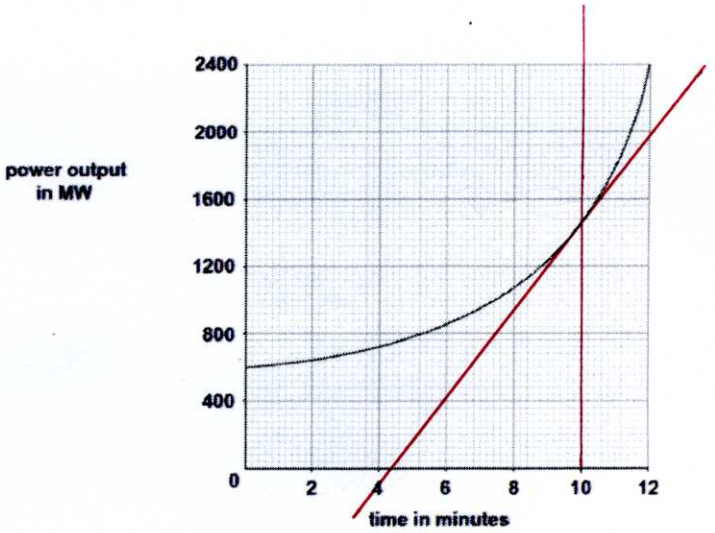
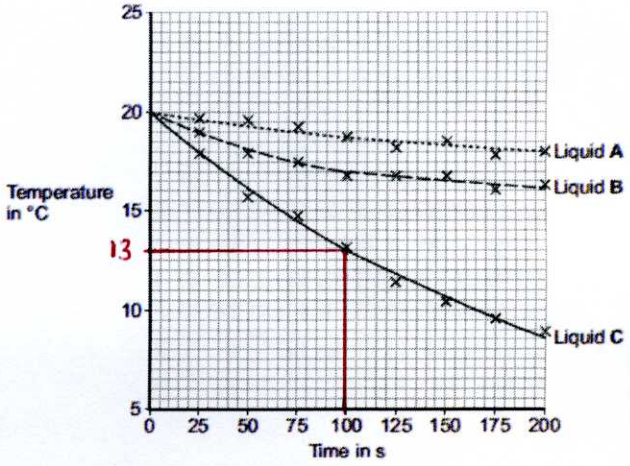
Graphical Interpretation Questions

1. Calculate the rate of increase of power output at 10 minutes.



Gradient at 10 min
= 2000/12-4.4 = 2000/7.6
= 263 MW/min
(240-276 accepted)

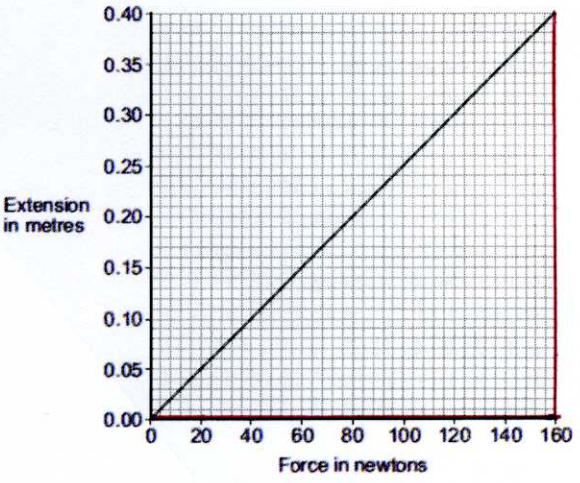
2. Calculate the average rate of temperature decrease of liquid **C** between 0 and 100 seconds.



