2023 Sec 3 Physics

Answers to AS 5.1 - 5.2

AS 5.1

Reminders on presentation:

- State the formula/equation first!
- Insert units in the first step of substitution
- Final answer:
  - In decimal, not fraction
  - In 2 or 3 s.f. in general
- Vectors (displacement, velocity & acceleration) have both magnitude & direction

1 (a) 120 + 400 = 520 m
(b) 120 – 400 = 280 m West
(c) 520 ÷ (80+30+25) = 520 ÷ 135 = 3.85 m s^{-1}
(d) 280 ÷ 135 = 2.07 m s^{-1} West

2 If downstream is given a positive sign convention,

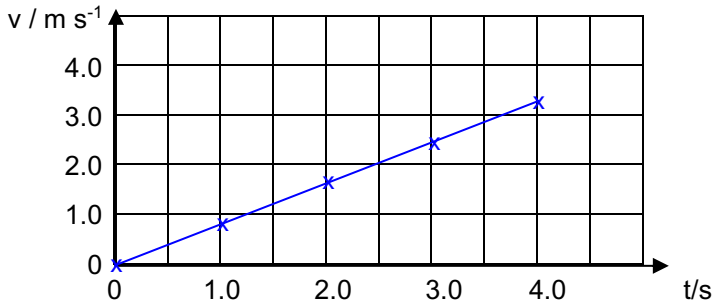
(a) resultant velocity = 5.0 – 20.0 = -15.0 km h^{-1}
15.0 km h^{-1} upstream
(b) resultant velocity = 5 + 20.0 = 25.0 km h^{-1}
25.0 km h^{-1} downstream

3 (a) Frequency, f = 60 Hz

average speed = distance / time = $\frac{10.0}{\left(\frac{8}{60}\right)}$ = 75 cm s^{-1} [1]

(b) The speed of the trolley is decreasing.

4 (a)



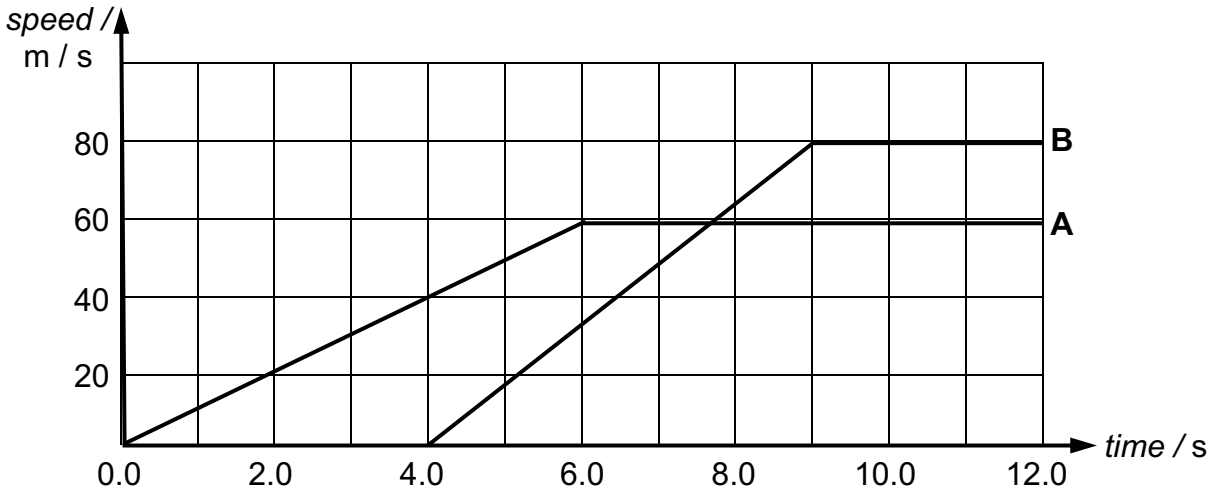
(b) The gradient of the v-t graph is constant.
(c) a = (v-u) / t = (3.2 – 0.0) / 4.0 = 0.80 m s^{-2}

AS 5.2

1. A : constant deceleration or velocity decreasing at a constant rate
B : constant velocity or zero acceleration
C : constant acceleration or velocity increasing at a constant rate
D : decreasing acceleration or velocity increasing at an decreasing rate
E : increasing deceleration or velocity decreasing at an increasing rate

Note:
- Describe motion in terms of "v" or "a" (preferably not both)
- Describe "v" with "rate of change", but "a" without.

2. a)



b) average speed = total distance / total time = [(½ x 60 x 6.0)+(60 x 6.0)] / 12.0
= **45 m s^{-1}**

c) Let **t** be the time taken for the cars to reach the finishing line.

distance travelled by car A = distance travelled by car B
(½ x 60 x 6.0) + (**t** – 6.0)(60) = (½ x 80 x 5.0) + (**t** – 9.0)(80)
t = 340 / 20
t = **17 s**

3 a) downwards positive

bi) distance traveled = ½ x 1.2 x 12.0 = **7.2 m**

bii) acceleration = 0 – (-12.0) / 1.2 or 16.0 – (-12.0) / 2.8 = **10 m s^{-2}**

ci) Ball will end up **lower** [1]. The distance moved downwards is greater than the distance moved upwards as shown by the areas under the graph.
(up: -7.2 m, down: 12.8 m)

cii) displacement = ½ (12.0 + 16.0) (2.8 – 2.4) = **5.6 m**

or s = average v × time