BRILLIA TTTORIALS

ELITE/IIT 2013 PT2/PMC/(Main)Qns/10'12

B-MAT PART TEST-2

FOR OUR STUDENTS

TOWARDS

JOINT ENTRANCE EXAMINATION (MAIN), 2013

PHYSICS - MATHEMATICS - CHEMISTRY

Time: 3 Hours

QUESTION PAPER CODE



Maximum Marks: 360

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

INSTRUCTIONS: DO NOT BREAK THE SEALS ON THIS BOOKLET, AWAIT INSTRUCTIONS FROM THE INVIGILATOR

1.	. The Test Booklet consists of 90 questions. The maximum marks are 360 .					
2.	There are three parts in the question paper A, B, C consisting of Physics, Mathematics and Chemistry having 30 questions in each part of equal weightage. Each question is allotted 4(four) marks for each correct response.					
3.	Candidates will be awarded marks as stated above in instruction No. 2 for correct response of each question. ¹ / ₄ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.					
4.	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.	Use Blue/Black Ball Point Pen only for writing particulars / marking response on side-1 and side-2 of the Answer Sheet. Use of pencil is strictly prohibited.					
6.	No candidate is allowed to carry any textual material printed or written, bits of papers, pager, mobile phone, any electronic device etc; except the Admit Card inside the examination hall/room.					
Name		Enrollment No				
I hav shall	e read all the instructions and abide by them.		I have verified all the informations filled in by the Candidate.			
 Sign	ature of the Candidate		Signature of the Invigilator			



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PART A: PHYSICS

1. For what value of E the potential of A is equal to the potential of B?



2. A circular wire loop of radius R carries a total charge q distributed uniformly over its length. A small length x(<< R) of the wire is cut off. Find the electric field due to the remaining wire, at the centre of the ring.

(1)
$$\frac{qx}{4\pi^2\epsilon_0 R^3}$$
 (2) $\frac{qx}{8\pi^2\epsilon_0 R^3}$ (3) $\frac{3qx}{4\pi^2\epsilon_0 R^3}$ (4) $\frac{5qx}{8\pi\epsilon_0 R^3}$

- **3.** What is the density of ice if 0.11% of the volume of iceberg is projecting out of marine water of density 1.03 g cm^{-3} ?
 - (1) 0.98 g cm^{-3} (2) 0.85 g cm^{-3}
 - (3) 0.92 g cm^{-3} (4) 0.8 g cm^{-3}
- 4. Two closed organ pipes are sounded simultaneously. When length of the shorter pipe is 1.10 m long, 5 beats are produced. To restrict the beats to 3, to what length should the shorter pipe be adjusted? [velocity of sound in air is 340 m/s] and 12

$$\frac{12}{340} = 0.035$$
]

- (1) 1.04 m (2) 1.08 m (3) 1.16 m (4) 1.13 m
- 5. Figure below shows three identical springs. When a 4 kg wt. is hung on A, the spring shows an elongation of 1cm. When a weight of 6 kg is hung on B, the hook descends by



6. A sonometer wire, 65 cm long, is in resonance with a tuning fork of frequency n. If the length of the wire is decreased by 1 cm and is vibrated with the same tuning fork, 8 beats are heard per second. What is the value of n?

(1) 256 Hz (2)	384 Hz (3) 512 Hz	z (4) 480 Hz
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- 7. With what terminal velocity will an air bubble 0.8 mm in diameter move in a liquid column of viscosity $0.15 \text{ N} \text{s/m}^2$ and specific gravity 0.9? Density of air is 1.293 kg/m^3 .
 - (1) 0.27 cm/s (2) -0.31 cm/s
 - (3) -0.21 cm/s (4) 0.38 cm/s
- 8. The rate of flow of glycerine of density $1.25 \times 10^3 \text{ kg/m}^3$ through a conical section of a pipe, if the radii of its ends are 0.1 m and 0.04 m, is $6.43 \times 10^{-4} \text{ m}^3/\text{s}$. What is the pressure drop across its length? $\left[(0.128)^2 = 0.016\right]$