Temp drop = 20 - 13 = 7°C

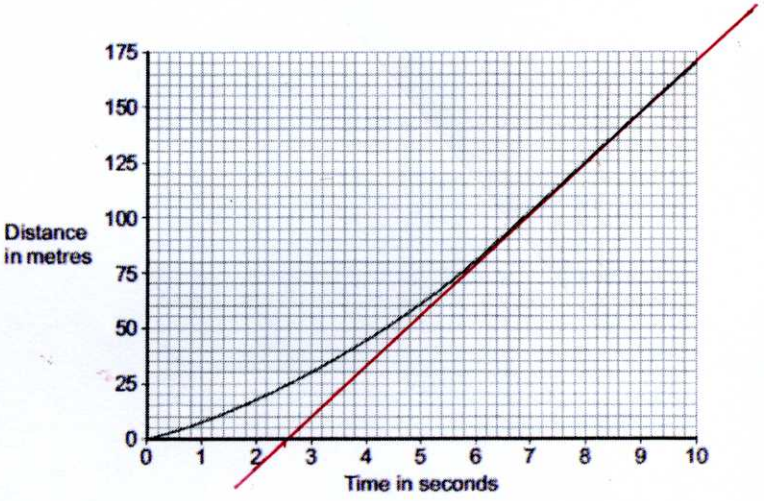
Rate = 7/100 = 0.07 °C/s

3. The graph shows how the extension of a single spring from the chest expander depends on the force acting on the spring. Use data from the graph to calculate the spring constant of the spring. Give the unit.



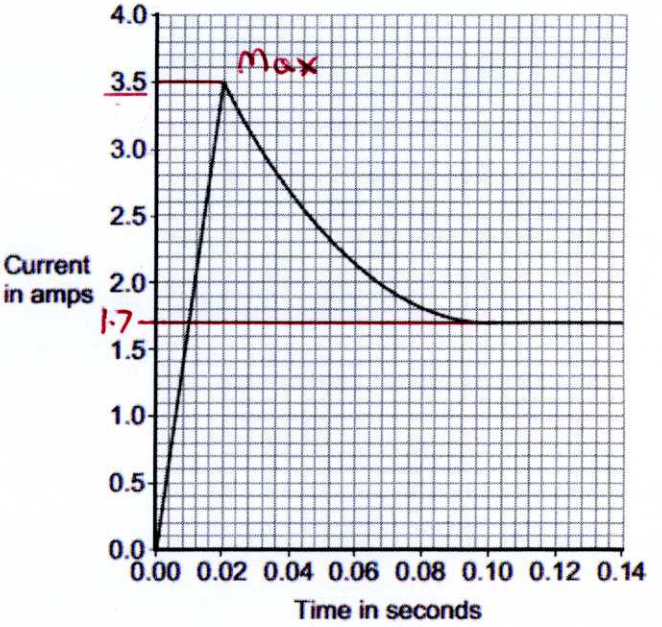
F = kx ∴ k = F/e
= 160/0.4
= 400 N/m

4. The graph shows the distance–time graph for a car. Use the graph to calculate the maximum speed the car was travelling at.



v = s/t = gradient
= 170/10-2.6
= 23.0 m/s

5. A 12 V filament bulb is connected to a 12 V power supply. The graph shows how the current changes after the bulb is switched on.



a) Calculate the rate at which the current increases in the first 0.02s → gradient

$3.5/0.02 = 175$ A/s

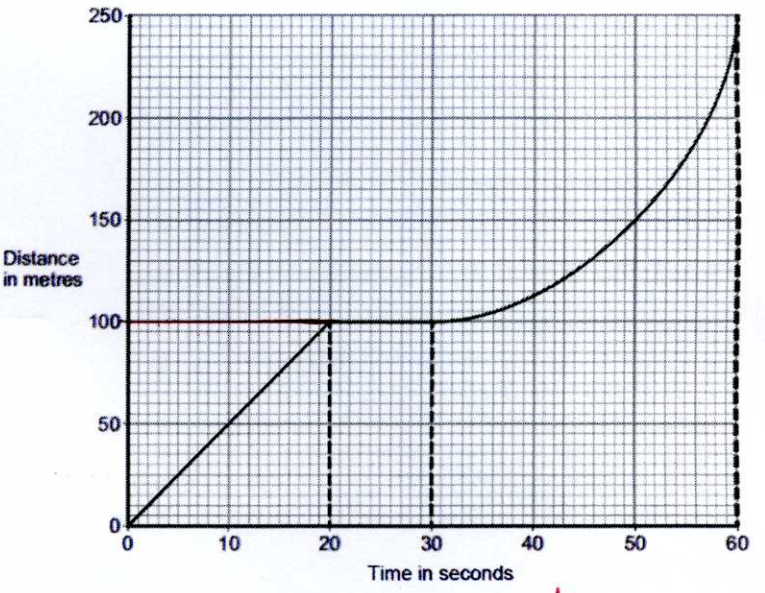
b) Calculate the maximum power of the bulb.

