4/7/21

H/W

1) The velocity-time graph of a particle moving along a straight line is as shown in fig. Which of the following is/are INCORRECT for this motion?

i) The motion is uniform.
ii) The acceleration is uniform.
iii) The particle changes its dir^n of motion.
iv) The displacement during the period 0-4s is equal to the area under the velocity-time graph for this period.
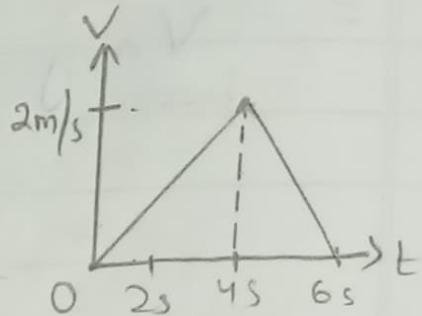
2) Initially car A is 10.5 m ahead of car B. Both start moving at time $t = 0$ in the same dir^n along a straight line. The velocity time graph of two cars is shown in fig. find the time (in sec) when the car B will catch the car A.

Car B.

Car A

$10m/s$

$45°$

t
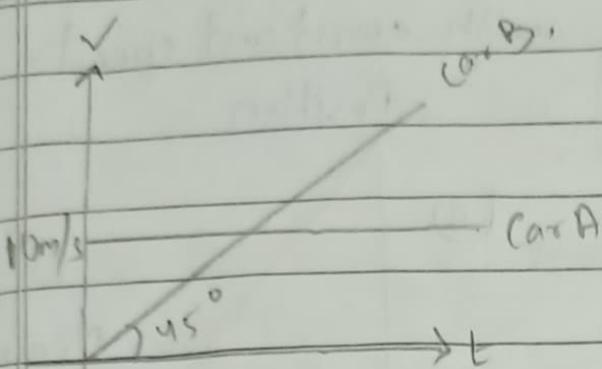
As car A is 10.5m ahead of car
B then in 1st case :-

$$S = ut + \frac{1}{2}at^2 + 10.5$$

$$= 10t + 10.5$$

In 2nd case :-

$$s = ut + \frac{1}{2}at^2$$

$$= \frac{1}{2}t^2$$

Equating both the sides :-

⇒) $10t + 10.5 = \frac{1}{2}at^2$

⇒) $t^2 - 20t - 21 = 0$

⇒) $t = 20 + \sqrt{400+84}/2$

⇒) $t = \frac{20+22}{2}$

⇒) $t = 42/2$

⇒) $t = 21$ sec.

3) Match the following.

A) A particle moving with constant speed.

(q)

Position vs *time* graph with angles θ, θ

(S)

Position vs *Time* graph
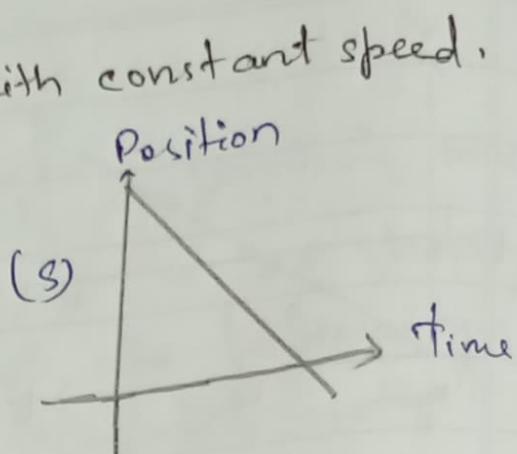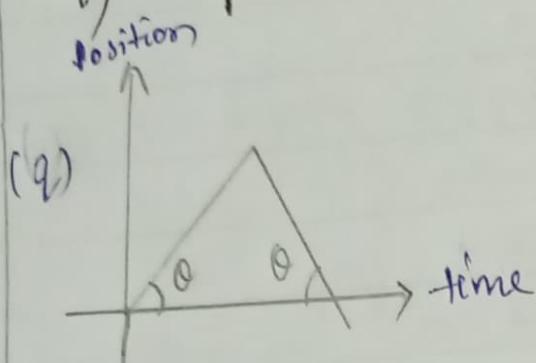
B) Particle moving with increasing acceleration:

(r)

Velocity vs *time* graph
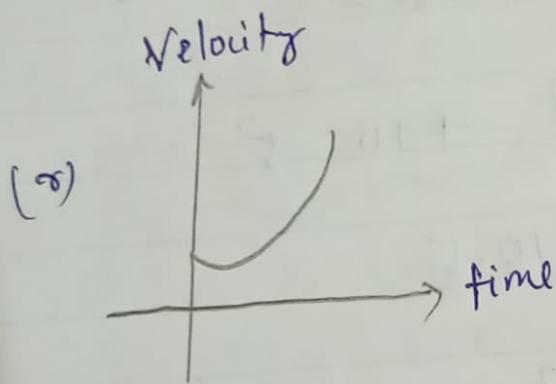
C) Particle moving negative acceleration:

(p)

Position vs *Time* graph
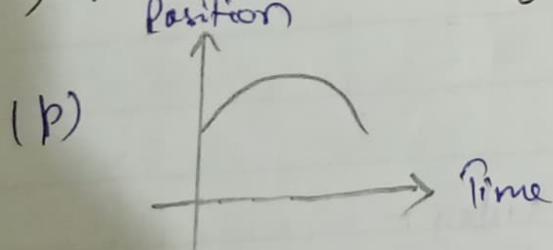
D) Particle moving with zero acceleration:

