



TARGET IIT JEE-PMT CLASSES™

(NTTSE) National Target Talent Search Examination

(FOR CLASS XII) (Engineering)

TIME: 2:15 Hrs.

INSTRUCTIONS FOR THE CANDIDATES

M.M: 360

Section	Subject	No. of Questions	Mark per Question	Negative Marking	Total Marks
A	Physics	30	4	-1/4 th	120
B	Chemistry	30	4	-1/4 th	120
C	Mathematics	30	4	-1/4 th	120
	Total	90			360

- ❖ Read each question carefully.
- ❖ Do not use white – fluid or any other rubbing material on sheet. No change in the answer once marked.
- ❖ Student can not use log tables and calculators or any other electronic material in the examination hall.
- ❖ Rough work is to be done on the rough sheet provided for this purpose with the booklet.
- ❖ Immediately after the prescribed examination time is over, the answer sheet to be returned to the invigilator.
- ❖ Marking Scheme:
 - a. If darkened bubble is RIGHT answer: **4 Marks**.
 - b. If no bubble is darkened in any question: **No Mark**.
 - c. If darkened bubble is WRONG answer: **1/4 Mark (Minus)**.
- ❖ If you are found involved in cheating or disturbing others then your OMR Sheet will be cancelled.
- ❖ Do not put any stain on OMR Sheet and hand it over back properly to the invigilator.

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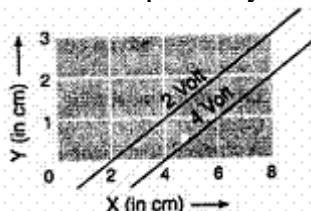
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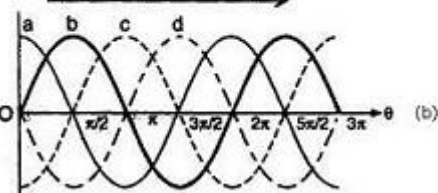
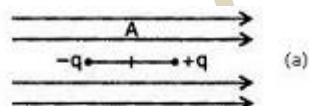
SECTION -A: PHYSICS

This section contains **30 Multiple Choice Questions**. Each question has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

- 1) The figure shows two equipotential lines in XY-plane for an electric field. The scales are marked. The X-component E_x and Y-component E_y of the electric field in the space between these equipotential lines are respectively.



- a) $+100 \text{ Vm}^{-1}, -200 \text{ Vm}^{-1}$
 - b) $+200 \text{ Vm}^{-1}, +100 \text{ Vm}^{-1}$
 - c) $-100 \text{ Vm}^{-1}, +200 \text{ Vm}^{-1}$
 - d) $-200 \text{ Vm}^{-1}, -100 \text{ Vm}^{-1}$
- 2) The electric dipole is situated in an electric field as shown in figure. The dipole and electric field are both in the plane of paper. The dipole is rotated about an axis perpendicular to the paper at point A in anticlockwise direction. If the angle of rotation is measured with respect to the direction of the electric field then the torque for different values of the angle of rotation θ will be represented in Fig. (b)



- a) a
- b) b
- c) c
- d) d

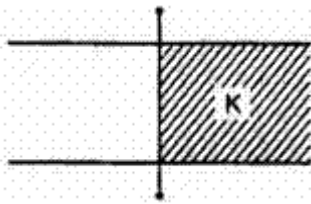
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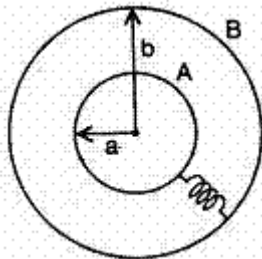
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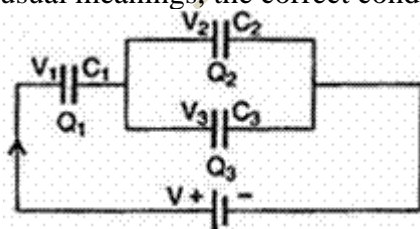
- 3) A dielectric is placed in between the two parallel plates of a capacitor as shown in figure, the dielectric constant of the dielectric being K . If the initial capacity is C , then the new capacity will be :



