

**TARGET : JEE (M + A) : 2026**
**CLASS : IIT-NURTURE (ELITE) - PHASE - 1**
**TEST TYPE: OFFLINE**
**DATE : 27.04.2024**
**PATTERN : JEE MAINS**

Time : 3 Hours

## INTERNAL TEST - 01

Maximum Marks : 300

Student's Form No. : ..... Batch : .....

Student's Name : .....

### INSTRUCTIONS

**Important Instructions :**

1. Immediately fill in the form number on this page of the Test Booklet with Blue/Black Ball Point Pen. Use of pencil is strictly prohibited.
2. The candidates should not write their Form Number anywhere else (except in the specified space) on the Test Booklet/ Answer Sheet.
3. The test is of **3 hours** duration.
4. The Test Booklet consists of **90** questions. The maximum marks are **300**.
5. There are **three** parts in the question paper 1, 2, 3 consisting of **Physics, Chemistry and Mathematics** having **30 questions** in each subject and each subject having **Two sections**.
  - (i) **Section-A** contains 20 multiple choice questions with **only one correct** option.  
**Marking scheme** : +4 for correct answer, 0 if not attempted and -1 in all other cases.
  - (ii) **Section-B** contains 10 **Numerical Value Type** questions. Attempt any 5 questions. First 5 attempted questions will be considered for marking or each question.  
**Marking scheme** : +4 for correct answer, 0 if not attempted and -1 in all other cases.
6. Use **Blue/Black Ball Point Pen** only for writing particulars/marking responses on **Side-1** and **Side-2** of the Answer Sheet. **Use of pencil is strictly prohibited**.
7. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electronic device etc, except the Identity Card inside the examination hall/room.
8. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
9. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Room/ Hall. **However, the candidate are allowed to take away this Test Booklet with them.**
10. **Do not fold or make any stray marks on the Answer Sheet.**

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## PHYSICS

## SECTION-I : (Maximum Marks: 80)

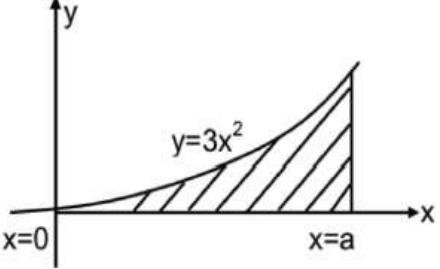
This section contains **20 questions**. Each question has 4 options for correct answer. Multiple-Choice

Questions (MCQs) **Only one option is correct**. For each question, marks will be awarded as follows:

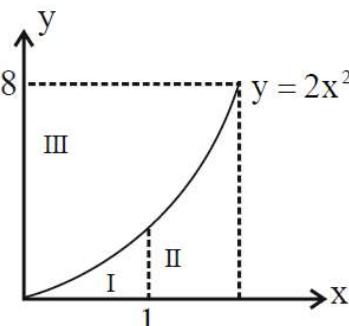
**Full Marks** : +4 If correct answer is selected.

**Zero Marks** : 0 If none of the option is selected.

**Negative Marks** : -1 If wrong option is selected.

1. Use the small angle approximation to find approximate value for  $\left(\frac{\sin 1^\circ}{\cos 2^\circ}\right)$  :-  
 (A) 1      (B)  $\frac{\pi}{30}$       (C)  $\frac{\pi}{60}$       (D)  $\frac{\pi}{180}$
2. Consider a function  $y = x^3 - 3x^2 + 6$ , then find the maximum and minimum values of y is :  
 (A)  $y_{\max} = 4, y_{\min} = 2$   
 (B)  $y_{\max} = 6, y_{\min} = 2$   
 (C)  $y_{\max} = 2, y_{\min} = -2$   
 (D)  $y_{\max} = 4, y_{\min} = -2$
3. The shaded area of graph is :  
  
 (A)  $a^2$       (B)  $3a^2$       (C)  $a^3$       (D)  $3a^3$

4. The ratio of 3 MJ (mega joule) energy and 2 ns (nanosecond) is given as :  
 (A)  $1.5 \times 10^3$  W      (B)  $1.5 \times 10^{15}$  N  
 (C)  $1.5 \times 10^3$  N      (D)  $1.5 \times 10^{15}$  W

