

CHAPTER 1: MOTION, FORCES AND ENERGY

NOTE

- Using smaller measuring cylinder will give more accurate measurements
- Always measure from the bottom of the meniscus to get accurate measurements

1. Explain the difference between speed & velocity

- Speed is a scalar quantity, so it has only magnitude
- Velocity is a vector quantity, so it has both magnitude and direction

2. Examples of scalar quantities

- speed
- mass
- energy
- temperature

3. Examples of vector quantities

- displacement
- velocity
- weight
- force
- acceleration
- momentum
- electric field strength
- gravitational field strength

4. Device used to measure mass: balance

5. Difference between mass & weight; why weight is different on Mars than on earth

- Mass is the quantity of matter contained in a body
- Mass is a scalar quantity, so has only magnitude
- Weight is a force equal to the mass of body x gravitational field strength $W=mg$
- Weight is a vector quantity, so has both magnitude and direction
- Therefore, agree with student 1, because mass will be the same on Mars & Earth, while weight changes because gravitational field strength changes.

NOTE: When asked to state the direction of the resultant vector in scale diagrams, calculate the angle from the horizontal.

An object of weight W is suspended by two ropes from a beam, as shown in Fig. 1.1.

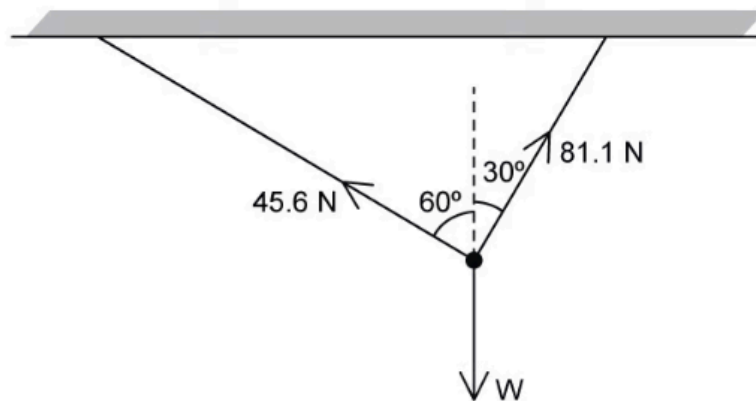


Fig. 1.1

The tensions in the ropes are 45.6 N and 81.1 N, as shown.

In this case, the direction of resultant force is vertically upwards OR opposite to W .

Value of W = Value of resultant force = 93N

NOTE: Unit of gravitational field strength = N/kg

1.

A cannonball is dropped from a three story building.

Which row of the table correctly describes both the speed and the acceleration of the cannonball as it falls?

You can ignore air resistance for this question.

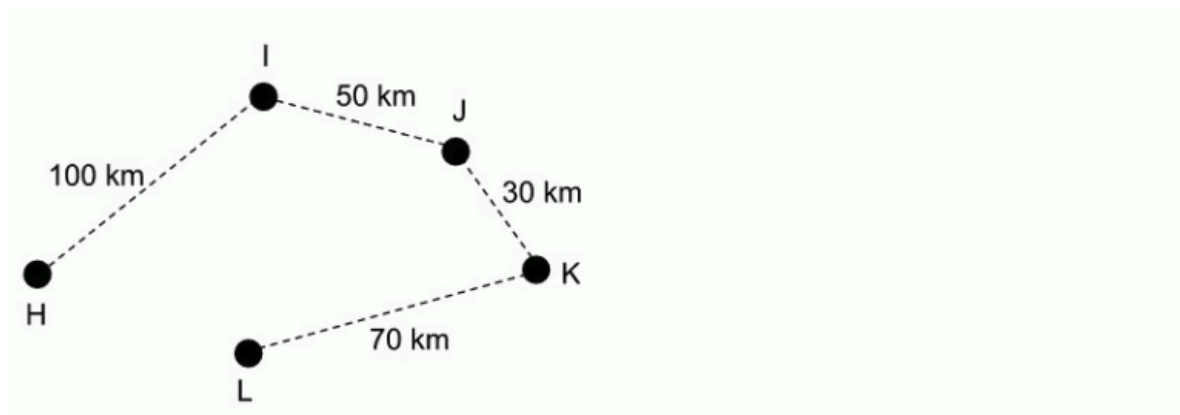
	Speed	Acceleration
A	constant	constant
B	increasing	constant
C	increasing	increasing
D	constant	increasing

Answer: B

2.

A helicopter flies the route shown below.

It stops at point I for 30 minutes to pick up some cargo.



The total time the helicopter takes between taking off from **H** and landing at **L** is 4.0 hours.

Calculate the average speed of the helicopter **when it is flying**.

$$\text{Speed} = (100 + 50 + 30 + 70) / (3.5) = 71.4 \text{ km/h}$$

3.

A man claps in a forest. There is nobody around to hear the sound.

However, there is a very flat cliff face some distance away, and the man hears an echo from the clap 0.84 s later.

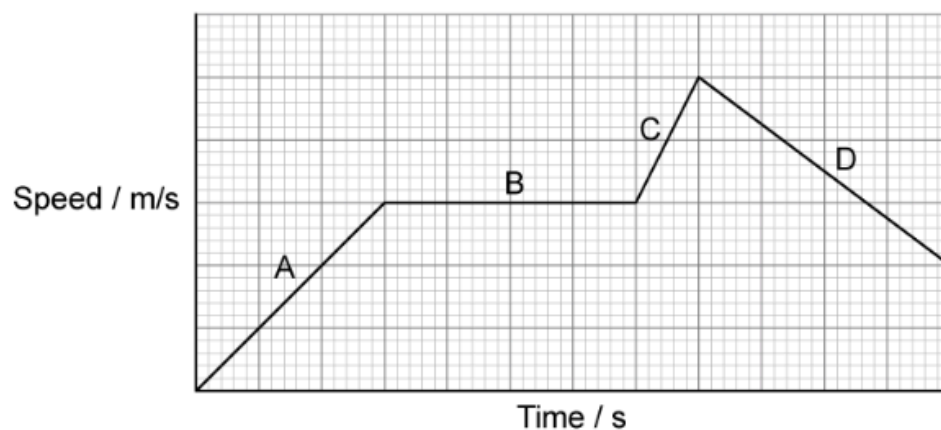
The speed of sound in air is 343 m/s.