$P = IV = 3.5 \times 12 = 42$ W

c) Calculate the resistance of the bulb after 0.1s

$R = V/I = 12/1.7 = 7.1\ \Omega$

6. A bus is taking some children to school. The bus has to stop a few times. The distance–time graph for part of the journey is shown to the right.



How far has the bus travelled in the first 20 seconds?

100m

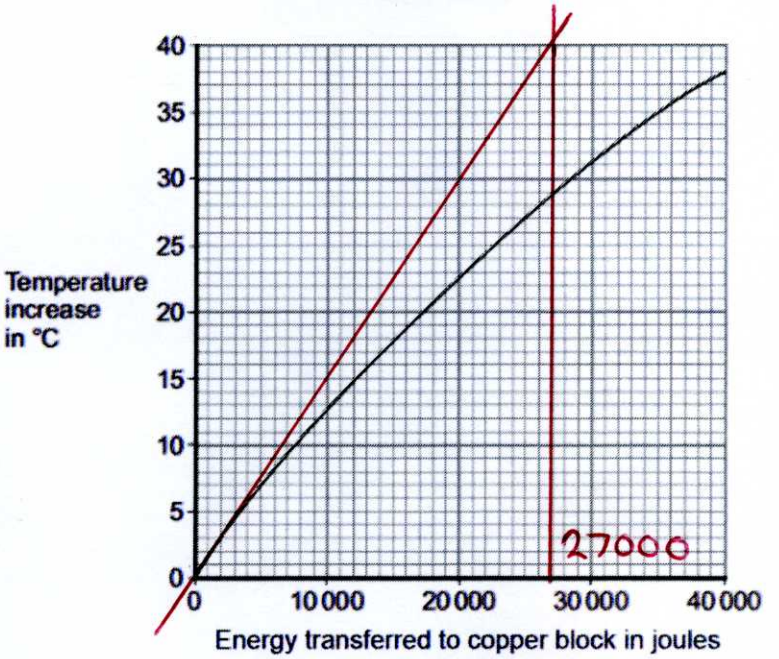
Describe the motion of the bus between 20 seconds and 30 seconds.

stationary

Describe the motion of the bus between 30 seconds and 60 seconds.

accelerating

7. The graph shows a 2.0 kg copper block being heated. Use the data in the graph to calculate the specific heat capacity of copper.