5. In a system of units, unit of mass is 10 kg, unit of length is 5m and unit of time is 1 sec what will be unit of force ?  
 (A) 25 N      (B) 50 N  
 (C) 0.5 N      (D) 2500 N
6. Dimensional formula for spring constant  $k = \left(\frac{F}{x}\right)$  (where  $x$  = change in length) ( $F$  = Force) is  $M^a L^b T^c$ . Then find the value of  $\frac{a-b}{c-b}$ .  
 (A)  $\frac{1}{2}$       (B) -1      (C) 1      (D)  $-\frac{1}{2}$
7. If the speed  $v$  of a particle of mass  $m$  as function of time  $t$  is given by  $v = \omega A \sin\left[\left(\sqrt{\frac{k}{m}}\right)t\right]$ . Where A has dimension of length.  
 (A) The argument of trigonometric function must be a dimensionless quantity  
 (B) Dimensional formula of  $\omega$  is  $LT^{-1}$   
 (C) Dimensional formula of  $k$  is  $MLT^{-2}$   
 (D) Dimensional formula of  $\sqrt{\frac{k}{m}}$  is  $T$
8. The equation of a curve is given by  $y = 2x^2$  (see figure). Find the ratio of areas of regions I, II and III. i.e  $A_I : A_{II} : A_{III}$  is :  
  
 (A) 1 : 8 : 16      (B) 1 : 8 : 24  
 (C) 1 : 7 : 16      (D) 1 : 7 : 14

9. Potential energy of mass  $m$  depends on position  $x$  as  $V(x) = \frac{a}{x^2} - \frac{b}{x}$  here  $a$  &  $b$  are positive constant, then dimensional formula of  $\frac{a}{b}$  will be :-
- (A)  $ML^2T^{-2}$       (B) L  
 (C) M      (D) T
10. Assuming that the mass  $m$  of the largest stone that can be moved by a flowing river depends upon the velocity  $v$  of the water, its density  $\rho$  and the acceleration due to gravity  $g$ . Then  $m$  is directly proportional to which dimension of velocity :-
- (A) 3      (B) 4  
 (C) 5      (D) 6
11. If the value of indefinite integration  $\int \cos^2 x \, dx$  is  $\frac{1}{a} \left[ \frac{\sin bx}{d} + x \right] + C$  [constant] then the value of  $a + b + d$  is :
- (A) 6      (B) 3  
 (C) 9      (D) 5
12.  $\int_0^{\pi/4} \frac{\sec^2 x}{\sqrt{\tan x}} \, dx$  is :
- (A) 1      (B) 2  
 (C) 3      (D) 4
13. The charge flowing through a conductor beginning with time  $t = 0$  is given by the formula  $q = 4t^2 - 2t + \ell nt$  (coulombs). Find the current  $i = \frac{dq}{dt}$  at the end of the 2<sup>nd</sup> second.
- (A) 11.5 amp.      (B) 12.5 amp.  
 (C) 13.5 amp.      (D) 14.5 amp.
14.  $\int_0^{\sqrt{\pi}} x \sin x^2 \, dx$
- (A)  $\frac{1}{2}$       (B) 1  
 (C) -1      (D)  $-\frac{1}{2}$
15. If  $y = 3x^2 + x + 5$ . Then find value of  $\frac{dy}{dx}$  at  $x = 1$  :-
- (A) 11      (B) 9  
 (C) 7      (D) 5
16. If  $y = x^2 e^x$ , then  $\frac{dy}{dx}$  is equal to :
- (A)  $2xe^x$       (B)  $2e^x(x + e^x)$   
 (C)  $xe^x(x + 2)$       (D) None of these
17.  $p = 5t^2 - 3t + 4$ , then  $\frac{dp}{dt} =$
- (A)  $10t - 3t + 4$       (B)  $10t - 3t$   
 (C)  $10t - 3$       (D)  $10t + 4$
18.  $I = \int_0^{2\pi} \sin(\theta + \phi) \, d\theta$  where  $\Phi$  is a constant. Then the value of  $I$  is
- (A) may be positive  
 (B) always zero for any value of  $\Phi$   
 (C) may be negative  
 (D) may be zero
19. The maximum area of the rectangle that can be inscribed in a circle of radius  $r$ ?
- (A)  $\pi r^2$       (B)  $2r^2$   
 (C)  $\frac{\pi}{2}r^2$       (D)  $r^2$
20.  $\int \frac{5(x^6 + 1)}{x^2 + 1} \, dx$
- (A)  $5(x^7 + x)\tan^{-1}x + C$   
 (B)  $x^5 - \frac{5}{3}x^3 + 5x + C$   
 (C)  $3x^4 - 5x^2 + 15x + C$   
 (D)  $5\tan^{-1}(x^2 + 1) + \log(x^2 + 1) + C$