Calculate distance between man and cliff

$$\text{Distance} = (343 \times 0.84) / 2$$

4.

In which section of the graph is the most distance covered?

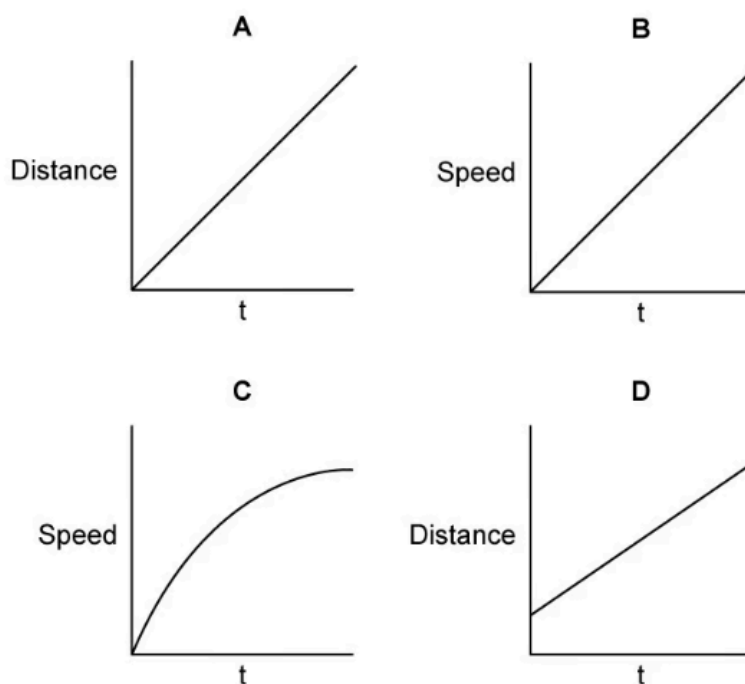


Answer: D

5.

A BASE jumper, initially at rest, falls from the top of El Capitan in Yosemite National Park.

Which graph represents their motion before they deploy their parachute?



Answer: B

6.

During a training flight, a fighter jet travelling at 300 m/s makes a turn to avoid bad weather.

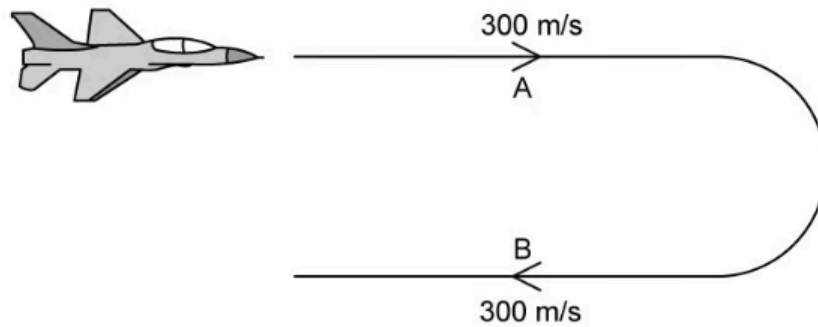


Fig. 1.1

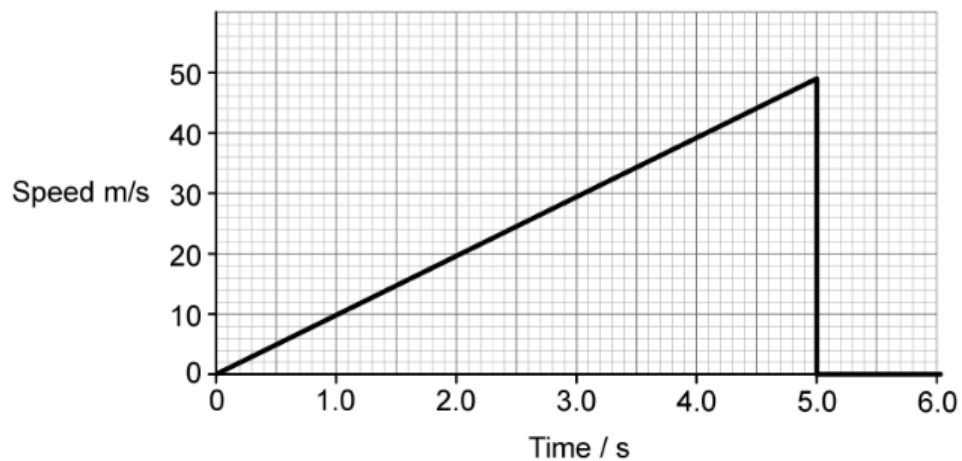
Compare the speed and velocity between points A and B in Fig. 1.1.

- Speed is constant/ same/ 300m/s at both A and B
- Velocity is different (due to difference in direction)

7.

Once everyone has left the elevator, the cable breaks. A device which measures speed over time was found in the elevator when a team investigated the incident.

The data from this are shown in Fig. 1.1.



a. Calculate gradient of the speed time graph

$$\text{Gradient} = 49/5 = 9.8$$

b. When the elevator's cable completely snapped, the elevator is in freefall.

Explain how the gradient shows this.

9.8 m/s² is the acceleration due to gravity

c. Describe motion of the elevator after 5s, and explain how the graph shows this

- It is stationary
- The speed is 0

8. For a brief time, a jet is in free fall.

a. Describe the shape & gradient of the speed-time graph during this time.

