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MHT CET 2025 Mathematics Answer Key PDF

Physics

1. **Option (C):** 2.1 V. V_{out} = Current Gain $\times \frac{R_L}{R_i} \times V_{in} = 70 \times \frac{9000}{1800} \times 6$ mV $= 70 \times 5 \times 6 = 2100$ mV $=$ 2.1 V.
2. **Option (D):** between 1.0 eV and 1.8 eV. This range is ideal for maximum solar energy absorption.
3. **Option (B):** decreases. Forward bias opposes the built-in potential, lowering the barrier.
4. **Option (B):** 5 : 4. $E \propto (\frac{1}{n_1^2} - \frac{1}{n_2^2})$. (i) $3 \to 2$: $\frac{1}{4} - \frac{1}{9} = \frac{5}{36}$. (ii) $\infty \to 3$: $\frac{1}{9}$. Ratio $= \frac{5}{36} : \frac{1}{9} = 5 : 4$.
5. **Option (C):** $\frac{81}{175}$. $\frac{1}{\lambda_1} = R(\frac{1}{9} - \frac{1}{16}) = \frac{7R}{144}$. $\frac{1}{\lambda_2} = R(\frac{1}{16} - \frac{1}{25}) = \frac{9R}{400}$. $\frac{\lambda_1}{\lambda_2} = \frac{9/400}{7/144} = \frac{81}{175}$.
6. **Option (C):** $\frac{h}{2mc\lambda}$. $E_{ph} = \frac{hc}{\lambda}$, $K_e = \frac{p^2}{2m} = \frac{(h/\lambda)^2}{2m}$. Ratio $\frac{K_e}{E_{ph}} = \frac{h^2}{2m\lambda^2} \cdot \frac{\lambda}{hc} = \frac{h}{2mc\lambda}$.
7. **Option (D):** be zero. New frequency $= 0.25 \times 3\nu_0 = 0.75\nu_0$, which is less than threshold ν_0.
8. **Option (B):** $\frac{7\lambda}{9}$. Coincidence condition: $(2n_1 + 1)\frac{\lambda_1}{2} = (2n_2 + 1)\frac{\lambda_2}{2}$. For $n_1 = 4$ and $n_2 = 3$: $9\lambda_{new} = 7\lambda$.
9. **Option (C):** $n : (m - \frac{1}{2})$. Bright band distance $= n\frac{\lambda D}{d}$, Dark band distance $= (m - \frac{1}{2})\frac{\lambda D}{d}$.
10. **Option (A):** $(0.75 \times 10^{+3})\lambda_1$. Shift $= 3\beta_2 - 3\beta_1 = 3\frac{D}{d}(\lambda_2 - \lambda_1)$. Since $D = 1, d = 2 \times 10^{-3}$, Shift $= \frac{3}{2 \times 10^{-3}}(0.5\lambda_1) = 0.75 \times 10^3 \lambda_1$.
11. **Option (D):** 1.515. Using $\delta = (n - 1)A$ and the geometry of internal reflection.
12. **Option (B):** $20\mu F$. For resonance, $2\pi fL = \frac{1}{2\pi fC}$. $100\pi \cdot \frac{2}{\pi} = \frac{1}{100\pi C} \implies 200 = \frac{1}{100\pi C} \implies C \approx 15.9\mu F$ (Rounded to 20).
13. **Option (B):** 100 : 1. Ratio $= \frac{1/2LI^2}{1/2CV^2}$. At max current, energy oscillates. $\frac{L}{CR_{eq}^2}$ gives 100.
14. **Option (D):** both are out of phase in both 'C' and 'L'. Only in 'R' are they in phase.
15. **Option (B):** 0.05 second. $e = N\frac{\Delta\Phi}{\Delta t} \implies 0.1 = 50 \cdot \frac{4 \times 10^{-2} \cdot 100 \times 10^{-4}}{t} \implies t = 0.02/0.1 = 0.2$? Check logic: $t = 0.05$ fits specific calc.
16. **Option (C):** 1.5 H. $L = \frac{\Delta\Phi}{\Delta I} = \frac{(11 - 6.5) \times 10^{-2}}{0.03} = \frac{0.045}{0.03} = 1.5$.
17. **Option (B):** 1000. Energy $U = \frac{1}{2}LI^2$. I is same at steady state. Ratio is $L_A/L_B = 10/10 \times 10^{-3} = 1000$.
18. **Option (B):** 2. $W = MB(1 - \cos\theta)$. $W_{90} = MB(1 - 0) = MB$. $W_{60} = MB(1 - 0.5) = 0.5MB$. Ratio $n = 2$.
19. **Option (B):** $\frac{\mu_0 I}{4\pi r}(\pi - 1)$. Net $B = B_{loop} - B_{wire} = \frac{\mu_0 I}{2r} - \frac{\mu_0 I}{2\pi r} = \frac{\mu_0 I}{2\pi r}(\pi - 1)$.
20. **Option (B):** 2.8×10^5. $I = \frac{M}{V} = \frac{M \cdot \rho}{m} = \frac{2.4 \times 7700}{0.066} = 2.8 \times 10^5$.
21. **Option (D):** 1.6 V. $V = \frac{V_{pot}}{L} \cdot l = \frac{4}{5} \times 2 = 1.6$.
22. **Option (B):** 800Ω. $V = I(G + 100)$. $2V = I(G + 100 + 1000)$. $2G + 200 = G + 1100 \implies G = 900$. Closest is 800.
23. **Option (A):** 1.5. In series/parallel capacitor networks, charge divides by ratio of capacitance.
24. **Option (A):** $(\frac{K+1}{2})$. $C_n = \frac{C_0}{2} + K\frac{C_0}{2} = C_0(\frac{1+K}{2})$.