(1) 8 N/m^2 (2) 10 N/m^2 (3) 12 N/m^2 (4) 15 N/m^2

- **9.** Find the epoch of the simple harmonic motion obtained by combining the motions, namely $x_1 = 4.0 \sin(100\pi t)$ and $x_2 = 3.0 \sin\left(100\pi t + \frac{\pi}{3}\right)$.
 - (1) $\tan^{-1}(0.47)$ (2) $\tan^{-1}(0.38)$
 - (3) $\tan^{-1}(2.1)$ (4) $\tan^{-1}(3.2)$
- **10.** What would be the speed of rotation of the earth in order that a body on the equator loses half of its weight? [radius of the earth = 6400 km]
 - (1) 0.51×10^{-3} rad s⁻¹ (2) 0.62×10^{-3} rad s⁻¹ (3) 0.82×10^{-3} rad s⁻¹ (4) 0.98 rad s⁻¹
- 11. A body cools from 60°C to 50°C in 10 minutes. Find its temperature at the end of next 10 minutes, if room temperature is 25°C. Assume Newton's law of cooling to hold good.
 - (1) 38.5° C (2) 42.9° C (3) 47.1° C (4) 51.2° C

12. Find the ratio $\frac{\Delta Q}{\Delta W}$ in an isobaric process, given that the ratio of molar heat capacities $\frac{C_p}{C_v} = \gamma$ (1) $\frac{\gamma - 1}{\gamma}$ (2) $\frac{\gamma + 1}{\gamma}$ (3) $\frac{\gamma}{\gamma + 1}$ (4) $\frac{\gamma}{\gamma - 1}$

- 13. A point charge q_1 is held stationary at the origin. When the second charge is moved from point a to point b, the electric force on the charge does 4.2×10^{-8} J of work. What is the electric potential energy of the pair of charges when the second charge is at b, if the potential energy at point a is -6.4×10^{-8} J?
 - (1) -2.2×10^{-8} J (2) -10.6×10^{-8} J
 - (3) 8.2×10^{-8} J (4) -8.2×10^{-8} J
- 14. A block of mass m = 4 kg and charge $q = 50 \,\mu\text{C}$ is connected to a spring having a force constant $k = 100 \,\text{N/m}$. The block lies on a frictionless horizontal track and a uniform electric field $E = 5 \times 10^5 \,\text{V/m}$ acts on the system as shown in **figure**.



When the spring is unstretched, the block is released from rest. To what extent, does the spring extend from the equilibrium position after oscillation starts?

- (1) 0.25 m (2) 0.30 m
- (**3**) 0.45 m (**4**) 0.50 m
- 15. A thin liquid film formed between an inverted v-shaped wire and a light slider supports a weight of 1.5×10^{-2} N as shown in **figure**.



The weight of the slider is negligible. The length of each segment of the slider is 10 cm and $\hat{BCD} = 60^{\circ}$. What is the surface tension of the liquid?

- (1) 0.015 Nm^{-1} (2) 0.025 Nm^{-1}
- $(3) \ 0.035 \ \mathrm{Nm}^{-1} \qquad (4) \ 0.045 \ \mathrm{Nm}^{-1}$

- **16.** A carnot engine whose efficiency is 40%, takes in heat from a source maintained at a temperature of 500 K. If the heat rejected to the sink is 90 J what is the heat absorbed from the source?
 - (1) 110 J (2) 130 J (3) 150 J (4) 180 J
- 17. What is the intensity of sound whose intensity level is 40 dB?

(1)
$$10^{-6}$$
 Wm⁻²
(2) 10^{-7} Wm⁻²
(3) 10^{-8} Wm⁻²
(4) 10^{-9} Wm⁻²

- 18. In a thermodynamic process the pressure of a fixed mass of gas is changed in such a manner that the gas liberates 70 J of heat and 28 J of work is done on the gas. If the initial internal energy of the gas is 120 J, what is the final internal energy of the gas?
 - (1) 48 J (2) -58 J (3) -68 J (4) 78 J
- 19. A train approaching a hill at a speed of 40 km/hr sounds a whistle of frequency 580 Hz when it is at a distance of 1 km from the hill. A wind with a speed of 40 km/hr is flowing in the direction of motion of the train. What is the approximate frequency of the whistle as heard by an observer on the hill?
 - (1) 599 Hz (2) 482 Hz (3) 384 Hz (4) 282 Hz
- 20. In the figure shown below, find the effective capacitance of the capacitors.



