Question 3

Two athletes, A and B, run a 100 m race. At time $t = 0$, a gun is fired to start the race.

Fig. 1.1 shows the distance-time graph for the two athletes.

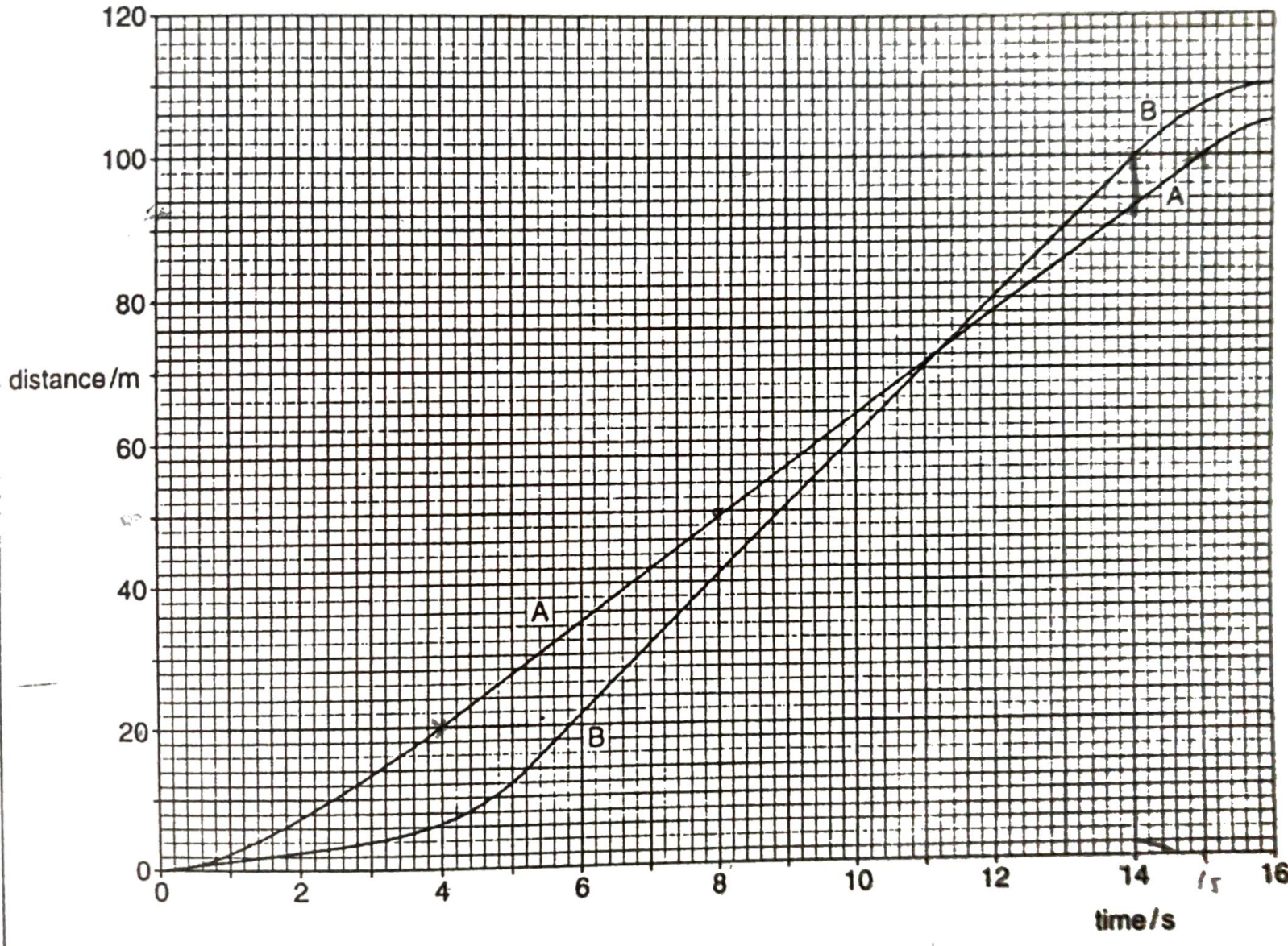


Fig. 1.1

(a) Describe the motion of athlete A during the first 8 s of the race. **[2]**

(b) State the distance between the two athletes as the winner passes the 100 m mark. **[1]**

(c) Calculate the speed of athlete A between $t = 4$ s and $t = 15$ s. **[2]**

[J07/P2/Q1]

Question 2

Fig. 1.1 represents the motion of a car along a straight road. As the car approaches a small town, it slows down. The car travels at a constant speed from the start of the town to the end of the town. After passing through the town, the car speeds up.

