This is a Class 1 exam

Lebanon Evangelical School for Boys and Girls

Lebanon Evangelical School

for Boys and Girls Loueizeh - Baabda

Stage Exam 01

06NOV2023

Do NOT write in this box. Your MARK will be placed here.

Subject :	A Level Maths : M1Mech
Class :	11A and 12A
Teacher :	Dr Ruth Brett
Duration :	20 minutes

Answer on squared paper and staple it to the question paper. No work written on this paper will be graded. Remember that you must include sufficient working, or you may get no credit for a correct answer.

Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

Where necessary, use $g = 9.8\ ms^{-2}$

1. A small ball is thrown vertically upwards with speed $14.7\ ms^{-1}$ from a point that is 19.6 m above horizontal ground. The ball is modelled as a particle moving freely under gravity.

Find

(*a*) the total time from when the ball is thrown to when it first hits the ground,

(4)

(*b*) the speed of the ball immediately before it first hits the ground,

(3)

(Total 7 marks)

2. A train travels for a total of 270 s along a straight horizontal track between two stations A and B. The train starts from rest at A and moves with constant acceleration for 60 s until it reaches a speed of $V\ ms^{-1}$. The train then travels at this constant speed $V\ ms^{-1}$ before it moves with constant deceleration for 30 s, coming to rest at B.

(*a*) Sketch a speed-time graph for the journey of the train between the two stations A and B.

(2)

Given that the distance between the two stations is 4.5 km,

(*b*) find the value of V,

(3)

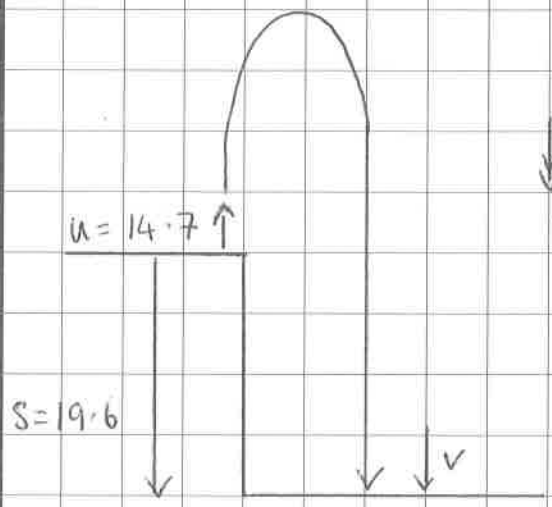
(*c*) find how long it takes the train to travel from station A to the point that is exactly halfway between the two stations.

(4)

(Total 9 marks)

M1 MECH SEO1

1.



a) Take down as positive $S = 19.6$ $a = 9.8$ $u = -14.7$ $t = ?$

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

$19.6 = -14.7t + 4.9t^2$ M① A① A①

$4.9t^2 - 14.7t - 19.6 = 0$

$t = \frac{14.7 \pm \sqrt{(-14.7)^2 - 4(4.9)(-19.6)}}{2(4.9)} = \frac{14.7 \pm \sqrt{600.25}}{9.8} = \frac{14.7 \pm 24.5}{9.8}$

$t = 4s$ A① $t = -1$ REJECT

b) $v^2 = u^2 + 2as$

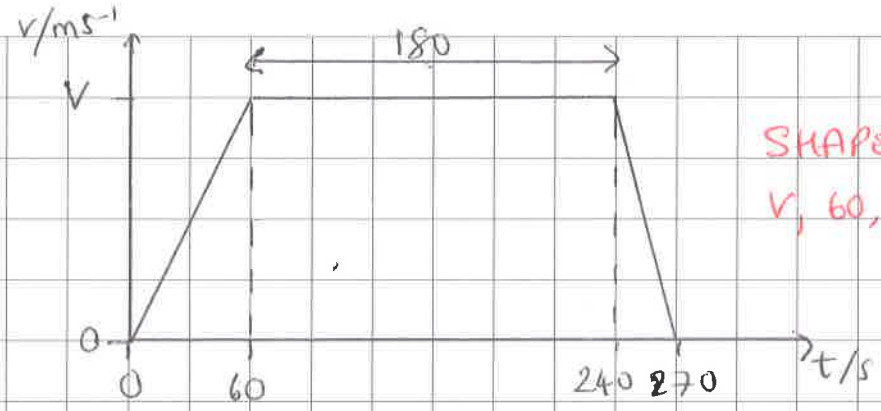
M① A①

$v^2 = (-14.7)^2 + 2(9.8)(19.6) = 216.09 + 384.16 = 600.25$

$v = \sqrt{600.25} = 24.5 ms^{-1}$ A①

2.

a)



SHAPE ①

V, 60, 240, 270 ①

↳ or 30s marked for deceleration

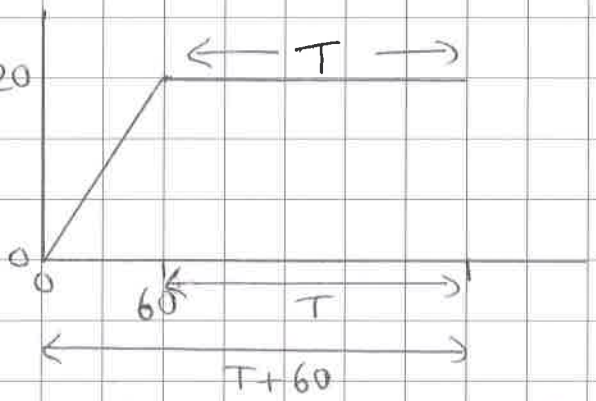
b) Distance = area under line = 4500 m

$\frac{(180 + 270)}{2}(v) = 4500$ M① A①

$450V = 9000$

$V = \frac{9000}{450} = 20$ A①

c) Distance = 2250 m



$\left(\frac{T + (T+60)}{2}\right)(20) = 2250$ M① A① A①

OR - using T for the whole time:

$\left(\frac{T + (T-60)}{2}\right)(20) = 2250$

$(T + 30)(20) = 2250$

$T + 30 = \frac{2250}{20} = 112.5$

$T = 142.5$s

$T = 112.5 - 30 = 82.5$

Total time to cover 2250m = $82.5 + 60 = 142.5$ secs A①