

FIITJEE INTERNAL TEST

SECOND YEAR 2018-20

JEE MAINS

REVISION-2 PART TEST - 1

Time: 3 hours

Maximum Marks: 300

INSTRUCTIONS:

19th April 2020

Instructions to the Candidates

A. General

1. This booklet is your Question Paper containing 75 questions.
2. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
3. Fill in the boxes provided for Name and Enrolment No.
4. The answer sheet, a machine-readable Objective Response (ORS), is provided separately.
5. DO NOT TAMPER WITH / MULTILATE THE ORS OR THE BOOKLET.

B. Filling in the OMR:

6. The instructions for the OMR sheet are given on the OMR itself.

C. Question paper format:

7. The question paper consists of **3 parts (Mathematics, Physics and Chemistry)**. Each part consists of **two sections**.
8. **Section I** contains **20 Multiple Choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE** is correct.
9. **Section II** contains **5 questions**. Each question is numerical value. For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to second decimal place.
(e.g. 6.25, 7.00, - 0.33, - .30, 30.27, - 127.30)
10. **Q.No. 21-25, 46-50, 71-75** are Numerical based questions with answer is of the type xxxx.xx. Suppose your answer is 25.3 (example-1) you need to write answer as 0025.30, if your answer is only 1 (example-2) then you have bubble like 0001.00 and bubble accordingly including zero's and dot.

D. Marking Scheme

11. For each question in **Section I**, you will be awarded **4 marks** if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **-1 negative marks** will be awarded for incorrect answers in this section.
12. For each question in **Section II**, you will be awarded **4 marks** if you darken the bubble corresponding to the correct answer **ONLY**. In all other cases **zero (0) marks** will be awarded. **No negative marks** will be awarded for incorrect answers in this section.

Don't write / mark your answers in this question booklet.

If you mark the answers in question booklet, you will not be allowed to continue the exam.

NAME:

ENROLLMENT NO.:

MATHEMATICS

Single Correct Answer Type

1. The value of $\cos 10^\circ - \sin 10^\circ$ is
(A) positive (B) negative (C) 0 (D) 1
2. The expression $\tan^2 \alpha + \cot^2 \alpha$ is
(A) ≥ 2 (B) ≤ 2 (C) ≥ -2 (D) None of these
3. The value of $\cos^4 \frac{\pi}{8} + \cos^4 \frac{3\pi}{8} + \cos^4 \frac{5\pi}{8} + \cos^4 \frac{7\pi}{8}$ is
(A) 0 (B) $\frac{1}{2}$ (C) $\frac{3}{2}$ (D) 1
4. $\cos^{-1} \frac{1}{2} + 2 \sin^{-1} \frac{1}{2}$ is equal to
(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{3}$ (D) $\frac{2\pi}{3}$
5. If $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = 3\pi$, then $xy + yz + zx$ is equal to
(A) -3 (B) 0 (C) 3 (D) -1
6. $\sec^2(\tan^{-1} 2) + \operatorname{cosec}^2(\cot^{-1} 3) =$
(A) 5 (B) 10 (C) 15 (D) 20
7. The value of x where $x > 0$ and $\tan\left(\sec^{-1}\left(\frac{1}{x}\right)\right) = \sin(\tan^{-1} 2)$ is
(A) $\sqrt{5}$ (B) $\frac{\sqrt{5}}{3}$ (C) 1 (D) $\frac{2}{3}$
8. The perimeter of a $\triangle ABC$ is 6 times the arithmetic mean of the sines of its angles. If the side a is 1, then the angle A is
(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{2}$ (D) π
9. If the sides of a triangle are in the ratio $1 : \sqrt{3} : 2$, then the angles of the triangle are in the ratio
(A) $1 : 3 : 5$ (B) $2 : 3 : 1$ (C) $3 : 2 : 1$ (D) $1 : 2 : 3$
10. In a $\triangle ABC$, $a(\cos^2 B + \cos^2 C) + \cos A(c \cos C + b \cos B) =$
(A) a (B) b (C) c (D) 0
11. The equation $k \cos x - 3 \sin x = k + 1$ is solvable only if k belongs to the interval
(A) $[4, \infty)$ (B) $[-4, 4]$ (C) $(-\infty, 4]$ (D) None
12. The number of distinct real roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$ is
(A) 0 (B) 2 (C) 1 (D) 3