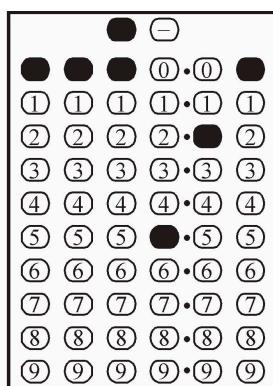
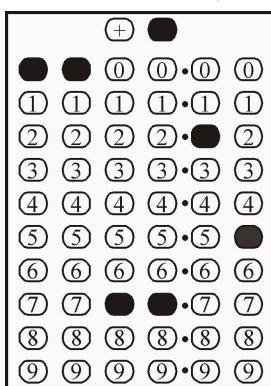
**SECTION-II : (Maximum Marks: 20)**

**This section contains 10 questions Candidates have to attempt any 5 questions out of 10. If more than 5 questions are attempted, then only first 5 attempted questions will be evaluated.**

The answer to each question is a **Numerical Value**

Type questions.

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the second decimal place; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct)



Answer to each question will be evaluated according to the following marking scheme:

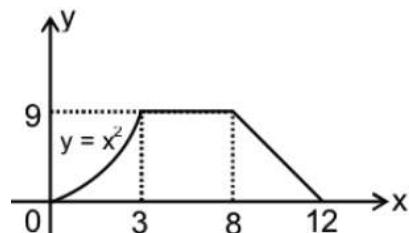
**Full Marks** : +4 If correct answer is entered.

**Zero Marks** : 0 If the question is unanswered.

**Negative Marks** : -1 If wrong answer is entered.

1. If  $y = x^2 + e^x + \sin x$  then value of  $\frac{dy}{dx}$  at  $x = 0$  will be
2. In a new system of units force (F), momentum (P) and mass (M) are taken as fundamental physical quantities. If the dimensional formula of power in new system is  $F^a P^b M^c$  then find the value of  $(a + b + c)$  is \_\_\_\_.
3. Value of  $\sin 16^\circ$  is  $x/25$ . Then the value of  $x$  is \_\_\_\_.
4. If  $y = e^{4x^2 \cos x}$  and  $\frac{dy}{dx} = A x e^{4e^2 \cos x} (B \cos x - x \sin x)$  then  $A + B$  is
5. A man starts moving from a point  $(1, 3)$  towards the point  $(3, 5)$  Angle made by the line of path of the man with positive x axis is \_\_\_\_ (in degrees)

6. In the graph shown below, the area enclosed between the graph and the x-axis from  $x = 0$  to  $x = 12$  is  $9N$ , then the value of  $N$  is \_\_\_\_.



7. If slope of tangent at  $x = \frac{\pi}{3}$  for curve  $y = \sec x$  is  $\sqrt{6n}$ , then find the value of  $n$  is \_\_\_\_.
8. Radius of a sphere is increasing at a rate of 2 cm/s. The rate of increase of volume when radius is 5 cm is  $x\pi \text{cm}^3/\text{s}$ . Then the value of  $x$  is \_\_\_\_.
9. If mass is expressed as  $v^x d^y a^z$  where  $v$  is velocity,  $d$  is density and  $a$  is acceleration then the value of  $x + y + z$  is \_\_\_\_.
10. If  $y = 4x^2$ , the slope of the curve at  $(1, 4)$  is \_\_\_\_.

