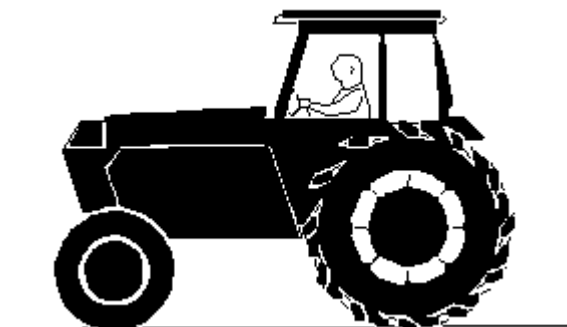


- Q1.** (a) The diagram below shows a moving tractor. The forward force from the engine exactly balances the resisting forces on the tractor.



- (i) Describe the motion of the tractor.

.....

- (ii) The tractor comes to a drier part of the field where the resisting forces are less. If the forward force from the engine is unchanged how, if at all, will the motion of the tractor be affected?

.....

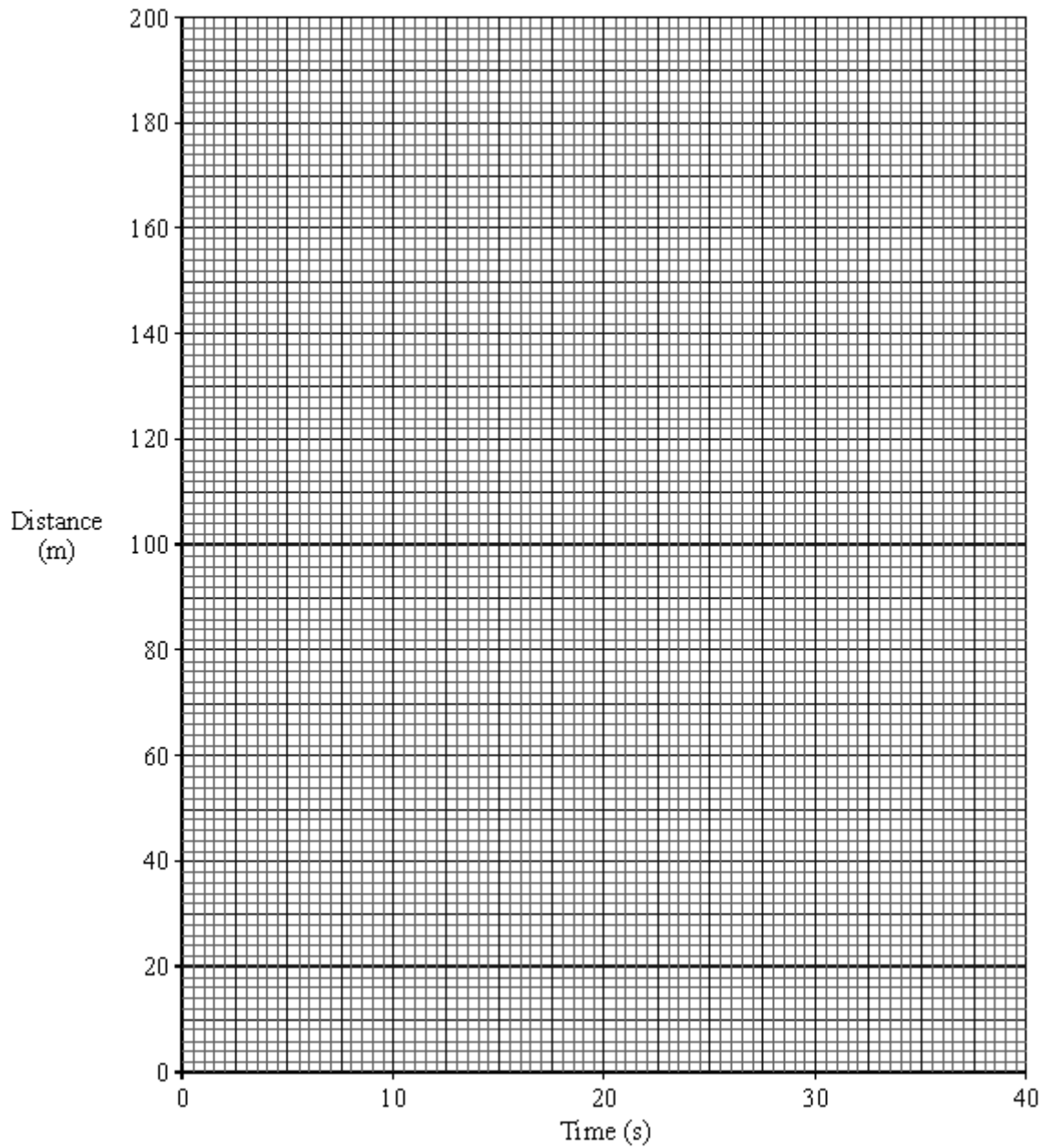
.....