- a) KC
 b) $(K + 1) C$
 c) $C (K + 1)/2$
 d) $(K - 1) C$
- 4) Two spherical conductors A and B of radii a and $(b > a)$ are placed concentrically in air. The two are connected by a copper wire as shown in figure. Then the equivalent capacitance of the system is :



- a) $\frac{4\pi\epsilon_0 ab}{(b - a)}$
 b) $4\pi\epsilon_0 (a + b)$
 c) $4\pi\epsilon_0 b$
 d) $4\pi\epsilon_0 a$
- 5) In the given figure, three capacitors C_1 , C_2 and C_3 are joined to a battery, with symbols having their usual meanings, the correct conditions will be :



- a) $Q_1 = Q_2 = Q_3$ and $V_1 = V_2 = V_3 + V$

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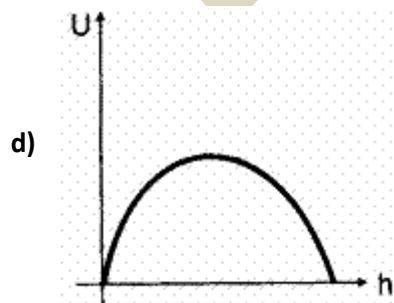
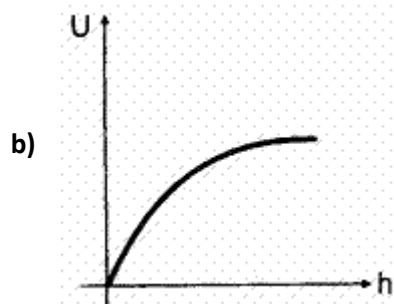
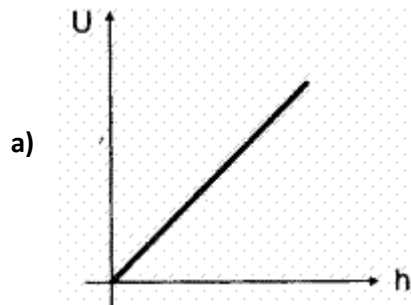
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b) $Q_1 = Q_2 + Q_3$ and $V = V_1 + V_2 + V_3$

c) $Q_1 = Q_2 = Q_3$ and $V = V_1 + V_2$

d) $Q_3 = Q_2$ and $V_2 = V_3$

- 6) A particle of mass m and charge q is projected vertically upwards. A uniform electric field \vec{E} is acted vertically downwards. The most appropriate graph between potential energy U (gravitational plus electrostatic) and height h (\ll radius of earth) is (assume U to be zero on surface of earth)



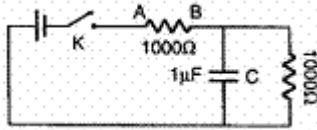
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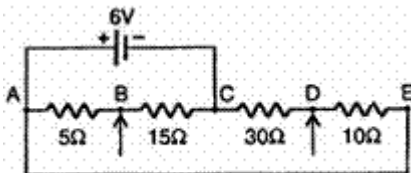
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- 7) When the key K is pressed at time $t = 0$, then which of the following statements about the current I in the resistor AB of the given circuit is true ?

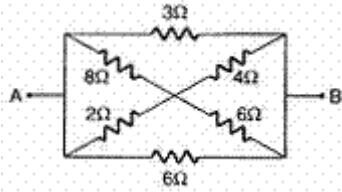


- a) $I = 1$ mA at all times
 b) $I = 2$ mA at all times
 c) I oscillates between 1 mA and 2 mA
 d) At $t = 0$, $I = 2$ mA and with time it goes to 1 mA
- 8) Four resistors are connected as shown in the following figure. A 6 V battery of negligible resistance is connected across terminals A and C. The potential difference across terminals B and D will be :



- a) 0 volt
 b) 1.5 volt
 c) 2 volt
 d) 3 volt
- 9) A cell supplies a current I_1 through a resistor of resistance R_1 and a current I_2 through a resistor of resistance R_2 , then the e.m.f. of the cell is :
- a) $I_1 R_1 + I_2 R_2$
 b) $I_1 R_1 - I_2 R_2$
 c) $\frac{I_1 I_2 (R_2 - R_1)}{I_1 - I_2}$
 d) $\frac{I_1 I_2 (R_1 + R_2)}{I_1 + I_2}$