13. If $\sin x = \lambda$ has exactly one solution in $\left[0, \frac{9\pi}{4}\right]$, then the number of values of λ is
 (A) 0 (B) 1 (C) 2 (D) 3
14. If $0 \leq x, y \leq 2\pi$ and $\sin x + \sin y = 2$, then $x + y =$
 (A) π (B) $\frac{\pi}{2}$ (C) 3π (D) None of these
15. AB is a vertical pole. The end A is on the level ground. C is the middle point of AB. P is a point on the level ground. The portion BC subtends an angle β at P. If $AP = nAB$, then $\tan \beta =$
 (A) $\frac{n}{2n^2 + 1}$ (B) $\frac{n}{n^2 - 1}$ (C) $\frac{n}{n^2 + 1}$ (D) None of these
16. From the top of a hill 'h' meters high the angles of depression of the top and the bottom of a pillar are α and β respectively. The height (in metres) of the pillar is
 (A) $\frac{h(\tan \beta - \tan \alpha)}{\tan \beta}$ (B) $\frac{h(\tan \alpha - \tan \beta)}{\tan \alpha}$ (C) $\frac{h(\tan \beta + \tan \alpha)}{\tan \beta}$ (D) $\frac{h(\tan \beta + \tan \alpha)}{\tan \alpha}$
17. The negation of $q \vee \sim (p \wedge r)$ is
 (A) $\sim q \vee \sim (p \wedge r)$ (B) $\sim q \vee (p \wedge r)$ (C) $\sim q \wedge (p \wedge r)$ (D) $\sim q \wedge \sim (p \wedge r)$
18. If $A = \{(x, y) : x^2 + y^2 \leq 1; x, y \in \mathbb{R}\}$ and $B = \{(x, y) : x^2 + y^2 \leq 4; x, y \in \mathbb{R}\}$, then
 (A) $A - B = A$ (B) $B - A = B$ (C) $A - B = \phi$ (D) $B - A = \phi$
19. If A_n is the set of first n prime numbers, then $\bigcap_{n=3}^{10} A_n =$
 (A) $\{3, 5, 7, 11, 13, 17, 19\}$ (B) $\{2, 3, 5\}$
 (C) $\{2, 3, 5, 7, 11, 13, 17, 19, 23, 29\}$ (D) $\{3, 5, 7\}$
20. S is a relation over the set R of all real numbers and it is given by $(a, b) \in S \Leftrightarrow ab \geq 0$. Then, S is
 (A) symmetric and transitive only (B) reflexive and symmetric only
 (C) an equivalence relation (D) none of these

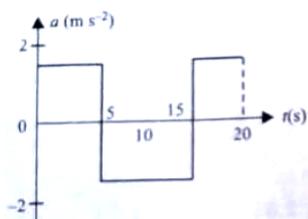
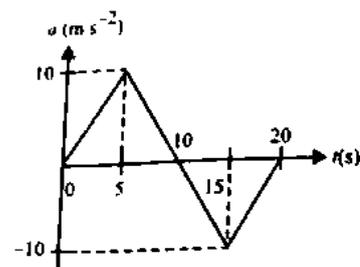
Numerical based

21. The number of equivalence relations that can be defined on the set $\{a, b, c\}$ is
22. The value of $\sqrt{3} \operatorname{cosec} 20^\circ - \sec 20^\circ$ is equal to
23. In a $\triangle ABC$, $a = 5, b = 4$ and $\tan \frac{C}{2} = \sqrt{\frac{7}{9}}$, then $c =$
24. If $\tan^{-1} 3 + \tan^{-1} x = \tan^{-1} 8$, then $\frac{1}{x} =$
25. The number of solutions of the equation $3 \sin^2 x - 7 \sin x + 2 = 0$ in the interval $[0, 5\pi]$ is