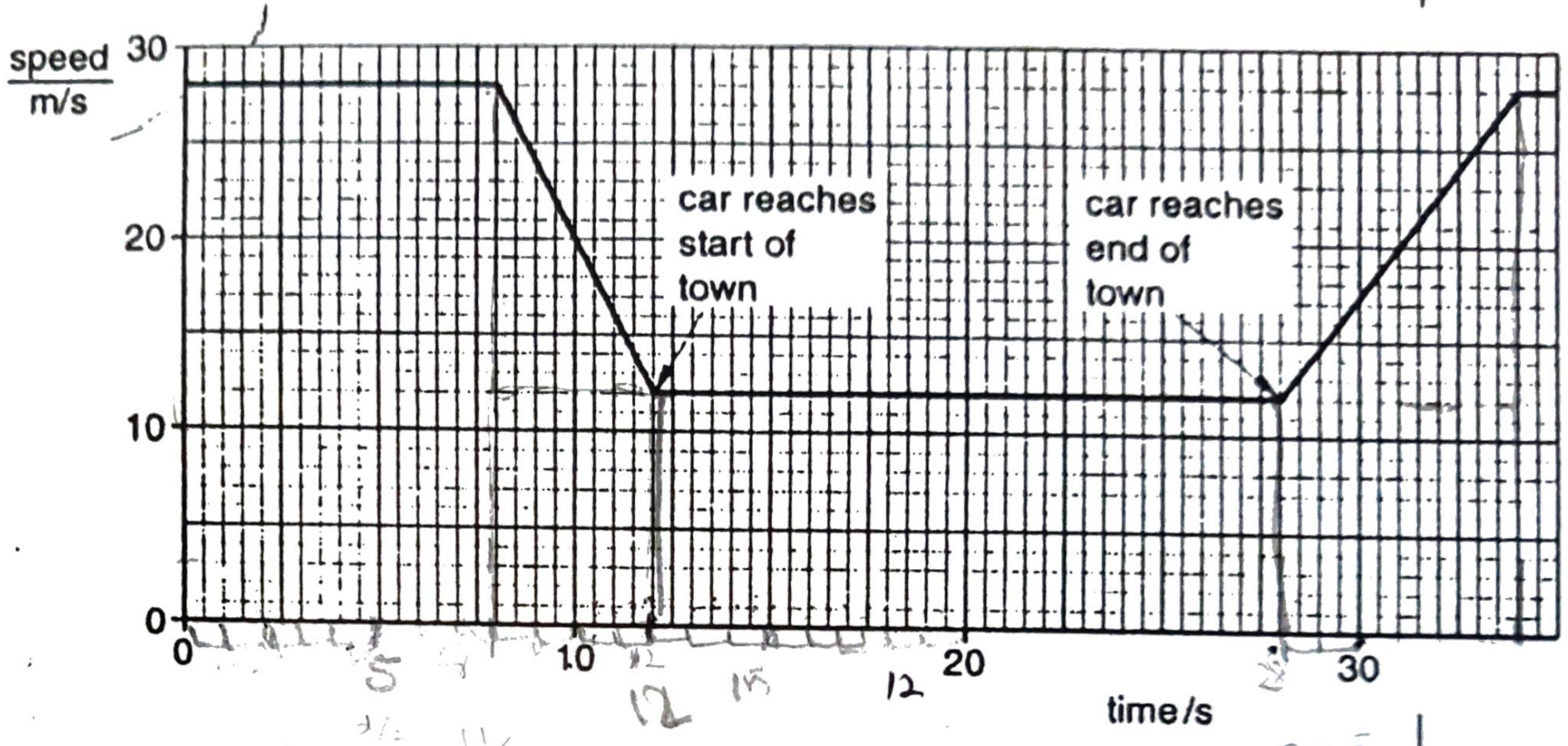


Fig. 1.1

(a) Calculate the distance travelled by the car through the town. [2]

(b) The car accelerates after passing through the town. Calculate the acceleration. [2]

(c) A second car is stationary on the road at the point where the town starts. It accelerates uniformly for 30 s and reaches a speed of 10 m/s. Determine whether this car reaches the end of the town in the 30 s. You may plot a speed-time graph of the second car on Fig. 1.1 if you wish. [2]

[N06/P2/Q1]

Question 1

A cyclist starts from rest. He accelerates and then travels at a constant speed. At 12 s, the cyclist applies the brakes and slows down. Photographs are taken of the cyclist at 4 s intervals. Fig. 2.1 shows the results.