## CHEMISTRY

**SECTION-I : (Maximum Marks: 80)**

This section contains **20 questions**. Each question has 4 options for correct answer. Multiple-Choice

Questions (MCQs) **Only one option is correct**. For each question, marks will be awarded as follows:

**Full Marks** : +4 If correct answer is selected.

**Zero Marks** : 0 If none of the option is selected.

**Negative Marks** : -1 If wrong option is selected.

1. Total number of electrons present in  $^{18}_8\text{O}^{-2}$  is  $1.2 \times 10^{22}$  then the number of moles of oxide ion present is -  
 (A)  $2 \times 10^{-3}$  mole      (B)  $10^{-3}$  mole  
 (C) 10 mole      (D) 0.02 mole
2. Haemoglobin contains 0.25% iron by mass. The molecular mass of Haemoglobin is 89600 then the number of iron atoms per molecule of Haemoglobin (Atomic mass of Fe = 56) -  
 (A) 8      (B) 4  
 (C) 12      (D) 160
3. Find number of oxygen atoms present in 100 mg of  $\text{CaCO}_3$ . (Atomic mass of Ca = 40u, C = 12 u, O = 16u)  
 (A)  $6.02 \times 10^{23}$       (B)  $6.02 \times 10^{20}$   
 (C)  $1.806 \times 10^{21}$       (D)  $1.204 \times 10^{20}$
4. Find the ratio of the number of atoms present in 16 g of  $\text{O}_2$  and 32 g of  $\text{O}_3$   
 (A) 1 : 1      (B) 2 : 1  
 (C) 1 : 3      (D) 1 : 2
5. Calculate the percentage of water of crystalline in Blue vitriol ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ) (Atomic masses are given as Cu = 63.5, S = 32, O = 16, H = 1)  
 (A) 7.2%      (B) 36%  
 (C) 56.42%      (D) 64%

6. A hydrocarbon contains 91.3% carbon by mass. Find the empirical formula of hydrocarbon ?  
 (A) CH      (B)  $\text{C}_2\text{H}_3$   
 (C)  $\text{C}_7\text{H}_8$       (D)  $\text{C}_3\text{H}_5$
7. An organic compound contains 49.3% carbon, 6.84% hydrogen rest oxygen and its vapour density is 73. Molecular formula of compound is :-  
 (A)  $\text{C}_6\text{H}_{10}\text{O}_4$       (B)  $\text{C}_4\text{H}_{10}\text{O}_2$   
 (C)  $\text{C}_3\text{H}_5\text{O}_2$       (D)  $\text{C}_3\text{H}_{10}\text{O}_2$
8. The density of water at  $4^\circ\text{C}$  is  $1 \times 10^3 \text{ kg m}^{-3}$ . The volume occupied by one molecule of water is approximately  
 (A)  $3.0 \times 10^{-23} \text{ mL}$       (B)  $6.0 \times 10^{-22} \text{ mL}$   
 (C)  $3.0 \times 10^{-21} \text{ mL}$       (D)  $9.0 \times 10^{-23} \text{ mL}$
9. From 392 mg of  $\text{H}_2\text{SO}_4$ ,  $1.204 \times 10^{21}$  molecules are removed. How many moles of  $\text{H}_2\text{SO}_4$  are left ?  
 (A)  $2.0 \times 10^{-3}$       (B)  $1.2 \times 10^{-3}$   
 (C)  $4.0 \times 10^{-3}$       (D)  $1.5 \times 10^{-3}$
10. Consider the following reaction -  

$$\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$$
 which condition will make  $\text{H}_2$  a limiting reagent under all cases (where 'w' is weight of substance)  
 (A)  $\frac{W_{\text{N}_2}}{W_{\text{H}_2}} < \frac{14}{3}$   
 (B)  $\frac{W_{\text{N}_2}}{W_{\text{H}_2}} > \frac{14}{3}$   
 (C)  $\frac{W_{\text{N}_2}}{W_{\text{H}_2}} = 1$   
 (D)  $\text{N}_2$  will always be present as limiting reagent

- 11.** To find formula of compound composed of A & B which is given by  $A_xB_y$ , it is strongly heated in oxygen as per reaction-

$$A_xB_y + O_2 \rightarrow AO + \text{Oxide of B}$$

If 2.5 gm of  $A_xB_y$  on oxidation gives 3 gm oxide of A, Find empirical formula of  $A_xB_y$ , [Take atomic mass of A = 24 & B = 14]

(A)  $A_3B_2$       (B)  $A_2B_3$   
 (C)  $AB_2$       (D)  $A_2B$

**12.** If mass % of oxygen in monovalent metal carbonate is 48%. Then find the number of atoms of metal present in 5mg of this metal carbonate sample is ( $N_A = 6.0 \times 10^{23}$ )

(A)  $3 \times 10^{21}$       (B)  $6 \times 10^{19}$   
 (C)  $30 \times 10^{16}$       (D)  $6.0 \times 10^{18}$