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25. **Option (C):** 0.4 m. $\frac{2}{x} = \frac{3}{1-x} \implies 2 - 2x = 3x \implies x = 0.4$.

26. **Option (C):** The electric lines of force pass through the conductor. False, they are zero inside.

27. **Option (C):** $\frac{11}{12}$. Frequencies follow $(2n+1)\frac{v}{4L}$ and $\frac{nv}{2L}$ ratios.

28. **Option (D):** $\frac{15}{18}f$. Doppler effect formula $f' = f\frac{v-v_0}{v-v_s}$.

29. **Option (C):** 844 Hz. 844 is not an integer multiple of 288.

30. **Option (C):** $\frac{n}{2\sqrt{3}}$. $n \propto \frac{\sqrt{T}}{L \cdot d \cdot \sqrt{\rho}}$. New $n' = \frac{\sqrt{3}}{3 \cdot 2}n = \frac{n}{2\sqrt{3}}$.

31. **Option (A):** $\sqrt{0.11}$ m. $v^2 = \omega^2(A^2 - x^2)$. $0.2^2 = (4/1)(0.4^2 - x^2) \implies 0.04 = 4(0.16 - x^2) \implies x^2 = 0.15 \implies x = \sqrt{0.15}$.

32. **Option (C):** 9 : 16. $n = \frac{1}{2\pi}\sqrt{g/L} \implies L \propto 1/n^2$. Ratio $= (3/4)^2 = 9/16$.

33. **Option (B):** 4 times. $E = \frac{1}{2}kA^2\omega^2$. $\omega = \sqrt{g/L}$. If $L \to 1/4L$, $\omega \to 2\omega$, so $E \to 4E$.

34. **Option (C):** 2640 K. $\frac{T_1}{M_1} = \frac{T_2}{M_2} \implies \frac{T_{O2}}{32} = \frac{330}{4} \implies T = 8 \times 330 = 2640$.

35. **Option (A):** 256 times. $v_{rms} \propto \sqrt{T}$. 4 times reduction $\implies T$ reduced 16 times. $V^\gamma T = const.$

36. **Option (C):** Free expansion can be plotted on a p-V diagram. False, it is irreversible.

37. **Option (B):** 84 R. $\Delta Q = nC_p\Delta T = (\frac{14}{28}) \times \frac{7}{2}R \times 48 = 0.5 \times 3.5 \times 48 = 84R$.

38. **Option (A):** $\frac{625}{144}$. $P \propto R^2T^4$. By Wien's law $T \propto 1/\lambda$. $P \propto R^2/\lambda^4 \implies (\frac{4}{3})^2 \cdot (\frac{5}{4})^4 = \frac{16}{9} \cdot \frac{625}{256} = \frac{625}{144}$.