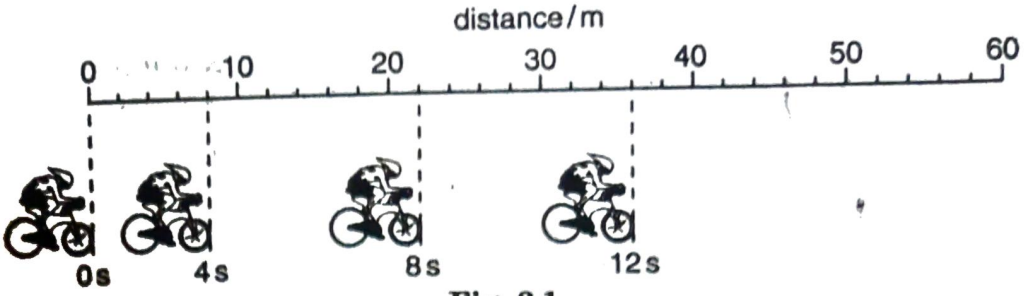


Fig. 2.1

(a) On Fig. 2.1, draw a possible position of the front wheel of the cycle at 16 s. [1]

(b) On Fig. 2.2, plot a distance-time graph of the cyclist for the first 16 s. [4]

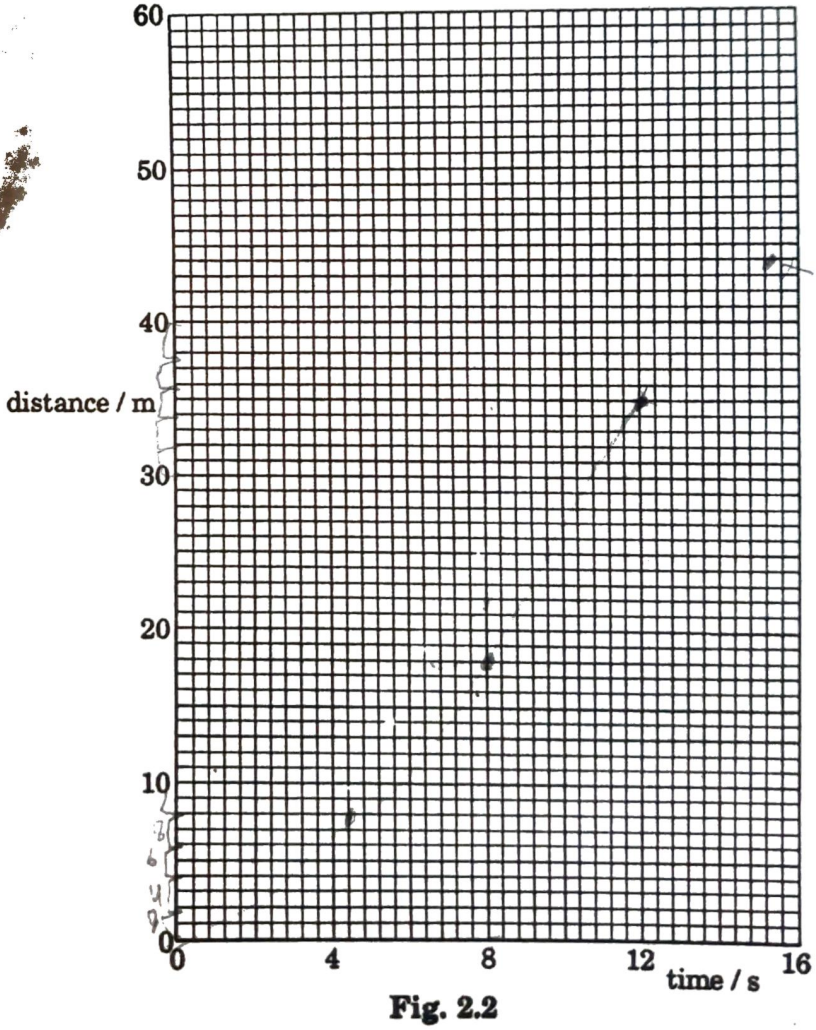


Fig. 2.2

(c) Calculate the average speed of the cyclist during the first 12 s.

average speed = ... [2]

Question 12

A bungee jumper falls from a bridge above a river, as shown in Fig. 11.1.