- Gradient is positive
- Gradient is constant

b. Describe the shape & gradient of the distance-time graph during this time.

- Gradient is positive
- Gradient is increasing

9. **Hooke's law:** up to the limit of proportionality, extension of the spring is directly proportional to the force/load applied to it.

10. Relationship between mass of an object and force exerted on spring due to that object

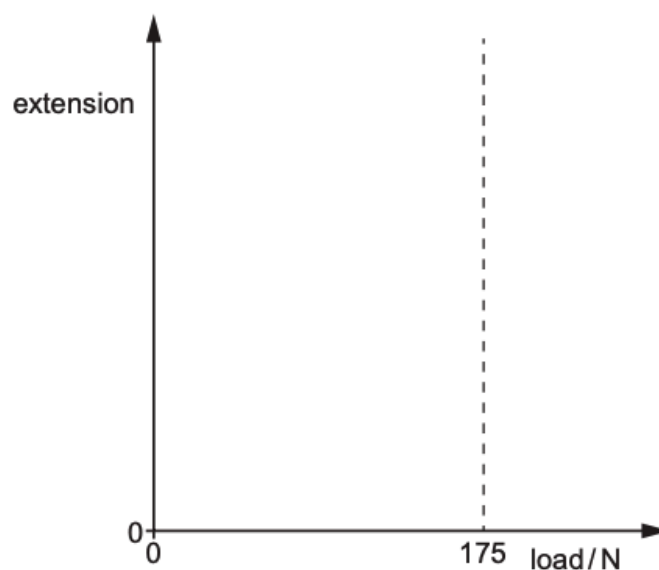
$$W = mg$$

NOTE: relationship refers to the equation connecting those 2 parameters

11.

The limit of proportionality for the spring is at a force of 175N.

Sketch the extension-load graph for the spring. The sketch must continue beyond a force of 175N.



- straight line through / from origin with positive gradient up to 175
- smooth curve after 175 N with increasing positive gradient

12.

A boat crosses a river. The boat points at right angles to the river bank and it travels at a speed of 3.5m/s relative to the water.

A river current acts at right angles to the direction the boat points. The river current has a speed of 2.5m/s.

By drawing a scale diagram or by calculation, determine the speed and direction of the boat relative to the river bank.

Answers:

speed = 4.3 m / s	speed = 4.3 m / s
correct vector triangle or rectangle drawn	use of Pythagoras' theorem e.g. $a^2 + b^2 = c^2$ OR (speed =) $\sqrt{(2.5^2 + 3.5^2)}$
direction = 54° or 55°	direction = 54° or 55°
resultant velocity vector (including arrow)	use of trigonometry to find angle e.g. $\tan \theta = 3.5 / 2.5$

13. Density of steel is 7800kg/m³ and density of water is 1000kg/m³. Explain why a ship made of steel floats in the water.

- ship is not solid steel / there are air spaces in ship
- average density of ship is less than the density of the water

14. Containers with more mass are loaded at the bottom of ship. How this affects stability:

- the centre of gravity is lower
- so the ship is more stable

15. Principle of conservation of energy:

- Energy can neither be created nor destroyed
- It can be transferred/transformed between energy stores

16. Define the unit kWh

energy transferred in one hour at a rate of transfer of 1 kW

17. A wind turbine has maximum output power of 1.8MW. The turbine operates at maximum power for 4.0h. Calculate energy produced by the wind turbine operating at maximum power for 4.0h. Give your answer in kWh.

$$\begin{aligned}\Delta E &= Pt = 1800 \times 4.0 \\ &= 7200 \text{ kWh}\end{aligned}$$

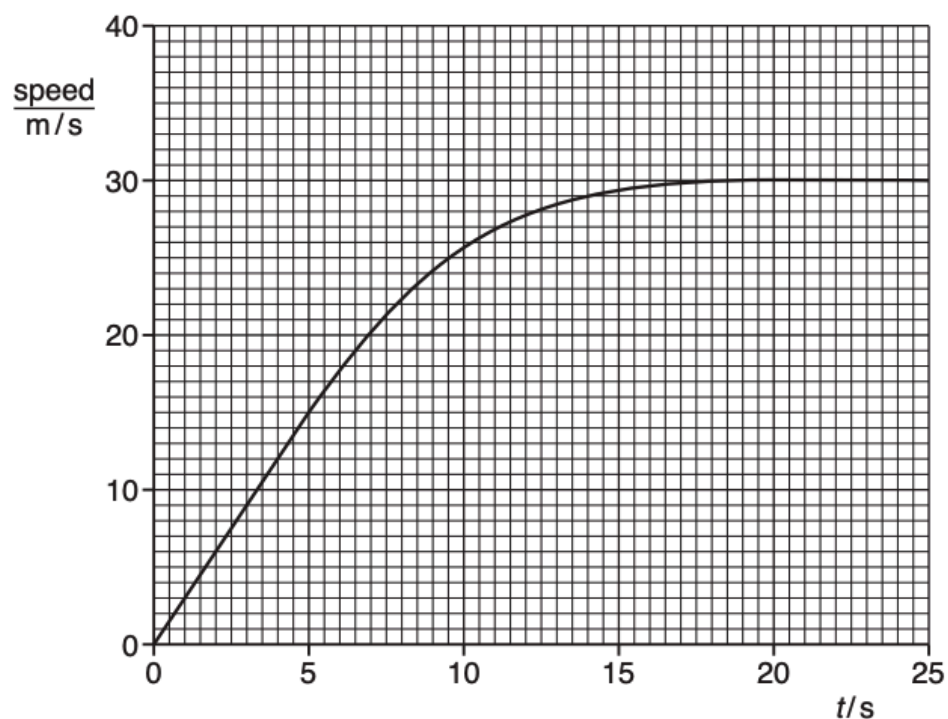
18. Energy resources that are not due to radiation from the Sun.

- Geothermal
- Tidal
- Nuclear

19.