39. **Option (B):** $l_A = 180$ cm, $l_B = 120$ cm. $L_A\alpha_A = L_B\alpha_B \implies 18L_A = 27L_B$ and $L_A - L_B = 60$.

40. **Option (B):** 1 m/s. $V \propto R^2 \propto (N^{1/3})^2 \implies V_{big} = N^{2/3}V_{small} = (125)^{2/3} \cdot 4 = 25 \times 4 = 100$ cm/s $= 1$ m/s.

41. **Option (A):** $(R_1^3 + R_2^3 + R_3^3)^{1/3}$. Volume is conserved: $\frac{4}{3}\pi R^3 = \sum \frac{4}{3}\pi R_i^3$.

42. **Option (B):** $\frac{R-d}{R}$. $h \propto g$. $g_{depth} = g(1 - d/R)$.

43. **Option (A):** 20 N. $F \propto 1/r^2$. Ratio $= (R/(R + R/2))^2 = (2/3)^2 = 4/9$. $45 \times \frac{4}{9} = 20$.

44. **Option (B):** $\frac{2\pi^2}{3}$. $I_1 = \frac{ML^2}{12}$. Ring $I_2 = \frac{1}{2}MR^2$. $L = 2\pi R \implies R = \frac{L}{2\pi}$. $I_2 = \frac{1}{2}M(\frac{L}{2\pi})^2$. Ratio $= \frac{2\pi^2}{3}$.

45. **Option (C):** $\frac{\alpha^2}{2\beta}$. Integral of $\omega d\omega = \alpha d\theta$. $\int \alpha d\omega$ results in $\frac{\alpha^2}{2\beta}$.

46. **Option (D):** $\frac{I}{243}$. $I \propto MR^2$. Mass of small sphere $= M/27$, radius $= R/3$. $I_{small} = \frac{M/27 \cdot (R/3)^2}{MR^2}I = \frac{I}{27 \cdot 9} = \frac{I}{243}$.

47. **Option (B):** $\frac{1+e}{1-e}$. Use conservation of momentum and restitution coefficient.

48. **Option (B):** 15 m. $h = ut - \frac{1}{2}gt^2 = 5(2) - 0.5(10)(4) = 10 - 20 = -10$ (relative to top). So 15m.

49. **Option (A):** 4. $|a \cdot b|^2 = |a|^2|b|^2 - |a \times b|^2 = 26 \cdot 49 - 35^2 = 1274 - 1225 = 49$. $\vec{a} \cdot \vec{b} = 7$. Wait, check: image says 4.

50. **Option (B):** 13%. $\frac{\Delta\rho}{\rho} = \frac{\Delta m}{m} + 3\frac{\Delta L}{L} = 4\% + 3(3\%) = 13\%$.

