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# 2025 JEE 28<sup>TH</sup> Shift - 2 Questions **HISTORY CREATED**

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**S VENKAT KOUNDINYA**  
H.T.No. 230310124339  
CLASSROOM STUDENT  
FROM GRADE I - XII

**NEET**



**B VARUN CHAKRAVARTHI**  
H.T.No. 1205120175  
CLASSROOM STUDENT  
FROM GRADE VI - XII

**JEE ADVANCED**



**VAVILALA CHIDVILAS**  
H.T.No. 236165088  
CLASSROOM STUDENT  
FROM GRADE VI - XII

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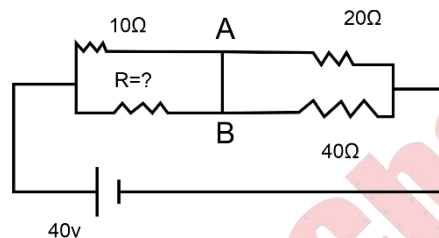
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**JEE Main - 28<sup>th</sup> January - 2025 (Shift-2)**

**[Memory Based Questions]**

**PHYSICS**

1. Find the value of  $R$  such that  $V_A = V_B$  and also current in the circuit.



- a)  $10\ \Omega, 1\ \text{A}$       b)  $15\ \Omega, 2\ \text{A}$       c)  $20\ \Omega, 2\ \text{A}$       d)  $30\ \Omega, 1\ \text{A}$

**Ans: (c)**

2. Bohr's model is applicable for single electron atom of atomic number  $Z$ . Dependency of frequency of rotation of electron in  $n^{\text{th}}$  principal quantum number is proportional to

- a)  $z/n^2$       b)  $z^2/n^3$       c)  $n^3/2$       d)  $2/n$

**Ans: (b)**

3. For concave mirror, distance between object and image = 20 cm and  $m = -3$  find focal length

- a) -1.35 cm      b) 2.35 cm      c) 4.7 cm      d) -7.5 cm

**Ans: (d)**

4.  $B = \left(\frac{\sqrt{3}}{2} \hat{i} + \frac{1}{2} \hat{j}\right) 30 \sin(\omega(t - z/c))$ ,  $E = ?$

- a)  $9 \times 10^9 \sin\left(\omega\left(t - \frac{z}{c}\right)\right) \left(\frac{1}{2} \hat{i} - \frac{\sqrt{3}}{2} \hat{j}\right)$       b)  $9 \times 10^9 \sin\left(\omega\left(t - \frac{z}{c}\right)\right) \left(\frac{1}{2} \hat{i} + \frac{1}{\sqrt{3}} \hat{j}\right)$   
 c)  $7 \times 10^{10} \sin\left(\omega\left(t + \frac{z}{c}\right)\right) \left(\frac{1}{2} \hat{i} + \frac{1}{\sqrt{3}} \hat{j}\right)$       d)  $5 \times 10^{10} \sin\left(\omega\left(t - \frac{z}{c}\right)\right) \left(\frac{1}{2} \hat{i} - \frac{1}{\sqrt{3}} \hat{j}\right)$

**Ans: (a)**

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H.T.No. 236165088  
**CLASSROOM STUDENT**  
FROM GRADE VI-XII

**NEET**



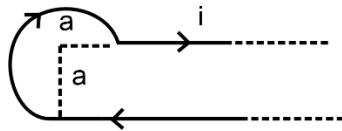
**B VARUN CHAKRAVARTHI**  
H.T.No. 1205120175  
**CLASSROOM STUDENT**  
FROM GRADE VI-XII

**JEE MAIN**



**S VENKAT KOUNDINYA**  
H.T.No. 230310124339  
**CLASSROOM STUDENT**  
FROM GRADE I-XII

5. Find the magnetic field about the center of the ring



- a)  $\frac{\pm\mu_0 I}{8\pi a} (3\pi + 2)(-\hat{k})$                       b)  $\frac{-\mu_0 I}{8\pi a} (3\pi + 2)(-\hat{k})$   
c)  $\frac{\pm\mu_0 I}{8\pi a} (3\pi - 2)(-\hat{k})$                       d)  $\frac{-\mu_0 I}{8\pi a} (3\pi - 2)(-\hat{k})$

