SAMPLE SELECTION TEST PAPER

INSTRUCTION FOR STUDENTS

A. GENERAL INSTRUCTIONS

1. There are total 60 questions and four sections - **Section I (Aptitude), Section II (Physics), Section III (Mathematics) & Section IV (Chemistry).**
2. Each section contains 15 Questions.
3. +4 marks will be given for each correct answer and –1 mark for each wrong answer. In all other cases, no marks will be given.
4. There is only one correct response for each question. Filling up more than one response in each question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instruction 3 above.
5. **Duration of test will be 2 hours.**
6. **Maximum marks is 240.**

APTITUDE (SECTION - I)

1. Pointing to Manju, Raju said, "The son of her only brother is the brother of my wife". How is Manju related to Raju?

   (A) Mother's sister
   (B) Grandmother
   (C) Mother-in-law
   (D) Sister of father-in-law

2. When 75% of a number is added to 75, the result is the number again. Find the number.

   (A) 350
   (B) 300
   (C) 250
   (D) 200

3. 20 men can dig 40 holes in 60 days. So, 10 men can dig 20 holes in how many days?

   (A) 30 days
   (B) 60 days
   (C) 75 days
   (D) 90 days

4. A father said to his son, "I was as old as you are at the present at the time of your birth". If the father's age is 38 years now, the son's age five years back was:

   (A) 14 years
   (B) 19 years
   (C) 33 years
   (D) 38 years

5. Arun and Amit started walking from two different points 'A' and 'B' respectively. Arun walks 2 kms North and turns to the East and walks 3 kms and again turns to North walks 4 kms and finally turns to East and Walks 5kms to reach point 'C'. Similarly, Amit walks 2 kms North and turns to west and walks 3 kms and finally turns to North, walks 4 kms and meets Arun at point 'C'.

   What is the distance between Arun and Amit's starting points?

   (A) 5 km
   (B) 8 km
   (C) 11 km
   (D) 13 km

6. If '–' stands for '×', '×' stands for '+', '+'stands for '÷' and '÷' stands for '–', then what is the value of $9 \div 18 \times 15 + 3 - 6 \times 12$?

   (A) 24
   (B) 30
   (C) 33
   (D) 42

Space for rough work

7. In a certain code language if the word 'MUSEUM' is coded as 'LSPAPG', then how will the word 'PALACE' be coded in that language?

(A) OYIWXY (B) OYIXYW
(C) IYXYWO (D) YXWYOI

8. Find the missing term : 157.5, 45, 15, _, 3, 2, 2

(A) 4 (B) 5
(C) 6 (D) 7

9. At what time between 3 PM and 4 PM would the two hands of the clock be together ?

(A) 3:15:12 PM (B) 3:15:44 PM
(C) 3:16:22 PM (D) 3:17:26 PM

10. **Study the following information to answer the given questions:**
P $ Q means P is not smaller than Q
P @ Q means P is neither smaller than nor equal to Q
P # Q means P is neither greater than nor equal to Q
P & Q means P is neither greater than nor smaller than Q
P * Q means P is not greater than Q

Statements: S @ L, L # M, M & B, B * Q
Conclusions: I. Q $ M
II. B @ L
III. S @ Q
IV. L @ Q

(A) I, II and III are true (B) I, II are true
(C) I, III are true (D) I, III and IV are true

11. In a certain code language, if the value of 28 + 14 = 50 and 36 + 43 = 63, then what is the value of 44 + 52 = ?

(A) 54 (B) 56
(C) 58 (D) 62

Space for rough work

12. There are 25 horses among which you need to find out the fastest 3 horses. You can conduct race among at most 5 to find out their relative speed. At no point you can find out the actual speed of the horse in a race. Find out how many races are required to get the top 3 horses.