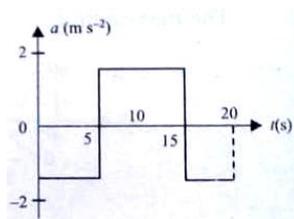
PHYSICS

Single Correct Answer Type

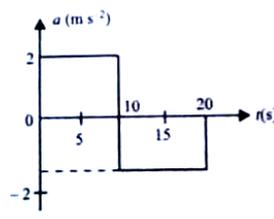
26. Plot the acceleration-time graph of the velocity-time graph given in Figure.



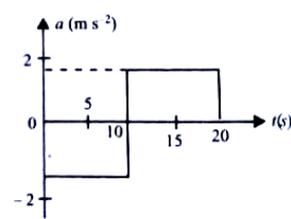
(A)



(B)

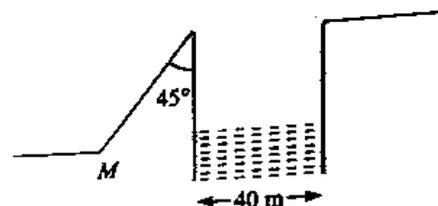


(C)



(D)

27. A body is projected up a smooth inclined plane (length = $20\sqrt{2}$ m) with velocity u from the point M as shown in the figure. The angle of inclination is 45° and top is connected to a well of diameter 40 m. If the body just manages to cross the well, what is the value of u ?



- (A) 40 ms^{-1} (B) $40\sqrt{2} \text{ ms}^{-1}$
(C) 20 ms^{-1} (D) $20\sqrt{2} \text{ ms}^{-1}$

28. A ship A sailing due east with a velocity of 10 km/h happens to appear sailing due north with a velocity of 5 km/h, to a person, sitting in a moving ship B. Determine the velocity (absolute) of ship B.

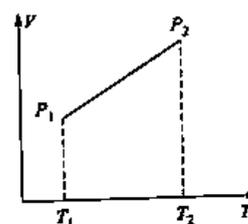
- (A) $5\sqrt{5} \text{ km/h}$, $\tan^{-1}(1/2)$ S of E (B) $5\sqrt{5} \text{ km/h}$, $\tan^{-1}(1/2)$ E of S
(C) $4\sqrt{5} \text{ km/h}$, $\tan^{-1}(1/2)$ S of E (D) $4\sqrt{5} \text{ km/h}$, $\tan^{-1}(1/2)$ E of S

29. One mole of an ideal monatomic gas requires 210 J heat to raise the temperature by 10 K, when heated at constant pressure. If the same gas is heated at constant volume to raise the temperature by 10 K then heat required is

- (A) 238 J (B) 126 J (C) 210 J (D) 350 J

30. From the following V-T diagram, we can conclude

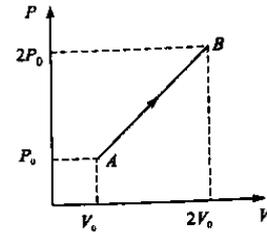
- (A) $P_1 = P_2$ (B) $P_1 > P_2$
(C) $P_1 < P_2$ (D) None of these