10) In the following figure, the equivalent between A and B is :

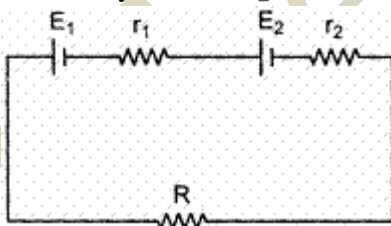


- a) $(17/24) \Omega$
- b) $(4/3) \Omega$
- c) 29Ω
- d) $(24/17) \Omega$

11) A galvanometer has a resistance of 3663 ohm. A shunt S is connected across it such that $(1/34)$ of the total current passes through the galvanometer. The combined resistance of the shunt and the galvanometer is :

- a) 3663Ω
- b) 111Ω
- c) 107.7Ω
- d) 3555.3Ω

12) Under what conditions current passing through the resistance R can be increased by short circuiting the battery of emf E_2 . The internal resistances of the two batteries are r_1 and r_2 respectively



- a) $E_2 r_1 > E_1 (R + r_2)$
- b) $E_1 r_2 > E_2 (R + r_1)$
- c) $E_2 r_2 < E_1 (R + r_2)$
- d) $E_1 r_1 > E_2 (R + r_1)$

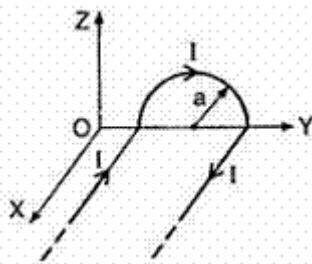
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- 13) A vertical straight conductor carries a current vertically upwards. A point P lies to the east of it at a small distance and another point Q lies to the west at the same distance. The magnetic field at P is :
- greater than at Q
 - same as at Q
 - less than at Q
 - greater or less than at Q depending upon the strength of current
- 14) A plastic disc of radius R has a charge q uniformly distributed over its surface. If the disc is rotated with a frequency f about its axis, then the magnetic induction at the centre of the disc is given by :
- $(\mu_0 f q / R)$
 - $(\mu_0 f q / 2\pi R)$
 - $(\mu_0 q / f R)$
 - $(\mu_0 f / q R)$
- 15) A long wire bent as shown in the figure carries current I. If the radius of the semi-circular portion of a the magnetic induction at the centre O is :



- $\frac{\mu_0 I}{4a}$
- $\frac{\mu_0 I}{4\pi a} \sqrt{\pi^2 + 4}$
- $\frac{\mu_0 I}{4a} + \frac{\mu_0 I}{2\pi a}$
- $\frac{\mu_0 I}{4\pi a} \sqrt{(\pi^2 - 4)}$

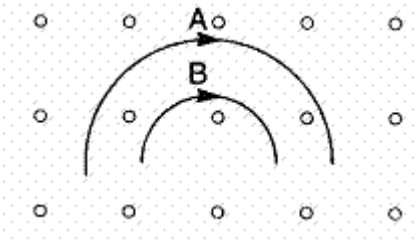
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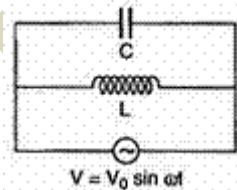
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- 16) Two particles A and B of masses m_A and m_B respectively and having the same charge are moving in a plane. A uniform magnetic field exists perpendicular to this plane. The speeds of the particles are v_A and v_B respectively and the trajectories are as shown in the figure. Then



- a) $m_A v_A < m_B v_B$
 b) $m_A v_A > m_B v_B$
 c) $m_A < m_B$ and $v_A < v_B$
 d) $m_A = m_B$ and $v_A = v_B$
- 17) If the inductance per unit length for a solenoid near its centre and near the end be denoted by L_c and L_e , then :
- a) $L_c = L_e$
 b) $L_c > L_e$
 c) $L_c < L_e$
 d) $L_c > L_e$
- 18) For the circuit shown in the figure, the current through the inductor is 0.9 A while the current through the condenser is 0.4 A. Hence, the current drawn from the generator is :