(A) 5 (B) 6

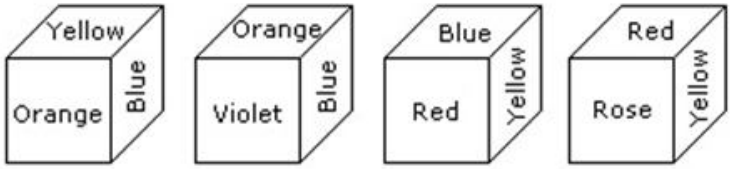
(C) 7 (D) 8

13. A software engineer has the capability of thinking 100 lines of code in five minutes and can type 100 lines of code in 10 minutes. He cannot type and think simultaneously. He takes a break for five minutes after every ten minutes. How many lines of codes will he complete typing after an hour?

(A) 250 lines (B) 300 lines

(C) 350 lines (D) None of these

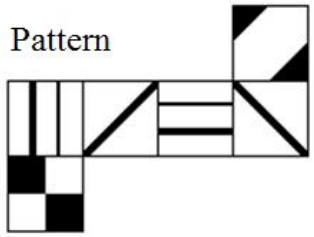
14. From the four positions of a dice given below, find the color which is opposite to orange?



(A) Violet (B) Red

(C) Rose (D) Blue

15. Which of the cubes shown could be made from the pattern?



(A)  (B) 

(C)  (D) 

Space for rough work

PHYSICS (SECTION - II)

16. A parallel-plate capacitor holds charge q and is not connected to anything. The distance between the plates is now increased. The electrical energy stored in the capacitor

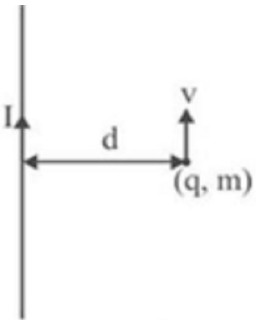
(A) Remains the same

(B) Increases

(C) Decreases

(D) Can do any of the above, depending on how the capacitance changes

17. An electron is moving at 10^6 *m*/sec in a direction parallel to a current of 5A flowing through an infinite long straight wire separated by a perpendicular distance of 10cm in air. Magnetic force experienced by the electron:



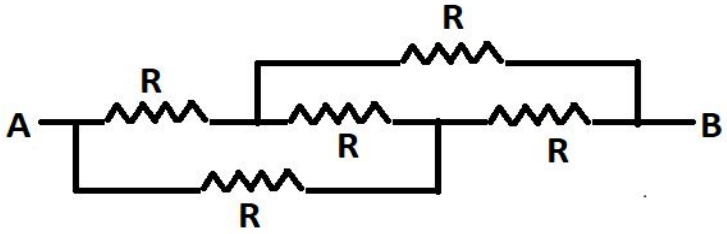
(A) 1.6×10^{-19} N

(B) 1.6×10^{-20} N

(C) 1.6×10^{-18} N

(D) 1.6×10^{-21} N

18. Find equivalent resistance of the following circuit.



(A) $R_{AB} = R$

(B) $R_{AB} = \frac{3R}{7}$

(C) $R_{AB} = \frac{R}{2}$

(D) None of these

19. Find the static friction force on a stationary body of mass 10 kg, place on a rough horizontal ground with $\mu = 0.5$. (Take : g = 9.8 m/s^2)

(A) 98 N

(B) 49 N

(C) 24.5 N

(D) Zero

Space for rough work

20. A car travels 6 km towards north at an angle of 45° to the east and then travels a distance of 4 km towards west at angle 45° to the north. How far is the point from the starting point? What angle does straight line joining its initial and final position makes with the east?

