JEECUP 2024 Group A Polytechnic Question Paper

Time Allowed :2 Hours 30 Mins	**Maximum Marks :**400	**Total Questions :**100

General Instructions

Read the following carefully and follow them strictly:

1. The paper consists of **100 multiple-choice questions (MCQs)**. For each correct answer, **+4 marks** will be awarded, and for each incorrect answer,**-1 mark** will be deducted.
2. If a candidate fills more than one circle for a question, the answer will be considered **invalid**.
3. The OMR answer sheet instructions will be given separately. Follow these instructions carefully, and ensure that all entries and circles are filled with a **ballpoint pen**.
4. Candidates must follow all instructions given by the **Centre Superintendent, Invigilator, or Board Authorities**. Failure to do so, or engaging in misconduct, such as tearing the question paper, exchanging written materials, or assisting others, will result in cancellation of the exam.
5. The use of **log tables, electronic calculators, pagers, mobile phones, and slide rules** is strictly prohibited during the examination.
6. The answer sheet should be filled carefully with a **ballpoint pen**. Make sure to mark the correct answer, as no changes will be allowed once the circle is filled.
7. After the examination, candidates may keep the question paper, but the answer sheet should be submitted as per the instructions.

MATHEMATICS

1. The perimeter of an equilateral triangle whose area is $4\sqrt{3}$ cm^2 is equal to
(A) 20 cm
(B) 10 cm
(C) 15 cm
(D) 12 cm

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2. $\tan 3A - \tan 2A - \tan A$ **is equal to**
(A) $\tan 3A - \tan 2A - \tan A$
(B) $\tan 3A + \tan 2A + \tan A$
(C) $\tan 3A \tan 2A \tan A$
(D) None of these

3. The value of $\sqrt[3]{\frac{72.9}{0.4096}}$ is
(A) 5.625
(B) None of these
(C) 5.652
(D) 5.265

---

4. If 7 is the mean of $5, 3, 0.5, 4.5, a, 8.5, 9.5$ then the value of 'a' is
(A) 49
(B) 18
(C) 31
(D) 12

---

5. The value of $\sin\theta + \cos(90^\circ + \theta) + \sin(180^\circ - \theta) + \sin(180^\circ + \theta)$ is
(A) 0
(B) -1
(C) 1
(D) $\frac{1}{2}$

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6. The volume of a cuboid is $x^3 - 7x + 6$, then the longest side of cuboid is
(A) None of these
(B) $x - 1$
(C) $x + 3$
(D) $x - 2$

---

7. If $5\sqrt{5} \times 5^3 \div 5^{-3/2} = 5^{a+2}$ then the value of a is
(A) 8
(B) 5
(C) 6
(D) 4

---

8. The value of $\sqrt{\frac{1+\sin x}{1-\sin x}}$ is
(A) $\tan x - \sec x$
(B) $\sec x - \tan x$

(C) $\sec x \tan x$
(D) $\sec x + \tan x$

---

9. If $2^x = 5^y = 10^{-z}$, then the value of $\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right)$ is
(A) 3
(B) 5
(C) 0
(D) -2

---

10. The volume of cylinder is 448π cm^3 and height 7 cm. Then its lateral surface area is
(A) 259 cm^2
(B) 352 cm^2
(C) 252 cm^2
(D) None of these

---

11. The value of $\tan 15^\circ$ is
(A) $2 - \sqrt{3}$
(B) $\frac{2}{\sqrt{3}}$
(C) $\frac{1}{2\sqrt{3}}$
(D) $2 + \sqrt{3}$

---

12. The value of $\frac{\cos 20^\circ \cos 70^\circ - \sin 20^\circ \sin 70^\circ}{\sin 70^\circ}$ is
(A) ∞
(B) None of these
(C) 1
(D) 0

---

13. Ravi can do $3/4$ of a work in 12 days. In how many days Ravi can finish the $1/2$ work?
(A) 7 days
(B) None of these
(C) 8 days
(D) 6 days

