TARGET IIT-JEE
HINT & SOLUTION

CLASS XI **DATE : 13-06-2010**

ANSWER KEY WITH SOLUTION

MATHEMATICS

SECTION – A

1.	B	**2.**	A	**3.**	B	**4.**	C	**5.**	B	**6.**	B	**7.**	B
8.	B	**9.**	B,C	**10.**	A,C	**11.**	B,C	**12.**	B	**13.**	C	**14.**	A
15.	C												

SECTION – C

1.	0002	**2.**	0006	**3.**	0004	**4.**	0003	**5.**	0001

PHYSICS

SECTION - A

1.	A	**2.**	D	**3.**	B	**4.**	C	**5.**	C	**6.**	A	**7.**	A
8	B	**9.**	A,B,C,D	**10.**	A,B,D	**11.**	B,D	**12.**	A	**13.**	C	**14.**	B
15.	D												

SECTION - C

1.	0150	**2.**	0010	**3.**	0006	**4.**	0006	**5.**	0007

CHEMISTRY

SECTION A

1.	C	**2.**	A	**3.**	A	**4.**	B	**5.**	C	**6.**	B	**7.**	C
8.	C	**9.**	ABCD	**10.**	ABC	**11.**	ABC	**12.**	B	**13.**	B	**14.**	B
15.	A												

SECTION C

1.	0050	**2.**	0016	**3.**	2200	**4.**	0016	**5.**	4000

SECTION - A

1. **A**

By sine Rule :

$$\frac{\sin 53°}{2x^2-1} = \frac{\sin 90°}{\frac{5}{4}x} = \frac{\sin 37°}{\frac{3}{4}y}$$

$\Rightarrow x = y$

2. **D**

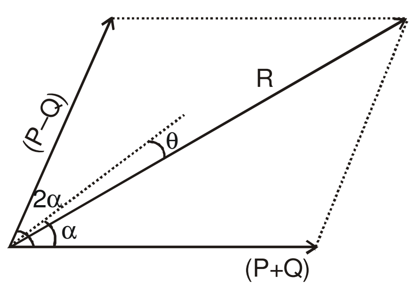
In option D $\frac{v^2}{c^2}$ is dimension less.

3. **B**
4. **C**
5. **C**
6. **A**

Let that vector is $\vec{C}$. Then

$$\vec{C} = C\hat{C} = b\hat{a} \Rightarrow \vec{C} = \frac{b\hat{a}}{a} = \frac{5}{\sqrt{2}}(\hat{i}-\hat{j})$$

7. **A**



The angle which the resultant makes with P + Q will be $(\alpha - \theta)$.

Thus $\tan(\alpha-\theta) = \frac{(P-Q)\sin 2\alpha}{(P+Q)+(P-Q)\cos 2\alpha}$

or $\frac{\sin(\alpha-\theta)}{\cos(\alpha-\theta)} = \frac{(P-Q)\sin 2\alpha}{(P+Q)+(P-Q)\cos 2\alpha}$

$\sin(\alpha+\theta)\,(P+Q) + (P-Q)\cos 2\alpha \sin(\alpha-\theta)$
$= (P-Q)\sin 2\alpha \cos(\alpha-\theta)$

$\sin(\alpha-\theta)\,(P+Q) = (P-Q)\,[\sin(2\alpha)\cos(\alpha-\theta) - \cos 2\alpha \sin(\alpha-\theta)]$

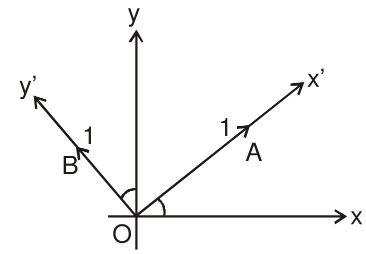
or $(P+Q)\sin(\alpha-\theta) = (P-Q)\sin(\alpha+\theta)$

or $P\,[\sin(\alpha+\theta) - \sin(\alpha-\theta)] = Q[\sin(\alpha+\theta) + \sin(\alpha-\theta)]$

or $P \times 2\cos\alpha \sin\theta = Q \times 2\sin\alpha\cos\theta$

$\therefore$ $P\tan\theta = Q\tan\alpha$

8. **B**



$$\hat{OA} = 1\cos\theta\hat{i} + 1\sin\theta\hat{j}$$

$$\hat{OB} = 1\cos\theta\hat{j} + 1\sin\theta(-\hat{i})$$

9. **A,B,C,D**

Velocity $= \frac{\text{length}}{\text{time}}$, acc. $= \frac{\text{length}}{(\text{time})^2}$

$\Rightarrow$ Length $= \frac{(\text{velocity})^2}{\text{acc.}}$, i.e., $L' = \frac{v^2}{a'}$ and $L = \frac{v^2}{a}$

$$\Rightarrow \frac{L'}{L} = \left(\frac{v'}{v}\right)^2\left(\frac{a}{a'}\right) = \left(\frac{\alpha^2}{\beta}\right)^2\frac{1}{\alpha\beta} = \frac{\alpha^3}{\beta^3}$$

