

**TEST # X - 02, July 2023**

NAME: \_\_\_\_\_

Total. Time: 1:30 Hr

M.M: 150

**INSTRUCTIONS**

1. The paper consists of two sections A & B. Section A – Mathematics & Section B - Science.
2. The objective paper is designed by considering School Exam, NTSE & IIT Foundation.
3. The marking system is given just before the start of the Part in each section.
4. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers and electronic gadgets are NOT allowed during exam.
5. The maximum mark allotted to the paper is 150.
6. Total time allotted for the exam is 1:30 Hours.
7. SECTION – A (MATHEMATICS) Questions No's: 1 – 15.  
SECTION – B (SCIENCE) Questions No's 16 – 45.

**Mathsarc Test Series**

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**Invigilator Sign**

*Test is just a crosscheck of our learning during the month! So, be honest with thyself!*

**SECTION - A (MATHEMATICS)****PART - I****SINGLE OPTION CORRECT (+ 4, - 1, 0)**

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1. The value of  $\frac{\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta)}{\tan(60^\circ + \theta)\tan(30^\circ - \theta)}$  is  
(A) 0 (B) -1 (C) 1 (D) 2
2. If  $\sin A + \sin^2 A = 1$ , then the value of the expression  $\cos^2 A + \cos^4 A$  is  
(A) 1 (B) 1/2 (C) 2 (D) 3
3. There are 15 terms in an arithmetic progression. Its first term is 5 and their sum is 390. The middle term is  
(A) 23 (B) 26 (C) 29 (D) 32
4. The value of  $k^2$  for which  $2x^2 + kx + 3 = 0$  has equal roots  
(A) 12 (B) 24 (C) 8 (D) 6
5. If the 9<sup>th</sup> term of an A.P. be zero, then the ratio of its 29<sup>th</sup> and 19<sup>th</sup> term is  
(A) 1 : 2 (B) 2 : 1 (C) 1 : 3 (D) 3 : 1
6. If one root of the equation  $x^2 - x - 3m = 0 (m \neq 0)$  is twice of one root of  $x^2 - x - m = 0$  then the value of  $m$  is equal to \_\_\_\_\_.  
(A) 1 (B) 2 (C) 3 (D) None of these
7. The remainder when we divide  $p(x) = 4x^4 - 3x^3 + 2x - 1$  by  $x^2 + 1$  is  
(A)  $3x - 5$  (B)  $3x + 5$  (C)  $5x + 3$  (D) None of these

**ROUGH SPACE**

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←~■: ☺ ☺ Best of Luck! ☺ ☺ :■~→

**COMPREHENSION (8 - 10)**

Consider the system of linear equations  $L_1 \equiv a_1x + b_1y + c_1 = 0$  &  $L_2 \equiv a_2x + b_2y + c_2 = 0$

8. if  $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ , then system has

- (A) one Solution                      (B) Zero Solution                      (C) Infinite Solutions                      (D) None of These

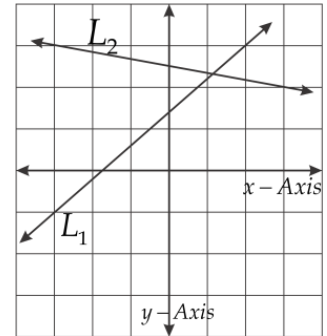
9. If  $a_1 + 2b_1 + c_1 > 0$  &  $3a_1 - 2b_1 + c_1 < 0$  then points

- (A) (1, 2) & (3, -2) are same side of line  $L_1$                       (B) (1, 2) & (3, -2) are same side of line  $L_2$   
(C) (1, 2) & (3, -2) are opposite side of line  $L_1$                       (D) (1, 2) & (3, -2) are opposite side of line  $L_2$

10. Consider the Graph of Lines  $L_1$  &  $L_2$  as shown in figure

Scale: 1 square is of 1 unit. Select the wrong option

- (A)  $c_1(2a_1 + c_1) > 0$   
(B)  $c_2(2a_2 + 3b_2 + c_2) < 0$   
(C)  $2a_1 + 3b_1 + c_1 = 0$   
(D)  $2a_2 + 3b_2 + c_2 = 0$



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**PART - II**

**MULTI OPTION CORRECT (+ 4, -1, 0).**

11. Root of the equation  $\frac{2}{x} - \frac{3}{x-1} = 2, x \neq 0, 2$  is/are

- (A) Real & Distinct      (B) Imaginary      (C)  $x = 2$  &  $5$       (D)  $x = \frac{1 \pm i\sqrt{15}}{4}$

12. Select the correct statement(s)

- (A)  $\frac{\tan 47^\circ}{\cot 43^\circ} = 1$       (B)  $\sqrt{(1 - \cos^2 \theta)} \sec^2 \theta = \tan \theta$   
 (C)  $\cos^2 23^\circ - \sin^2 67^\circ > 0$       (D)  $\sin 80^\circ - \cos 80^\circ < 0$

13. Which of the following is a quadratic Equation?

- (A)  $t^2 + 4t - 5 = 0$       (B)  $(\sqrt{x})^2 - 2\sqrt{x} - 1 = 0$   
 (C)  $(x-1)(x+4) = x^2 + 1$       (D)  $(2x-1)(3x+2) = 2x^2 - 1$