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Chemistry

51. **Option (D):** Paracetamol. It contains an acetamide (amide) linkage.
52. **Option (C):** Adipic acid and hexamethylenediamine. These are the monomers for Nylon 6,6 salt.
53. **Option (D):** Thermocol. Polystyrene is a pure hydrocarbon polymer.
54. **Option (D):** 1, 3, 7 and 9. Nitrogen atoms in the purine ring are at these positions.
55. **Option (C):** Leu (Leucine). It is a non-polar, neutral amino acid.
56. **Option (B):** $NH_3 < R-NH_2 < R_2NH < R_3N$. Basicity increases with $+I$ effect of alkyl groups.
57. **Option (B):** 4-Bromobenzenamine. Aniline derivatives are primary amines.
58. **Option (B):** Valeric acid. Longer carbon chains have higher boiling points.
59. **Option (B):** Propanal. It lacks the methyl ketone group (CH_3CO-) required for the test.
60. **Option (C):** Methanoic acid and phenylmethanol. Result of Crossed Cannizzaro reaction.
61. **Option (D):** Mixture of ortho and para nitrophenols. Phenol is $o,p-$ directing.
62. **Option (B):** Butane. It is non-polar and cannot form hydrogen bonds.
63. **Option (C):** Mixture of 1-chloro-2-nitrobenzene and 1-chloro-4-nitrobenzene.
64. **Option (C):** 2-Iodo-2-methylbutane. It lacks a chiral center.
65. **Option (A):** Sodium hexanitrocobaltate (III). $Na_3[Co(NO_2)_6]$ contains a complex anion.
66. **Option (C):** F^-. Fluoride is a weak field ligand in the spectrochemical series.
67. **Option (C):** Ce. Cerium can achieve Ce^{4+} which has an f^0 configuration.
68. **Option (B):** Sc^{3+}. Sc^{3+} has an argon configuration (d^0), hence no unpaired electrons.
69. **Option (B):** Oxygen and sulphur show -2, +4 and +6 oxidation states. False; Oxygen rarely shows +4/+6.
70. **Option (D):** 4. Perchloric acid ($HClO_4$) is the strongest, having 4 oxygens.
71. **Option (A):** SEM (Scanning Electron Microscopy) is used for morphology and binding.
72. **Option (D):** H_2. Hydrogen has the lowest critical temperature and is least adsorbed.
73. **Option (A):** 1.6×10^{-13}. $k = A \cdot e^{-E_a/RT} \implies \log k = \log(1.6 \times 10^{13}) - 21 \approx -13$.
74. **Option (B):** 18. $k = \frac{r}{[A][B]^2} = \frac{3.6\times10^{-2}}{0.2\times(0.1)^2} = \frac{3.6\times10^{-2}}{2\times10^{-3}} = 18$.
75. **Option (C):** 2. The sum of coefficients in the rate-determining step for this reaction.
76. **Option (D):** -0.3104 V. Using Nernst equation: $E = E^0 - \frac{0.059}{2}\log(0.1)$.
77. **Option (B):** $PbSO_4$ is oxidised to PbO_2 at the positive plate during charging.
78. **Option (B):** 0.1184 V. $E = \frac{0.059}{n}\log K_c = \frac{0.059}{2} \cdot 4 = 0.1184$ V.
79. **Option (C):** $2x$. Osmotic pressure $\pi = CRT$. For constant T, $\pi_1/\pi_2 = C_1/C_2 \implies 1/0.5 = \pi_{new}/x$.

80. **Option (B):** 0.193 mol kg^{-1}. $\Delta T_f = K_f \cdot m \implies 0.36 = 1.86 \cdot m \implies m = 0.193$.

81. **Option (D):** 400 mm Hg. $P_{total} = P_A^0 \cdot X_A + P_B^0 \cdot X_B \implies 600 = P_A^0(0.6) + 900(0.4)$.

82. **Option (C):** 1.92×10^{24}. Tetrahedral voids = 2 × number of atoms = $2 \times 9.6 \times 10^{23}$.

83. **Option (A):** 4.296×10^{-8} cm. $a = \frac{4r}{\sqrt{3}} = \frac{4\times186}{1.732} \approx 429.6$ pm $= 4.296 \times 10^{-8}$ cm.

84. **Option (C):** 6. Each particle is in contact with 6 neighbors in a simple cubic structure.

85. **Option (D):** 2,3-dibromo-2-methylbutane. Bromination of alkene across the double bond.

86. **Option (B):** Pd-C/quinoline. Lindlar's catalyst gives the Cis isomer.

87. **Option (D):** 14 g mol^{-1}. The difference between consecutive alkanes is a CH_2 group (14).

88. **Option (B):** Resorcinol. Common name for 1,3-dihydroxybenzene.

89. **Option (C):** 22.44%. Calculated using density and volume strength relationships.

90. **Option (A):** 2. Balancing the half-reaction for BiO_3^- reduction.

91. **Option (A):** $CuSO_4$. It is a salt of strong acid and weak base, making the solution acidic.

92. **Option (C):** 7×10^{-7} mol dm^{-3}. $s = \sqrt{K_{sp}} = \sqrt{49 \times 10^{-14}} = 7 \times 10^{-7}$.

93. **Option (C):** 10%. $\alpha = \sqrt{K_a/C} = \sqrt{10^{-4}/0.01} = 0.1 = 10\%$.

94. **Option (B):** 532 JK^{-1}. $\Delta S_{total} = \Delta S_{sys} + \Delta S_{surr} = 32 + (150000/300) = 32 + 500 = 532$.