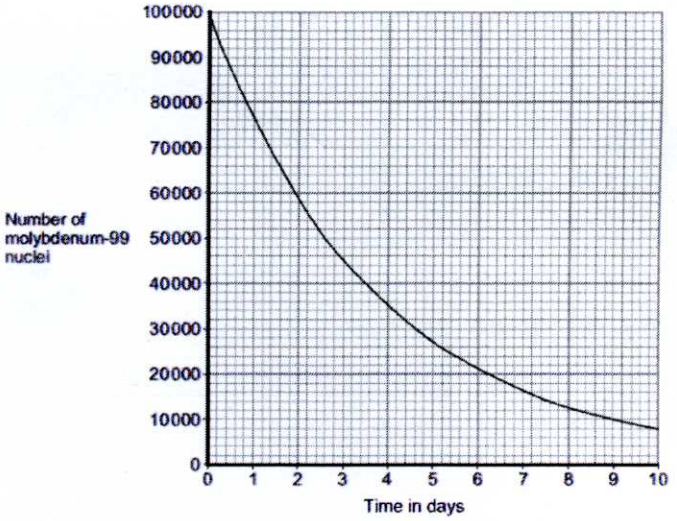


Use gradient at 0°C as no heat loss. $\Delta E = mc\Delta\theta$

$c = \Delta E/m\Delta\theta = 27000/2 \times 40$

$= 338$ J/kg°C

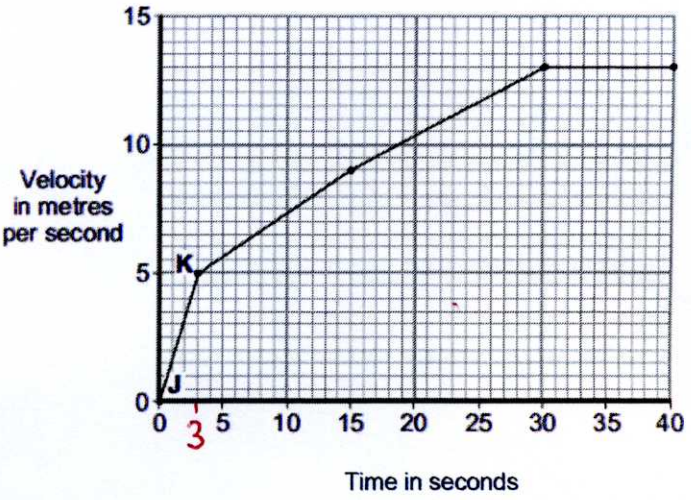
8. The figure below shows how the number of nuclei in a sample of molybdenum-99 changes with time as the nuclei decay.



Calculate the time for 80% of the Mo-99 nuclei in a sample to decay. so 20000 remain

6·2 days

9. The graph shows how the velocity of a go-kart changes during the first 40 seconds of a race. Use the graph to calculate the acceleration of the go-kart between points J and K.



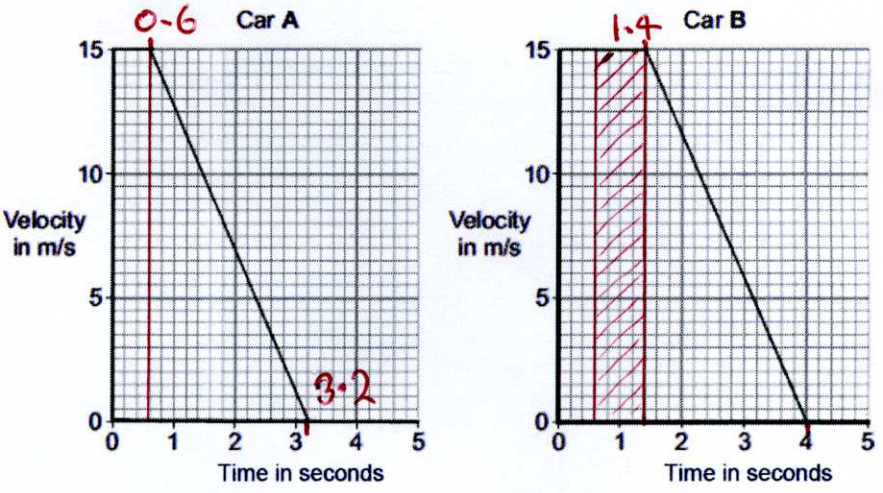
$a = \Delta v / \Delta t = 5/3 = 1.67\ m/s^2$

Use the graph to calculate the distance the go-kart travels between points J and K.

Average speed = 5/2 = 2·5 m/s

$s = vt = 2.5 \times 3 = 7.5\ m$

10. The graphs show how the velocity of two cars, A and B, change from the moment the car drivers see an obstacle blocking the road. One of the car drivers has been drinking alcohol. The other driver is wide awake and alert.



Calculate the acceleration during breaking.