Ans: (a)

6. Which of the following does not explain the wave theory of light?

- a) Refraction of light                                      b) Reflection of light  
c) Diffraction of light                                      d) Compton effect

Ans: (d)

7. Find energy density of the capacitor if  $V = 20$  V,  $C = 1\mu$  F and distance between the plates is  $1\mu$  m

- a)  $1990$  J/m<sup>3</sup>                      b)  $1770$  J/m<sup>3</sup>                      c)  $2000$  J/m<sup>3</sup>                      d)  $1850$  J/m<sup>3</sup>

Ans: (b)

8. Earth has mass 8 times and radius 2 times that of planet. If the escape velocity from the earth is  $11.2$  km/s, the escape velocity in km/s from the planet will be

- a)  $6.5$                                       b)  $5.6$                                       c)  $11.2$                                       d)  $7.5$

Ans: (b)

9. A cube of side  $10$  cm having bulk modulus of  $1.4 \times 10^{11}$  Pa is placed in atmosphere. Now it is subjected to extra pressure of  $7 \times 10^6$  Pa then magnitude of change in volume of cube is

- a)  $10$  mm<sup>3</sup>                                      b)  $30$  mm<sup>3</sup>                                      c)  $40$  mm<sup>3</sup>                                      d)  $50$  mm<sup>3</sup>

Ans: (d)

10. A uniform rod of mass  $250$  g and length of  $100$  cm is balanced at a sharp edge at  $40$  cm mark. A mass of  $400$  g is suspended at  $10$  cm mark. To maintain the balance of the rod, the mass to be suspended at  $90$  cm mark is

- a)  $190$  g                                      b)  $200$  g                                      c)  $250$  g                                      d)  $350$  g

Ans: (a)



**VAVILALA CHIDVILAS**  
H.T.No. 236165088  
**CLASSROOM STUDENT**  
FROM GRADE VI-XII



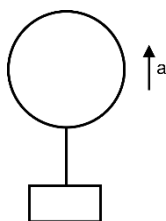
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H.T.No. 1205120175  
**CLASSROOM STUDENT**  
FROM GRADE VI-XII



**S VENKAT KOUNDINYA**  
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**CLASSROOM STUDENT**  
FROM GRADE I-XII

11. A balloon system having mass  $m$  is moving up with acceleration  $a$ , find the mass to be removed from it to have acceleration  $3a$ .

(Neglect the volume of mass attached)



- a)  $\frac{2ma}{3a+g}$       b)  $\frac{2ma}{2a+g}$       c)  $\frac{ma}{3a+g}$       d)  $\frac{ma}{g-3a}$

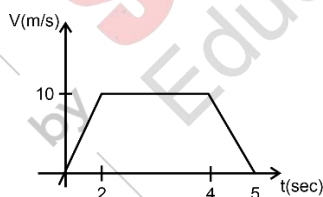
Ans: (a)

12. The translational Kinetic energy of molecules of 50 g of  $\text{CO}_2$  gas at  $17^\circ\text{C}$  is

- a) 2500 J      b) 4119 J      c) 5250 J      d) 6300 J

Ans: (b)

13. Find the distance travelled by the body in 4 sec.



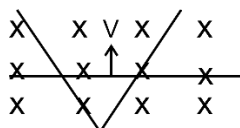
- a) 7 m      b) 18 m      c) 30 m      d) 45 m

Ans: (c)

14. An electric dipole of moment  $6 \times 10^{-6}\text{Cm}$  is placed parallelly in electric field of strength  $10^6 \text{ N/C}$ . Work done required to rotate the dipole by  $180^\circ$  is  $x$  joules, then  $x = ?$