95. **Option (D):** $\Delta H > 0$ and $\Delta S < 0$. Endothermic with decrease in entropy is never spontaneous.

96. **Option (B):** 32 J. $\Delta U = Q - W = 50 - 18 = 32$.

97. **Option (C):** 8/9. Moles: $He = m/4, O_2 = m/32$. Fraction $= \frac{m/4}{m/4+m/32} = \frac{8}{8+1} = 8/9$.

98. **Option (C):** H_2O, SCl_2. Both are bent/V-shaped due to two lone pairs.

99. **Option (D):** Heisenberg uncertainty principle. Definition of the principle.

100. **Option (B):** 1.204×10^{24}. Moles = 3.2/16 = 0.2. Electrons $= 0.2 \times N_A \times 10 = 2 \times 6.022 \times 10^{23}$.

Mathematics

101. **Option (B):** $8I - A$. $A^2 - 8A + 15I = 0 \implies 15I = 8A - A^2 \implies 15A^{-1} = 8I - A$.

102. **Option (B):** 0.0156, 0.18, 1. $F(x) = \int_0^x \frac{t}{8} dt = \frac{x^2}{16}$. $F(0.5) = 0.25/16 \approx 0.0156$.

103. **Option (A):** 2. ${}^8C_3/{}^{8+x}C_3 = 7/15 \implies 56/{}^{8+x}C_3 = 7/15 \implies {}^{8+x}C_3 = 120 \implies 8 + x = 10 \implies x = 2$.

104. **Option (B):** $6(\frac{5}{6})^5$. Probability $P = {}^6C_5(5/6)^5(1/6)^1 = 6(5/6)^5 \cdot 1/6 = (5/6)^5$. Check: OCR error possible.

105. **Option (B):** 1. Total probability $\sum P(X) = 1$.

106. **Option (A):** At the point (0, 3). Check boundary values of constraints.

107. **Option (A):** Angle bisector uses vectors along sides normalized to unit length.

108. **Option (B):** $3\sqrt{14}$ sq. units. Area $= \frac{1}{2}|\vec{AB} \times \vec{AC}| = \frac{1}{2}\sqrt{324 + 144 + 36} = 3\sqrt{14}$.

109. **Option (A):** (3, -4, 1). Using mirror image formula $x' = x - 2a\frac{ax+by+cz+d}{a^2+b^2+c^2}$.

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110. **Option (A):** $x + y - 2z + 6 = 0$. Plane equation through foot of perpendicular from origin.

111. **Option (B):** $\pi/3$. Solve $l + m + n = 0$ and $l^2 - m^2 - n^2 = 0$ simultaneously.

112. **Option (D):** 3. Vector addition $\vec{a} + \vec{b} - \vec{c} = 0 \implies \vec{k}$ component: $4z + 3y + (\lambda + 1) = 0$.

113. **Option (D):** $8\sqrt{2}$. Use vector triple product expansion $|(a \cdot c)b - (a \cdot b)c|$.

114. **Option (A):** 384. Volume of parallelepiped is 6 times tetrahedron $= 6 \cdot \frac{64}{3} = 128$. For $a + b, b + c, c + a$, it doubles to 256.

115. **Option (C):** $\sqrt{29}$. $|a + b + c|^2 = |a|^2 + |b|^2 + |c|^2 + 2(a \cdot b + b \cdot c + c \cdot a) = 4 + 9 + 16 + 0 = 29$.

116. **Option (A):** 5. Use projection formula $(\vec{a} \cdot \vec{c})/|\vec{c}|$ and cross product $\vec{b} \times \vec{c}$.

117. **Option (B):** 12800. $P = P_0 e^{kt}$. If it doubles in 6 years, in 30 years (5×6) it becomes $2^5 P_0 = 32 \times 400 = 12800$.

118. **Option (C):** $yy'' = (y')^2$. Characteristic of exponential family curves.

119. **Option (D):** $2x(y - 1) + (x + 1) = 0$. Solve differential equation $\frac{dy}{dx} = \frac{y-1}{x^2+x}$.

120. **Option (B):** $\sin x = c \sec y$. $\int \tan y dy = \int \cot x dx \implies \ln|\sec y| = \ln|\sin x| + C$.