14. The L.C.M. of $12x^2y^3z^2$ and $18x^4y^2z^3$ is
(A) $21xyz$
(B) $36x^4y^3z^3$
(C) $24x^4y^2z^2$
(D) $32x^4yz^3$

---

15. Vertex of a triangle are $(4, 6), (2, -2)$ and $(0, 2)$, then co-ordinates of its centroid must be
(A) $(2, 3)$
(B) $(1, 2)$
(C) $(-2, 2)$
(D) $(2, 2)$

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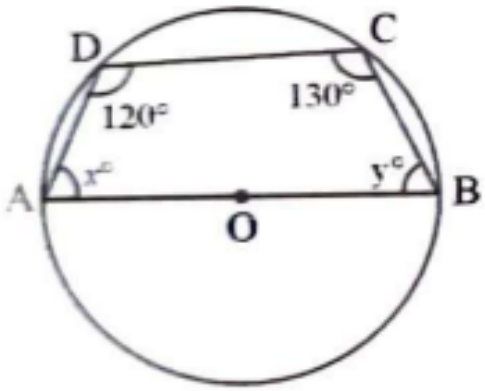
16. Use the following figure to find x° and y°



(A) $x = 50°, y = 30°$
(B) $x = 30°, y = 50°$
(C) $x = 50°, y = 60°$
(D) $x = 55°, y = 65°$

---

17. If the ratio of volumes of two spheres is $1 : 8$, then the ratio of their surface areas is
(A) $1 : 6$
(B) $1 : 2$
(C) $1 : 4$
(D) $1 : 8$

18. The compound interest on $24,000$ compounded semi-annually for $1\frac{1}{2}$ years at the rate of 10% per annum are
(A) $3,783$
(B) $3,774$
(C) $3,583$
(D) $3,780$

---

19. The sum of two numbers is 11 and their product is 30, then the numbers are
(A) 8, 3
(B) 7, 4
(C) 6, 5
(D) 9, 2

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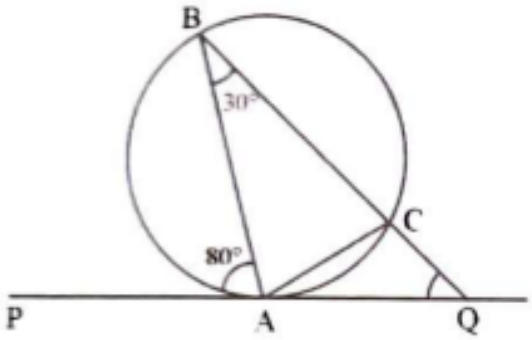
20. In figure $\angle BAP = 80°$ and $\angle ABC = 30°$, then $\angle AQC$ will be



(A) $55°$
(B) $110°$
(C) $50°$
(D) $65°$

---

21. Two straight lines $3x - 2y = 5$ and $2x + ky + 7 = 0$ are perpendicular to each other. The value of k is
(A) $\frac{1}{3}$
(B) $\frac{4}{3}$
(C) $\frac{3}{2}$
(D) 3

---

22. A Verandah of area 90 m^2 is around a room of length 15 m and breadth 12 m.

The width of the Verandah is
(A) 1.5 m
(B) 2 m
(C) 2.5 m
(D) 1 m

---

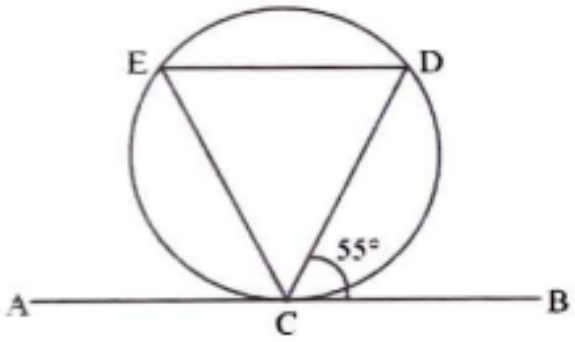
23. If points $(5, 5), (10, k)$ and $(-5, 1)$ are collinear. Then the value of k is
(A) 9
(B) 6
(C) 8
(D) 7