A car accelerates from rest at time $t = 0$ to its maximum speed.

Fig. 1.1 is the speed-time graph for the first 25 s of its motion.



Describe motion of the car between $t = 10$ s and $t = 15$ s. Explain how Fig. 1.1 shows this.

- accelerating or speed / velocity increasing
- at a decreasing rate or acceleration decreasing
- gradient of graph is positive and decreasing

Between $t = 10$ s and $t = 15$ s, the force exerted on the car due to the engine remains constant. Suggest and explain why the car moves in the way shown by Fig. 1.1.

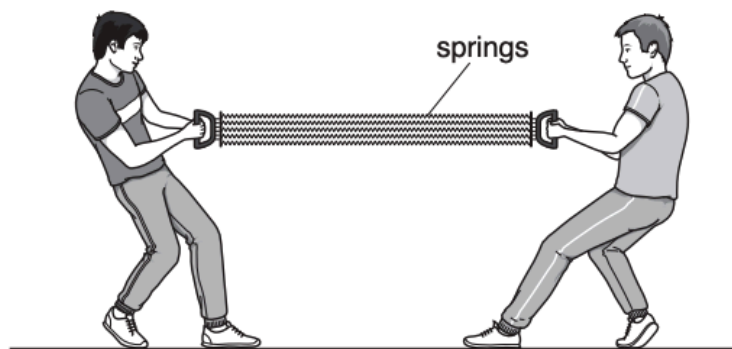
- Air resistance/ friction
- Air resistance/ friction increases with speed

Properties of an object that may be changed by the action of forces

- shape
- size/ volume / length /density / any linear dimension
- direction (of motion)/ speed / velocity /momentum / kinetic energy / acceleration

20.

A chest expander is a piece of equipment used by athletes in a gym. Fig. 2.1 shows a chest expander that consists of five identical springs connected in parallel between two handles.



Each spring has an unstretched length of 0.63m

Each athlete pulls the handle towards himself with a force of 1300N. State the tension in each spring.

$$1300 / 5 = 260\text{N}$$

The chest expander stretches and each spring is now 0.94m long. Calculate the spring constant k of each spring.

$$260 / (0.94 - 0.63) = 840 \text{ N/m}$$

State the energy changes taking place as the two athletes use their muscles to stretch the chest expander.

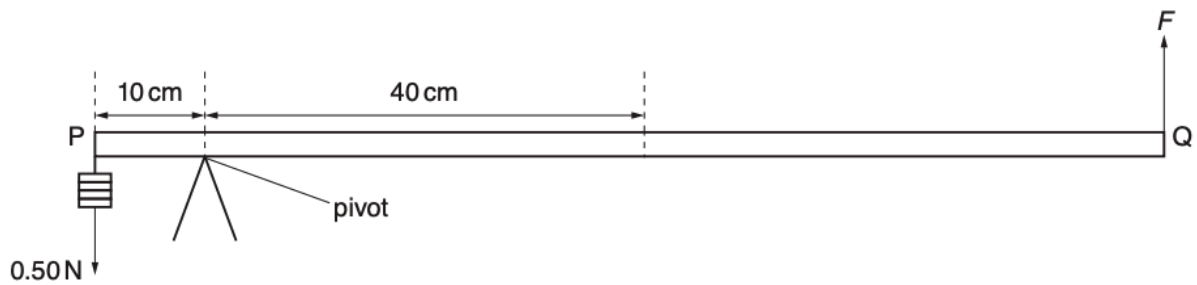
- from chemical (potential energy)
- to elastic (potential)/ strain (at end)

21. Define impulse: force $\times$ time (for which it acts)

22. Conditions which must be true for an object to be in equilibrium

- no resultant force // forces are balanced
- no resultant moment/torque/turning effect // sum of clockwise moments = sum of anticlockwise moments

23. Uniform metre rule in equilibrium



The distance PQ is 100cm. The mass of the metre rule is 0.12kg and its weight is W.

On Fig 2.1, draw and label:

1. an arrow to show the force W acting on PQ at the centre of mass
2. an arrow to show the force R acting on PQ at the pivot.

1. down arrow labelled W at dashed line on 50 cm mark
2. up arrow labelled R at pivot

By taking moments about the pivot, calculate F.

- expression / evaluation for one correct moment seen
- expressions / evaluation for all correct moments seen
- equation seen relating correct expressions / evaluations for moments:
 - moment of 0.5 N + moment F = moment of W OR
 - $90 F = 43$ OR $0.9F = 0.43$
- $(F = 43 / 90 \text{ OR } 0.43 / 0.9 =) 0.48 \text{ N}$

Calculate R

- upwards force = downwards force
- $(R =) 1.2 \text{ N}$

24.

Fig. 1.1 is the top view of a tank in an aquarium. The tank is filled with salt water.

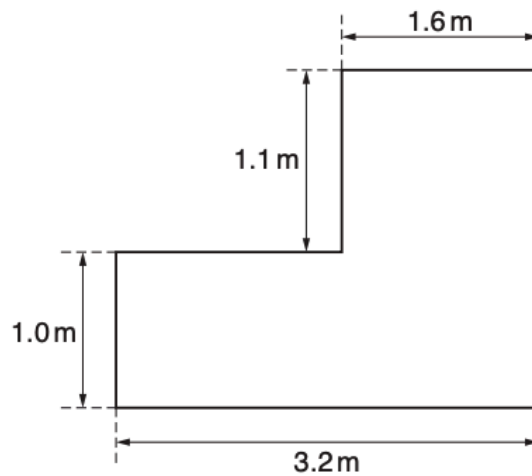


Fig. 1.1 (not to scale)

The depth of the water in the tank is 2.0 m.

