



Video Solution on Website:-

<https://physicsaholics.com/home/courseDetails/52>

Video Solution on YouTube:-

<https://youtu.be/hmH8jwEsj98>

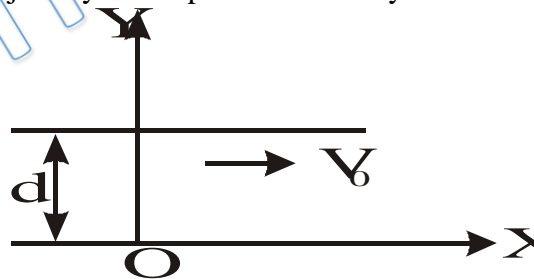
Written Solution on Website:-

<https://physicsaholics.com/note/notesDetails/74>

- Q 1. A boat moves relative to water with a velocity which is  $n$  times the river flow velocity
- If  $n < 1$ , boat cannot cross the river
  - If  $n = 1$ , boat cannot cross the river without drifting
  - If  $n > 1$ , boat can cross the river along shortest path
  - Boat can cross the river whatever is the value of  $n$  (excluding zero value)
- Q 2. A river is flowing east to west with velocity  $v$ . A man can swim with velocity  $v_0$  in still water. He takes minimum time  $t_1$  to cross the river. When he swims along shortest path, takes time  $t_2$ . The ratio of time  $t_1 t_2$  is  $1 : 2$ , then  $\frac{v_0}{v}$  is equal to
- $\sqrt{3} : 2$
  - $1 : 1$
  - $2 : \sqrt{3}$
  - $2 : 1$
- Q 3. A boat which has a speed of 5 km/h in still water crosses a river of width 1 km along the shortest possible path in 15 min. The velocity of the river water in km/h is:
- 1
  - 3
  - 4
  - $\sqrt{41}$
- Q 4. River is flowing with a velocity  $\vec{v}_R = 4\hat{i}$  m/s. A boat is moving with a velocity of  $\vec{v}_{BR} = (-\hat{i} + 4\hat{j})$  m/s relative to river. The width of the river is 100 m along  $y$ -direction. Choose the correct alternative(s)
- The boatman will cross the river in 25 s
  - Absolute velocity of boatman is  $2\sqrt{5}$  m/s
  - Drift of the boatman along the river current is 50 m
  - The boatman can never cross the river.
- Q 5. A man wants to cross a river 500 m wide. The rowing speed of the man relative to water is 3 km/hr and the river flows at the speed of 2 km/hr. If the man's walking speed on the shore is 5 km/hr, then in which direction should he start rowing in order to reach the directly opposite point on the other bank in the shortest time?
- At an angle  $\sin^{-1}\left(\frac{3}{7}\right)$  with the river flow direction
  - At an angle  $90^\circ + \sin^{-1}\left(\frac{3}{7}\right)$  with the river flow direction
  - At an angle  $90^\circ - \sin^{-1}\left(\frac{3}{7}\right)$  with the river flow direction
  - At an angle  $90^\circ - \cos^{-1}\left(\frac{3}{7}\right)$  with the river flow direction