---

24. The value of $\log_5\left(\frac{1}{125}\right)$ is
(A) 5
(B) 3
(C) -3
(D) 0

---

25. In the given figure, the value of $\angle DEC$ is



(A) 65°
(B) 75°
(C) 55°
(D) 45°

---

26. The factor of $(a^4b^4 - 16c^4)$ is
(A) $(a^2b^2 - 4c^2)^2(ab + 2c)(ab + 4c)$
(B) $(a^2b^2 - 4c^2)(ab + 2c)^2$
(C) $(a^2b^2 + 4c^2)(ab + 2c)(ab - 2c)$

(D) $4(a^2b^2 + c^2)(ab - 2c)(ab + 2c)$

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27. The Quadratic equation, whose roots are $\frac{4+\sqrt{7}}{2}$ and $\frac{4-\sqrt{7}}{2}$ is
(A) $4x^2 + 16x + 9 = 0$
(B) $4x^2 - 16x - 9 = 0$
(C) $4x^2 - 16x + 9 = 0$
(D) $4x^2 + 16x - 9 = 0$

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28. A train passes telegraph post in 40 seconds moving at a rate of 36 km/h. Then the length of the train is
(A) 400 m
(B) 395 m
(C) 500 m
(D) 450 m

---

29. If side of cube is 6 cm, then the diagonal of cube is
(A) $3\sqrt{2}$ cm
(B) $6\sqrt{3}$ cm
(C) $6\sqrt{2}$ cm
(D) $2\sqrt{3}$ cm

---

30. Angles of a triangle are in ratio of $1 : 5 : 12$, biggest angle of this triangle is
(A) $60°$
(B) $120°$
(C) $90°$
(D) $45°$

---

31. If $\sin x + \sin^2 x = 1$, then the value of $\cos^2 x + \cos^4 x$ is
(A) 1
(B) -1
(C) 2
(D) 0

---

32. The value of expression $\log \frac{14}{15} - \log \frac{3}{25} - \log \frac{7}{9}$ is
(A) 2
(B) 3
(C) 0
(D) 1

---

33. The solution of equation $y^{2/3} - 2y^{1/3} = 15$ is
(A) 25, 27
(B) $27, -125$
(C) $25, -27$
(D) $125, -27$

---

34. If $\tan(A + B) = \sqrt{3}$ and $\cos(A - B) = \frac{\sqrt{3}}{2}$, the values of A and B are
(A) $40°, 20°$
(B) $15°, 30°$
(C) $45°, 15°$
(D) $60°, 30°$

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35. The HCF of two polynomials $p(x) = 4x^2(x^2 - 3x + 2)$ and $q(x) = 12x(x - 2)(x^2 - 4)$ is $4x(x - 2)$. The LCM of polynomials is
(A) $4x(x - 2)$
(B) $12x^2(x^2 - 3x + 2)(x^2 + 4)$
(C) $x^2(x^2 - 3x + 2)(x^2 - 4)$
(D) $12x^2(x^2 - 3x + 2)(x^2 - 4)$

---

36. The value of $\frac{15}{\sqrt{10+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}}}$ is
(A) $\sqrt{5}(2 + \sqrt{2})$
(B) $\sqrt{5}(5 + \sqrt{2})$
(C) $\sqrt{5}(1 + \sqrt{2})$
(D) $\sqrt{3}(3 + \sqrt{2})$

---

37. Find equation of line passing through the two points $(3, 5)$ and $(-4, 2)$
(A) $3x - 7y + 26 = 0$
(B) $3x + 7y + 26 = 0$