14. Solutions of the equation  $4x - 3y + 1 = 0$  is/are?

- (A)  $\left(1, \frac{5}{3}\right)$       (B)  $\left(0, \frac{1}{3}\right)$       (C)  $\left(-\frac{1}{4}, 0\right)$       (D)  $(101, 135)$

15. If  $\frac{\sqrt{7}-1}{\sqrt{7}+1} - \frac{\sqrt{7}+1}{\sqrt{7}-1} = a + b\sqrt{7}$ , then

- (A)  $a > b$       (B)  $b^a = 1$       (C)  $\frac{b}{a} = 0$       (D)  $|b| > a$

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**SECTION – B (SCIENCE)**

**PART – I (PHYSICS)**

**SINGLE OPTION CORRECT (+ 3, - 1, 0)**

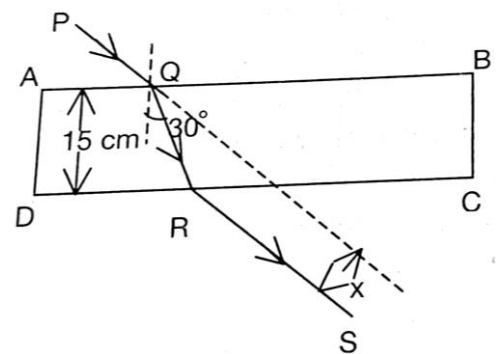
16. A 3.5 cm high object is placed at a distance of 12 cm from concave lens of focal length 16 cm. The size of the image is \_\_\_\_\_  
(A) 2 cm (B) 4 cm (C) 3 cm (D) 5 cm
17. A thin lens and a spherical mirror have a focal length of +15 cm each.  
(A) Both are convex (B) The lens is convex and the mirror is concave  
(C) The lens is concave and the mirror is convex (D) Both are concave
18. A lens has a power of +0.5 D. It is  
(A) a concave lens of focal length 5 m (B) a convex lens of focal length 5 cm  
(C) a convex lens of focal length 2 m (D) a concave lens of focal length 2 m
19. The correct lens formula is  
(A)  $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$  (B)  $\frac{1}{u} - \frac{1}{v} = \frac{1}{f}$  (C)  $f = \frac{uv}{u - v}$  (D)  $f = \frac{u + v}{uv}$
20. Consider the spherical mirror with  $u = -20$  cm,  $f = -15$  cm,  $h_o = 1.0$  cm. Select the correct option  
(A) Image is Real, erect and of size 3 cm. (B) Real & Inverted Image of size 3 cm.  
(C) Magnification (m) = 3 (D)  $m = \frac{h_e}{h_o} = \frac{v}{u}$

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21. A ray of light travelling in air falls on the surface of a transparent material at an angle of  $45^\circ$  to the normal. It bends by  $15^\circ$  after refraction. The refractive index of the material is \_\_\_\_\_
- (A) 2                                      (B)  $\sqrt{2}$                                       (C)  $\frac{\sqrt{3}}{2}$                                       (D)  $\sqrt{3}$
22. A pin which is 2 cm long is placed at a distance of 16 cm from a convex lens. Assuming it to be perpendicular to the principal axis. Select the correct statement if the focal length of the lens is 12 cm.
- (A) Image position  $v = 45$  cm                                      (B) Height of Image = 6 cm  
(C) Magnification is - 2                                      (D) Image is real and Inverted with  $h_e = - 6$  cm
23. For the object placed between the optical center and focus of a convex lens, the image is
- (A) Real and enlarge                                      (B) Real and diminished  
(C) Virtual and enlarged                                      (D) Virtual and diminished
24. An object in a denser medium when viewed from a rarer medium appears to be raised. The shift is maximum for
- (A) Red light                                      (B) Violet light                                      (C) Yellow light                                      (D) Green light

25. ABCD represents a glass slab and PQRS indicates the path of a light ray passing through the slab, If the refractive index of the glass is  $\sqrt{3}$ , then value of "x" as shown in the figure is \_\_\_\_\_



- (A)  $6\sqrt{3}$  cm  
(B) 6 cm  
(C)  $3\sqrt{3}$  cm  
(D)  $5\sqrt{3}$  cm

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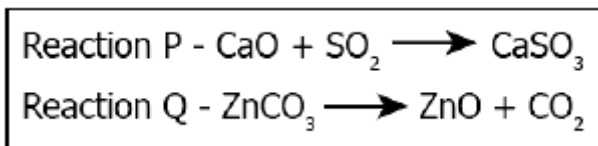
**PART – II (CHEMISTRY)****SINGLE OPTION CORRECT (+ 3, - 1, 0)**