(3)

- (b) Two pupils are given the task of finding out how fast a tractor moves across a field. As the tractor starts a straight run across the field the pupils time how long it takes to pass a series of posts which are forty metres apart. The results obtained are shown in the table below.

Distance travelled (m)	0	40	80	120	160	200
Time taken (s)	0	8	16	24	32	40

- (i) Draw a graph of distance travelled against time taken using the axes on the graph below. Label your graph line A.



(2)

(ii) Calculate the speed of the tractor.

.....

(3)

(c) In another, wetter field there is more resistance to the movement of the tractor. It now travels at 4 m/s.

(i) Calculate the time needed to travel 200m.

.....
.....
.....

(ii) On the graph in part (b) draw a line to represent the motion of the tractor across the second field. Label this line B.

(4)

(d) On a road the tractor accelerates from rest up to a speed of 6 m/s in 15 seconds.
Calculate the acceleration of the tractor.

.....
.....
.....

.....Acceleration =m/s²

(3)

(Total 15 marks)

Q2.A car has an oil leak. Every 5 seconds an oil drop falls from the bottom of the car onto the road.

(a) What force causes the oil drop to fall towards the road?

.....

(1)

(b) The diagram shows the spacing of the oil drops left on the road during part of a journey



Describe the motion of the car as it moves from **A** to **B**.

.....

Explain the reason for your answer.

.....
.....
.....
.....

(3)

(c) When the brakes are applied, a braking force slows down and stops the car.

(i) The size of the braking force affects the braking distance of the car.

State **one** other factor that affects the braking distance of the car.

.....

(1)

(ii) A braking force of 3 kN is used to slow down and stop the car in a distance of 25 m.

Calculate the work done by the brakes to stop the car and give the unit.

.....
.....
.....

Work done =

(3)
(Total 8 marks)

Q3. The figure below shows the horizontal forces acting on a car.



(a) Which **one** of the statements describes the motion of the car?

Tick **one** box.

It will be slowing down.

It will be stationary.

It will have a constant speed.

It will be speeding up.

(1)

(b) During part of the journey the car is driven at a constant speed for five minutes.

Which one of the equations links distance travelled, speed and time?

Tick **one** box.

distance travelled = speed + time

distance travelled = speed \times time

distance travelled = speed - time

distance travelled = speed \div time

(1)

(c) During a different part of the journey the car accelerates from 9 m/s to 18 m/s in 6 s .

Use the following equation to calculate the acceleration of the car.

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

.....
.....

$$\text{acceleration} = \dots\dots\dots \text{ m / s}^2$$

(2)

(d) Which equation links acceleration, mass and resultant force?

Tick **one** box.

resultant force = mass + acceleration

resultant force = mass \times acceleration

resultant force = mass - acceleration

resultant force = mass \div acceleration

(1)

(e) The mass of the car is 1120 kg. The mass of the driver is 80 kg.

Calculate the resultant force acting on the car and driver while accelerating.

.....
.....

$$\text{Resultant force} = \dots\dots\dots \text{ N}$$

(2)

(f) Calculate the distance travelled while the car is accelerating.

Use the correct equation from the Physics Equation Sheet.

.....
.....
.....

Distance = m

(3)

- (g) A car driver sees a fallen tree lying across the road ahead and makes an emergency stop.

The braking distance of the car depends on the speed of the car.

For the same braking force, explain what happens to the braking distance if the speed doubles.

You should refer to kinetic energy in your answer.

.....
.....
.....
.....
.....
.....
.....
.....
.....

(4)

(Total 14 marks)

- Q4.(a)** Human ears can detect a range of sound frequencies.

(i) Use the correct answers from the box to complete the sentence.

2	20	200	2000	20 000
---	----	-----	------	--------

The range of human hearing is from about Hz to Hz.

(2)

(ii) What is ultrasound?

.....
.....

(1)

(iii) Ultrasound can be used to find the speed of blood flow in an artery.

State **one** other medical use of ultrasound.

.....

(1)

(b) The speed of an ultrasound wave in soft tissue in the human body is 1.5×10^3 m / s and the frequency of the wave is 2.0×10^6 Hz.

Calculate the wavelength of the ultrasound wave.

.....
.....

Wavelength = m

(2)

(c) When ultrasound is used to find the speed of blood flow in an artery:

- an ultrasound transducer is placed on a person's arm
- ultrasound is emitted by the transducer

- the ultrasound is reflected from blood cells moving **away** from the transducer
- the reflected ultrasound is detected at the transducer.

Describe the differences between the ultrasound waves emitted by the transducer and the reflected waves detected at the transducer.

.....

.....

.....

.....

(2)
(Total 8 marks)