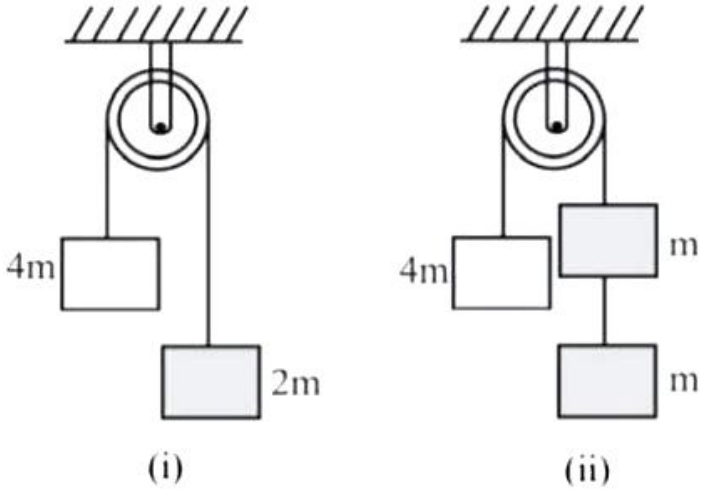
(A) 10 km and $\tan^{-1}(\sqrt{5})$

(B) $\sqrt{50}$ km and $\tan^{-1}(5)$

(C) $\sqrt{52}$ km and $\tan^{-1}(\sqrt{5})$

(D) $\sqrt{52}$ km and $\tan^{-1}(5)$

21. In the arrangement shown in figure, pulley is smooth and massless and all the strings are light. Let F_1 be the force exerted on the pulley in case (i) and F_2 in case (ii). Then



(A) $F_1 < F_2$

(B) $F_1 > F_2$

(C) $F_1 = 2F_2$

(D) $F_1 = F_2$

22. Three equal charges, each +q, are placed on the corners of an equilateral triangle. The electric field intensity at the centroid of the triangle is

(A) kq/r^2

(B) $3kq/r^2$

(C) $\sqrt{3}\,kq/r^2$

(D) zero

23. The dimension of $\frac{1}{2}\varepsilon_0 E^2$ (ε_0: Permittivity of free space, E: Electric field) is

(A) $[MLT^{-1}]$

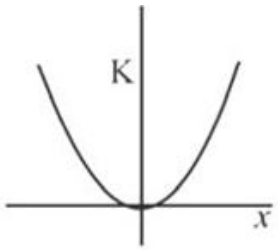
(B) $[ML^2T^{-2}]$

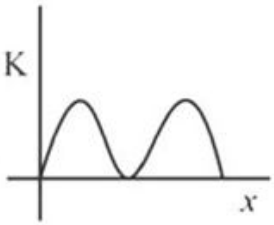
(C) $[ML^{-1}T^{-2}]$

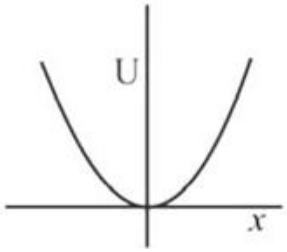
(D) $[ML^2T^{-1}]$

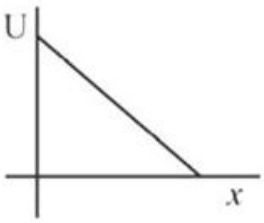
Space for rough work

24. During Simple Harmonic Motion (SHM) a particle has displacement x from mean position. If kinetic energy and potential energy are represented by K and U respectively, then choose the appropriate graph

(A) 

(B) 

(C) 

(D) 

25. Current in a circuit falls from 5.0A to 0A in 0.1 s. If an average emf of 200 V is induced, give an estimate of the self-inductance of the circuit:

(A) 2H (B) 4H

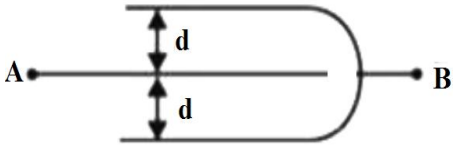
(C) 6H (D) None of these

26. The equivalent impedance of a circuit with $R = 4\Omega$, $L = \frac{40}{\pi} mH$ and $C = \frac{10}{\pi} mF$ connected in series to a source of 220 V, 50 Hz is

(A) 4Ω (B) 5Ω

(C) $\sqrt{41}\Omega$ (D) 8Ω

27. Three plates of common surface area A are connected as shown in figure. The effective capacitance will be



(A) $\varepsilon_0 A / d$ (B) $3\varepsilon_0 A / d$

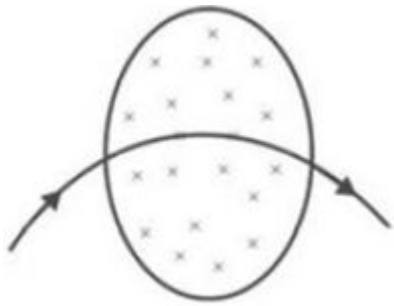
(C) $\frac{3}{2} \varepsilon_0 A / d$ (D) $2\varepsilon_0 A / d$