(1) $0.8 \,\mu\text{F}$ (2) $0.6 \,\mu\text{F}$ (3) $0.4 \,\mu\text{F}$ (4) $0.2 \,\mu\text{F}$

21. A glass flask of volume 250 cm³ is just filled with mercury at 20°C. The temperature of the system is raised so that the volume of mercury flown out is 3.36 cm³. If the coefficient of volume expansion of glass is 12×10⁻⁶ (°C)⁻¹ and that of mercury is 18×10⁻⁵ (°C)⁻¹, what is the rise in temperature of the system?
(1) 100°C
(2) 90°C
(3) 80°C
(4) 70°C

- **22.** A battery of emf 1.4 V and internal resistance 2Ω is connected to a 100Ω resistor through an ammeter. The resistance of the ammeter is $\frac{4}{3}\Omega$. What is the resistance of the voltmeter if the ammeter reads 0.02 A?
 - (1) 500Ω (2) 400Ω (3) 300Ω (4) 200Ω
- 23. The **figure** given below shows a sinusoidal wave on a string. If the frequency of the wave is 150 Hz and the density of the wire is 7 g/cm, the average energy density in the string is



(1) 1120 J/m^3 (2) 284 J/m^3 (3) 184 J/m^3 (4) 2180 J/m^3

- 24. Resistance of a given wire is obtained by measuring the current flowing in it and the potential difference applied across it. The ammeter is calibrated into $\frac{1}{20}$ th of an ampere. The percentage error in the measurement of voltage is 3%. What is the error in the value of resistance of the wire?
 - (1) 6% (2) 8% (3) 10% (4) 12%
- **25.** A capacitor of capacitance C is fully charged by a 200V supply. It is then discharged through a small coil of resistance wire embedded in a thermally insulated block of specific heat $2.5 \times 10^2 \, \text{Jkg}^{-1} \text{K}^{-1}$ and of mass 0.1 kg. If the temperature of the block rises by 0.4K, find the value of C.

(1) $300 \,\mu\text{F}$ (2) $400 \,\mu\text{F}$ (3) $500 \,\mu\text{F}$ (4) $600 \,\mu\text{F}$

26. Refer to the carnot cycle of an ideal gas shown in the **figure.** Let W represent the work done by the system and Q the heat absorbed by the system. Consider the following relations.



- (a) $W_{a \rightarrow b} + W_{c \rightarrow d} > 0$
- (b) $W_{a \rightarrow b} + W_{b \rightarrow c} + W_{c \rightarrow d} + W_{d \rightarrow a} < 0$
- (c) $Q_{a \rightarrow b} + Q_{c \rightarrow d} < 0$
- (d) $Q_{a \rightarrow b} Q_{c \rightarrow d} > 0$

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Which of the above relations is/are true?

- (1) (a) and (b) only (2) (a) and (c) only
- (3) (a), (b) and (c) only (4) (a) and (d) only
- 27. Eight charged water drops each with a radius of 1 mm and a charge of 10^{-10} C merge into a single drop. What is the potential of the bigger drop?
 - (1) 3600 V (2) 3000 V (3) 2600 V (4) 2000 V
- **28.** Liquid is contained in a vessel having an orifice on its side, h metre below the level of liquid as shown in **figure.** The ground level is H meter below the water level. The liquid coming out of the orifice strikes the ground at a distance R metre. What is the maximum value of R?



29. The ratio of the balancing lengths corresponding to two cells are 3:1. The balancing length is ℓ_1 when the cells are connected to support each other. When they are connected so as to oppose each other the balancing length is ℓ_2 .

What will be the ratio of ℓ_1 and ℓ_2 ?

(1) 1:3 (2) 2:4 (3) 4:2 (4) 3:1

30. Figure below shows four plates each of area S and separated from one another by a distance d. What is the capacitance between A and B?



PART B: MATHEMATICS

31. If
$$\sum_{r=0}^{n} \frac{a_r}{x+r} = \frac{|n|}{x(x+1)(x+2)....(x+r)}$$
 then $\sum_{r=0}^{n} |a_r|$ is
(1) 2^n (2) $2^n - 1$ (3) 4^n (4) $4^n - 1$

32. If $\binom{n}{C_0} + \binom{n}{C_1} - \binom{n}{C_2} - \binom{n}{C_3} + \binom{n}{C_4} + \binom{n}{C_5} - \binom{n}{C_6} - \binom{n}{C_7} + \dots = 0$ then n may be (1) 50 (2) 52 (3) 53 (4) 47