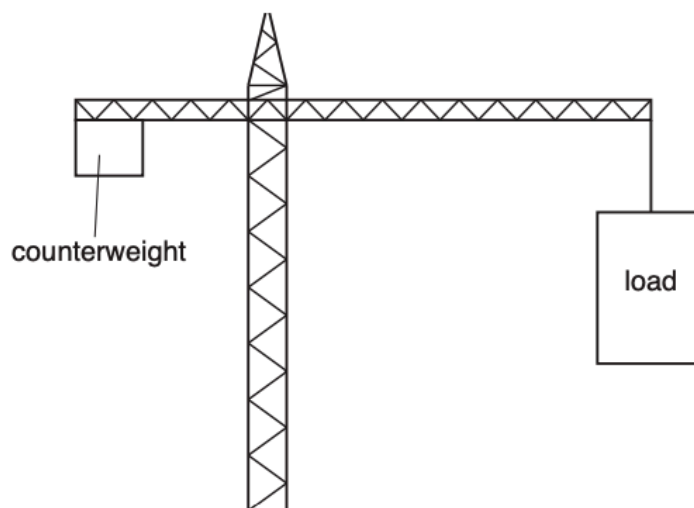
Density of water = $1.1 \times 10^3 \text{ kg/m}^3$

Calculate the pressure due to the water at a level of 0.80 m above the base of the tank.

$$P = \rho gh = 1.1 \times 10^3 \times 10 \times (2 - 0.8) = 1.3 \times 10^4 \text{ Pa}$$

25.

Fig. 2.1 shows a tower crane used to lift a load on a construction site.

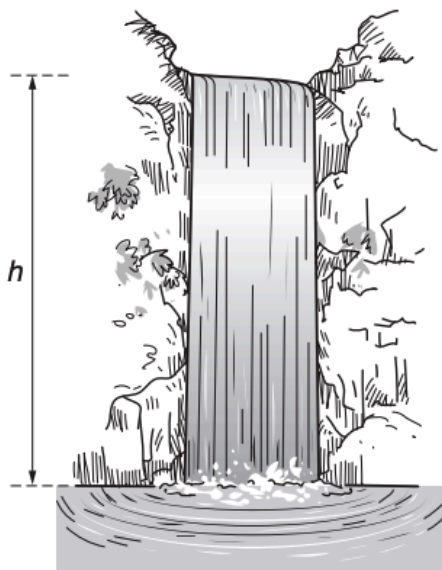


Explain how counterweight prevents crane from toppling over

- provides (anticlockwise) moment
- total clockwise moment = total anticlockwise moment OR resultant turning effect = 0

26.

Fig. 3.1 shows a waterfall.



The speed of the water as it hits the bottom is 21m/s. Calculate height of the waterfall.

KE gained = PE lost

$$\frac{1}{2} mv^2 = mgh$$

$$h = v^2 / 2g = 22 \text{ m}$$

State and explain any assumption you made in the previous question.

No energy lost to surroundings (as thermal energy) OR No air resistance

27. Define acceleration

Change of velocity per unit time OR $(v-u) / t$

28. State the principle of conservation of momentum

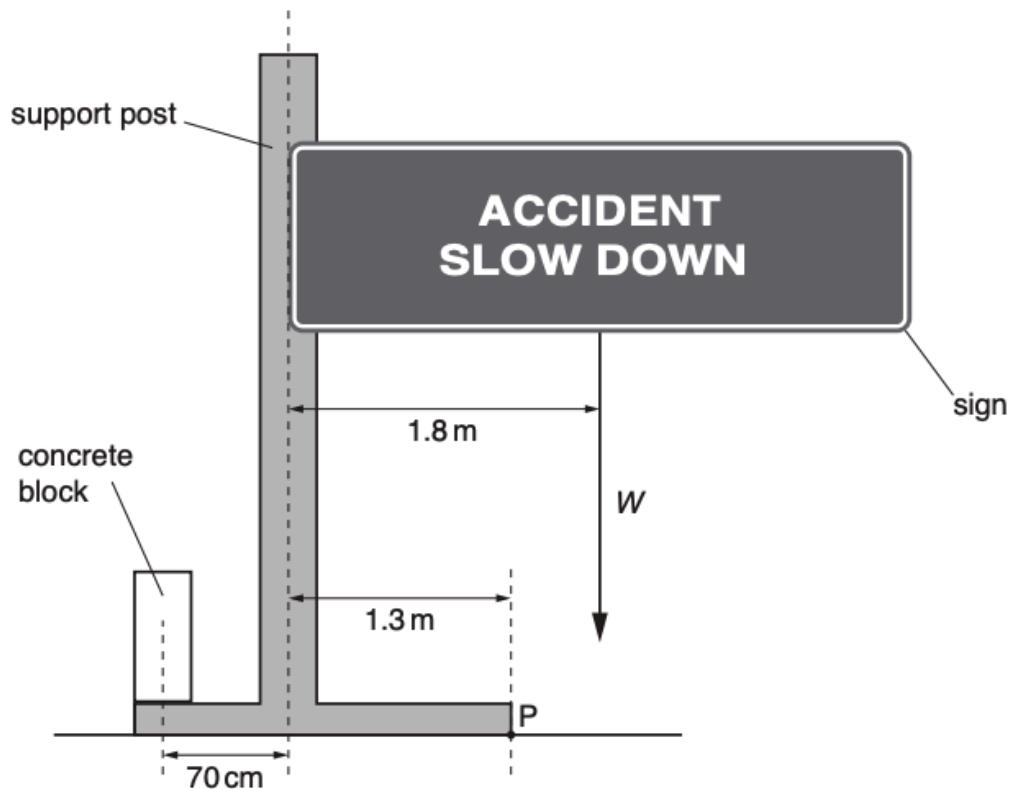
- no external forces // isolated system // closed system
- sum of momenta / (total) momentum remains constant

29. A rocket is stationary on the launchpad. At time $t = 0$, the rocket engines are switched on and exhaust gases are ejected from the nozzles of the engines. The rocket accelerates upwards. Some time later, the rocket is far from the Earth. The effect of the Earth's gravity on the motion of the rocket is insignificant. As the rocket accelerates, its momentum increases. Explain how the principle of the conservation of momentum applies to the accelerating rocket and the exhaust gases.