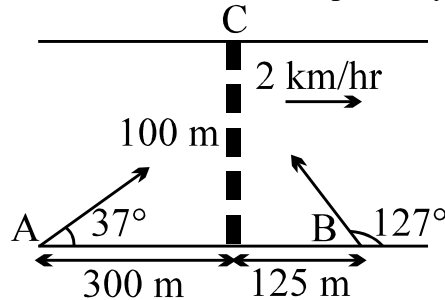
- Q 6. A swimmer crosses a river of width  $d$  flowing at velocity  $v$ . While swimming, he keeps himself always at an angle of  $120^\circ$  with the river flow and on reaching the other end he finds a drift of  $d/2$  in the direction of flow of river. The speed of the swimmer with respect to the river is
- (a)  $(2 - \sqrt{3})v$  (b)  $2(2 - \sqrt{3})v$   
(c)  $4(2 - \sqrt{3})v$  (d)  $(2 + \sqrt{3})v$
- Q 7. A motor boat is to reach at a point  $30^\circ$  upstream on the other side of a river flowing with velocity  $5 \text{ m/s}$ . Velocity of motor boat with respect to water is  $5\sqrt{3} \text{ m/sec}$ . The driver should steer the boat an angle:
- (a)  $30^\circ$  w.r.t. the line of destination from starting point  
(b)  $60^\circ$  w.r.t.. normal to the bank  
(c)  $120^\circ$  w.r.t. stream direction  
(d) None of these
- Q 8. A man can swim at a speed of  $5 \text{ km/h}$  w.r.t. water. He wants to cross a  $1.5 \text{ km}$  wide river flowing at  $3 \text{ km/h}$ . He keeps himself always at an angle of  $60^\circ$  with the flow direction while swimming. The time taken by him to cross the river will be
- (a)  $0.25 \text{ hr}$ . (b)  $0.35 \text{ hr}$ . (c)  $0.45 \text{ hr}$ . (d)  $0.55 \text{ hr}$ .
- Q 9. A swimmer wishes to cross a  $1 \text{ km}$  wide river flowing at  $5 \text{ kmh}^{-1}$ . His speed in still waters is  $3 \text{ km/h}$ . He has to reach directly opposite in minimum possible time. If he does not reach directly opposite by swimming, he has to walk that distance at  $5 \text{ kmh}^{-1}$ . Find the time taken
- (a)  $0.45 \text{ hr}$  (b)  $0.66 \text{ hr}$   
(c)  $1 \text{ hr}$  (d)  $1.5 \text{ hr}$
- Q 10. A swimmer swims (with respect to water) perpendicular to the current with acceleration  $a = 2t$  (where  $t$  is time) starting from rest from the origin  $O$  at  $t = 0$ . Velocity of the river with respect to ground is given by ' $V_0$ '. Width of the river is ' $d$ '. The equation of trajectory of the path followed by the swimmer



- (a)  $y = \frac{x^3}{3V_0^3}$  (b)  $y = \frac{x^2}{2V_0^2}$   
(c)  $y = \frac{x}{V_0}$  (d)  $y = \sqrt{\frac{x}{V_0}}$
- Q 11. Two swimmers start a race. One who reaches the point C first on the other bank wins the race. A makes his strokes in a direction of  $37^\circ$  to the river flow with velocity  $5 \text{ km/hr}$  relative to water. B makes his strokes in a direction  $127^\circ$  to the river flow with same



relative velocity. River is flowing with speed of 2km/hr and is 100m wide. speeds of A and B on the ground are 8km/hr and 6km/hr respectively.



- (a) A will win the race
- (b) B will win the race
- (c) the time taken by A to reach the point C is 165 seconds
- (d) the time taken by B to reach the point C is 150 seconds

- Q 12. A man wishes to swim across a river 0.5 km wide. If he can swim at the rate of 2 km/h in still water and the river flows at the rate of 1 km/h. The angle (with respect to the flow of the river) along which he should swim so as to reach a point exactly opposite his starting point, should be-
- (a)  $60^\circ$
  - (b)  $120^\circ$
  - (c)  $145^\circ$
  - (d)  $90^\circ$
- Q 13. A boat moves relative to water with a speed which is  $\frac{1}{n}$  times the river flow speed. At what angle to the stream direction be boat move to minimize drifting (given  $n > 1$ ) -
- (a)  $\frac{\pi}{2}$
  - (b)  $\sin^{-1} \frac{1}{n}$
  - (c)  $\frac{\pi}{2} + \sin^{-1} \frac{1}{n}$
  - (d)  $\frac{\pi}{2} + \sin^{-1}(n)$
- Q 14. Flow velocity of river of width  $d$  is given as  $u = u_0 r$ , where  $u_0$  is constant and  $r$  is perpendicular distance from nearer bank. A swimmer heads perpendicular to direction of flow of river. Find his drift if his velocity in still water is  $v$  ?
- (a)  $\frac{u_0 d^2}{4v}$
  - (b)  $\frac{u_0 d}{2}$
  - (c)  $\frac{u_0^2 d^3}{3v^2}$
  - (d)  $\frac{u_0^2 d^2}{2v}$

## Answer Key

Q.1 b,c,d	Q.2 c	Q.3 b	Q.4 a	Q.5 b
Q.6 c	Q.7 b	Q.8 b	Q.9 b	Q.10 a
Q.11 b,c,d	Q.12 b	Q.13 c	Q.14 a	