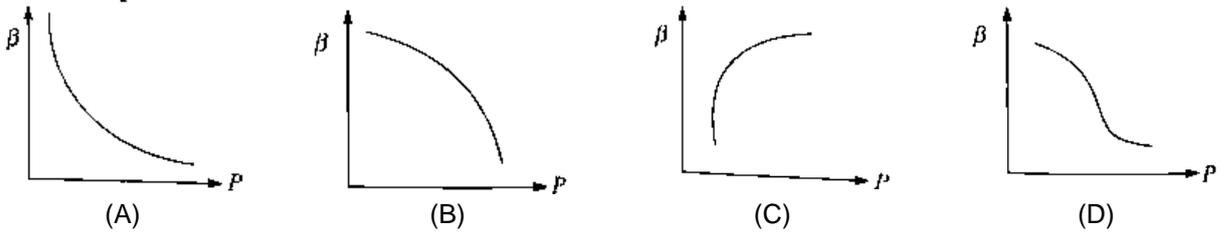
31. Certain amount of an ideal gas is contained in a closed vessel. The vessel is moving with a constant velocity v . The molecular mass of gas is M . The rise in temperature of the gas when the vessel is suddenly stopped is ($\gamma = C_p$)

- (A) $\frac{Mv^2}{2R(\gamma+1)}$ (B) $\frac{Mv^2(\gamma-1)}{2R}$ (C) $\frac{Mv^2}{2R(\gamma+1)}$ (D) $\frac{Mv^2}{2R(\gamma+1)}$

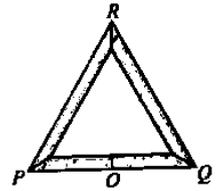
32. The P-V diagram of 2 gm of helium gas for a certain process $A \rightarrow B$ is shown in the figure. What is the heat given to the gas during the process $A \rightarrow B$
- (A) $4P_0V_0$ (B) $6P_0V_0$
 (C) $4.5P_0V_0$ (D) $2P_0V_0$



33. A carnot engine absorbs an amount Q of heat from a reservoir at an absolute temperature T and rejects heat to a sink at a temperature of $T/3$. The amount of heat rejected is
 (A) $Q/4$ (B) $Q/3$ (C) $Q/2$ (D) $2Q/3$
34. Which of the following graphs correctly represents the variation of $\beta = -(dV/dP)/V$ with P for an ideal gas at constant temperature

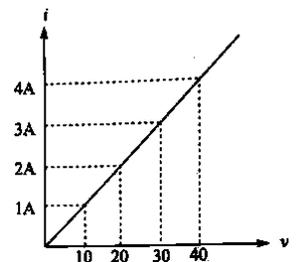


35. Three rods of equal length l are joined to form an equilateral triangle PQR. O is the mid point of PQ. Distance OR remains same for small change in temperature. Coefficient of linear expansion for PR and RQ is same i.e. α_2 but that for PQ is α_1 . Then
 (A) $\alpha_2 = 3\alpha_1$ (B) $\alpha_2 = 4\alpha_1$
 (C) $\alpha_1 = 3\alpha_2$ (D) $\alpha_1 = 4\alpha_2$



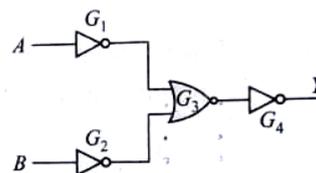
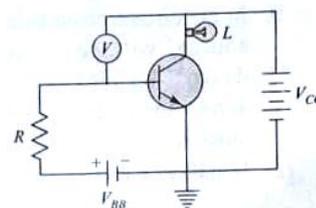
36. A rod of length 20 cm is made of metal. It expands by 0.075 cm when its temperature is raised from 0°C to 100°C . Another rod of a different metal B having the same length expands by 0.045 cm for the same change in temperature. A third rod of the same length is composed of two parts, one of metal A and the other of metal B. This rod expands by 0.060 cm for the same change in temperature. The portion made of metal A has the length
 (A) 20 cm (B) 10 cm (C) 15 cm (D) 18 cm
37. The relative density of material of a body is found by weighing it first in air and then in water. If the weight in air is (5.00 ± 0.05) Newton and weight in water is (4.00 ± 0.05) Newton. Then the relative density along with the maximum permissible percentage error is
 (A) $5.0 \pm 11\%$ (B) $5.0 \pm 1\%$ (C) $5.0 \pm 6\%$ (D) $1.25 \pm 5\%$

