# WEEKLY TEST OYM TEST - 21 Balliwala
# SOLUTION Date 08-09-2019

## [PHYSICS]

1. Using $d \sin\theta = n\lambda$, for $n = 1$

$$\sin\theta = \frac{\lambda}{d} = \frac{550 \times 10^{-9}}{0.55 \times 10^{-3}} = 10^{-3} = 0.001 \text{ rad}$$

2. By using $\mu = \tan\theta_p \Rightarrow \mu = \tan 60 = \sqrt{3}$,

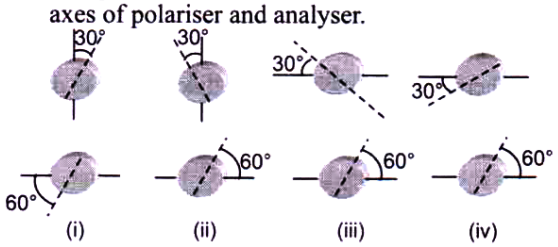
also $C = \sin^{-1}\left(\frac{1}{\mu}\right) \Rightarrow C = \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

3. $\mu = \tan\theta_P \Rightarrow \theta_P = \tan^{-1} n$

4. The amplitude will be $A \cos 60° = A / 2$

5. If an unpolarised light is converted into plane polarised light by passing through a polaroid, its intensity becomes half.

6. Final intensity of light is given by Brewster's law $I = I_0 \cos^2\theta$; where $\theta$ = Angle between transmission axes of polariser and analyser.



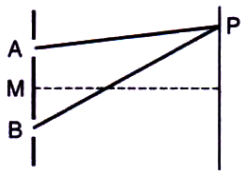

7. For first minima,

$AP - BP = \lambda$

Hence, $AP - MP = \frac{\lambda}{2}$

$\therefore$ Phase difference

$= \frac{2\pi}{\lambda} \times \frac{\lambda}{2} = \pi$ radian



8.

$$\Delta x = n\lambda$$

or $d \sin\theta = n\lambda$ [For maximum intensity]

For maximum number of possible interference maxima,

$$\sin\theta = 1$$

$\therefore$ $d = n\lambda$ or $4\lambda = n\lambda$ or $n = 4$.

9.

In Young's double slit experiment intensity at a point is given by:

$$I = I_0 \cos^2\left(\frac{\phi}{2}\right)$$

where $\phi$ = phase difference; $I_0$ = maximum intensity

or $$\frac{I}{I_0} = \cos^2\left(\frac{\phi}{2}\right) \quad ...(i)$$

Phase difference, $\phi = \frac{2\pi}{\lambda} \times$ path difference

$\therefore$ $$\phi = \frac{2\pi}{\lambda} \times \frac{\lambda}{6}$$

or $$\phi = \frac{\pi}{3} \quad ...(ii)$$

Substitute eqn. (ii) in eqn. (i), we get;

$$\frac{I}{I_0} = \cos^2\left(\frac{\pi}{6}\right)$$

or $$\frac{I}{I_0} = \frac{3}{4}.$$

10.

$$\Delta = x\frac{d}{D}$$

$\therefore$ Phase difference $= \phi = \frac{2\pi}{\lambda}\Delta$

Let $a$ = amplitude at the screen due to each slit

$\therefore$ $I_0 = K(2a)^2 = 4Ka^2$,

where $K$ is a constant.

For phase difference $\phi$ amplitude $A = 2a\cos(\phi/2)$

Intensity, $I = KA^2 = K(4a)^2\cos^2(\phi/2)$

$= I_0\cos^2(\pi\Delta/\lambda)$

$= I_0\cos^2\left(\frac{\pi}{\lambda}\frac{xd}{D}\right)$

$= I_0\cos^2(\pi x/\beta)$.

11.

Path difference $\Delta x = \frac{yd}{D}$

Here, $y = \frac{d}{2} = \frac{5\lambda}{2}$ (as $d = 5\lambda$)

and $D = 10d = 50\lambda$

So, $\Delta x = \frac{5\lambda}{2} \times \frac{5\lambda}{50\lambda} = \frac{\lambda}{4}$

Corresponding phase difference will be,

$$\Delta\phi = \frac{2\pi}{\lambda} \cdot \Delta x = \left(\frac{2\pi}{\lambda}\right)\left(\frac{\lambda}{4}\right) = \frac{\pi}{2}$$

or $\frac{\Delta\phi}{2} = \frac{\pi}{4}$

$\therefore$ $I = I_0 \cos^2\left(\frac{\Delta\phi}{2}\right) = I_0 \cos^2\left(\frac{\pi}{4}\right) = \frac{I_0}{2}$.

12.

$$x_n = 2n\left(\frac{D\lambda}{2d}\right)$$

or $\frac{x_n}{D} = \frac{n\lambda}{d}$

$\therefore$ $\sin\theta = \frac{n\lambda}{d} = \frac{3 \times 589 \times 10^{-9}}{0.589}$

or $\theta = \sin^{-1}(3 \times 10^{-6})$.

13.

In first case, $I_{max.} = (a + a)^2 = 4a^2$

In second case, $I'_{max.} = a^2 + a^2 = 2a^2$

$\therefore$ $\frac{I_{max.}}{I'_{max.}} = \frac{4a^2}{2a^2} = \frac{2}{1}$.

14.

$\phi = 60°$, $\cos\phi = 1/2$, $I_1 = I_2 = I_0$

$\therefore$ $I = I_1 + I_2 + 2(\sqrt{I_1 I_2})\cos\phi$

$= I_0 + I_0 + 2(\sqrt{I_0 \times I_0})\cos 60° = 3I_0$.

15.