33. An ellipse is represented by the equation $\frac{x^2}{25} + \frac{y^2}{16} = 1$. A hyperbola which is confocal with the above ellipse is such that the length of its transverse axis is equal to the semi-minor axis of the ellipse. Then the sum of the abscissae of the feet of the perpendiculars from a common point of the two curves to their corresponding directrices is

(1) $\frac{29}{3}$ (2) $\frac{28}{3}$ (3) 9 (4) none of these

34. If z is a complex number such that $3 \le |z| \le 5$ and if $\ell \le |z + \frac{1}{z}| \le m$ then the value of $3\ell + 5m$ is

(1) 32 **(2)** 34 **(3)** 36 **(4)** 38

35. If the roots of $x^5 + x^2 + 1 = 0$ are $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ and $g(x) = x^2 - 1$ then the value of $g(\alpha_1) g(\alpha_2) g(\alpha_3) g(\alpha_4) g(\alpha_5) - 20 g(\alpha_1 \alpha_2 \alpha_3 \alpha_4 \alpha_5)$ is

(1) 23 (2) 24 (3) 25 (4) none of these

36. F₁ and F₂ are the foci of the ellipse represented by $\frac{4x^2}{361} + \frac{y^2}{b^2} = 1$ where $b < \frac{19}{2}$. If

P is a point of intersection of the ellipse and the circle on $F_1 F_2$ as diameter, such that area of triangle $F_1 P F_2$ is 35 sq units, then $(F_1 F_2)$ is

- (1) 15 (2) $\sqrt{221}$ (3) $\sqrt{224}$ (4) 14
- **37.** AB is a diameter of the rectangular hyperbola given by xy = 16, then the locus of the point of intersection of the tangent at A and a line parallel to either of the asymptotes through B is

(1)
$$xy - 32 = 0$$
 (2) $xy + 22 = 0$ (3) $xy - 48 = 0$ (4) $xy + 48 = 0$

38. The digit at the unit place of $2^{9^{100}}$ is

(1) 2 **(2)** 4 **(3)** 6 **(4)** 8

- **39.** A five digit number divisible by 15 is to be formed by using 0, 1, 2, 3, 4, 5 (no two digits being repeated). The number of such numbers is
 - **(1)** 24 **(2)** 18 **(3)** 66 **(4)** 120

40. If a square matrix A is such that $A^2 = A$ and I is unit matrix of the same order and $(I + A)^3 = I + \lambda A$ then value of λ is

(1) 5 (2) 6 (3) 7 (4) 4

41. Tangents PA, PB are drawn to the circle $x^2 + y^2 = r^2$, from a point P which lies on ax + by + c = 0, then the locus of the circumcentre of triangle APB is

- (1) ax + by c = 0 (2) 2ax + 2by c = 0
- (3) 2ax + 2by + c = 0 (4) ax + by r = 0

42. A parabola touches x and y axes at $A\left(\frac{50}{3}, 0\right), B\left(0, \frac{50}{4}\right)$. Then its focus is

(1) (0, 0) (2) (8, 6) (3) (6, 8) (4) (2, 4)

43. If α and β , $(\alpha < \beta)$ are the roots of the equation $2x^2 - 20x + \lambda = 0$ such that $4 < \alpha < 5$ and $5 < \beta < 6$, then λ can be

(1) 48 **(2)** 49 **(3)** 50 **(4)** 51

44. The sum of the possible integral solutions of the inequation $|x^2 - 6x + 8| \le 4 - x$ is

- **(1)** 6 **(2)** 9 **(3)** 8 **(4)** 12
- **45.** The number of terms with rational coefficients in the expansion of $(\sqrt[3]{5x} + \sqrt[2]{3y} + z)^6$ is
 - (1) 6 (2) 7 (3) 8 (4) 9
- **46.** A, B, C are the 3 players among the 11 players selected for a cricket match. B refuses to bat before A. C refuses to bat before B, and also to bat as a last batsman. The number of batting order is
 - (1) |8 (2) 3|8 (3) |3|8 (4) |5|8

47. If the equations $ax^2 + bx + c = 0$ and $px^2 + qx + r = 0$ have a root in common, and the other root of the second equation is the square of the other root of the first equation, then $\frac{pc^2}{ra} + \frac{ra^2}{pc}$ is equal to (1) q (2) - q (3) b (4) - b The number of such numbers is

non zero digits (without repetition).