- a) $I = 1.13$ amp
 b) $I = 0.9$ amp
 c) $I = 0.5$ amp

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- d) $I = 0.6$ amp
- 19) When high speed electrons hit a target of high atomic number, the efficiency for the production of X-rays is :
- a) 100%
 - b) 99%
 - c) 50%
 - d) even less than 1%
- 20) Decay constant of radium is λ . By a suitable process its compound radium bromide is obtained. The decay constant of radium bromide will be :
- a) λ
 - b) $>\lambda$
 - c) $<\lambda$
 - d) zero
- 21) After a time equal to four half-lives the amount of radioactive material remaining undecayed is :
- a) 6.25%
 - b) 12.50%
 - c) 25.00%
 - d) 50%
- 22) The half-life of radium is 1600 years. What is the mean life and disintegration constant of radium ?
- a) 2309, $\frac{1}{2309}$ per year
 - b) 3309, $\frac{1}{3309}$ per year
 - c) 1309, $\frac{1}{1309}$ per year
 - d) None of these

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- 23) $\nu_{K\alpha}$, $\nu_{K\beta}$ and $\nu_{L\alpha}$ represent the frequencies of K_{α} , K_{β} and L_{α} X-ray lines of a given material, then :
- $\nu_{K\beta} = \nu_{K\alpha} + \nu_{L\alpha}$
 - $\nu_{K\beta} = \sqrt{\nu_{K\alpha} + \nu_{L\alpha}}$
 - $\nu_{L\alpha} = \nu_{K\alpha} + \nu_{L\alpha}$
 - $\nu_{K\beta} = \nu_{K\alpha} - \nu_{L\alpha}$
- 24) Two equal charges are separated by a distance 'd'. A third charge placed on a perpendicular bisector at a distance 'x' will experience maximum coulomb force when:
- $x = d\sqrt{2}$
 - $x = d/2$
 - $x = \frac{d}{2\sqrt{2}}$
 - $x = \frac{d}{2\sqrt{3}}$
- 25) Two equal negative charges $-q$ are fixed at points $(0, a)$ and $(0, -a)$. A positive charge Q is released from rest at the point $(2a, 0)$ on the x-axis. The charge Q will:
- execute SHM about the origin
 - move to origin and remain at rest
 - move to infinity
 - execute oscillation but not SHM
- 26) If a charge q is placed at the centre of the joining two equal like charges Q . The systems or three will be in equilibrium if q is:
- $-Q/2$
 - $-Q/4$
 - $Q/2$
 - $4Q$

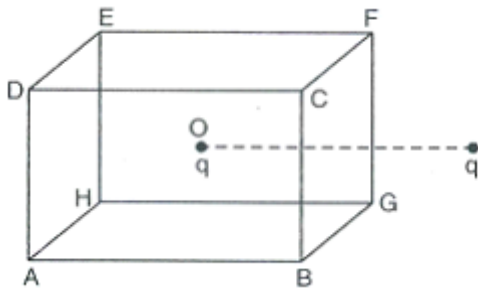
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- 27) A charged particle q is placed at the centre O of a cube of length L (ABCDEFGH). Another same charge q is placed at a distance L from O . Then the electric flux through ABCD is:



- a) $\frac{q}{4\pi\epsilon_0 L}$
- b) Zero
- c) $\frac{q}{2\pi\epsilon_0 L}$
- d) $\frac{q}{3\pi\epsilon_0 L}$
- 28) Which of the following is a natural resource of gamma rays?
- a) Radio-cobalt
- b) Radio-phosphorus
- c) Radiogas
- d) Radio-carbon
- e) Radio-iodine
- 29) The mean electric energy density between the plates of charged capacitor is (here q = charge on the capacitor and A = area of the capacitor plate)
- a) $\frac{q^2}{2E_0 A^2}$
- b) $\frac{q}{2E_0 A^2}$
- c) $\frac{q^2}{2E_0 A}$
- d) none of these

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30) If λ_v, λ_x and λ_m represent the wavelengths of visible light, x-rays and microwaves respectively, the