- The rocket gains upward momentum
- The momentum of the exhaust gases decreases by equal amount

30.

Fig. 2.1 shows a sign that extends over a road.



The mass of the sign is 3.4×10^3 kg. The weight of the sign acts at a horizontal distance of 1.8m from the centre of the support post and it produces a turning effect about point P. Point P is a horizontal distance of 1.3m from the centre of the support post.

Calculate the moment about P due to the weight of the sign.

$$\text{Moment about P} = F \times d = 3.4 \times 10^4 \times (1.8 - 1.3) = 1.7 \times 10^4 \text{ Nm}$$

The weight of the concrete block produces a moment about point P that exactly cancels the moment caused by the weight W. Calculate the weight of the concrete block.

$$(1.7 \times 10^4) / (1.3 + 0.70) \quad \text{OR} \quad (1.7 \times 10^4) / (2.0) \\ = 8.5 \times 10^3 \text{ N}$$

The concrete block is removed. The sign and support post rotate about point P in a clockwise direction. State and explain what happens to the moment about point P due to the weight of the sign as it rotates.

- Moment increases
- Because perpendicular distance between P and line of action of W increases

31. **Centre of mass:** the point where all the mass can be considered to be concentrated.

32. **Centre of gravity:** the point where all the weight seems to act.

33.

- 3 A cube of side 0.040 m is floating in a container of liquid. Fig. 3.1 shows that the surface of the liquid is 0.028 m above the level of the bottom face of the cube.

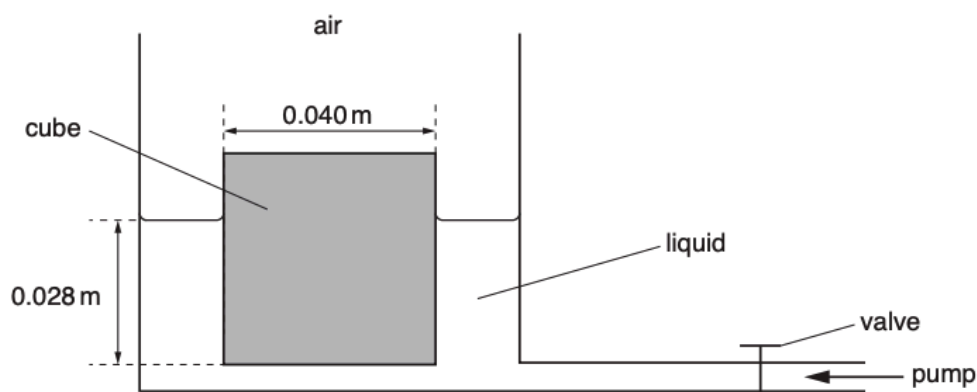


Fig. 3.1

The pressure of the air above the cube exerts a force on the top face of the cube. The valve is closed.

(a) Explain, in terms of air molecules, how the force due to the pressure of the air is produced.

- air molecules / they move / collide B1
- air molecules / they collide with cube / upper surface of cube / wall B1
- impulse exerted on surface OR momentum change of molecules

34.

Fig. 2.1 shows a model fire engine. Its brakes are applied.

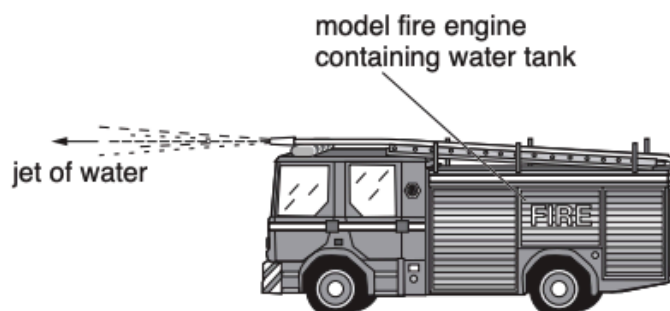


Fig. 2.1

0.80 kg of water is emitted in the jet every 6.0 s at a velocity of 0.72 m/s relative to the model.

The brakes of the model are released. State and explain the direction of the acceleration of the model.

- acceleration is to the right/backward

- Explanation: force from water acts on model to right /backwards OR acceleration in same direction as force from water

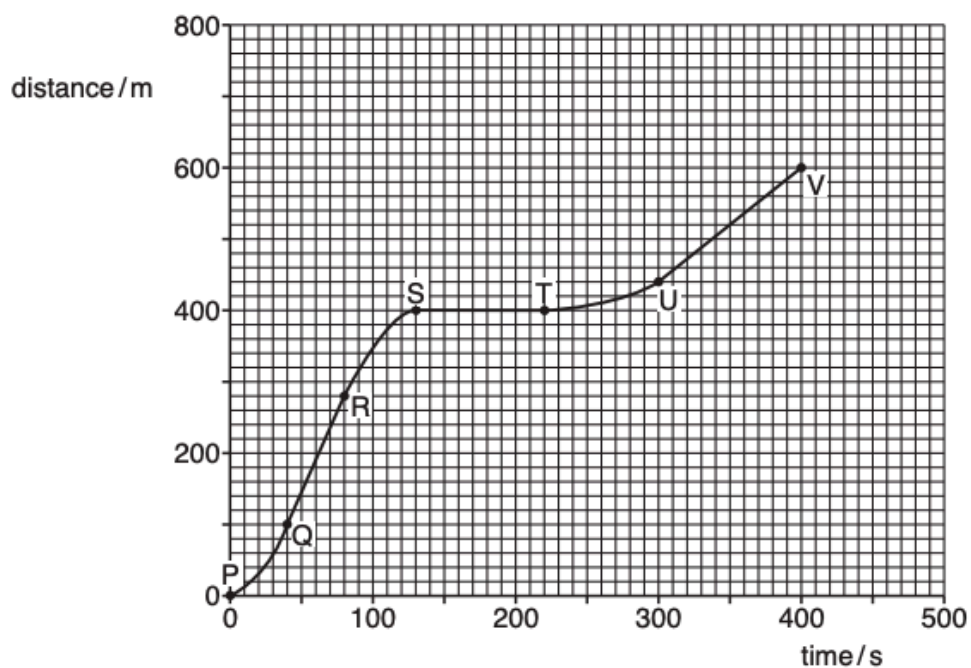
In (c) the model contains a water tank, which is initially full. State and explain any change in the magnitude of the initial acceleration if the brakes are first released when the tank is nearly empty.