Now, $m' = \frac{F'}{a'}$ and $m = \frac{F}{a}$

$$\Rightarrow \frac{m'}{m} = \frac{F'}{F}\frac{a}{a'} = \frac{1}{\alpha\beta} \times \frac{1}{\alpha\beta} = \frac{1}{\alpha^2\beta^2}$$

Time $= \frac{\text{vel.}}{\text{acc.}}$ i.e., $T' = \frac{v'}{a'}$ and $T = \frac{v}{a}$

$$\Rightarrow \frac{T'}{T} = \frac{v'}{v}\frac{a}{a'} = \frac{\alpha^2}{\beta}\frac{1}{\alpha\beta} = \frac{\alpha}{\beta^2}$$

Momentum = mass × velocity, i.e.,
$P' = m'v'$ and $P = mv$

$$\Rightarrow \frac{P'}{P} = \frac{m'}{m}\frac{v'}{v} = \frac{1}{\alpha^2\beta^2}\frac{\alpha^2}{\beta} = \frac{1}{\beta^3}$$

10. **A,B,C,D**

$c^2 = a^2 + b^2 - 2ab\cos\theta$ ....(1)
$2a = b$ ....(2)

$$\therefore c^2 = \frac{5a^2}{4} - a^2\cos^2\theta$$

Now check for A, B, C, D

11. **B,D**

$\vec{A} = a_1\hat{i} + b_1\hat{j} \quad \Rightarrow |A| = \sqrt{a_1^2 + b_1^2}$

$\vec{B} = a_2\hat{i} + b_2\hat{j} \quad \Rightarrow |B| = \sqrt{a_2^2 + b_2^2}$

$A_x + B_x = a_1 + a_2$ and $|A| + |B| = \sqrt{a_1^2+b_1^2} + \sqrt{a_2^2+b_2^2}$

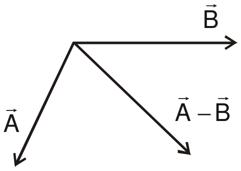
$\Rightarrow \sqrt{a_1^2+b_1^2} + \sqrt{a_2^2+b_2^2} \geq a_1 + a_2$

$\Rightarrow |A| + |B| \geq A_x + B_x$

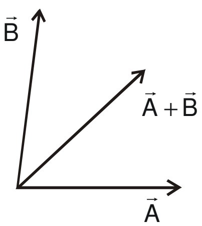
12. **A**

'All rivers are sea, some streams are rivers, some streams are sea'.

13. **C**



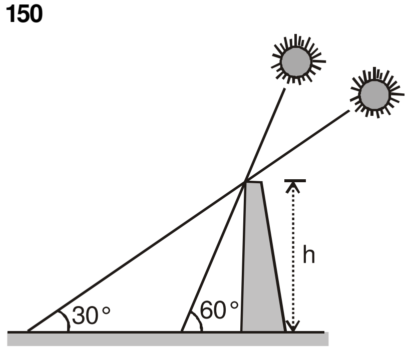
14. **B**



15. **D**

SECTION - C

1. **150**



If h is the height of tower, then

$$h = \frac{d}{\cot\theta_2 - \cot\theta_1}$$

$$h = \frac{100\sqrt{3}}{\cot 30° - \cot 60°} = 50 \times 3 = 150$$

2. **10**

Let fundamental unit be v, a and f :

v = [LT^{-1}], ...(1)

a = [LT^{-2}] ...(2)

and F = [MLT^{-2}] ...(3)

Dividing (1) by (2), $\frac{v}{a} = \frac{[LT^{-1}]}{[LT^{-2}]} = T$

$\therefore$ Unit of time (z) = $\frac{20\,m/s^2}{5\,m/s^2} = 4\,sec$

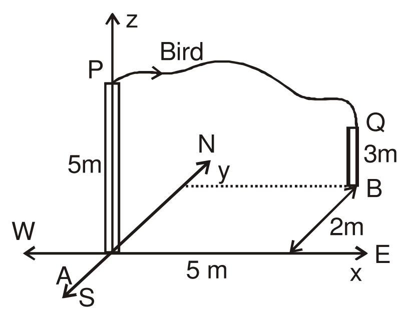
Dividing (3) by (2), $\frac{F}{a} = M$

$\therefore$ Unit of mass (x) = $\frac{F}{a} = \frac{10}{5} = 2kg$

From (1) [L] = [vT] = 20 × 4 = 80 m

$\Rightarrow \frac{y}{xz} = 10$

3. **6**



$\overrightarrow{AP} = 5\hat{k}$, $\overrightarrow{AQ} = 5\hat{i} + 2\hat{j} + 3\hat{k}$

Displacement of the brid = $\overrightarrow{PQ} = \overrightarrow{AQ} - \overrightarrow{AP} = 5\hat{i} + 2\hat{j} - 2\hat{k}$