(C) $7x - 3y + 26 = 0$
(D) $3x - 7y + 62 = 0$

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38. The area of circle whose circumference is equal to the perimeter of a square of side 11 cm is
(A) 134 cm^2
(B) 124 cm^2
(C) 144 cm^2
(D) 154 cm^2

---

39. The perpendicular distance between two parallel lines $3x + 4y - 6 = 0$ and $6x + 8y + 7 = 0$ is equal to
(A) 19/5 unit
(B) 10/19 unit
(C) 19/10 unit
(D) 19/2 unit

---

40. The length of sides of a triangle are in the ratio $3 : 4 : 5$ and its perimeter is 144 cm. The area of triangle is
(A) 764 cm^2
(B) 864 cm^2
(C) 664 cm^2
(D) 684 cm^2

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41. The earth makes a complete rotation about its axis in 24 h. What angle will it turn in 3 h 20 minutes?
(A) None of these
(B) $50°$
(C) $120°$
(D) $130°$

---

42. If $A = 4x + \frac{1}{x}$ then the value of $A + \frac{1}{A}$ is
(A) $\frac{1}{4x^3+x}$
(B) $\frac{4x^2+1}{x}$
(C) None of these

(D) $\frac{x}{4x^2+1}$

---

43. The median of the following data $25, 34, 31, 23, 22, 26, 35, 29, 20, 32$ **is**
(A) 22.5
(B) 29.5
(C) 30.5
(D) 27.5

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44. Find the value of complementary angle of $75°$
(A) $85°$
(B) $15°$
(C) $30°$
(D) $45°$

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45. If $\tan\theta + \sin\theta = m$ **and** $\tan\theta - \sin\theta = n$**. Then the value of** $m^2 - n^2$ **is**
(A) $\sqrt{mn}$
(B) $4mn$
(C) $2\sqrt{mn}$
(D) $4\sqrt{mn}$

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46. The value of $\left(x - \frac{2}{x}\right)\left(x^2 + 2 + \frac{4}{x^2}\right)$ **is equal to**
(A) $x^3 + 2x + \frac{4}{x} - 8$
(B) $x^3 - \frac{8}{x^3}$
(C) $x^3 + \frac{8}{x^3}$
(D) $x^3 - \frac{8}{x^2}$

---

47. The value of $x^{(\log y - \log z)} y^{(\log z - \log x)} z^{(\log x - \log y)}$ **is equal to**
(A) 0
(B) 3
(C) 5
(D) 1

---

48. A and B can do a piece of work in 72 **days. B and C in** 120 **days and A and C in** 90 **days. In what time can A alone do it?**

(A) 110 days
(B) 120 days
(C) 60 days
(D) 55 days

---

49. If $\left(x+\frac{1}{x}\right)=\sqrt{3}$, then the value of $\left(x^3+\frac{1}{x^3}\right)$ will be
(A) $3(\sqrt{3}+1)$
(B) $3\sqrt{3}$
(C) 0
(D) $3(\sqrt{3}-1)$

---

50. If $\sqrt{3x}-2=2\sqrt{3}+4$, then the value of x is
(A) $1+\sqrt{3}$
(B) $2(1+\sqrt{3})$
(C) $1-\sqrt{3}$
(D) $2(1-\sqrt{3})$

PHYSICS

51. Two resistances combines in series order provide 50 ohm resultant resistance and when it combines in parallel order provides 8 ohm resultant resistance. Then the value of each resistance.
(A) 21 ohm and 29 ohm
(B) 10 ohm and 40 ohm
(C) 20 ohm and 30 ohm
(D) 15 ohm and 35 ohm

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52. A ball is released from the top of a tower of height h meter. It takes T seconds to reach ground. What is the position of ball above the ground in $T/5$ seconds?
(A) $25h$ m
(B) $\frac{h}{25}$ m
(C) $24h$ m
(D) $\frac{24}{25}h$ m