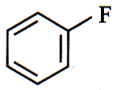
## [CHEMISTRY]

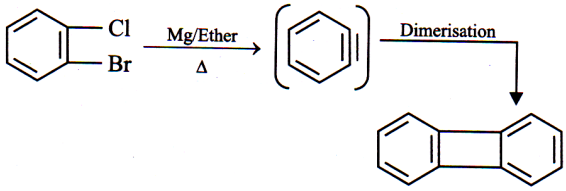
16. **(d)**

17. **(a)** $CH_3 - \underset{\underset{CH_3}{|}}{CH} - \underset{\underset{CH_3}{|}}{C(Br)CH_3}$ — $MeO^- K^+$ → **X**; $Et_3CO^- K^+$ → **Y**

X = $\begin{matrix} CH_3 \\ CH_3 \end{matrix}\!\!>\!C=C<\!\!\begin{matrix} CH_3 \\ CH_3 \end{matrix}$ (Saytzeff)

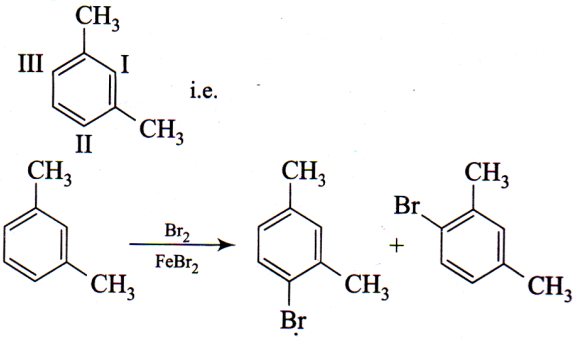
Y = $\begin{matrix} (CH_3)CH \\ CH_3 \end{matrix}\!\!>\!C=C<\!\!\begin{matrix} H \\ H \end{matrix}$ (Hoffmann)

18. **(a)** Fluoro benzene 

19. **(c)** 


Ortho-dihalobenzene does not form Grignard reagent.

20. **(c)** Methyl group is ortho para directing but due to steric hindrance effect, generated by two $CH_3$ groups substitution will not take place on position (I). Hence only two products are possible.




21. **(c)** $CaC_2 + 2H-OH \rightarrow Ca(OH)_2 + H-C\equiv C-H$ (A)

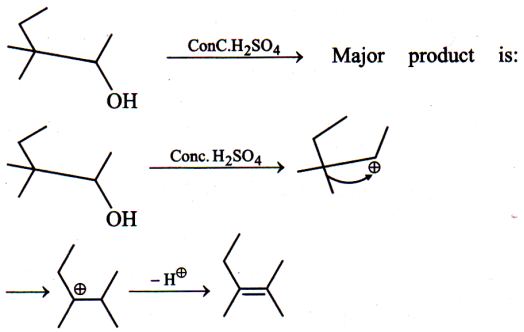
$H-C(=O)-CH_3 \xrightarrow{H_2/Ni} CH_3-CH_2OH$ ; (A) $\xrightarrow{Hg^{2+}/H_2SO_4}$ $H-C(=O)-CH_3$

22. **(c)** 3° alcohol is $R-\underset{\displaystyle R''}{\overset{\displaystyle R'}{\overset{|}{\underset{|}{C}}}}-OH$

23. **(b)** Tertiary alcohols are formed by treating Grignard reagents either with ketones or excess of an ester other than formate which will give 2° alcohol.

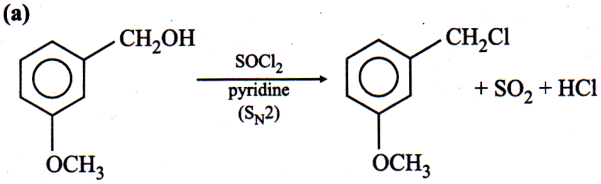
24. **(d)** According to carbocation stability

25. **(d)** Tertiary alcohols react fastest with Lucas reagent followed by 2° and 1° alcohols.

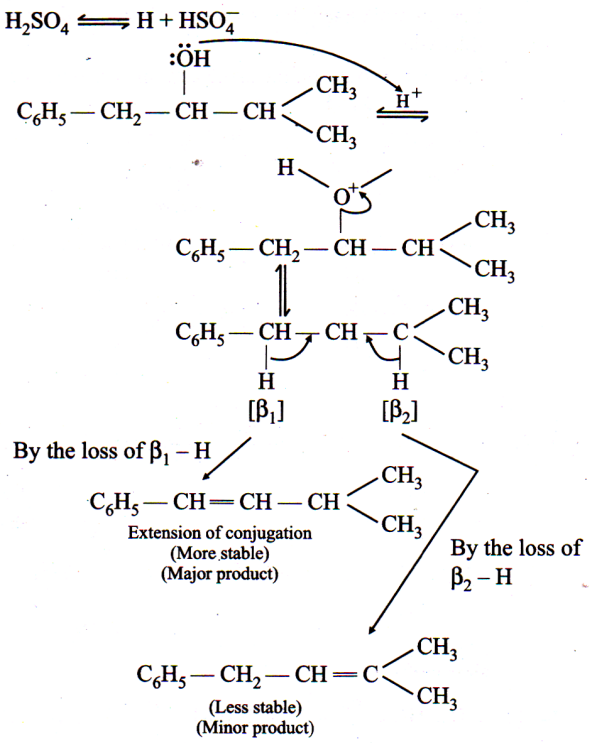
26. **(c)** 

27. **(a)** Nucleophilic substitution of alcohol is acid catalysed reaction.

28. **(a)**




29 **(a)**




30. **(b)** The mechanism of this reaction is represented as follows.