Ans: 12

15. A uniform magnetic field into the plane 'B' exists. A rod joining 2 rails moves with a constant velocity ' $v$ '. The induced EMF is  $t^n$ ,  $n = ?$



Ans: 1

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FROM GRADE VI-XII

**JEE MAIN**



S VENKAT KOUNDINYA  
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CLASSROOM STUDENT  
FROM GRADE I-XII



**CHEMISTRY**

1. Consider the following oxides,  $V_2O_3$ ,  $V_2O_4$ , and  $V_2O_5$  change in oxidation state of vanadium when amphoteric oxide reacts with acids to form  $VO_4^{+}$  is

- a) 5                                      b) 2                                      c) 3                                      d) 7

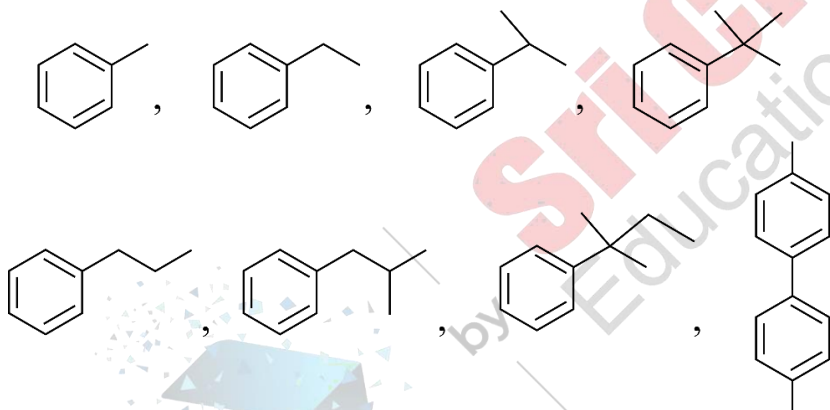
**Ans: (b)**

2. Which has maximum oxidizing power among the following

- a)  $VO_2^{+}$                                       b)  $Cr_2O_7^{2-}$                                       c)  $MnO_4^{-}$                                       d)  $TiO_2$

**Ans: (c)**

3. How many of the following will give Benzoic acid on oxidation with  $KMnO_4$  ?



- a) 4                                      b) 7                                      c) 5                                      d) 8

**Ans: (c)**

4. How many of the following are paramagnetic in nature  $O_2$ ,  $O_2^{-}$ ,  $NO_2$ ,  $CO$ ,  $NO$ ,  $[Ni(NH_3)_6]^{2-}$ ,  $K_3[Co(CN)_6]$ ,  $[NiCl_4]^{2-}$

- a) 5                                      b) 7                                      c) 6                                      d) 4

**Ans: (a)**

5. How many of the following molecules are polar?

$CH_4$ ,  $CCl_4$ ,  $CH_2Cl_2$ ,  $H_2O$ ,  $NH_3$ ,  $H_2O_2$ ,  $O_2$ ,  $F_2$

- a) 0                                      b) 7                                      c) 5                                      d) 3

**Ans: (c)**

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**NEET**



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**CLASSROOM STUDENT**  
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**JEE MAIN**