Space for rough work

28. When a spring is stretched by 10 cm, the potential energy stored is *E.* When the spring is stretched by 10 cm more, the potential energy stored in the spring becomes

(A) 2 E
(B) 4 E
(C) 6 E
(D) 10 E

29. There is a magnetic field acting perpendicular to the plane of paper in downward direction. A particle in vacuum moves in the plane of paper from left to right as shown in the figure. The path indicated by the arrow could be due to



(A) Proton
(B) Neutron
(C) Electron
(D) Alpha particle

30. A carnot engine having an efficiency of $\frac{1}{10}$ as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is

(A) 90 J
(B) 99 J
(C) 100 J
(D) 1 J

Space for rough work

MATHEMATICS (SECTION - III)

31. What value of λ for which $f(x)$ is continuous at $x = \frac{\pi}{2}$

$$f(x) = \begin{cases} \dfrac{1-\sin x}{1+\cos 2x}, & x < \dfrac{\pi}{2} \\ \lambda & x = \dfrac{\pi}{2} \\ \dfrac{\sqrt{2x-\pi}}{\sqrt{4+\sqrt{2x-\pi}}-2} & x > \dfrac{\pi}{2} \end{cases}$$

(A) $\frac{1}{4}$ (B) $-\frac{1}{4}$

(C) $-\frac{1}{2}$ (D) $\frac{1}{2}$

32. In a certain city, all telephone numbers have six digits, the first two digits always being 41 or 42 or 46 or 62 or 64. How many telephone numbers have all six digits distinct?

(A) 4800 (B) 6800

(C) 7800 (D) 8400

33. In a geometric progression consisting of positive terms, each term equals the sum of the next two terms. Then the common ratio of this progression equals

(A) $\frac{1}{2}(1-\sqrt{5})$ (B) $\frac{1}{2}\sqrt{5}$

(C) $\sqrt{5}$ (D) $\frac{1}{2}(\sqrt{5}-1)$

34. $\underset{x\to\infty}{Limit}\left(\dfrac{x^2-2x+1}{x^2-4x+2}\right)^x$

(A) 1 (B) 2

(C) e^2 (D) e

35. If z is a complex number such that $|z| = 4$ and $\arg(z) = \frac{5\pi}{6}$, then z is equal to

(A) $-2\sqrt{3}+2i$ (B) $2\sqrt{3}+i$

(C) $2\sqrt{3}-i$ (D) $\sqrt{3}+i$

Space for rough work

36. If $x = \frac{1+t}{t^3}$, $y = \frac{3}{2t^2} + \frac{2}{t}$ then, $x\left(\frac{dy}{dx}\right)^3 - \frac{dy}{dx} =$

(A) 0 (B) –1

(C) 1 (D) 2

37. If $f(x) = \cos\left[\frac{\pi^2}{2}\right]x + \sin\left[-\frac{\pi^2}{2}\right]x$, where $[x]$ denotes the greatest integer function, then which of the following is not correct –

(A) $f(0) = 1$ (B) $f\left(\frac{\pi}{3}\right) = \frac{1}{\sqrt{3}+1}$

(C) $f\left(\frac{\pi}{2}\right) = 0$ (D) $f(\pi) = 0$

38. If A is a square matrix of order n × n and k is a scalar, then adj (kA) is equal to

(A) k adj A (B) k^n adj A

(C) k^{n-1} adj A (D) k^{n+1} adj A

39. The true set of real values of x for which the function, $f(x) = x\ell nx - x + 1$ is positive is

(A) $(1, \infty)$ (B) $(1/e, \infty)$

(C) $[e, \infty)$ (D) $(0, 1)$ and $(1, \infty)$

40. If the quadratic equations $ax^2 + bx + c = 0$ & $2x^2 + 3x + 2 = 0$ have one common root, and $a + b + c = 14$ then the value of the $a - c + b$