- a) $\lambda_m > \lambda_x > \lambda_v$
- b) $\lambda_v > \lambda_m > \lambda_x$
- c) $\lambda_v > \lambda_x > \lambda_m$
- d) $\lambda_m > \lambda_v > \lambda_x$

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SECTION -B: CHEMISTRY

This section contains **30 Multiple Choice Questions**. Each question has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

- 31) The vapour pressure of a liquid in a closed container does not depend upon
- (I) the viscosity of the liquid
 - (II) the surface area of the container
 - (III) The temperature
 - (IV) concentration of the solution
- a) I, II, III
 - b) I, II, IV
 - c) II, III, IV
 - d) III, IV
- 32) What is the molarity of H_2SO_4 solution if 25 ml is exactly neutralised with 32.63 ml of 0.164 M. NaOH ?
- a) 0.107 M
 - b) 0.126 M
 - c) 0.214 M
 - d) -0.428 M
- 33) A solution containing components A and B follows Raoult's law when
- a) A-B attractive force is greater than A-A and B-B
 - b) A-B attractive force is less than A-A and B-B
 - c) A-B attractive force remain same as A-A and B-B
 - d) volume of solution is different from sum of volume of solute and solvent
- 34) The average osmotic pressure of benzoic acid is 7.8 bar at 37°C . What is the concentration of aqueous KCl solution that could be used in blood stream ?

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- a) 0.16 mol L^{-1}
- b) 0.32 mol L^{-1}
- c) 0.60 mol L^{-1}
- d) 0.45 mol L^{-1}
- 35) 2.5 litres of 1 M NaOH solution is mixed with 3.0 litres of 0.5 M NaOH solution. The molarity of resulting solution is
- a) 0.80 M
- b) 1.0 M
- c) 0.73 M
- d) 0.50 M
- 36) Identify the mixture that shows positive deviation from Raoult's law
- a) $\text{CHCl}_3 + (\text{CH}_3)_2\text{CO}$
- b) $(\text{CH}_3)_2\text{CO} + \text{C}_6\text{H}_5\text{NH}_2$
- c) $\text{CHCl}_3 + \text{C}_6\text{H}_5$
- d) $(\text{CH}_3)_2\text{CO} + \text{CS}_2$
- 37) The boiling point of an azeotropic mixture of water and ethanol is less than that of water and ethanol. The mixture shows
- a) no deviation from Raoult's law
- b) positive deviation from Raoult's law
- c) negative deviation from Raoult's law
- d) that the solution is unsaturated
- 38) When a small amount of FeCl_3 is added to a freshly precipitated $\text{Fe}(\text{OH})_3$ a reddish brown colloidal solution is obtained. This phenomenon is known as

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- a) dialysis
 - b) peptization
 - c) protection
 - d) dissolution
- 39) The potential difference between the fixed charged layer and the diffused layer having opposite charge is called
- a) zeta potential
 - b) electrokinetic potential
 - c) both (1) and (2)
 - d) streaming potential
- 40) If the dispersed phase is a liquid and the dispersion medium is solid, the colloid is known as a / an
- a) sol
 - b) emulsion
 - c) gel
 - d) foam
- 41) The langmuir adsorption isotherm is deduced using the assumption
- a) the adsorption sites are equivalent in their ability to absorb the particles
 - b) the heat of adsorption varies with coverage
 - c) the adsorption takes place in multilayers
 - d) the adsorbed molecules interact with each other
- 42) Which of the following is an application of adsorption?

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- a) Formation of delta
- b) Smoke precipitation by cottrell precipitator
- c) Artificial rain by spraying electrified sand
- d) Decolourisation of sugar solution
- 43) Which of the following is capable of forming micelles in aqueous solution above certain concentration ?
- a) Sucrose
- b) Fructose
- c) Acetic acid
- d) Sodium palmitate
- 44) The volume of a colloidal particle, V_c as compared to the volume of a solute particle in a true solution V_s could be
- a) ~ 1
- b) $\sim 10^{23}$
- c) $\sim 10^{-3}$
- d) $\sim 10^3$
- 45) The volume of gases H_2 , CH_4 , CO_2 and NH_3 adsorbed by 1 g of activated charcoal at 298 K are in the order:
- a) $H_2 > CH_4 > CO_2 > NH_3$
- b) $CH_4 > CO_2 > NH_3 > H_2$
- c) $CO_2 > NH_3 > H_2 > CH_4$
- d) $NH_3 > H_2 > CH_4 > CO_2$
- 46) The action of enzymes in living system is to :