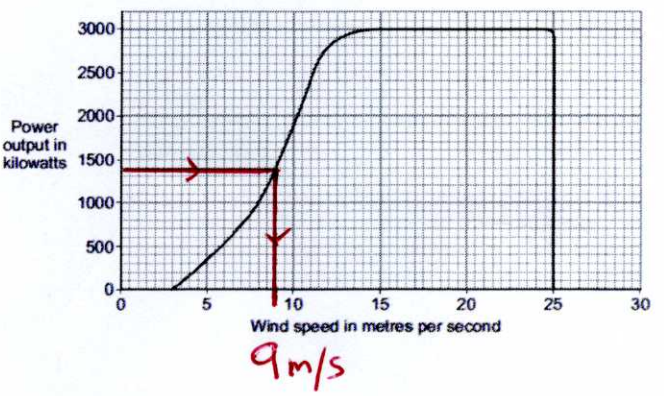
$a = \Delta v / \Delta t = 15/(3.2 - 0.6)$

$= 5.77\ m/s^2$

Use the graphs to calculate how much further car B travels before stopping compared to car A.

Extra distance = $(1.4 - 0.6) \times 15 = 12\ m$

11. The graph shows how wind speed affects the power output from a wind turbine. In one 4-hour period, the wind turbine transfers 5600 kilowatt-hours of electrical energy. Use the data in the graph to calculate the average wind speed during this 4-hour period.

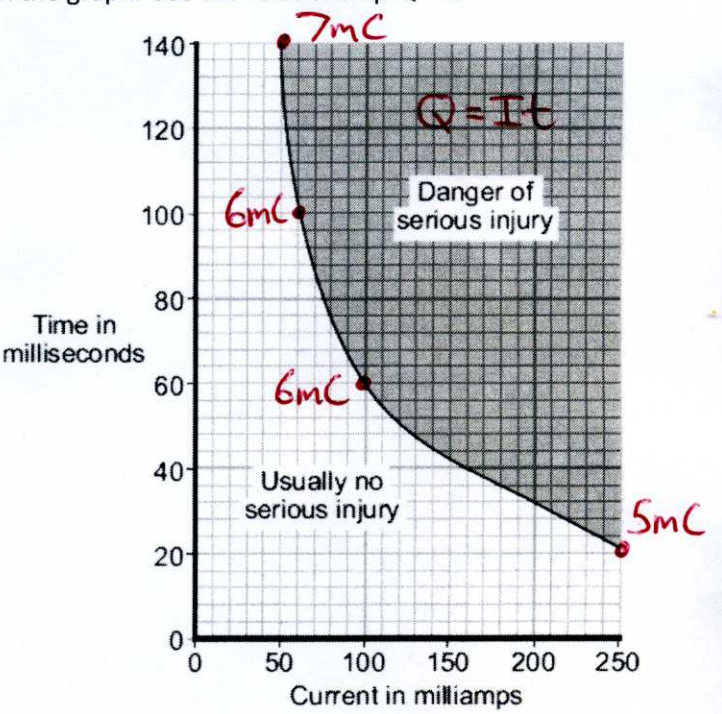


5600/4 = 1400 kW

→ 9 m/s

12. The graph shows how the severity of an electric shock depends on the size of the current and the time that the current flows through the body. Describe the data shown in the graph. Use the relationship Q = It

For currents below 50mA there is no danger. and above 250mA there is danger within 20ms. The bigger the current and the time it lasts the higher the danger. For charge transfers below around 5mC there is usually no serious injury



13. A driver is driving along a road at 30 m/s. The driver suddenly sees a large truck parked across the road and reacts to the situation by applying the brakes so that a constant braking force stops the car. The reaction time of the driver is 0.67 seconds, it then takes another 5 seconds for the brakes to bring the car to rest.

Using the data above, draw a speed-time graph to show the speed of the car from the instant the truck was seen by the driver until the car stopped.

Calculate the acceleration of the car whilst the brakes are applied.

$a = \Delta v / \Delta t = 30/5$

$= 6\ m/s^2$

Calculate the stopping distance.

Thinking dist = 30×0.67

$= 20.1\ m$

Breaking dist = $0.5 \times 30 \times 5$

$= 75\ m$

Stopping dist = 95.1m