

WEEKLY TEST OYJ TEST - 23 R & B
SOLUTION Date 22-09-2019

[PHYSICS]

1.

As the image is real it will be inverted and so

$$m = -(v/u) = -n, \quad \text{i.e., } v = nu$$

$$\therefore \frac{1}{v} + \frac{1}{u} = -\frac{1}{f} \quad \text{or} \quad \frac{1}{nu} + \frac{1}{u} = -\frac{1}{f}$$

$$\text{or} \quad \frac{(1+n)}{nu} = -\frac{1}{f} \quad \text{or} \quad u = -\frac{(n+1)}{n} f$$

i.e., object is in front of mirror at a distance $[(n+1)f/n]$.

2.

As the image formed by a convex mirror is always virtual or erect,

$$\text{so} \quad m = -(v/u) = + (1/n) \quad \text{or} \quad v = -\frac{u}{n}$$

$$\therefore \frac{1}{v} + \frac{1}{u} = \frac{1}{f} \quad \text{or} \quad -\frac{n}{u} + \frac{1}{u} = \frac{1}{+f}$$

$$\text{or} \quad \frac{-(n-1)}{u} = \frac{1}{f}$$

$$\text{or} \quad u = -(n-1) f$$

i.e., object is in front of mirror at a distance $(n-1) f$.

3.

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f} \quad \text{or} \quad -\frac{dv}{v^2} - \frac{du}{u^2} = 0$$

i.e., $dv = -du[v/u]^2$

$$\text{But} \quad v = \frac{uf}{(u-f)} \quad \text{or} \quad \frac{v}{u} = \frac{f}{(u-f)}$$

$$\text{So,} \quad dv = -du \left[\frac{f}{(u-f)} \right]^2$$

$$\text{Hence,} \quad |dv| = L \left[\frac{f}{(u-f)} \right]^2$$

4.

The focal length of a mirror is independent of the medium from which the light is incident. So, it remains equal to f .

5.

Object distance $u = -40$ cm,Focal length $f = -20$ cm

According to mirror formula

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f} \quad \text{or} \quad \frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

$$\text{or} \quad \frac{1}{v} = \frac{1}{-20} - \frac{1}{(-40)} = \frac{1}{-20} + \frac{1}{40}$$

$$\frac{1}{v} = \frac{-2+1}{40} = -\frac{1}{40} \quad \text{or} \quad v = -40 \text{ cm}$$

Negative sign shows that image is in front of concave mirror. The image is real.

$$\text{Magnification, } m = \frac{-v}{u} = -\frac{(-40)}{(-40)} = -1$$

6.

$$f = 15 \text{ cm, } m = 2$$

$$m = 2 = \frac{\text{size of the image}}{\text{size of the object}}$$

$$= \frac{v}{u}$$

$$\text{or} \quad v = 2u$$

For concave mirror,

$$\frac{1}{15} = \frac{1}{f} = \frac{1}{u} - \frac{1}{v} = \frac{1}{u} - \frac{1}{2u}$$

$$\text{or} \quad 2u = 15$$

$$\text{or} \quad u = 7.5 \text{ cm.}$$

7.

From mirror equation,

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} = -\frac{1}{20} - \frac{1}{10} \quad \dots(i)$$

$$= -\frac{3}{20}$$

$$\therefore \frac{1}{v'} = -\frac{3}{20} + \frac{1}{9.9}$$

$$\text{or} \quad v' = -20.4 \text{ cm}$$

i.e., shift is 0.4 cm away from the mirror.

8.

$$f = -15 \text{ cm} \quad (\text{as mirror is concave})$$

$$m = -2 \quad (-\text{ve sign is due to virtual image})$$

$$m = \frac{v}{u}$$

$$\text{or} \quad -2 = \frac{v}{u} \quad \text{or} \quad v = -2u \quad \dots(i)$$

$$\text{Also, } \frac{1}{f} = \frac{1}{v} + \frac{1}{u} = -\frac{1}{2u} + \frac{1}{u} = \frac{1}{2u}$$

$$\therefore u = \frac{f}{2} = \frac{-15}{2} = -7.5 \text{ cm.}$$



9.

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$v = 3u$, $u = 20$ cm and both v and u are $-ve$.

10.

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f} \quad \text{or} \quad \frac{1}{-20} + \frac{1}{v} = \frac{1}{20}$$

$$\therefore v = 10 \text{ cm}$$

$$m = \frac{v}{u} = \frac{h_2}{h_1}$$

$$\text{or} \quad \frac{10}{20} = \frac{h_2}{2 \text{ mm}} \quad \text{or} \quad h_2 = 1 \text{ mm.}$$

11.

Erect, virtual and diminished image is formed by convex mirror and concave lens. In case of concave mirror and convex lens, erect, virtual and enlarged image is formed when object is placed between focus and the pole.

12.

$$\text{In convex mirror, } \frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\text{or} \quad \frac{1}{v} + \frac{1}{f} = -\frac{1}{f}$$

$$\therefore v = -\frac{f}{2}$$

13.