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53. In an L-C-R circuit, 100 volt alternating voltage is applied between end points. In circuit inductive reactance is $X_L = 20$ ohm, capacitance reactance is $X_C = 20$ ohm and resistance is of 5 ohm. The impedance of circuit will be
(A) 20 ohm
(B) 5 ohm
(C) 15 ohm
(D) 45 ohm

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54. The capacitance of a capacitor is 3 μF. If 108 μC charge is available in it, then what will be potential difference between plates?
(A) 324 volt
(B) 224 volt
(C) 36 volt
(D) 24 volt

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55. One proton enters in a magnetic field of 2500 N/Amp $\cdot$ m intensity with velocity of 4×10^5 m/sec in parallel of field. The force exerted on proton will be
(A) 0 N
(B) 4.8×10^{-10} N
(C) 0.48×10^{-10} N
(D) 4.8×10^{10} N

---

56. 100 gm of water at 60°C is added to 180 gm of water at 95°C. The resultant temperature of mixture is
(A) 80°C
(B) 82.5°C
(C) 77.5°C
(D) 85°C

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57. Two unlike parallel forces 2 N and 16 N act at the ends of a uniform rod of 21 cm length. The point where the resultant of these two act is at a distance of from the greater force.
(A) 4 cm
(B) 3 cm
(C) 2 cm
(D) 1 cm

---

58. Magnetic flux of a 20 round coil is reduced to zero from 0.3 weber in one second then the induced e.m.f. between the terminal of coil
(A) 1.5 V
(B) 6 V
(C) 2.5 V
(D) 3 V

---

59. The electric field strength at a point in an electric field is 30 N/C. Find the force experienced by a charge of 20 C at that point
(A) 600 N
(B) 30 N
(C) 20 N
(D) 300 N

---

60. A particle is moving along a circular track of radius 1 m with a uniform speed. The ratio of the distance covered and the displacement in half revolution is
(A) $1 : 1$
(B) $\pi : 1$
(C) $2 : \pi$
(D) $\pi : 2$

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61. A car of mass 2000 kg is moving with a velocity of 18 km/h. Work done to stop this car is
(A) 2.5×10^6 joule
(B) 2.5×10^5 joule
(C) 2.5×10^4 joule
(D) 2.5×10^3 joule

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62. If radius of Earth shrinks by 4% and mass of Earth unchanged, then the value of acceleration due to gravity will be changed by
(A) 16%
(B) 8%
(C) 2%
(D) 4%

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63. A spherical mirror and a thin spherical lens each have a focal length of -15 cm. Nature of mirror and lens will be
(A) Both concave
(B) Mirror convex and lens concave
(C) Mirror concave and lens convex
(D) Both convex

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64. A stone is gently dropped from a height of 20 m. If its velocity increases uniformly at the rate of 10 m/s^2. With what velocity and after what time will it strike the ground?
(A) 20 m/s, 2 s
(B) 10 m/s, 20 s
(C) 10 m/s, 2 s
(D) 20 m/s, 20 s

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65. A sound wave has a frequency of 500 Hz and wavelength 80 cm. How long time will it take to travel 1 km?
(A) 2.5 seconds
(B) 25 seconds
(C) 25 minutes
(D) 2.5 minutes

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66. In a simple pendulum experiment, a student calculate the value of g is 9.92 m/s^2 but the standard value of g is 9.80 m/s^2 then the percentage error in the calculation of g is
(A) 1.42%
(B) 1.32%
(C) 1.12%
(D) 1.22%

---

67. A charge of 10 coulomb is brought from infinity to a point P near a charged body and in this process 200 joule of work is done. Electric potential at point P
(A) 10 V
(B) 100 V
(C) 200 V
(D) 20 V