38. If emf of battery is 100 V, then what was the resistance of Rheostat adjusted at reading (2)? ($i = 2\text{A}$, $V = 20\text{V}$)
 (A) $10\ \Omega$ (B) $20\ \Omega$
 (C) $30\ \Omega$ (D) $40\ \Omega$



39. If ϕ_1 and ϕ_2 be the angles of dip observed in two vertical planes at right angles to each other and ϕ be the true angle of dip, then
 (A) $\cos^2 \phi = \cos^2 \phi_1 + \cos^2 \phi_2$ (B) $\sec^2 \phi = \sec^2 \phi_1 + \sec^2 \phi_2$
 (C) $\tan^2 \phi = \tan^2 \phi_1 + \tan^2 \phi_2$ (D) $\cot^2 \phi = \cot^2 \phi_1 + \cot^2 \phi_2$

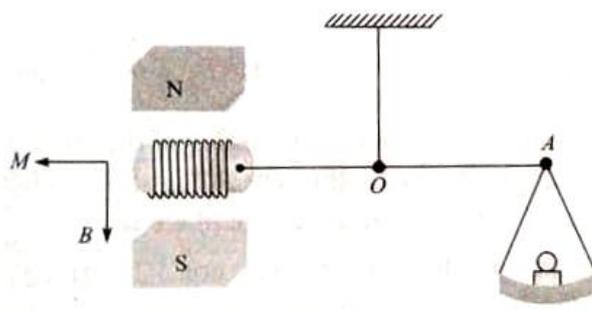
40. A dip needle lies initially in the magnetic meridian when it shows an angle of dip θ at a place. The dip circle is rotated through an angle x in the horizontal plane and then it shows an angle of dip θ' . Then $\frac{\tan\theta'}{\tan\theta}$ is
- (A) $\frac{1}{\cos x}$ (B) $\frac{1}{\sin x}$ (C) $\frac{1}{\tan x}$ (D) $\cos x$
41. A point source of electromagnetic radiation has an average power output of 800 W. The maximum value of electric field at a distance 4.0 m from the source is
- (A) 64.7 V/m (B) 57.8 V/m (C) 56.72 V/m (D) 54.77 V/m
42. A transmitter supplies 9 kW to the aerial when unmodulated. The power radiated when modulated to 40% is
- (A) 5 kW (B) 9.72 kW (C) 10 kW (D) 12 kW
43. The antenna current of an AM transmitter is 8 A when only carrier is sent but increases to 8.96 A when the carrier is sinusoidally modulated. The percentage modulation is
- (A) 50% (B) 60% (C) 65% (D) 71%
44. In the following circuit, a voltmeter V is connected across a lamp L . What change would occur in voltmeter reading if the resistance R is reduced in value?
- (A) Increases (B) Decreases
(C) Remains same (D) None of these



Numerical based

46. An object is projected with a velocity of 20 m/s making an angle of 45° with horizontal. The equation for the trajectory is $h = Ax - Bx^2$ where h is height, x is horizontal distance, A and B are constants. The ratio $A : B$ is ($g = 10 \text{ ms}^{-2}$)
47. Two cylinders A and B fitted with pistons contains 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 cylinder. If the rise in temperature of the gas in A is 30 K, then the rise in temperature of the gas in B is (in K)
48. What is the maximum amount of work that a Carnot engine can perform per kilocalorie of heat input if it absorbs heat at 427°C and exhausts heat at 177°C ? (in kJ)
49. A piece of metal weight 46 gm in air, when it is immersed in the liquid of specific gravity 1.24 at 27°C it weighs 30 gm. When the temperature of liquid is raised to 42°C the metal piece weighs 30.5 gm, specific gravity of the liquid at 42°C is 1.20, then the linear expansion of the metal will be..... $\times 10^{-6}^\circ\text{C}$