(A) 4 (B) 10

(C) 6 (D) 8

41. Value of $\int \sin^5 x \cos^4 x\, dx$

(a) $-\frac{\cos^9 x}{9} + 2\frac{\cos^7 x}{7} - \frac{\cos^5 x}{5} + C$ (b) $\frac{\cos^9 x}{9} + 2\frac{\cos^7 x}{7} - \frac{\cos^5 x}{5} + C$

(c) $\frac{\cos^9 x}{9} + 2\frac{\cos^7 x}{7} + \frac{\cos^5 x}{5} + C$ (d) $-\frac{\cos^9 x}{9} + 2\frac{\cos^7 x}{7} + \frac{\cos^5 x}{5} + C$

Space for rough work

42. The distance of the point, (– 1, – 5, – 10) from the point of intersection of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$, and the plane, $x - y + z = 5$, is:

(A) 10 (B) 11

(C) 12 (D) 13

43. For a ΔABC in which a = $\sqrt{3}$ + 1, b = $\sqrt{3}$ – 1, C = 60°. Then value of side c and angle A respectively

(A) $\sqrt{6}, 105^0$ (B) $\sqrt{6}, 15^0$

(C) $\sqrt{3}, 15^0$ (D) $\sqrt{3}, 105^0$

44. The area bounded by the curves y = |x| –1 and y = – |x| + 1 is

(A) 1 (B) 2

(C) $2\sqrt{2}$ (D) 4

45. Sum of the integral values of ***a***, for which the function $f(x) = \left|x^2 - 4|x| + 3\right|$ when equated as $f(x) = \boldsymbol{a}$ has exactly four distinct real roots.

(A) 2 (B) 3

(C) 4 (D) 5

Space for rough work

CHEMISTRY (SECTION - IV)

46. The amount of energy released when 10^6 atoms of iodine in vapour state are converted to I^- ions is 4.9×10^{-13} J. What will be electron affinity of iodine in eV per atom

(A) 2.0 (B) 2.5

(C) 2.75 (D) 3.06

47. Molecular shapes of ClF_3, I_3^- and XeO_3 respectively are

(A) T-shape, Linear, Pyramidal (B) Planar, Linear, Tetrahedral

(C) T-shape, Planar, Pyramidal (D) Trigonal bipyramidal, Linear, Tetrahedral

48. Oxidation number of Cr in K_3CrO_8 is

(A) +6 (B) +5

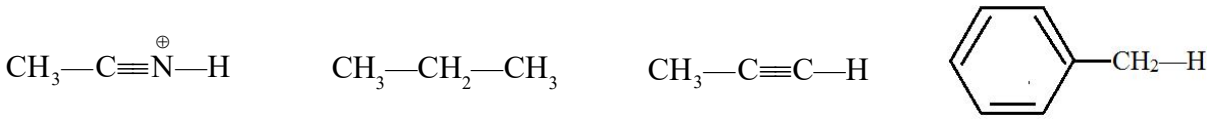
(C) +3 (D) +2

49. Two identical bulbs containing ideal gases A and B are taken. Density of A is twice that of B and Molecular weight of A is half that of B. If the two gases are at the same temperature, the ratio of pressure of A & B is

(A) 1 : 2 (B) 1 : 4

(C) 4 : 1 (D) 2 : 1

50. Correct order of acidic strength for the given species



(I) (II) (III) (IV)

(A) I > II > IV > III (B) II > IV > III > I

(C) III > I > IV > II (D) I > III > IV > II

51. S – S bond is present in

(A) $H_2S_2O_7$ (B) $H_2S_2O_8$

(C) $H_2S_2O_6$ (D) $H_2S_2O_5$

Space for rough work

52. A cricket ball of 0.5 kg is moving with a velocity of 100 m/sec. The wavelength associated with its motion is

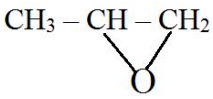
(A) 1/100 cm

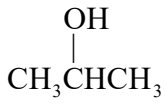
(B) 6.6×10^{-34} m

(C) 1.32×10^{-35} m

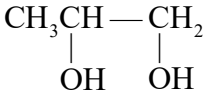
(d) 6.6×10^{-28} m

53. $CH_3CH = CH_2 \xrightarrow{H^+/H_2O}$ major product is:

