-3}$

12. B

12. $C_0 + (C_0 + C_1) + (C_0 + C_1 + C_2) + \ldots + (C_0 + C_1 + C_2 + \ldots + C_{n-1})$

$= nC_0 + (n-1) C_1 + (n-2) C_2 + \ldots$

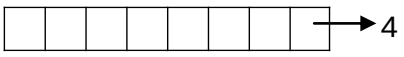
$\because (x + 1)^n = C_0 x^n + C_1 x^{n-1} + C_2 x^{n-2} + \ldots + C_{n-1} x + C_n$

put $x = 1$, we get $nC_0 + (n-1)C_1 + (n-2)C_2 + \ldots = n.2^{n-1}$

13. Number of permutations of all the letters in "CASANAVA" that does not end with A can be expressed in the form of $\frac{m!}{n!}$, then the value of (m +n), is

(A) 10 (B) 11
(C) 12 (D) 13

13. A

13. 

Required number of ways = $\frac{7!}{3!}$

PART – B
(Numerical based)

1. If $k \in R$ and the middle term of $\left(\frac{k}{2} + 2\right)^8$ is 1120, then value of k is:

1. 2

2. A G.P. consists of even number of terms. If the sum of all the terms is 5 times the sum of the terms occupying odd places, then its common ratio is

2. 4

2. Apply the sum formula for G.P.

Solution: Let the number of terms of G.P. be 2n.

$\therefore$ Given $a_1 + a_2 + a_3 + ... + a_{2n} = 5\left[a_1 + a_3 + a_5 + ... + a_{2n-1}\right]$

$$\Rightarrow \quad \frac{a_1\left(r^{2n}-1\right)}{r-1} = 5 \cdot \frac{a_1\left(r^{2n}-1\right)}{r^2-1}$$

$\Rightarrow r + 1 = 5$

$\therefore r = 4.$

3. The sum of the series $\sum_{r=1}^{n} 2^{2r+3}\,{}^{n}C_r$ is $k(5^n - 1)$, then the numerical value of k must be

3. 8

3. Sum $= 8\sum_{r=1}^{n} 4^r\,{}^{n}C_r = 8[(1+4)^n - 1] = 8(5^n - 1)$ $\Rightarrow k = 8.$

4. There are three groups of identical red, blue and green balls and each group contains atleast 10 balls. Find the number of ways of selecting 10 balls if twice as many red balls as green balls are to be selected.

4. 4

4. Let the number of green balls be x, then the number of red balls is 2x. Let the number of blue balls be y, then x + 2x + y = 10.
$\Rightarrow 3x + y = 10 \Rightarrow y = 10 - 3x$
Clearly x can take values 0, 1, 2, 3, the corresponding values of y are 10, 7, 4 and 1
Thus the possibilities are as follows
Hence total number of required ways = 4

Red	Blue	Green
0	10	0
2	7	1
4	4	2
6	1	3
Total = 4 ways		

5. If the integral part of the number $(\sqrt{3}+1)^{10}$ is 23160 + k, then k must be

5. 7

5. $I = \left(\sqrt{3}+1\right)^{10} + \left(\sqrt{3}-1\right)^{10} - 1$ $\left(\because 0 < (\sqrt{3}-1)^{10} < 1\right)$

$= (4+2\sqrt{3})^5 + (4-2\sqrt{3})^5 - 1 \quad = 2^5\left[(2+\sqrt{3})^5 + (2-\sqrt{3})^5\right] - 1$

$= 2^5.2\left[2^5 + {}^{5}C_2.3\left(\sqrt{3}\right)^2 + {}^{5}C_4 2^1\left(\sqrt{3}\right)^4\right] - 1$

= 64[32 + 240 + 90] –1

= 23160 + 7

ANSWERS

SECTION-1 : PHYSICS

PART – A

PART – B

SECTION – 2 : CHEMISTRY

PART – A

PART – B

SECTION – 3 : MATHEMATICS

PART – A

PART – B