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68. Heat (in calorie) required to increase the temperature from $10°$C to $20°$C of 6 kg copper is same as heat (in calorie) required to increase the temperature from $20°$C to $100°$C of 3 kg lead. If specific heat of copper is 0.09 then the specific heat of lead will be
(A) 0.033
(B) 0.022
(C) 0.044
(D) 0.055

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69. V_V, V_R, V_G are the velocities of violet, red and green light respectively, in a glass prism. Which among the following is a correct relation?
(A) $V_V < V_R < V_G$
(B) $V_V = V_R = V_G$
(C) $V_V < V_G < V_R$
(D) $V_V > V_R > V_G$

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70. The gravitational force between two masses kept at a certain distance is 'P' Newton. The same two masses are now kept in water and the distance between them are same. The gravitational force between these two masses in water is 'Q' Newton then
(A) $P > Q$
(B) None of these
(C) $P = Q$
(D) $P < Q$

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71. 100 joule of heat is produced each second in a 4 ohm resistance. Potential difference across the resistor
(A) 40 V
(B) 100 V
(C) 20 V
(D) 50 V

---

72. An object 4.0 cm in size, is placed at 25 cm in front of a concave mirror of focal length 15 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image?
(A) +25 cm
(B) +25.5 cm
(C) −35.5 cm

(D) -37.5 cm

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73. An object is placed in front of a convex lens of focal length 12 cm. If the size of the real image formed is half the size of the object, then the distance of object from the lens
(A) 48 cm
(B) 36 cm
(C) 26 cm
(D) 30 cm

---

74. A body weights 75 gm in air, 51 gm when completely immersed in unknown liquid and 67 gm when completely immersed in water. Find the density of the unknown liquid
(A) 4 gm/cm^3
(B) 6 gm/cm^3
(C) 8 gm/cm^3
(D) 3 gm/cm^3

---

75. A wooden block of mass 6 kg is pulled across a rough surface by a 54 N force against a friction force F. The acceleration of the block is 6 m/s^2 then the value of friction force F is
(A) 36 N
(B) 54 N
(C) 18 N
(D) 9 N

CHEMISTRY

76. Electronic configuration of copper can be represented as
(A) [Ar]$4s^1 3d^{10}$
(B) [Ar]$4s^2 3d^9$
(C) [Ar]$4s^2 3d^9 4p^1$
(D) [Ar]$4s^2 3d^{10} 4p^1$

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77. Which among the following pairs are not having same number of total electrons?
(A) Na^{+} and Al^{3+}
(B) O^{2-} and F^{-}
(C) Mg^{2+} and Ar
(D) P^{3-} and Ar

---

78. The half life period of a radioactive element is 150 days. After 600 days 1 gm of the element will be reduced to
(A) $\frac{1}{32}$ gm
(B) $\frac{15}{16}$ gm
(C) $\frac{1}{8}$ gm
(D) $\frac{1}{16}$ gm

---

79. The number of molecules present in 2.8 g of nitrogen is
(A) 6.023×10^{22}
(B) 6.023×10^{21}
(C) 6.023×10^{20}
(D) 6.023×10^{23}

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80. The common name of 2-Butanone is
(A) Acetone
(B) Butyraldehyde
(C) Acetic anhydride
(D) Ethyl Methyl Ketone

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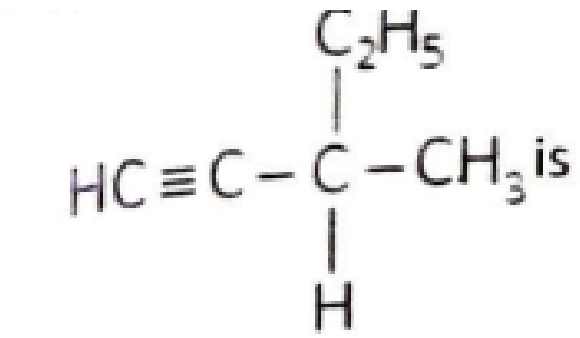
81. The IUPAC name of