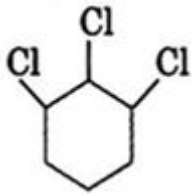
(A) 

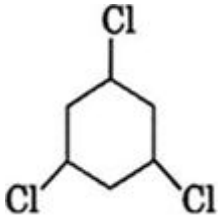
(B) 

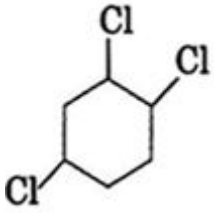
(C) $CH_3CH_2CH_2OH$

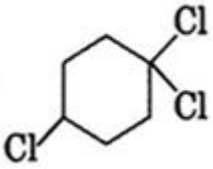
(D) 

54. Which of the following compounds does not have any geometrical isomer?

(A) 

(B) 

(C) 

(D) 

55. For a reaction $N_2O_5 \longrightarrow 2NO_2 + \frac{1}{2}O_2$

Given : $-\frac{d(N_2O_5)}{dt} = k_1[N_2O_5]$; $\frac{d(NO_2)}{dt} = k_2[N_2O_5]$; $\frac{d(O_2)}{dt} = k_3[N_2O_5]$

The relation between k_1, k_2 and k_3 are

(A) $2k_1 = k_2 = 4k_3$

(B) $k_1 = k_2 = k_3$

(C) $2k_1 = 4k_2 = k_3$

(D) $4k_1 = 2k_2 = k_3$

Space for rough work

56. A crystal is made of particles X, Y and Z, X forms FCC packing. Y occupies all the octahedral voids of X and Z occupies all the tetrahedral voids of X. If all the particles along one body diagonal are removed, then the formula of the crystal would be

(A) XYZ_2 (B) X_2YZ_2

(C) $X_8Y_4Z_5$ (D) $X_5Y_4Z_8$

57. If nickel oxide has the formula $Ni_{0.98}O$, then what fraction of nickel exists as Ni^{3+}?

(A) 96% (B) 4%

(C) 98% (D) 2%

58. In an experiment 2.847 g of pure $MOCl_3$ was allowed to undergo a set of reactions as a result of which all the Cl was converted to AgCl. The weight of AgCl was 7.2 g. Find atomic weight of M. (Atomic weight of Ag = 108)

(A) 35.52 (B) 47.72

(C) 65.2 (D) 80.42

59. If relative decrease in vapour pressure is 0.4 for a solution containing 1 mol NaCl in 3 mol of H_2O, then % ionization of NaCl is

(A) 60% (B) 80%

(C) 40% (D) 100%

60. The E^0_{cell} of the reaction

$MnO_4^- + Fe^{+2} + H^+ \rightarrow Mn^{+2} + Fe^{+3} + H_2O$ is 0.59 V at 25^0C. The equilibrium constant for the reaction is

(A) 50 (B) 10

(C) 10^{50} (D) 10^5

Space for rough work

Center for Social Responsibility and Leadership							
Sample Paper Answer Key (CODE-2S)							
S.No	APTITUDE	S.No	PHYSICS	S.No	MATHS	S.NO	CHEMISTRY
1	D	16	B	31	A	46	D
2	B	17	C	32	D	47	A
3	B	18	A	33	D	48	B
4	A	19	D	34	C	49	C
5	C	20	D	35	A	50	D
6	C	21	D	36	C	51	C
7	A	22	D	37	D	52	C
8	C	23	C	38	C	53	B
9	C	24	C	39	D	54	D
10	B	25	B	40	C	55	A
11	B	26	B	41	A	56	D
12	C	27	D	42	D	57	B
13	A	28	B	43	A	58	B
14	B	29	C	44	B	59	D
15	A	30	A	45	A	60	C