26. Sodium and chlorine are reacted, and as a result, sodium chloride is formed, which is also called table salt. What option gives the reactants and products of the reaction?
- (A) Reactants - sodium; products - chlorine  
(B) Reactants - sodium and table salt; products - chlorine  
(C) Reactants - tables salt; products - sodium and chlorine  
(D) Reactants - sodium and chlorine; products - sodium chloride
27. Which of the following reaction can also be termed a thermal decomposition reaction?
- (A) Combination reaction (B) Decomposition reaction  
(C) Displacement reaction (D) Double displacement reaction
28. From the following, which one is an example of a chemical reaction?
- (A) Grapes get fermented (B) Breakdown of food  
(C) Formation of curd (D) All of these
29. A student performs an experiment to form aluminium chloride from aluminium and chlorine. Which of the following option gives the chemical equation of the reaction?
- (A)  $\text{Al} + \text{Cl}_2 \rightarrow \text{AlCl}_2$  (B)  $2\text{Al} + \text{Cl}_2 \rightarrow 2\text{AlCl}$  (C)  $2\text{Al} + 3\text{Cl}_2 \rightarrow 2\text{AlCl}_3$  (D)  $3\text{Al} + 3\text{Cl}_2 \rightarrow 3\text{AlCl}_3$
30. Give the ratio in which hydrogen and oxygen are present in water by volume.
- (A) 1 : 2 (B) 1 : 1 (C) 2 : 1 (D) 1 : 8
31. A researcher adds barium hydroxide to hydrochloric acid to form a white-coloured barium chloride. Which of the following option gives the balanced chemical equation of the reaction?
- (A)  $\text{HCl} + \text{Ba}(\text{OH})_2 \rightarrow \text{BaCl}_2 + 2\text{HOH}$  (B)  $2\text{HCl} + \text{Ba}(\text{OH})_2 \rightarrow \text{BaCl}_2 + 2\text{HOH}$   
(C)  $2\text{HCl} + \text{Ba}(\text{OH})_2 \rightarrow \text{BaH}_2 + 2\text{HCl} + \text{O}_2$  (D)  $\text{HCl} + 2\text{Ba}(\text{OH}) \rightarrow 2\text{BaCl}_2 + 2\text{HOH} + \text{O}_2$

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32. One of the following processes does not involve a chemical reaction, that is:
- (A) Melting of candle wax when heated                      (B) Burning of candle wax when heated  
(C) Digestion of food in your stomach                      (D) Ripening of banana
33. A student learns that some products are formed as a result of combining two compounds while some compounds are formed as a result of the dissociation of two compounds. The image shows two reactions.



- Which reaction is an example of a combination reaction and a decomposition reaction?
- (A) Both reactions are examples of combination reaction  
(B) Both reactions are examples of a decomposition reaction  
(C) Reaction P is an example of a combination reaction, while reaction Q is an example of a decomposition reaction  
(D) Reaction P is an example of a decomposition reaction, while reaction Q is an example of a combination reaction
34. The chemical reaction between potassium chloride and silver nitrate is given by the chemical equation,
- $$\text{AgNO}_3 + \text{KCl} \rightarrow \text{AgCl} + \text{KNO}_3$$
- What can be inferred from the chemical equation?
- (A) Silver nitrate and potassium undergo a decomposition reaction to form silver chloride and potassium nitrate  
(B) Silver nitrate and potassium undergo a displacement reaction to form silver chloride and potassium nitrate  
(C) Silver nitrate and potassium undergo a combination reaction to form silver chloride and potassium nitrate  
(D) Silver nitrate and potassium undergo a double displacement reaction to form silver chloride and potassium nitrate
35. Which of the following shows an oxidation reaction?
- (A) Gain of oxygen              (B) Loss of oxygen              (C) Gain of hydrogen              (D) None of these

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**PART – III (BIOLOGY)**

**SINGLE OPTION CORRECT (+ 3, - 1, 0)**

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36. Blood from upper parts of the body into right atrium is carried by:  
(A) Superior Vena cava (B) Posterior Vena cava (C) Pulmonary Arteries (D) Pulmonary Veins
37. Blood vessel entering the kidney from heart:  
(A) Hepatic Arteries (B) Renal arteries (C) Renal Vein (D) Hepatic portal veins
38. Blood vessel leaving the kidney:  
(A) Hepatic Arteries (B) Renal arteries (C) Renal Vein (D) Hepatic portal veins
39. Blood from lower parts of the body into right atrium is carried by:  
(A) Superior Vena cava (B) Posterior Vena cava (C) Pulmonary Arteries (D) Pulmonary Veins
40. Exchange of gases in plants occurs in:  
(A) Stomata (B) Leaves and stems  
(C) Stomata, Leaves, roots, stems (D) Only Stomata and leaves
41. Blood vessel entering the kidney from heart:  
(A) Hepatic Arteries (B) Renal arteries (C) Renal Vein (D) Hepatic portal veins
42. The movement that allows the food to flow through the gut is:  
(A) Peristaltic (B) Systole (C) Diastole (D) None of these
43. The breaking down of glucose to Pyruvate occurs in:  
(A) Mitochondria (B) Yeast (C) Nucleus (D) Cytoplasm
44. Double circulation does not occur in:  
(A) Three chamber heart (B) Two Chamber heart (C) Four chamber Heart (D) None of these
45. Sucrose is transferred in phloem tissue by:  
(A) Osmosis (B) Using ATP (C) diffusion (D) None of these



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