(S)

Position vs *time* graph
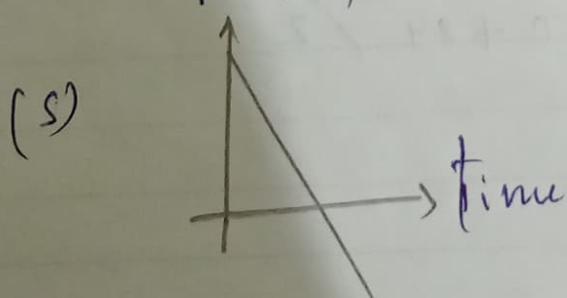
4) The velocity - time graph of an object is shown in the fig.

a) State the kind of motion the obj has from A to B & from B to C.

Ans) From A to B body has an constant velocity of 40m/s.
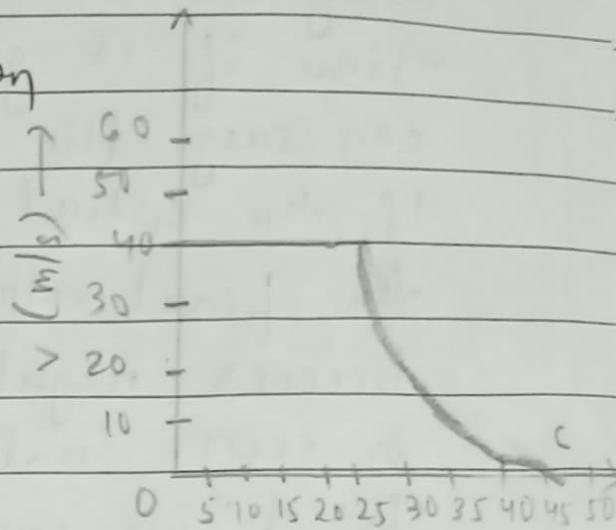
from B to C, the body uniformly retards.

b) Identify the part of graph where the obj has zero acceleration. Give reasons for your answer.

Ans) From A to B, the body has zero acceleration as we know that if the body is uniform velocity acceleration automatically becomes zero here in the graph as we know the body started from 40m/s & from A to B, when body reaches at B its velocity remains 40m/s. Here there in no change in velocity & we can say say that acceleration is zero in this part of the graph.

c) Identify the part of graph where the obj has negative acceleration. Give reasons.

Ans) From B to C the body has negative acceleration as we known that if the body has initial velocity & after some-time if it gains some velocity, we can say the body has an acceleration. If the initial velocity is greater than the final velocity the acceleration becomes negative that is retardation is seen. Similarly here at a point B, if we considered the initial velocity to be 40 m/s it uniformly retards to 0m/s by the time it crosses 45 sec.

5) The v-t graph of a body is given:-

i) State the kind of motion reported by OA, AB.

Ans) OA represents uniform acceleration since the slope of OA in the velocity-time graph is having uniform positive slope.
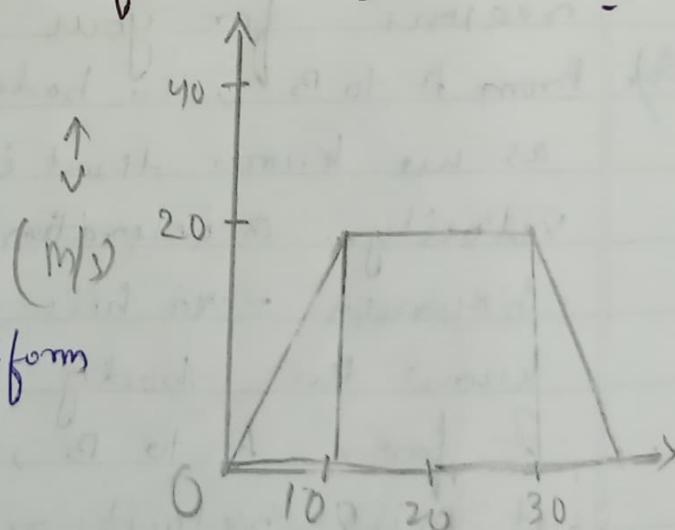
AB represents the uniform velocity of 20 ms⁻¹. Since the slope of AB is zero. Hence acceleration is zero.

ii) What is the velocity of body after 10s & after 40s?

A) After 10s, the velocity is 20 ms⁻¹ up to 30 s & after 30s, the velocity is uniformly~~to it is equal~~ ~~to the slope of BC i.e~~

Slope of BC = $\frac{BD}{DC}$ = $\frac{20}{40-30}$ = 2 ms⁻²

Acceleration = −2 ms⁻².

~~restarted~~ restarted to zero after 40 s.

iii) Calculate negative acceleration of the body.

Ans) Retardation is uniform & it is equal to the slope of BC i.e,

Slope of BC = $\frac{BD}{DC}$ = $\frac{20}{40-30}$ = 2 ms⁻²

Acceleration = −2 ms⁻²

(iv) Calculate the distance covered by the body b/w 10th & 30th sec.

Ar) Distance covered by the body b/w 10th & 30th sec

$$\Rightarrow 20 \times 20 = 400 \, m.$$