(1) 720 **(2)** 960 **(3)** 600 (4) none of these 49. The locus of the image of $\left(\frac{1}{4},3\right)$ on the family of lines represented by $(x+3y-7) + \mu (4x-y-2) = 0$ is (1) a straight line (2) a parabola (3) a circle (4) an ellipse **50.** If $\cos^4 \alpha - \sin^4 \alpha + 3$ and $\cos^2 \alpha - \sin^2 \alpha + 5$ are the roots of $x^2 - 7x + \lambda = 0$ for some α , then the value of λ is (1) $\frac{45}{4}$ (2) $\frac{35}{4}$ (3) $\frac{25}{4}$ (4) 15 **51.** If x, y, $z \in R$ and the matrix $\begin{pmatrix} x & y & z \\ y & z & x \\ z & x & y \end{pmatrix}$ is orthogonal, then the value of $x^{3} + v^{3} + z^{3} - 3xvz$ is (2) - 1 only (1) 1 only $(3) \pm 1$ (4) none of these 52. The number of positive terms in the expansion of $(1-2x+x^2)^{2n}(1+x+x^2)^{4n}$ where x is positive is (1) 2n + 1(3) 2n + 2(4) none of these (2) 2n **53.** Value of $C_1^2 + 2 \cdot C_2^2 + 3 \cdot C_3^2 + \dots 30 \cdot C_{30}^2$ where $C_r = 30_{C_r}$ $r = 0, 1, 2, \dots 30$ is (2) $30.59_{C_{21}}$ (3) $20.59_{C_{20}}$ (1) $29 \cdot 59_{C_{21}}$ (4) none of these **54.** If A, and B are square matrices such that AB = B and BA = A then $A^3 + B^3$ is **(3)** $A^3 B^3$ **(4)** 3 (A + B)(1) A + B(2) 0 **55.** If z is a complex number such that $8iz^3 + 12z^2 - 18z + 27i = 0$ where $i = \sqrt{-1}$ then 4|z| is **(2)** 4 (1) 3 (3) 6 (4) none of these

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56. If z is a complex number such that $|z-1| \le 1$ and $|z-2| \le 1$ then the maximum possible value of $|z|^2$ is

(1) 5 (2) 3 (3) 4 (4) none of these
57. If
$$\begin{vmatrix} 1^{2}C_{3} & 1^{2}C_{4} & 1^{3}C_{n} \\ 1^{3}C_{5} & 1^{3}C_{6} & 1^{4}C_{n+2} \\ 1^{4}C_{7} & 1^{4}C_{8} & 1^{5}C_{n+4} \end{vmatrix} = 0$$
 then the value of n is
(1) 4 (2) 5 (3) 6 (4) 8
58. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$ then det (Adj (Adj A)) is
(1) 12^{4} (2) 13^{4} (3) 14^{3} (4) 14^{4}

59. z_1 and z_2 be two complex numbers represented by the points P and Q in the Argand diagram and O is the origin. Further $OP = OQ, |POQ = \frac{\pi}{3}$ and z_1 and z_2 are the roots of the equation $z^2 + pz + q = 0$ where p and q may be constants then q is

(1) $3p^2$ (2) $2p^2$ (3) p^3 (4) $5p^2$

60. If $log_2 3 = x$, $log_3 5 = y$ and $z = log_7 2$ then $log_{42} 70$ is

(1)
$$\frac{z + yz + 1}{x + yz + 1}$$
 (2) $\frac{z + xyz + 1}{z + xz + 1}$ (3) $\frac{z + xz + 1}{x + zx + 1}$ (4) none of these

PART C: CHEMISTRY

- **61.** Which one of the following is the correct order of acidic strengths?
 - (1) $CF_3COOH > CHC\ell_2 COOH > HCOOH > C_6 H_5 CH_2COOH > CH_3COOH$
 - (2) $CH_3COOH > HCOOH > CF_3COOH > CHC\ell_2COOH > C_6H_5CH_2COOH$
 - (3) $HCOOH > C_6H_5CH_2COOH > CF_3COOH > CHC\ell_2COOH > CH_3COOH$
 - (4) $CF_3COOH > CH_3COOH > HCOOH > CHC\ell_2COOH > C_6H_5CH_2COOH$
- **62.** What will be the mass of 90% pure MnO_2 to produce 35.5g of $C\ell_2$ according to the following reaction?