50. A small coil C with $N = 200$ turns is mounted on one end of a balance beam and introduced between the poles of an electromagnet as shown in the figure. The cross-sectional area of coil is $A = 1.0 \text{ cm}^2$, length of arm OA of the balance beam is $l = 30 \text{ cm}$. When there is no current in the coil the balance is in equilibrium. On passing a current $I = 22 \text{ mA}$ through the coil the equilibrium is restored by putting the additional counter weight of mass $\Delta m = 60 \text{ mg}$ on the balance pan. Find the magnetic induction at the spot where coil is located. (in T)



CHEMISTRY

Single Correct Answer Type:

51. In H_2S , the bond angle is θ_1 , and in H_2O , the bond angle is θ_2 . Find the correct option,
 (A) $\theta_1 > \theta_2$ (B) $\theta_1 < \theta_2$ (C) $\theta_1 = \theta_2$ (D) θ_1, θ_2 are comparable
52. The correct order of decreasing stability of hexafluoride of group 16 members is
 (A) $\text{SF}_6 > \text{SeF}_6 > \text{TeF}_6$ (B) $\text{TeF}_6 > \text{SeF}_6 > \text{SF}_6$
 (C) $\text{SF}_6 > \text{TeF}_6 > \text{SeF}_6$ (D) $\text{TeF}_6 > \text{SF}_6 > \text{SeF}_6$
53. The correct O-O bond length (decreasing) in $\text{O}_2, \text{H}_2\text{O}_2$ and O_3 is
 (A) $\text{O}_2 > \text{H}_2\text{O}_2 > \text{O}_3$ (B) $\text{O}_3 > \text{O}_2 > \text{H}_2\text{O}_2$ (C) $\text{H}_2\text{O}_2 > \text{O}_3 > \text{O}_2$ (D) $\text{H}_2\text{O}_2 > \text{O}_2 > \text{O}_3$
54. Which of the following processes involves smelting?
 (A) $\text{ZnCO}_3 \xrightarrow{\text{Heat}} \text{ZnO} + \text{CO}_2$ (B) $\text{Fe}_2\text{O}_3 + 3\text{C} \xrightarrow{\text{Heat}} 2\text{Fe} + 3\text{CO}$
 (C) $2\text{PbS} + 3\text{O}_2 \xrightarrow{\text{Heat}} 2\text{PbO} + 2\text{SO}_2$ (D) $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O} \xrightarrow{\text{Heat}} \text{Al}_2\text{O}_3 + 2\text{H}_2\text{O}$
55. Super halogen is
 (A) F_2 (B) Cl_2 (C) Br_2 (D) I_2
56. Naturally occurring substances from which a metal can be profitably (or economically) extracted are called
 (A) Minerals (B) Ores (C) Gangue (D) Salts
57. When zinc reacts with very dilute HNO_3 , the oxidation state of nitrogen changes from
 (A) +5 to +1 (B) +5 to -3 (C) +5 to +4 (D) +5 to +3
58. The products formed by complete hydrolysis of PCl_3 are
 (A) H_3PO_3 and HCl (B) POCl_3 and HCl (C) H_3PO_4 and HCl (D) $\text{H}_4\text{P}_2\text{O}_7$ and HCl
59. Concentrated nitric acid reacts with iodine to give
 (A) HOI (B) HI (C) HOIO_2 (D) HOIO_3