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- a) supply energy to tissues
 - b) create immunity
 - c) circulate oxygen
 - d) enhance the rate of biochemical reactions
- 47) Which of the following is not an ore of iron?
- a) Limonite
 - b) Magnetite
 - c) Carnallite
 - d) none of these
- 48) Auto reduction process is used for the extraction of
- a) Hg
 - b) Pb
 - c) Cu
 - d) All
- 49) As we move down the blast furnace, the temperature
- a) first decreases then increases
 - b) increases
 - c) decreases
 - d) first increases then decreases
- 50) An ore / mineral which does not contain sulphur is:
- a) galena
 - b) cinnabar

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- c) argentite
d) fluorite
- 51) Bone black is a polymorphic form of :
- a) phosphorus
b) sulphur
c) carbon
d) nitrogen
- 52) XeF_4 and XeF_6 are expected to be
- a) oxidizing
b) reducing
c) unreactive
d) strongly basic
- 53) The crystalline forms of carbon are
- a) Diamond and graphite
b) Diamond and charcoal
c) Graphite and lamp black
d) Bone charcoal and fullerenes
- 54) Which form has maximum percentage of carbon ?
- a) Lignite
b) Bituminous
c) Peat
d) Anthracite

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- 55) How is H_2S prepared in laboratory ?
- $\text{FeSO}_4 + \text{H}_2\text{SO}_4$
 - $\text{FeS} + \text{dil. H}_2\text{SO}_4$
 - $\text{FeS} + \text{conc. H}_2\text{SO}_4$
 - Elementary H_2 + elementary S
- 56) The gas that turns lime water milky is / are
- CO_2
 - SO_2
 - Both 1 and 2
 - None of these
- 57) The compound which gives off oxygen on moderate heating is
- cupric oxide
 - mercuric oxide
 - zinc oxide
 - aluminium oxide
- 58) Inorganic graphite is
- $\text{B}_3\text{N}_3\text{H}_6$
 - B_3N_3
 - P_4S_3
 - $\text{Fe}(\text{CO})_5$
- 59) Active charcoal is a good catalyst because it :
- is made up of carbon atoms
 - is very reactive

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- c) has more adsorption power
- d) has inert nature towards reagent
- 60) The magnetic moment of transition metal of 3d-series is 6.92 BM. Its electronic configuration would be :
- a) $3d^44s^2$
- b) $3d^54s^1$
- c) $3d^6$
- d) $3d^54s^0$
-

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SECTION -C: MATHEMATICS

This section contains **30 Multiple Choice Questions**. Each question has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

61) If $f(x) = \frac{x-1}{x+1}$, then $f(2x)$ is :

- a) $\frac{f(x)+1}{f(x)+3}$
- b) $\frac{3f(x)+1}{f(x)+3}$
- c) $\frac{f(x)+3}{f(x)+1}$
- d) $\frac{f(x)+3}{3f(x)+1}$

62) If $g(x) = x^2 + x - 2$ and $\frac{1}{2}(g \circ f)(x) = 2x^2 - 5x + 2$, then $f(x)$ is equal to :

- a) $2x - 3$
- b) $2x + 3$
- c) $2x^2 + 3x + 1$
- d) $2x^2 - 3x - 1$

63) If A and B are two invertible matrices, then the inverse of AB is:

- a) AB
- b) BA
- c) $A^{-1}B^{-1}$
- d) $B^{-1}A^{-1}$

64) If $f(x) = \begin{vmatrix} 2\cos x & 1 & 0 \\ 1 & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$, then $f\left(\frac{\pi}{3}\right)$ is equal to :