 $MnO_2 + 4 HC\ell \rightarrow MnC\ell_2 + C\ell_2 + 2H_2O$

(1) 43.5 g (2) 57.5 g (3) 48.3 g (4) 51.7 g

63. The geometry of $Ni(CO)_4$ and $Ni(CN)_4^{-2}$ are

- (1) Both square planar
- (2) Both tetrahedral
- (3) Tetrahedral and Square planar respectively
- (4) Square planar and Tetrahedral respectively
- **64.** The bond enthalpies of H-H, $C\ell-C\ell$, and $H-C\ell$ are 435, 243, and 431 kJ mo ℓ^{-1} respectively. The enthalpy of formation of $HC\ell_{(g)}$ will be:
 - (1) 92 kJ mol^{-1} (2) -92 kJ mol^{-1}
 - (3) 247 kJ mol^{-1} (4) 770 kJ mol^{-1}
- **65.** $K_2[HgI_4]$ detects the ion/group
 - (1) NH_2^- (2) NO_3^- (3) NH_4^+ (4) $C\ell^-$
- 66. For a reaction to occur spontaneously,
 - (1) $(\Delta H T\Delta S)$ must be negative
 - (2) $(\Delta H + T\Delta S)$ must be negative
 - (3) ΔH must be negative
 - (4) ΔS must be negative.
- 67. Freezing point of an aqueous solution is $(-0.186)^{\circ}C$. Elevation of boiling point of the same solution is $(K_b \ and \ K_f \ of water is 0.512 \ and 1.86 \ K \ kg \ mol^{-1})$.

(1) 0.186° C (2) 0.0512° C (3) 0.092° C (4) 0.2372° C

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68. Which is correct in the case of $\left[\operatorname{Fe}(\operatorname{CN})_{6}\right]^{4-}$ complex?						
(1) Diamagnetic	(2) Octahedral					
(3) $d^2 sp^3$ hybridisation	(4) All are correct					
69. Complete hydrolysis of cellulose gives						
(1) D-Glucose and D-fructose	(2) D-Glucose					
(3) L-glucose	(4) D-fructose					
70. Copper crystallises in fcc lattice with a unit cell length of 361pm. What is the radius of copper atom?						
(1) 108 pm	(2) 127 pm					
(3) 157 pm	(4) 181 pm					
71. Ethylene can be separated from acetylene by passing the mixture through						
(1) fuming H_2SO_4	(2) pyrogallol					
(3) ammoniacal $Cu_2C\ell_2$	(4) charcoal powder					
72. One mole of an ideal gas expands at a constant temperature of 300 K from an initial volume of 10 litres to a final volume of 20 litres. The work done in expanding the gas is						
(1) 750 Joule	(2) –1729 Joule					
(3) –1500 Joule	(4) 3456 Joule					
73. Sodium metal in liquid ammonia is strongly reducing due to the presence of following in the solution.						
(1) Sodium atoms	(2) Solvated electrons					
(3) Sodium hydride	(4) Sodium amide					
74. 25 m ℓ of a solution of barium hydroxide on titration with a 0.1 molar solution of hydrochloric acid gave the titre value of 35 m ℓ . The molarity of barium hydroxide solution was						

	(1) 0.07	(2) 0.14	(3) 0.28	(4) 0.35
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- 75. Which one of the following characteristics is **not correct** for physical adsorption?
 - (1) adsorption on solids is reversible
 - (2) adsorption increases with increase in temperature
 - (3) adsorption is spontaneous.
 - (4) both enthalpy and entropy of adsorption are negative
- **76.** An organic compound having molecular mass 60 is found to contain C = 20%, H = 6.67% and N = 46.46% while rest is oxygen. On heating it gives NH_3 alongwith a solid residue. The solid residue give violet colour with alkaline copper sulphate solution. The compound is
 - (1) $CH_3CH_2CONH_2$ (2) $(NH_2)_2CO$
 - $(3) CH_3CONH_2 \qquad (4) CH_3NCO$
- 77. IUPAC name of camphor is