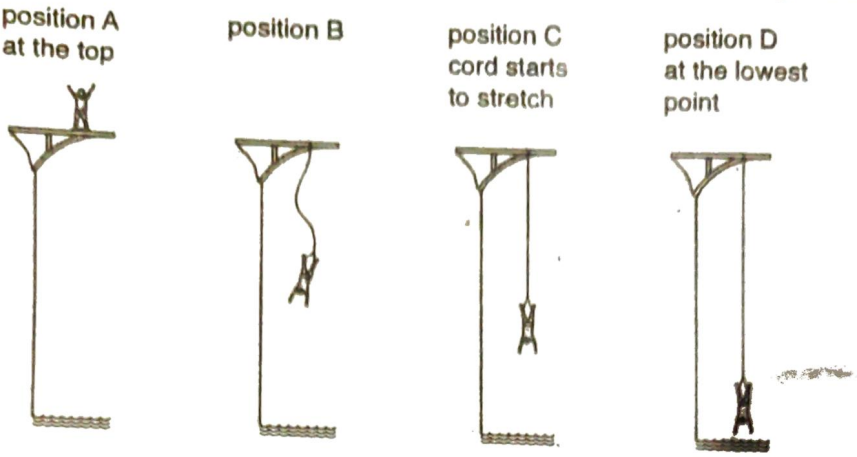


Fig. 11.1 (not to scale)

The man starts from position A in Fig. 11.1. The elastic cord **starts to stretch** at position C and he stops for the first time at position D. He **continues to rise** and fall.

Fig. 11.2 shows how the velocity of the man varies with time ***t***.

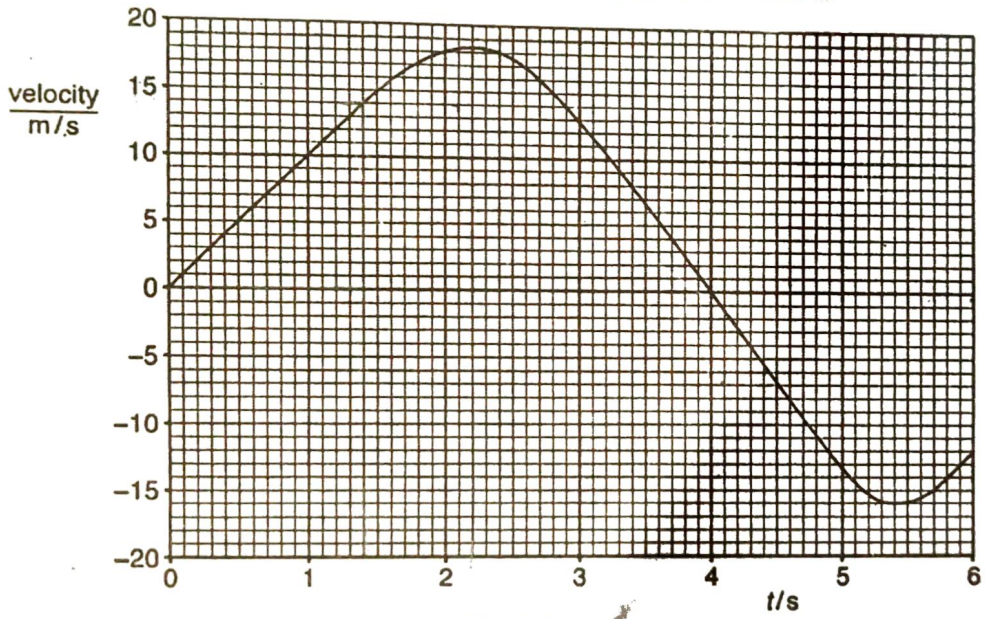


Fig. 11.2

(a) (i) State what is meant by *velocity*. **[2]**

(ii) State the difference between a **positive velocity** and a negative velocity. **[1]**

(iii) In the first 1.4 s the acceleration **is uniform.**

1. Using values from Fig. 11.**2, determine the** acceleration of the man in the first 1.4 s. **[3]**
2. Comment on your value **of acceleration.** **[1]**

(iv) 1. State the value of t **when the man is at position** D. **[1]**

2. Explain in terms of **the forces acting, why the** man is accelerating upwards at D. **[3]**

Question 11

A children's ride consists of a steel cable that runs between two posts of different heights, as shown in Fig. 9.1.