- a) -5
- b) -4
- c) -3

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d) -1

65) If $D = \text{diag. } (d_1, d_2, d_3, \dots, d_n)$ where $d_i \neq 0$ for all $i = 1, 2, \dots, n$, then D^{-1} is equal to:

a) $\text{diag. } (d_1^{-1}, d_2^{-1}, \dots, d_n^{-1})$

b) D

c) I_n

d) 0

66) If the value of the determinant $\begin{vmatrix} x+1 & 1 & 1 \\ 2 & x+2 & 2 \\ 3 & 3 & x+3 \end{vmatrix}$ is equal to zero, then x is:

a) 0 and -6

b) 0 and 6

c) 0

d) -6

67) If A and B are symmetric matrices of order n ($A \neq B$), then

a) $A + B$ is skew symmetric

b) $A + B$ is symmetric

c) $A + B$ is a diagonal matrix

d) $A + B$ is a zero matrix

68) The range of the function $f(x) = \frac{1}{\sqrt{x - [x]}}$ is :

a) $[1, \infty)$

b) $(1, \infty)$

c) $(-\infty, 1)$

d) \mathbb{R}

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69) The range of the function $f(x) = 1 + x - [x - 2]$ is :

- a) (3, 4]
- b) (4, 3)
- c) [3, 4)
- d) (3, 4)

70) If $f(x) = \tan x$, $-\frac{\pi}{2} < x < \frac{\pi}{2}$ and $g(x) = \sqrt{1-x^2}$, then domain of $f \circ g$ is:

- a) $[-\frac{\pi}{4}, \frac{\pi}{4}]$
- b) $(-\frac{\pi}{2}, \frac{\pi}{2})$
- c) (-1, 1)
- d) [-1, 1]

71) $\lim_{x \rightarrow 0} \frac{x(e^{\sin x} - 1)}{1 - \cos x}$ is equal to :

- a) 1
- b) 0
- c) 2
- d) $\frac{1}{2}$

72) If $\lim_{x \rightarrow 0} \frac{a^x - x^a}{x^x - a^a} = -1$, then the value of a is :

- a) 1
- b) 0
- c) e
- d) none of these

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73) Let $f(x) = \begin{cases} \frac{\sin \pi x}{5x}, & x \neq 0 \\ k, & x = 0 \end{cases}$ if $f(x)$ is continuous at $x = 0$, then the value of k is :

- a) $\frac{\pi}{5}$
- b) $\frac{5}{\pi}$
- c) 1
- d) 0

74) If $f(x) = \frac{3x + \tan^2 x}{x}$ is continuous at $x = 0$, then $f(0) =$:

- a) 1
- b) 2
- c) 4
- d) 3

75) The value of $\lim_{x \rightarrow 0} \frac{(1 - \cos 2x) \sin 5x}{x^2 \sin 3x}$ is :

- a) $\frac{10}{3}$
- b) $\frac{3}{10}$
- c) $\frac{6}{5}$
- d) $\frac{5}{6}$

76) If $f(x) = x \sin \frac{1}{x}$, $x \neq 0$
 $= k$, $x = 0$ is continuous at $x = 0$, then the value of k is :

- a) 1
- b) -1
- c) 0
- d) 2

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77) If $\log_7 2 = m$, then $\log_{49} 28$ is equal to :

- a) $2(1 + 2m)$
- b) $\frac{1+2m}{2}$
- c) $\frac{2}{1+2m}$
- d) $1 + m$

78) If $f(x) = 4x^8$, then

- a) $f'(1/2) = f'(-1/2)$
- b) $f'(x) = f'(-1/2)$
- c) $f(-1/2) = f(1/2)$
- d) $f(1/2) = f'(-1/2)$

79) If $x = b \cos^{-1} \sqrt{\frac{y}{b}} + \sqrt{by - y^2}$ then $\frac{dy}{dx}$ is equal to:

- a) $\frac{\sqrt{by - y^2}}{2}$
- b) $-\frac{\sqrt{(by - y^2)}}{y}$
- c) $-\frac{y}{\sqrt{(by - y^2)}}$
- d) $\frac{y}{\sqrt{(by - y^2)}}$

80) The function $f(x) = \cos\left(\frac{\pi}{x}\right)$ is increasing in the interval:

- a) $(2n + 1, 2n), n \in \mathbb{N}$
- b) $\left(\frac{1}{2n+2}, \frac{1}{2n+1}\right), n \in \mathbb{N}$
- c) $\left(\frac{1}{2n+1}, 2n\right), n \in \mathbb{N}$
- d) none of these

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- 81) The normal to the curve $x = a(1 + \cos \theta)$, $y = a \sin \theta$ at ' θ ' always passes through a fixed point:
- (a, a)
 - (a, 0)
 - (0, a)
 - none of these
- 82) The abscissa of the point on the curve $ay^2 = x^3$, the normal at which cuts off equal intercepts, from the coordinates axis is:
- $\frac{2a}{9}$
 - $\frac{4a}{9}$
 - $-\frac{4a}{9}$
 - $\frac{2a}{9}$
- 83) If the function $f(x) = 2x^2 - kx + 5$ is increasing on $[1, 2]$ then k lies in the interval:
- $(-\infty, 4)$
 - $(4, \infty)$
 - $(-\infty, 8)$
 - $(8, \infty)$
- 84) If $x + y = 60$; $x, y > 0$, then maximum value of xy^3 is:
- 30
 - 60
 - $15(45)^3$
 - $45(15)^3$

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- 85) If $x = f(t)$ and $y = g(t)$, then $\frac{d^2y}{dx^2}$ is equal to :
- $\frac{g'(t)}{f''(t)}$
 - $\frac{g'(t)f'(t) - g(t)f''(t)}{(f'(t))^3}$
 - $\frac{g'(t)f'(t) - g(t)f''(t)}{(f'(t))^2}$
 - none of the above
- 86) If $x = a(\theta + \sin\theta)$, $y = a(1 + \sin\theta)$, then $\frac{dy}{dx}$ at $\theta = \frac{\pi}{3}$ is :
- $\frac{1}{3}$
 - 3
 - $\frac{\sqrt{3}}{2 + \sqrt{3}}$
 - $\frac{2 + \sqrt{3}}{\sqrt{3}}$
- 87) $\cos 2\theta + 2\cos\theta$ is always:
- greater than $-\frac{3}{2}$
 - less than or equal to $\frac{3}{2}$
 - greater than or equal to $-\frac{3}{2}$
 - none of these
- 88) The number of real solutions of $\tan^{-1} \sqrt{x(x+1)} + \tan^{-1} \sqrt{x^2 + x + 1} = \frac{\pi}{2}$ is :
- zero
 - one
 - two
 - infinite

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89) $\sin^{-1}\left(\frac{3}{5}\right) + \tan^{-1}\left(\frac{1}{7}\right) =$

- a) $\frac{\pi}{4}$
- b) $\frac{\pi}{2}$
- c) $\cos^{-1}\left(\frac{4}{5}\right)$
- d) π

90) $\cot\left[\cos^{-1}\left(\frac{7}{25}\right)\right]$

- a) $\frac{25}{24}$
- b) $\frac{25}{7}$
- c) $\frac{24}{25}$
- d) none of these

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ANSWER KEYS**Physics**

Q1: b Q2: b Q3: c Q4: c Q5: c Q6: a Q7: d Q8: a Q9: c Q10: b

Q11: c Q12: b Q13: b Q14: a Q15: b Q16: b Q17: b Q18: c Q19: d Q20: a

Q21: a Q22: a Q23: a Q24: a Q25: c Q26: c Q27: d Q28: c Q29: a Q30: d

Chemistry

Q31: b Q32: a Q33: c Q34: b Q35: c Q36: d Q37: b Q38: b Q39: c Q40: c

Q41: a Q42: d Q43: d Q44: d Q45: d Q46: d Q47: c Q48: d Q49: b Q50: d

Q51: a Q52: a Q53: a Q54: d Q55: b Q56: c Q57: b Q58: b Q59: c Q60: b

Mathematics

Q61: b Q62: a Q63: d Q64: d Q65: a Q66: a Q67: b Q68: b Q69: c Q70: d

Q71: c Q72: a Q73: a Q74: d Q75: a Q76: c Q77: b Q78: c Q79: b Q80: c

Q81: b Q82: b Q83: a Q84: c Q85: b Q86: a Q87: c Q88: c Q89: a Q90: d

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