60. Hydrolysis of one mole of peroxodi-sulphuric acid produces
 (A) Two moles of sulphuric acid
 (B) Two moles of peroxomono-sulphuric acid
 (C) One mole of sulphuric acid, one mole of peroxomono-sulphuric acid
 (D) One mole of sulphuric acid, one mole of peroxomono-sulphuric acid and one mole of hydrogen peroxide
61. $A + H_2O \longrightarrow B + HCl$
 $B + H_2O \longrightarrow C + HCl$
 Compound (A), (B) and (C) will be respectively
 (A) $PCl_5, POCl_3, H_3PO_3$ (B) $PCl_5, POCl_3, H_3PO_4$
 (C) $SOCl_2, POCl_3, H_3PO_3$ (D) $PCl_3, POCl_3, H_3PO_4$
62. $NH_3 + O_2 \xrightarrow[\Delta]{Pt} A + H_2O$;
 $A + O_2 \longrightarrow B$;
 $B + O_2 + H_2O \longrightarrow C$
 A, B and C are
 (A) N_2O, NO_2 and HNO_3 (B) NO, NO_2 and HNO_3
 (C) NO_2, NO and HNO_3 (D) N_2O, NO and HNO_3
63. $MF + XeF_4 \longrightarrow 'A'$ (M^+ = Alkali metal cation)
 The state of hybridization of the central atom in 'A' and shape of the species are
 (A) sp^3d , TBP (B) sp^3d^2 , distorted octahedral
 (C) sp^3d^2 , pentagonal planar (D) No compound formed at all
64. SbF_5 reacts with XeF_4 to form an adduct. The shapes of cation and anion in the adduct are respectively
 (A) Square planar, trigonal bipyramidal (B) T-shaped, octahedral
 (C) Square pyramidal, octahedral (D) Square planar, octahedral
65. In P_4O_{10} each P atom is linked with O atoms
 (A) 2 (B) 3 (C) 4 (D) 5
66. KF combines with HF to form KHF_2 . The compound contains the species.
 (A) K^+, F^- and H^+ (B) K^+, F^- and HF (C) K^+ and $[HF_2]^-$ (D) $[KHF]^+$ and F^-
67. Aqua-regia is
 (A) 1 : 3 conc. HNO_3 and conc. HCl (B) 1 : 2 conc. HNO_3 and conc. HCl
 (C) 3 : 1 conc. HNO_3 and conc. HCl (D) 2 : 1 conc. HNO_3 and conc. HCl
68. Which of the following transition elements show the highest oxidation state?
 (A) Fe (B) Mn (C) Cr (D) V
69. Strong oxidizing power of fluorine is due to
 (A) low bond dissociation energy of $F - F$ (B) high hydration energy of F^- ion
 (C) high electronegativity of fluorine (D) both A and B
70. Which of the following halogens has metallic character?
 (A) F_2 (B) Cl_2 (C) Br_2 (D) I_2

Numerical Based:

71. How many of the following are correct regarding SF_4
- It is a gas
 - Hybridisation is sp^3d
 - Lone pair occupies the equatorial position
 - Geometry is trigonal bipyramidal
 - shape is see-saw
72.
$$S_{(s)} \xrightarrow[\text{air}]{\Delta} A_{(g)}$$
- $$A_{(g)} + O_2 \xrightarrow{V_2O_5} B_{(g)}$$
- $$B_{(g)} + H_2SO_{4(l)} \longrightarrow C_{(l)}$$
- $$C_{(l)} + H_2O_{(l)} \longrightarrow D_{(l)}$$
- The basicity of the compound 'D' is _____
73. How many of the following options are true regarding ozone
- It is an allotropic form of oxygen
 - Formation of ozone from oxygen is an endothermic process.
 - Compare to oxygen, ozone is thermodynamically unstable.
 - It oxidises PbS to $PbSO_4$
 - It oxidises I^- to I_2
 - Two oxygen-oxygen bond lengths in the ozone molecule are identical
74. How many of the following ores can be purified by froath floatation technique.
- | | | |
|-----------------|-------------------|------------------|
| (i) Zinc blende | (ii) Iron pyrite | (iii) Heamatitie |
| (iv) Magnesite | (v) Copper pyrite | |
75. How many of the following methods are used for concentration of ore
- | | | |
|------------------------|--------------------------|-------------------------|
| (i) gravity separation | (ii) magnetic separation | (iii) froath floatation |
| (iv) calcination | (v) roasting | |

❖ *Wish You all the Best* ❖