Lens maker's formula,

$$\frac{1}{f} = (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

(where, $R_2 = \infty$, $R_1 = 0.3$ m)

$$\therefore \frac{1}{f} = \left(\frac{5}{3} - 1 \right) \left(\frac{1}{0.3} - \frac{1}{\infty} \right)$$

$$\frac{1}{f} = \frac{2}{3} \times \frac{1}{0.3}$$

$$\text{or} \quad f = -0.45 \text{ m.}$$

14.

$$R = -24 \text{ cm, } f = -12 \text{ cm, } m = 1.5$$

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}; \quad \frac{1}{1.5u} + \frac{1}{u} = -\frac{1}{12}$$

$$\frac{2.5}{1.5u} = -\frac{1}{12} \quad \text{or} \quad u = -20 \text{ cm}$$

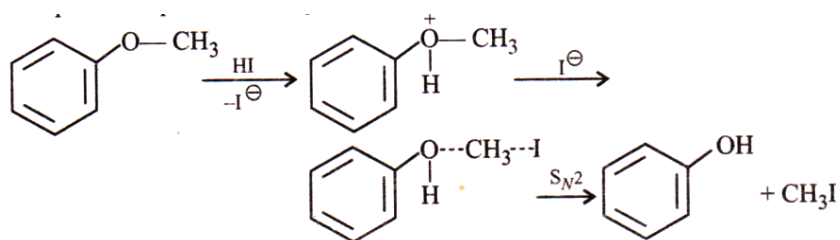
$-ve$ sign shows that object is placed in front of a convex mirror.

$$14. \quad (d) \quad \delta = (360 - 2\theta) = (360 - 2 \times 60) = 240^\circ$$



CHEMISTRY

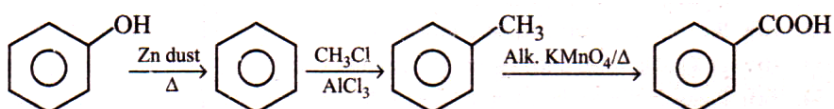
16.



17.

3°-Alkyl halides produce alkenes in Williamson synthesis.

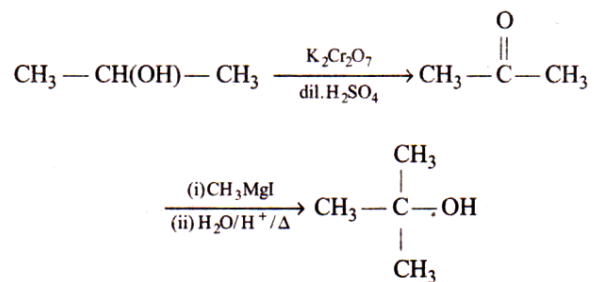
18.



19.

 $\text{S}_{\text{N}}2$ mechanism is followed.

20.



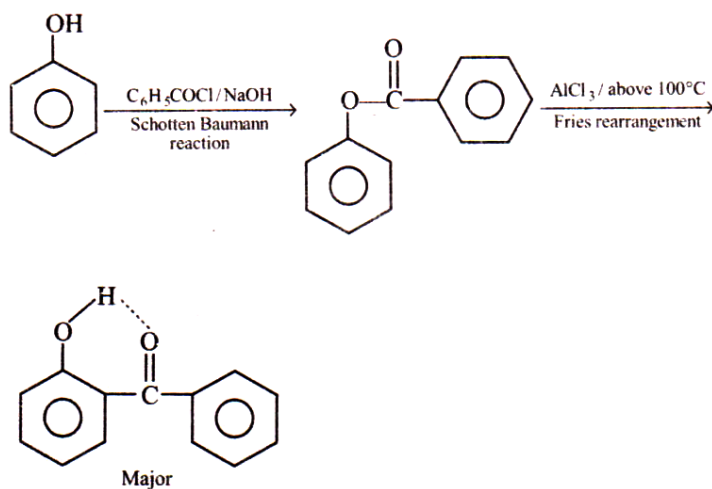
21.

 NO_2 group is electron withdrawing group and increases the acidic character of phenol.

22.

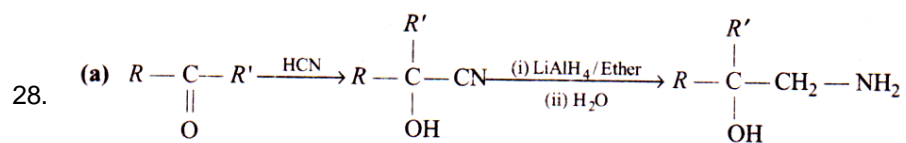
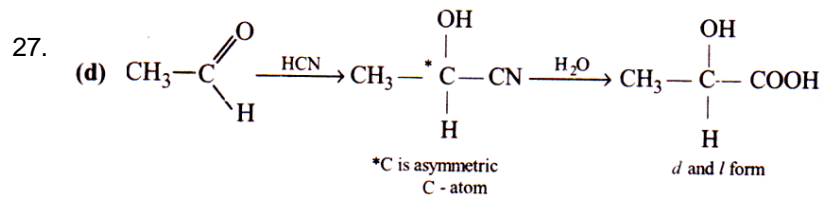
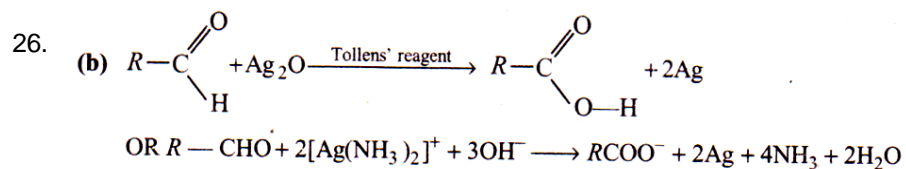
Markovnikov addition is followed.

23.



24.

25.



29. (d) PCC and PDC are the best reagents for the conversion of 1° alcohols to aldehydes.