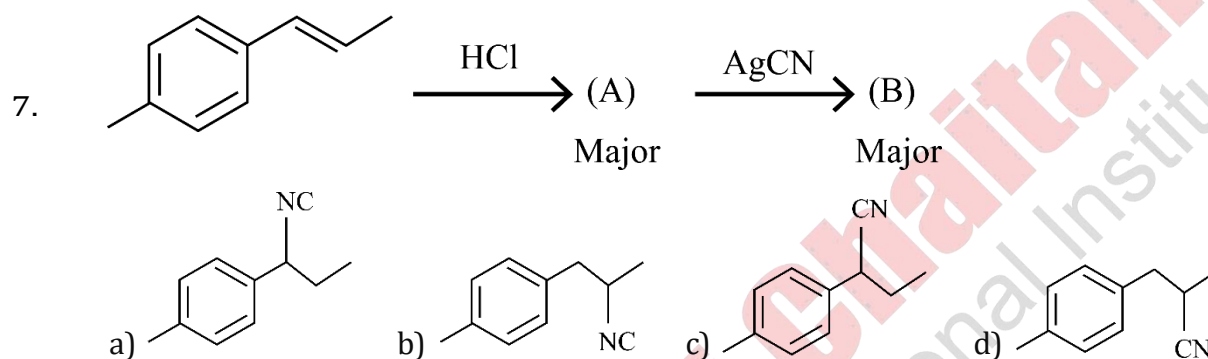


**S VENKAT KOUNDINYA**  
H.T.No. 230310124339

**CLASSROOM STUDENT**  
FROM GRADE I-XII

6. The increasing solubility order of HgS, PbS, AgBr, Ca(OH)<sub>2</sub>
- a) HgS < PbS < AgBr < Ca(OH)<sub>2</sub>      b) PbS < HgS < Ca(OH)<sub>2</sub> < AgBr  
c) AgBr < PbS < HgS < Ca(OH)<sub>2</sub>      d) Ca(OH)<sub>2</sub> < HgS < AgBr < PbS

Ans: (a)



Ans: (a)

8. The correct order of energy of the following subshell is

1s 2s 3p 3d

- a) 1s < 2s < 3d < 3p      b) 2s < 1s < 3p < 3d  
c) 1s < 3p < 2s < 3d      d) 1s < 2s < 3p < 3d

Ans: (d)

9. Bohr's model is applicable for single electron atom of atomic number Z. Dependency of frequency of rotation of electron in n<sup>th</sup> principal quantum number is proportional to

- a) Z/n<sup>2</sup>      b) Z<sup>2</sup>/n<sup>3</sup>      c) n<sup>3</sup>/Z      d) Z/n

Ans: (b)

10. Which of the following compound(s) is/are yellow in colour?  
(A) CdS, (B) PbS, (C) CuS, (D) ZnS (Cold), (E) PbCrO<sub>4</sub>  
Choose the correct answer from the options given below:

- a) (A), (C) and (E) only      b) (A) and (E) only  
c) (B) and (D) only      d) (A), (B) and (E) only

Ans: (b)

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NEET



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FROM GRADE VI-XII

JEE MAIN



S VENKAT KOUNDINYA  
H.T.No. 230310124339  
CLASSROOM STUDENT  
FROM GRADE I-XII



16. For an elementary reaction  $A + B \rightarrow C + D$ . When volume becomes  $\frac{1}{3}$ rd, rate of reaction becomes

- a) 8 times                      b) 9 times                      c) 6 times                      d) 2 times

Ans: (b)

17. Match the following List-I with List-II.

	List-I		List-II
(A)	$[\text{CoF}_6]^{3-}$	(i)	$sp^3d^2$
(B)	$[\text{Co}(\text{NH}_3)_6]^{3+}$	(ii)	$d^2sp^3$
(C)	$[\text{NiCl}_4]^{2-}$	(iii)	$sp^3$
(D)	$[\text{Ni}(\text{CN})_4]^{2-}$	(iv)	$dsp^2$

Choose the correct answer from the options given below:

- a) (A)-(i), (B)-(ii), (C)-(iii), (D)-(iv)      b) (A)-(ii), (B)-(i), (C)-(iv), (D)-(iii)  
c) (A)-(i), (B)-(ii), (C)-(iv), (D)-(iii)      d) (A)-(ii), (B)-(i), (C)-(iii), (D)-(iv)

Ans: (a)

18. Match the following List-I with List-II.

	List-I		List-II
P	Maltose	1	$C_1\beta - C_4\beta$
Q	Lactose	2	$C_1\alpha - C_6\alpha$
R	Amylopectin	3	$C_1\alpha - C_4\alpha$
S	Sucrose	4	$C_1\alpha - C_2\beta$