(A) 3-Methyl-1-Pentyne
(B) 3-Methyl-4-Pentyne

(C) 2-Ethyl-2-Propyne
(D) 3-Methyl-5-Pentyne

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82. Essential constituent of an amalgam is
(A) an alkali
(B) Silver
(C) Mercury
(D) an alkali metal

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83. Equivalent weight of a dibasic acid is 12. Its molecular weight is
(A) 6
(B) 12
(C) 24
(D) 48

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84. In the following reaction $SO_2 + 2H_2S \longrightarrow 3S + 2H_2O$
(A) Sulphur is reduced and oxygen is oxidised
(B) Sulphur is both oxidised and reduced
(C) Sulphur is oxidised and Hydrogen is reduced
(D) Hydrogen is oxidised and Sulphur is reduced

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85. Which of the following types drugs reduces fever?
(A) Analgesic
(B) Antibiotic
(C) Tranquilizers
(D) Antipyretic

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86. Hydrocarbon used for welding purpose is
(A) Ethene
(B) Ethyne
(C) Ethane
(D) Benzene

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87. An example of thermosetting plastic is
(A) Polythylene
(B) All of these
(C) Bakelite
(D) P.V.C.

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88. Which of the following order of ionic radii is correctly represented?
(A) $H^- > H^+ > H$
(B) $Na^+ > F^- > O^{2-}$
(C) $F^- > O^{2-} > Na^+$
(D) $Al^{3+} < Mg^{2+} < N^{3-}$

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89. Amount of copper deposited on the cathode of an electrolytic cell containing copper sulphate solution by the passage of 2 amperes for 30 minutes - (At. mass of Cu = 63.5)
(A) 1.184 gm
(B) 0.2214 gm
(C) 2.214 gm
(D) 0.1184 gm

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90. Which catalyst is used in oxidizing NH_3 in Ostwald's process?
(A) Pt
(B) FeO
(C) V_2O_5
(D) Molybdenum

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91. Real gas behaves like ideal gas at
(A) None of these
(B) Low temperature
(C) High temperature
(D) High pressure

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92. The rate of diffusion of a gas is r and its density is d, then under similar conditions of pressure and temperature
(A) $r \propto d$
(B) $r \propto \sqrt{d}$

(C) $r \propto \frac{1}{d}$
(D) $r \propto \frac{1}{\sqrt{d}}$

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93. Among the following, ionic hydride is
(A) BH_3
(B) PH_3
(C) MgH_2
(D) SiH_4

---

94. Detergents are the salt of
(A) Carboxylic acid and Sulphonic acids or alkyl hydrogen sulphates both
(B) Carboxylic acid
(C) Sulphonic acids or alkyl hydrogen sulphates
(D) None of these

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95. Hardness of water is due to the presence of
(A) Sodium and Potassium salt
(B) Calcium and magnesium salt
(C) Lead and copper salt
(D) None of these

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96. In which of the compound oxidation number of oxygen is +2?
(A) F_2O
(B) Na_2O_2
(C) K_2O
(D) O_3

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97. $\mathbf{F_2C = CF_2}$ is a monomer of
(A) Nylon-6
(B) Buna-S
(C) Teflon
(D) Glyptol

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98. 10.0 **gm** $CaCO_3$ **on heating gave** 5.6 **gm of CaO and** 4.4 **gm of** CO_2**, given data support the law of**
(A) Multiple proportion
(B) Constant proportion
(C) Law of conservation of mass
(D) All of these

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99. Cracking is a process used for change in
(A) Higher molecular weight alkane to lower molecular weight alkane
(B) Ketones to aldehydes
(C) Alkanes to aromatic hydrocarbons
(D) Alcohols to aldehydes

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100. An organic compound contains carbon = 38.71%, **Hydrogen** = 9.67% **and Oxygen. The empirical formula of the compound would be**
(A) CH_3O
(B) CH_4O
(C) CH_2O
(D) CHO