**13.** An oxide of element 'A' was analysed and found to have mass ratio of 'A' to oxygen equal to 7 : 3. Then formula of oxide can be :  
 [Atomic mass of A = 56]

(A)  $A_3O_2$       (B)  $A_2O_3$   
 (C)  $AO$       (D)  $A_2O$

**14.** 1.11 gm of  $CaCl_2$  is added to water forming 500 ml solution. 20 ml of this solution is taken out and diluted 10 folds. Find moles of  $Cl^-$  ions in 2 ml of diluted solution- [Atomic mass : Ca = 40, Cl = 35.5]

(A)  $8 \times 10^{-6}$       (B)  $4 \times 10^{-6}$   
 (C)  $12 \times 10^{-8}$       (D)  $5 \times 10^{-6}$

**15.** The molarity of a solution made by mixing 50 ml of conc.  $H_2SO_4$  (18 M) with 50 ml of water, is:

(A) 36 M      (B) 18 M  
 (C) 9 M      (D) 6 M

**16.** The density of a solution prepared by dissolving 120 g of urea (molar mass = 60 g) in 1000 g of water is 1.15 g/mL. The molarity of this solution is :

(A) 0.50 M      (B) 2.05 M  
 (C) 1.02 M      (D) 1.78 M

**17.** If 0.5 moles of  $BaCl_2$  is mixed with 0.2 moles of  $Na_3PO_4$ , the maximum amount of  $Ba_3(PO_4)_2$  that can be formed is

(A) 0.7 mol      (B) 0.5 mol  
 (C) 0.2 mol      (D) 0.1 mol

**18.** 500 mL of a glucose solution contains  $6.02 \times 10^{22}$  molecules of glucose. The concentration of the solution is :

(A) 0.1 M      (B) 1.0 M  
 (C) 0.2 M      (D) 2.0 M

**19.** How much amount of  $CaCO_3$  in grams having percentage purity 50 percent produces 0.56 L of  $CO_2$  at STP on heating?

(A) 2.5 g      (B) 7 g  
 (C) 5 g      (D) 3.5 g

**20.** The weight of  $2.01 \times 10^{23}$  molecules of CO is:

(A) 9.3 g      (B) 7.2 g  
 (C) 1.2 g      (D) 3 g

**SECTION-II : (Maximum Marks: 20)**

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Type questions.

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Answer to each question will be evaluated according to the following marking scheme:

*Full Marks* : +4 If correct answer is entered.

*Zero Marks* : 0 If the question is unanswered.

**Negative Marks** : -1 If wrong answer is entered.

- 1.** Find the percentage of hydrogen atom by mole in  $\text{CH}_4$ .  
*Fill your answer as sum of digits (excluding decimal places) till you get the single digit answer.*

**2.** What volume of a liquid (in L) will contain 10 mole? Molar mass of liquid is 280 g/mol and its density is 1.4 g/mL.

**3.** How many atoms are there in 100 amu of He ?

**4.** Mass (in gm) of  $\text{SO}_3$  which contains 3 moles of oxygen atoms is :-

**5.** An unknown solution [mol. wt. of solute = 250] is 20% (w/w). Molarity of solution is.  
[Given  $d_{\text{solution}} = 1.25 \text{ g/ml}$ ]

- 6.** Moles of  $\text{H}_2\text{O}$  present in an aqueous solution containing 40 gm NaOH and having mole fraction of NaOH = 0.25.  
(Na = 23, O = 16)

**7.** Find the mass of NaOH needed to prepare 100 ml 1M NaOH solution. (At. mass Na = 23)

**8.** Find the molarity of 5.6% w/v KOH if density of solution is 1.4 g/ml :

**9.** A bottle of 12 M, 75 ml HCl is diluted to 300 mL. What is the molarity of resulting HCl solution ?

**10.** A cylinder of compressed gas contains nitrogen and oxygen in the molar ratio of 3 : 1. If the cylinder contains 2.5 g of oxygen, what is the total mass of the gas in mixture? (Nearest Integer)

**SECTION-I : (Maximum Marks: 80)**

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Questions (MCQs) **Only one option is correct**. For each question, marks will be awarded as follows:

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**Negative Marks** : -1 If wrong option is selected.