Choose the correct answer from the options given below:

- a)  $P \rightarrow 3; Q \rightarrow 1; R \rightarrow 2; S \rightarrow 4$       b)  $P \rightarrow 1; Q \rightarrow 3; R \rightarrow 2; S \rightarrow 4$   
c)  $P \rightarrow 3; Q \rightarrow 2; R \rightarrow 1; S \rightarrow 4$       d)  $P \rightarrow 3; Q \rightarrow 1; R \rightarrow 4; S \rightarrow 2$

Ans: (a)

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VAVILALA CHIDVILAS  
H.T.No. 236165088

CLASSROOM STUDENT  
FROM GRADE VI-XII

NEET



B VARUN CHAKRAVARTHI  
H.T.No. 1205120175

CLASSROOM STUDENT  
FROM GRADE VI-XII

JEE MAIN



S VENKAT KOUNDINYA  
H.T.No. 230310124339

CLASSROOM STUDENT  
FROM GRADE I-XII



19. Given below are two statements:

**Statement-I** : According to law of octaves, the elements are arranged in the increasing order of atomic number

**Statement-II** : Lothar-Meyer observed a periodically repeated pattern upon plotting physical properties of certain elements against their respective atomic numbers.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (a) Both Statement I and Statement II are incorrect
- (b) Statement I is correct but Statement II is incorrect
- (c) Both Statement I and Statement II are correct
- (d) Statement I is incorrect but Statement II is correct

**Ans: (a)**

20. By passing current in 600 mL of NaCl solution pH increase to 12. Find current (i) if electrolysis occur for 10 min/assume 100% efficiency (nearest integer)

**Ans: 1**

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**CLASSROOM STUDENT  
FROM GRADE VI-XII**

**NEET**



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H.T.No. 1205120175

**CLASSROOM STUDENT  
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**JEE MAIN**



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H.T.No. 230310124339

**CLASSROOM STUDENT  
FROM GRADE I-XII**

**MATHEMATICS**

1. Bag 1 has 6-white, 4-black, bag 2 has 4-white, 6-black, bag 3 has 5 -white, 5-black balls. A bag is drawn then the probability that the white ball is taken from bag 2 ?

- a)  $\frac{4}{15}$                       b)  $\frac{2}{5}$                       c)  $\frac{5}{2}$                       d)  $\frac{5}{3}$

**Ans: (a)**

2. For positive integer  $n, 4a_n = n^2 + 5n + 6$  and  $S_n = \sum_{k=1}^n \left(\frac{1}{a_k}\right)$ , then the value of  $507S_{2025}$

- a) 675                      b) 540                      c) 1350                      d) 135

**Ans: (a)**

3. Let  $\begin{bmatrix} \frac{1}{\sqrt{2}} & -2 \\ 0 & 1 \end{bmatrix}$  &  $P = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}, \theta > 0$ . If  $B = PAP^T, C = P^T B^{10} P$  & the sum of the diagonal element of 'c' is  $\frac{m}{n}$  where  $\gcd(m, n) = 1$ , then  $(m + n)$  is

- a) 65                      b) 258                      c) 127                      d) 2049

**Ans: (a)**

4. Let the coefficient of three consecutive terms.  $T_r, T_{r+1}$  &  $T_{r+2}$  in the binomial expansion of  $(a + b)^{12}$  be in a G.P and let p be the no of all possible values of r. let a be the sum of all rational term in the binomial expansion  $(\sqrt[4]{3} + \sqrt[3]{4})^{12}$ . Then  $p + q$  is equal to

- a) 299                      b) 287                      c) 295                      d) 283

**Ans: (d)**

5. The no of natural number between 212 & 999 such that the sum of their digits is 15

**Ans: 64**

6. The interior angle of a polygon with n side are in A.P with common difference of  $6^\circ$ . If the biggest interior angle of polygon is  $219^\circ$  then n is equal to