- acceleration more when empty
- mass is less and force is constant
- $F=ma$ / Newton's 2nd law / change in momentum

35. State the main form of energy transferred from the Sun to the solar cells for the generation of electrical energy.

Light energy

36.



Describe the motion between R and S

Deceleration

37.

Fig. 2.1 is the top view of a small ship of mass $1.2 \times 10^6 \text{ kg}$. The ship is moving slowly sideways at 0.040 m/s as it comes in to dock.

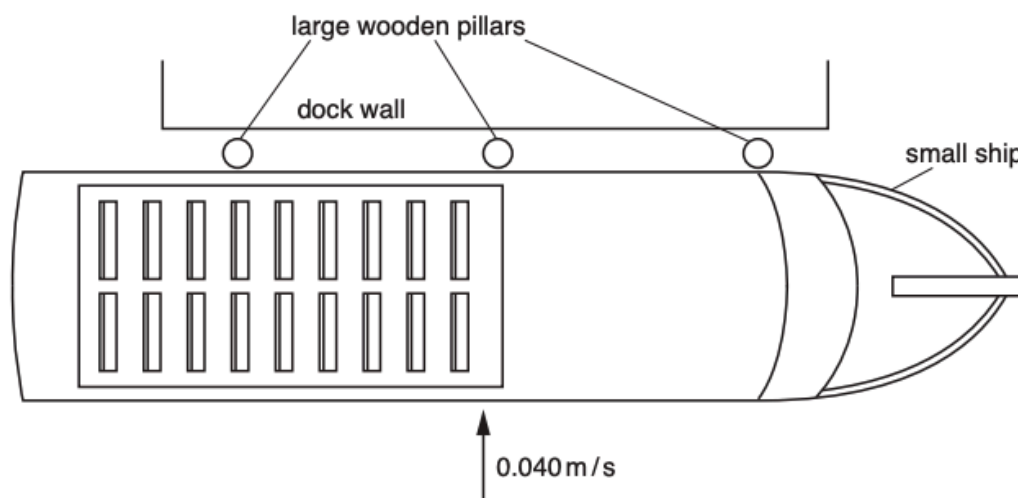


Fig. 2.1

The ship hits the wooden pillars which move towards the dock wall.

The ship is in contact with the pillars for 0.30 s as it comes to rest. Calculate the average force exerted on the side of the ship

EITHER
(change in momentum) = mv OR (change in momentum) = $1.2 \times 10^6 \times 0.04$
(=) $4.8 \times 10^4 \text{ (kg m/s)}$
change in momentum = Ft in any form
(Force = $4.8 \times 10^4 / 0.3$ =) $1.6 \times 10^5 \text{ N}$
OR
$a = (v-u)/t = 0.04/0.3$
= $0.13 \text{ (m/s}^2\text{)}$
$F = ma$
(Force = $1.2 \times 10^6 \times 0.13$ =) $1.6 \times 10^5 \text{ N}$

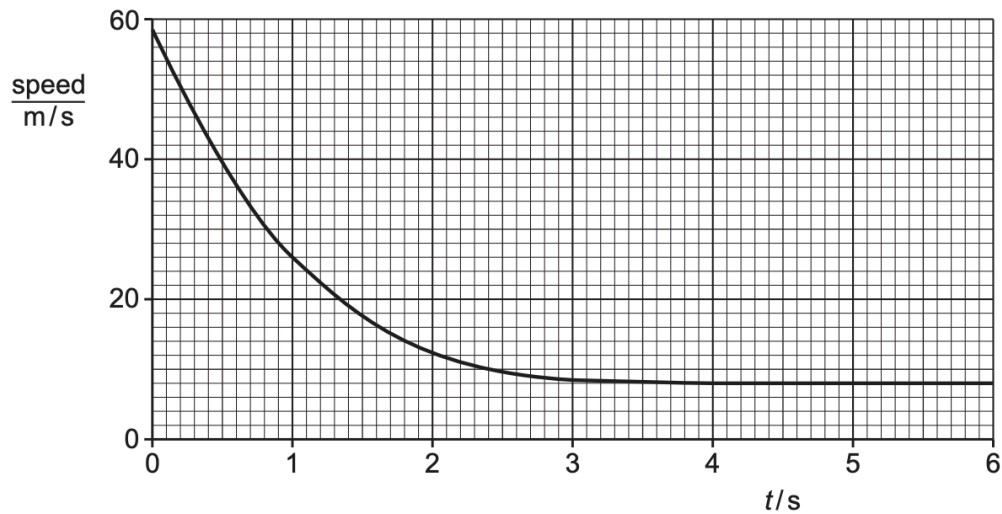
Dock walls sometimes have the pillars replaced with rubber car tyres. Explain how this reduces the possibility of damage when a boat docks.

smaller force (on dock/ship) because increases time of collision OR increased distance of collision (on the dock/ship)

38.

A skydiver of mass 76 kg is falling vertically in still air. At time $t = 0$, the skydiver opens his parachute.

Fig. 1.1 is the speed–time graph for the skydiver from $t = 0$.