1. The first term of an infinitely decreasing G.P. is unity and its sum is S. The sum of the squares of the terms of the progression is:

(A)  $\frac{S}{2S-1}$       (B)  $\frac{S^2}{2S-1}$   
 (C)  $\frac{S}{2-S}$       (D)  $S^2$

- 2.** Let  $a_n$  be the  $n^{\text{th}}$  term of an A.P. If  $\sum_{r=1}^{100} a_{2r} = \alpha$  and  $\sum_{r=1}^{100} a_{2r-1} = \beta$ , then the common difference of the A.P. is:

(A)  $\frac{\alpha - \beta}{200}$       (B)  $\alpha - \beta$   
 (C)  $\frac{\alpha - \beta}{100}$       (D)  $\beta - \alpha$

- 3.** The interior angles of a convex polygon are in A.P. The smallest angle is  $120^\circ$  and the common difference is  $5^\circ$ . Find the number of sides of the polygon:

- 4.** The sum of the series  
$$\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \dots \text{ up to 15 terms is:}$$

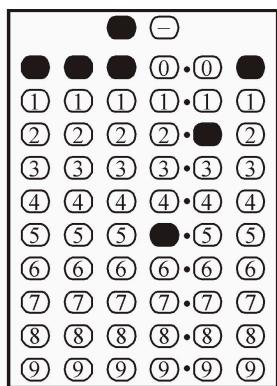
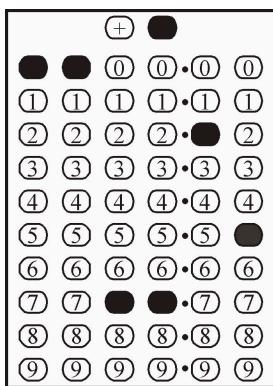
11. If  $|x| < 1$ ,  $|y| < 1$  and  $x \neq y$ , then the sum to infinity of the following series  $(x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + \dots$
- (A)  $\frac{x+y-xy}{(1-x)(1-y)}$       (B)  $\frac{x+y-xy}{(1+x)(1+y)}$   
 (C)  $\frac{x+y+xy}{(1+x)(1+y)}$       (D)  $\frac{x+y+xy}{(1-x)(1-y)}$
12. The quadratic equation whose roots are the A.M and H.M. between the roots of the equation,  $2x^2 - 3x + 5 = 0$  is:
- (A)  $4x^2 - 25x + 10 = 0$   
 (B)  $12x^2 - 49x + 30 = 0$   
 (C)  $14x^2 - 12x + 35 = 0$   
 (D)  $2x^2 + 3x + 5 = 0$
13. Consider an A.P. with first term 'a' and the common difference d. Let  $S_k$  denotes the sum of the first k terms. Let  $\frac{S_{kx}}{S_x}$  is independent of x, then:
- (A)  $a = \frac{d}{2}$       (B)  $a = d$   
 (C)  $a = 2d$       (D) None of these
14. If the sum  $\frac{3}{1^2} + \frac{5}{1^2 + 2^2} + \frac{7}{1^2 + 2^2 + 3^2} + \dots +$  upto 20 terms is equal to  $\frac{k}{21}$ , then k is equal to:
- (A) 240      (B) 120  
 (C) 180      (D) 60
15. For any three positive real numbers a, b and c,  $9(25a^2 + b^2) + 25(c^2 - 3ac) = 15b(3a + c)$ . Then,
- (A) a, b and c are in A.P.  
 (B) a, b and c are in G.P.  
 (C) b, c and a are in G.P.  
 (D) b, c and a are in A.P.
16. If  $19^{\text{th}}$  term of a non-zero A.P. is zero, then its  $(49^{\text{th}} \text{ term}) : (29^{\text{th}} \text{ term})$  is:
- (A) 3 : 1      (B) 4 : 1  
 (C) 2 : 1      (D) 1 : 3
17. The sum of the infinite series  $1 + \frac{2}{3} + \frac{7}{3^2} + \frac{12}{3^3} + \frac{17}{3^4} + \frac{22}{3^5} + \dots$  is equal to:
- (A)  $\frac{13}{4}$       (B)  $\frac{9}{4}$   
 (C)  $\frac{15}{4}$       (D)  $\frac{11}{4}$
18. Let  $a_n$  denotes the  $n^{\text{th}}$  term of given series  $5 + 8 + 14 + 23 + \dots$  upto n terms. If  $S_n = \sum_{k=1}^n a_k$ , then  $S_{30} - a_{40}$  is equal to :
- (A) 11290      (B) 12800  
 (C) 11600      (D) None of these
19. The geometric mean of  $5^{\text{th}}$  and  $7^{\text{th}}$  term is 2 and the product of  $3^{\text{rd}}$  and  $6^{\text{th}}$  term of the G.P is  $\frac{1}{3}$ . If  $a_n$  is the  $n^{\text{th}}$  term then  $(a_3 + a_4).(a_5 + a_6)$  is
- (A)  $\frac{1 + (12)^{\frac{1}{3}}}{(12)^{\frac{1}{3}}}$       (B)  $\frac{1 + (12)^{\frac{1}{3}}}{3}$   
 (C)  $\left(\frac{1 + (12)^{\frac{1}{3}}}{3 \times (12)^{\frac{1}{3}}}\right)^2$       (D)  $\frac{\left[1 + (12)^{\frac{1}{3}}\right]^2}{3 \times (12)^{\frac{1}{3}}}$
20. If  $a_n = \frac{-2}{4n^2 - 16n + 15}$ , then  $a_1 + a_2 + \dots + a_{25}$  is equal to :
- (A)  $\frac{51}{144}$       (B)  $\frac{49}{138}$   
 (C)  $\frac{50}{141}$       (D)  $\frac{52}{147}$