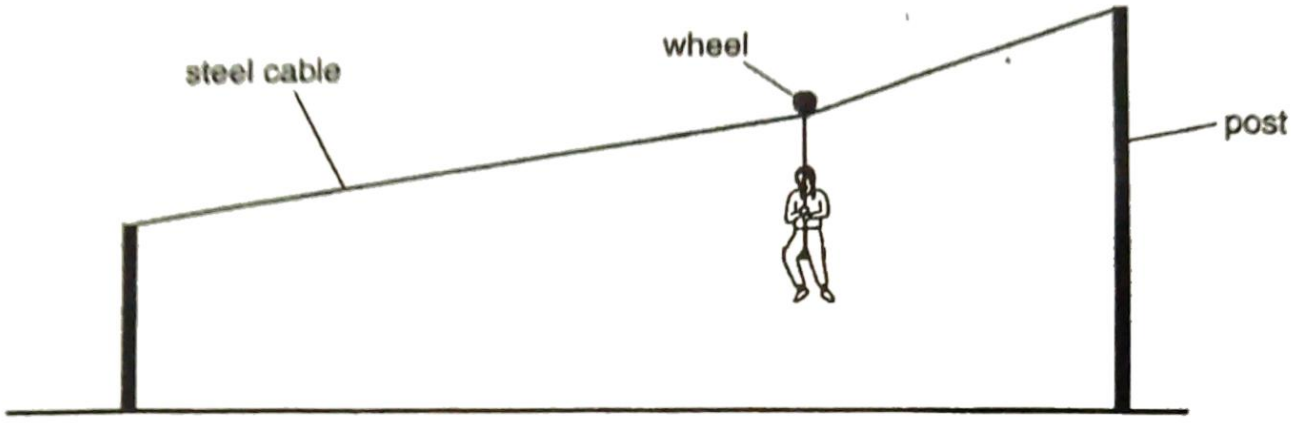
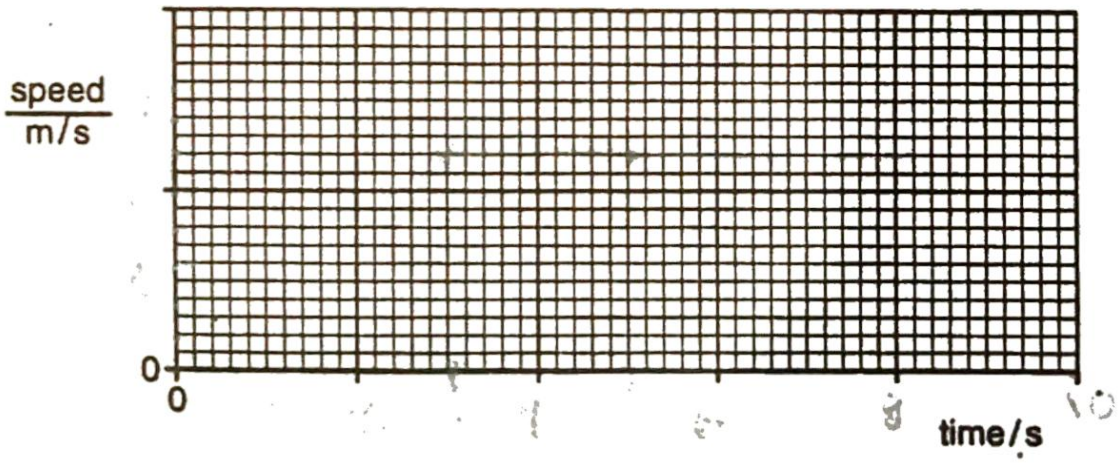


Fig. 9.1

A girl starts and finishes the ride at rest. Her horizontal motion can be taken as

- an initial uniform acceleration for 3.0 s, followed by
- a constant speed of 2.4 m/s for a further 5.0 s and
- a final uniform deceleration that lasts for 1.0 s.

(a) On Fig. 9.2, draw a speed-time graph of the horizontal motion.



[3]

(b) Explain what is meant by *uniform acceleration*. **[2]**

(c) The final deceleration is larger in size than the initial acceleration.
Explain how the data shows this. **[1]**

(d) Calculate the horizontal distance travelled by the girl in the first 8.0 s.
[3]