**Ans: 20**

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7.  $\sum_{r=1}^{13} \left\{ \frac{1}{\sin\left(\frac{\pi}{4} + (r-1)\frac{\pi}{6}\right)\sin\left[\frac{\pi}{4} + \frac{2r\pi}{6}\right]} \right\} = a\sqrt{3} + b, a, b \in \mathbb{Z}$  then  $a^2 + b^2$  is equal to

- a) 10                      b) 8                      c) 4                      d) 2

Ans: (b)

8. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be a twice differentiable function such that  $f(2) = 1$ . If  $F(x) = xf(x)$ . For all  $x \in \mathbb{R}$ .  $\int_0^2 xF'(x)dx = 6, \int_0^2 x^2F''(x)dx = 40$  then  $F'(2) + \int_0^2 F(x)dx$  is equal to

Ans: 11

9.  $f(x) = \int \frac{1}{x^{1/4}(1+x^{1/4})} dx, f(0) = -6$  then  $f(1) =$

- a)  $4(\log 2 + 2)$               b)  $\ln 2 + 2$               c)  $4(\log 2 - 2)$               d)  $2 - \ln 2$

Ans: (c)

10. The square of the distance the point  $\left(\frac{15}{7}, \frac{32}{7}, 7\right)$  from  $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ , in the direction of the vector  $i + 4j + 7k$  is

- a) 44                      b) 54                      c) 41                      d) 66

Ans: (d)

11. The Area of the region bounded by the curves  $x(1 + y^2) = 1$  &  $y^2 = 2x$  is

- a)  $\frac{\pi}{4} - \frac{1}{3}$                       b)  $\left(\frac{\pi}{2} - \frac{1}{3}\right)$                       c)  $\frac{\pi}{2} - \frac{1}{3}$                       d)  $\frac{1}{2}\left(\frac{\pi}{2} - \frac{1}{3}\right)$

Ans: (c)

12. Two equal sides of an isosceles triangle are along  $-x + 2y = 4, x + y = 4$ . If  $m$  is slope its 3<sup>rd</sup> side. Then the sum of all possible distinct Values of  $r$  is

- a) 12                      b) 6                      c) -6                      d)  $-2\sqrt{10}$

Ans: (b)

13. If  $y = y(x)$  is the solution of the differential equation

$\sqrt{4-x^2} \frac{dy}{dx} = \left[ \left[ \sin^{-1} \left( \frac{x}{2} \right) \right]^2 - y \right] \sin^{-1} \left( \frac{x}{2} \right), -2 \leq x \leq 2, y(2) = \frac{\pi^2 - 8}{4}$  then  $y(0)$  is equal to \_\_\_\_\_

Ans: 4

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14. If a components of vector  $A^{\rightarrow} = \alpha \hat{i} + \beta \hat{j} + \gamma \hat{k}$  along and perpendicular to  $B^{\rightarrow} = 3\hat{i} + \hat{j} - \hat{k}$  respectively are  $\frac{16}{11}(3\hat{i} + \hat{j} - \hat{k})$  and  $\frac{1}{11}(-4\hat{i} - 5\hat{j} - 17\hat{k})$  then  $\alpha^2 + \beta^2 + \gamma^2 = ?$

- a) 16                      b) 18                      c) 26                      d) 23

Ans: (c)

15. If  $A$  &  $B$  are the point of intersection of the circle  $x^2 + y^2 - 8x = 0$  & the hyperbola  $\frac{x^2}{9} - \frac{y^2}{4} = 1$  and a point  $p$  moves on the line  $2x - 3y + 4 = 0$ , then the Centroid of  $\Delta PAB$  lies on the line.

- a)  $x + 9y = 36$               b)  $9x - 9y = 32$               c)  $6x - 9y = k$               d)  $4x - 9y = 12$ .

Ans: (c)

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