PQ = $\sqrt{5^2 + 2^2 + 2^2} = \sqrt{33}m \simeq 6$

4. **6**

Subjective

$\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD} = \overrightarrow{AD}$ ...(1)

$\overrightarrow{AF} + \overrightarrow{FE} + \overrightarrow{ED} = \overrightarrow{AD}$ ....(2)

From diagram

$\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{CD}$

$\overrightarrow{AC} = \overrightarrow{ED} + \overrightarrow{FE}$ ...(3)

$\overrightarrow{AE} = \overrightarrow{AF} + \overrightarrow{FE} = \overrightarrow{CD} + \overrightarrow{BC}$ ...(4)

keeping the value (3) & (4) in (1) & (2) & adding (1) & (2)

$\overrightarrow{AB} + \overrightarrow{AE} + \overrightarrow{AF} + \overrightarrow{AC} = 2\,\overrightarrow{AD}$

$\overrightarrow{AD} = 2\overrightarrow{AO}$

$\overrightarrow{AB} + \overrightarrow{AC} + \overrightarrow{AD} + \overrightarrow{AF} + \overrightarrow{AE} = 3\overrightarrow{AD} = 6\overrightarrow{AO}$

5. **7**

The length of the vector is not changed by the rotation of the coordinate axes.

$\sqrt{(n+1)^2 + 1^2} = \sqrt{n^2 + 3^2}$ or $n^2 + 2n + 2 = n^2 + 9$

or 2n = 7

SECTION - A

1. C
2. A
3. A
4. B
5. C
Atomic Mass is a unitless quantity as implied from its defination.
6. B
It is in decreasing order of radii.
7. C
PV = nRT

$V = \frac{nRT}{p}$

$V = \frac{2\times 0.0821\times 273}{1}$ **= 44.8 L**

8. C
Molecular Mass of $CuSO_4 . 5H_2O$ = 249.5

$n = \frac{499}{249.5}$ = 2 moles

1 mole $CuSO_4 . 5\,H_2O$ contains O atoms = 9 moles
2 mole $CuSO_4 . 5\,H_2O$ contains O atoms = 9×2
= 18 moles

9. ABCD
10. ABC
Molecular Mass of NH_3 = 17

$n = \frac{1.7}{17}$ = 0.1 mole

no. of atoms = 0.1 ×4 × N_A = 0.4 × N_A
At STP 1 mole gas occupes = 22.7 L
So, 0.1 gas will occupy = 2.27 L
1 mole NH_3 contains electron = 7 + 3 ×1)N_A = 10 × N_A
So, 0.1 mole NH_3 will contain = (10 × N_A) × 0.1
= N_A Ans.

11. ABC
22.7 L at STP = 1 mole

5.675 L at STP = $\frac{1}{22.7}\times 5.675$ = 0.25 mole

1 gm He = $\frac{1}{4}$ mole = 0.25 mole

0.5 gm H atom = $\frac{0.5}{1}$ mole H atom

= 0.5 × $\frac{1}{2}$ mole H_2 mole cule = 0.25 mole

11 gm CO_2 = $\frac{11}{44}$ mole CO_2 = 0.25 mole

2 gm H_2 gas = $\frac{2}{2}$ = 1 mole

12. B
13. B
14. B
15. A

SECTION C

1. **0050 elements**
n = 9
$9s^2, 9p^6, 8d^{10}, 7f^{14}, 6g^{18}$
2 + 6 + 10 + 14 + 18 = **50** elements
(5 n^{22} is not possible)

2. **0016**
n = 4
ℓ = 0 s → 1 orbitals
1 p → 3 orbitals
2 d → 5 orbitals
3 f → 7 orbitals
Total orbitls = 1 + 3 + 5 + 7 = **16**

3. **2.2 (2200)**
Cs z = 55
σ = (0.85 ×8) + 46 × 1.0 = 52.80
$z^* = z - \sigma$
= 55 – 52.8 = 2.2
Answer to be marked as 2.2 × 1000= **2200 Ans.**

4. **0016**
22.7 L at STP = 1 mole

45.4 L = $\frac{1}{22.7}\times 45.4$ = 2 moles

super heated steam is nothing but H_2O.
So, no. of neutrons in 1 mole H_2O
= [(2 × 0 + (8 × 1)]moles
So, 2 mole H_2O contains = 8 ×2
= **16 mole neutrons**

5. **4000**
1 tonne = 1000 kg
Total moler of Urea manufactured every day

$= \frac{12\times 1000\times 1000\text{gm}}{60\text{gm}/\text{mol}} = 2\times 10^5$moles

mol. wt. of Urea NH_2CONH_2 = 60
10,000 moles of Urea = Rs 20,000 Profit
So, for 1 mole Urea = Rs 2 profit
for 2 ×10^5 moles Urea = Rs. 2 ×2×10^5 profit

$= \frac{4\times 10^5}{100}$ = 4,000