**SECTION-II : (Maximum Marks: 20)**

**This section contains 10 questions Candidates have to attempt any 5 questions out of 10. If more than 5 questions are attempted, then only first 5 attempted questions will be evaluated.**

The answer to each question is a **Numerical Value Type** questions.

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the second decimal place; e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct)



Answer to each question will be evaluated according to the following marking scheme:

**Full Marks** : +4 If correct answer is entered.

**Zero Marks** : 0 If the question is unanswered.

**Negative Marks** : -1 If wrong answer is entered.

1. If the arithmetic mean and geometric mean of the  $p^{\text{th}}$  and  $q^{\text{th}}$  terms of the sequence  $-16, 8, -4, 2, \dots$  satisfy the equation  $4x^2 - 9x + 5 = 0$ , then  $p + q$  is equal to \_\_\_\_\_.
2. Let  $a_1, a_2, a_3, \dots$  be a G.P. of increasing positive numbers. If the product of fourth and sixth terms is 9 and the sum of fifth and seventh terms is 24, then  $a_1a_9 + a_2a_4a_9 + a_5 + a_7$  is equal to \_\_\_\_\_.
3. Sum of squares of first three terms of G.P. is 33033 ( $a, r \in \mathbb{N}$ ) then sum of first three terms of G.P is:
4. The sum of first 9 terms of the series  $\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \dots$  is :

5. If  $m$  arithmetic means (A.Ms) and three geometric means (G.Ms) are inserted between 3 and 243 such that 4<sup>th</sup> A.M. is equal to 2<sup>nd</sup> G.M., then  $m$  is equal to \_\_\_\_\_.
6. If  $S = 109 + \frac{108}{5} + \frac{107}{5^2} + \dots + \frac{2}{5^{107}} + \frac{1}{5^{108}}$ , then the value of  $16S - (25)^{-54}$  is
7. Let  $a_1, a_2, \dots, a_n$  be in A.P. If  $a_5 = 2a_7$  and  $a_{11} = 18$ , then  

$$12 \left( \frac{1}{\sqrt{a_{10}} + \sqrt{a_{11}}} + \frac{1}{\sqrt{a_{11}} + \sqrt{a_{12}}} + \dots + \frac{1}{\sqrt{a_{17}} + \sqrt{a_{18}}} \right)$$
  
is equal to \_\_\_\_\_.
8. Let  $a_n$  be the  $n^{\text{th}}$  term of a G.P. of positive terms.  
If  $\sum_{n=1}^{100} a_{2n+1} = 200$  and  $\sum_{n=1}^{100} a_{2n} = 100$ , then  

$$\sum_{n=1}^{200} a_n$$
 is equal to :
9. 4, 11, 21, 34 ...., then find the value of  $\frac{S_{29} - S_9}{60}$ , where  $S_n = \sum_{k=1}^n a_k$ .
10. If  $\sum_{r=1}^{10} r! (r^3 + 6r^2 + 2r + 5) = \alpha (11!)$ , then the value of  $\alpha$  is equal to \_\_\_\_\_.



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