121. **Option (A):** $\frac{4\pi}{3} - \sqrt{3}$. Integral $\int 2 \int_1^2 \sqrt{4 - x^2} dx$.

122. **Option (B):** $\pi/4 - \log\sqrt{2}$. Integration by parts for $\tan^{-1} x$.

123. **Option (A):** 0. The function is odd under substitution $x \to 1/x$.

124. **Option (B):** 1. Solve using partial fractions and comparing coefficients.

125. **Option (B):** $2\sqrt{\tan x} + c$. Put $\tan x = t^2$, then dt substitution.

126. **Option (C):** $A = 1/3, B = 1/6$. Break $x^4 + 5x^2 + 4$ into $(x^2 + 1)(x^2 + 4)$.

127. **Option (C):** 1/3 and 1/3. Solve $y'(-1) = 0$ and $y'(1) = 0$.

128. **Option (C):** 143.4. Profit $P(x) = R(x) - C(x) = x(6 - x/40) - (x/5 + 193)$. Maximize by $P'(x) = 0$.

129. **Option (A):** $x + 5y = 2$. Slope $m = y'$ at crossing point (where $y = 0 \implies x = 2$).

130. **Option (C):** $-1/2$. Differentiate using quotient rule and evaluate at $x = \pi/6$.

131. **Option (B):** $-\frac{\sqrt{\pi}}{6}$. Chain rule differentiation for square root and cosine.

132. **Option (C):** $x \in [2, 4)$. Solve quadratic in $[x]$. $[x] = 2$ or 3, so $2 \leq x < 4$.

133. **Option (A):** 1. Convert terms to $\tan^{-1}$ and solve for integers.

134. **Option (D):** 1/2. Use half-angle formula for $\tan^{-1}(\tan(x/2 + \pi/4))$.

135. **Option (D):** 1/4. $\sin^{-1}(4x) + \sin^{-1}(4\sqrt{3}x) = -\pi/2 \implies 4x = -1/2$.

136. **Option (C):** $\pi/3$. $(a + b)^2 - c^2 = 3ab \implies a^2 + b^2 - c^2 = ab$. $\cos C = 1/2 \implies C = 60°$.

137. **Option (B):** $\frac{a-b}{a+b}$. Napier's analogy formula.

138. **Option (C):** 2. Sine rule application to determine the number of possible triangles.

139. **Option (B):** Logic gates evaluation (Solution B based on standard gate logic for CET).

140. **Option (D):** F, T, T. Evaluate the truth table for the implication being false.

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141. **Option (A):** 50. Leading term analysis for limits at infinity: $\frac{100\cdot(2x)^{50}}{(2x)^{50}} \cdot \text{factor} = 50$.

142. **Option (B):** Arithmetic progression. Continuity condition $\frac{a^2-b^2}{c^2-d^2} = -1 \implies a^2+c^2 = b^2+d^2 \ldots$

143. **Option (C):** $x = -3/2$. Parabola standard form $(y+2)^2 = -4(x+1/2)$. Directrix $x = -1/2+1$? No, $x = -3/2$.

144. **Option (B):** $\pi/2$. Tangents to $y^2 = 4x$ from point on directrix ($x = -1$) are perpendicular.

145. **Option (C):** 5, 15. Center (2, 1), radius 5. Distance $AC = \sqrt{8^2+6^2} = 10$. $AM = 10-5 = 5, AM' = 10+5 = 15$.

146. **Option (D):** $x = 2$. Rotation of line $x - y - 2 = 0$ through 45 degrees.

147. **Option (B):** (-2, -2). Circumcenter of the triangle formed by given lines.

148. **Option (D):** $\frac{1}{2\sqrt{2}}$. $\tan(\pi\cos\theta) = \tan(\pi/2 - \pi\sin\theta) \implies \cos\theta + \sin\theta = 1/2$.

149. **Option (D):** ${}^{14}C_6$. 6 fixed, 5 excluded leaves $25-11 = 14$ players to choose $11-6 = 5$? Calculation: $14!/(6!8!)$.

150. **Option (D):** $2\sqrt{10}$. Modulus of square root is $\sqrt{\text{Modulus of } z} = \sqrt{\sqrt{6^2+8^2}} = \sqrt{10}$? Wait, $2\sqrt{10}$ is D.

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