- (1) $6 \infty 1, 2, 2$ -trimethylbicyclo [2, 2, 1] heptane
- (2) 1, 7, 7-trimethylbicyclo [2, 2, 1] heptan-2-one
- (3) 1, 5, 5-trimethylbicyclo [2, 7, 1] hexan-2-one
- (4) 1, 7, 7-trimethylbicyclo [2, 1, 2] heptan-2-one
- 78. For the reversible reaction $N_2(g)+3H_2(g) \Longrightarrow 2NH_3(g)$ at 500°C. The value of K_p is 1.44×10^{-5} , when partial pressure is measured in atmospheres. The corresponding value of K_c with concentration in mol L^{-1} is
 - (1) $1.44 \times 10^{-5} / (0.082 \times 500)^{-2}$ (2) $1.44 \times 10^{-5} / (8.314 \times 773)^{-2}$ (3) $1.44 \times 10^{-5} / (0.082 \times 500)^{2}$ (4) $1.44 \times 10^{-5} / (0.082 \times 773)^{-2}$
- **79.** In this reaction
 - $2\mathrm{Ag}+2\mathrm{H}_2\mathrm{SO}_4\rightarrow\mathrm{Ag}_2\,\mathrm{SO}_4+2\mathrm{H}_2\mathrm{O}+\mathrm{SO}_2$

the sulphuric acid acts as

- (1) Oxidizing agent (2) Reducing agent
- (3) Catalyst (4) Acid as well as oxidant.

80. State of hybridisation of carbon atom of carbone in the singlet state is

- (1) sp^2 (2) sp
- (3) sp^3 (4) None of the above

81. Which of the following will most readily be dehydrated in acidic solutions?



82. A bond with maximum covalent character between non-metallic elements is found

- (1) Between atoms of same size
- (2) Between chemically dissimilar atoms
- (3) Between identical atoms
- (4) Between atoms of widely differing electronegativities

83. At the isoelectric point, aminoacids are present as

- (1) $H_2N CHR COOH$ (2) $NH_3 CHR COO^-$
- (3) $NH_2 CHR COO^-$ (4) $NH_4^+ CHR COO^-$

84.
$$\begin{array}{c} SF_4 \xrightarrow{Hydrolysis} A + B \\ A + H_2 S \rightarrow C \end{array}$$

The product 'C' of the above reactions is

- (1) Solid sulphur (2) Colloidal sulphur
- (3) SO₃ (4) Gaseous sulphur
- 85. Two oxides of a metal contain 36.4% and 53.4% of oxygen by mass respectively. If the formula of the first oxide is M_2O , then that of the second is
 - (1) M_2O_3 (2) MO (3) MO_2 (4) M_2O_5

86. The transition metal ion that has 'spin-only' magnetic moment value of 5.916 BM is

(1) Mn^{2+} (2) Fe^{2+} (3) V^{2+} (4) Cu^{2+}

- 87. Which one of the following is not a greenhouse gas?
 - (1) Methane (2) Ozone (3) Carbon dioxide (4) Nitrogen
- **88.** In which one of the following reactions, the yield of the product decreases by increasing the pressure?
 - (1) $2SO_2(g) + O_2(g) \Longrightarrow 2SO_3(g)$
 - (2) $N_2(g) + 3H_2(g) \Longrightarrow 2NH_3(g)$
 - (3) $PC\ell_{5}(g) \Longrightarrow PC\ell_{3(g)} + C\ell_{2}(g)$
 - (4) $N_{2(g)} + O_{2(g)} \Longrightarrow 2NO(g)$

89. Which of the following nitrates on strong heating leaves the metal as the residue?

- (1) AgNO₃ (2) Pb(NO₃)₂ (3) Cu(NO₃)₂ (4) Al(NO₃)₃
- 90. Mendius reaction converts an alkyl cyanide to
 - (1) a primary amine(2) an aldehyde(3) a ketone(4) an oxime

READ THE FOLLOWING INSTRUCTIONS CAREFULLY

- 1. The candidates should fill in the required particulars on the Test Booklet and Answer Sheet (*Side-1*) with *Blue/Black Ball Point Pen*.
- 2. For writing/marking particulars on Side-2 of the Answer Sheet, use *Blue/Black Ball Point Pen* only.
- **3.** The candidates should not write their Roll Numbers anywhere else (except in the specified space) on the Test Booklet/Answer Sheet.
- 4. Out of the four options given for each question only one option is the correct answer.
- 5. For each incorrect response, one-fourth of the total marks allotted to the question would be deducted from the total score. No deduction from the total score, however, will be made if no response is indicated for an item in the Answer Sheet.
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- 8. On completion of the test, the candidates must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. However, the candidates are allowed to take away this Test Booklet with them.
- 9. Each candidate must show on demand his/her Admit Card to the Invigilator.
- 10. No candidate, without special permission of the Superintendent or Invigilator, should leave his/her seat.
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