Calculate the force due to air resistance acting on the skydiver immediately after the parachute opens

$$\text{Deceleration right after parachute opens} = (60 - 40) / 0.5 = 40 \text{ m/s}^2$$

$$\text{Force of weight} = 76 \times 10 = 760 \text{ N}$$

$$\text{Force of air resistance} = ma = 76 \times 40 + 760 = 3800 \text{ N}$$

Explain, in terms of forces acting on the skydiver, his motion between $t=0$ and $t=6\text{s}$

- deceleration because upward force greater than weight // upward resultant force
- air resistance decreases with decreasing speed / with time /// deceleration decreases or resultant (upward) force decreases
- (until / finally) weight equals air resistance or forces balance or at terminal / constant velocity / speed

Explain why opening the parachute cannot reduce the speed of the skydiver to 0

- at zero speed there is no air resistance
- weight / downwards force is (still) acting or there is (now) a resultant force (downwards at zero speed)

OR

- forces balance at a speed greater than zero
- speed cannot decrease / no deceleration once forces balance

39. As a trolley moves across a rough surface, it slows down & stops. Explain in terms of work done, the energy change that takes place as the trolley slows down.

- work done against friction // kinetic energy (of trolley) used to do work
- kinetic energy decreases (to zero)

- thermal energy produced

40. Define moment of a force

Force $\times$ perpendicular distance from pivot

41. Describe an experiment involving vertical forces to show that there is no net moment on an object in equilibrium. You may draw a diagram.

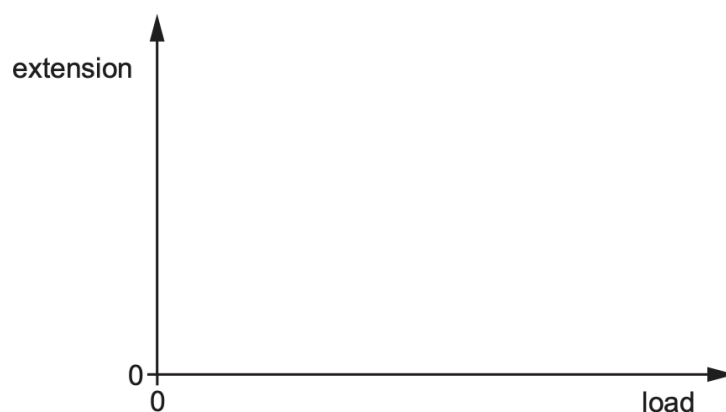
- clear diagram or description (of object) with pivot and vertical forces / weights / masses / cord tension causing moments in each direction
- indicate / measure forces and perpendicular distances
- calculates a moment or shows / describes how to AND confirms equality of total moment (in each direction) AND statement of equilibrium / balance

NOTE:

- For numericals involving force and momentum, state that force = rate of change of momentum, as the formula.
- State that PE loss = KE gain OR KE loss = PE gain; for questions where you have to use conservation of energy for calculations
- For numericals involving conservation of momentum, state that momentum before the collision = momentum after the collision, as the formula

42.

On Fig. 1.2, sketch an extension-load graph for a spring. Label the limit of proportionality with the letter L on your graph.



- graph initially straight line with positive gradient that passes through the origin B1
- point labelled, increasing gradient to the right

NOTE: for load-extension graph, there would be decreasing gradient to right; for extension-load graph, there would be increasing gradient to right. This is because the spring stretches much more for each unit increase of load after the limit of proportionality.

43.

The load is pulled down a small distance below its equilibrium position to position A, as shown in Fig. 1.3. The load then moves up and down between position A and position B in Fig. 1.3.

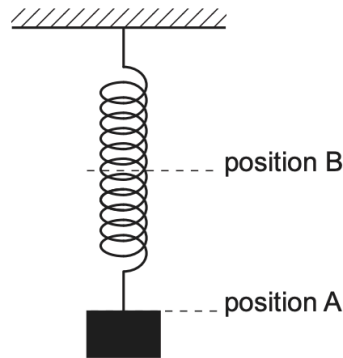


Fig. 1.3

Describe energy transfer which occurs as load moves from position A to the equilibrium position

from elastic / strain energy to gravitational potential energy OR
elastic / strain energy to kinetic energy

Describe energy transfer which occurs as load moves from the equilibrium position to position B

from elastic / strain energy to gravitational potential energy OR
kinetic energy to gravitational potential energy

NOTE

At top/ unstretched

- $GPE = mgh$ (maximum)
- $KE = 0$ (no speed)
- $EPE = 0$ (no extension)

At midpoint

- $GPE = mgh$
- $KE = \frac{1}{2} mv^2$
- $EPE = \frac{1}{2} kx^2$

At lowest point/ fully stretched

- $GPE = 0$
- $KE = 0$
- $EPE = \frac{1}{2} kx^2$ (maximum)

Total energy = $GPE + KE + EPE$ = same throughout

44.

A car travels at constant speed v on a horizontal, straight road. The driver sees an obstacle on the road ahead.

- (a) The distance travelled in the time between the driver seeing the obstruction and applying the brakes is the thinking distance.

Explain why the thinking distance is directly proportional to v .

.....
..... [1]

- (b) When the brakes are applied, the car decelerates uniformly to rest. The frictional force applied by the brakes is constant. The distance travelled between first applying the brakes and the car stopping is the braking distance.

Explain why the braking distance is proportional to v^2 .

.....
.....
.....
..... [3]

a) Thinking time is constant

b) - kinetic energy

- kinetic energy = $\frac{1}{2} mv^2$

- work done (to lose KE) = Fd

(so stopping distance is proportional to v^2)

OR (alternative route)

- time to decelerate is proportional to v

- $d = \text{average } v \times t = \frac{1}{2} v \times t$

- d is proportional to v^2

45.

The microphone is suspended from the ceiling by a cord attached to a small ring. Fig. 1.1 shows the microphone pulled to one side and kept stationary by a horizontal thread.

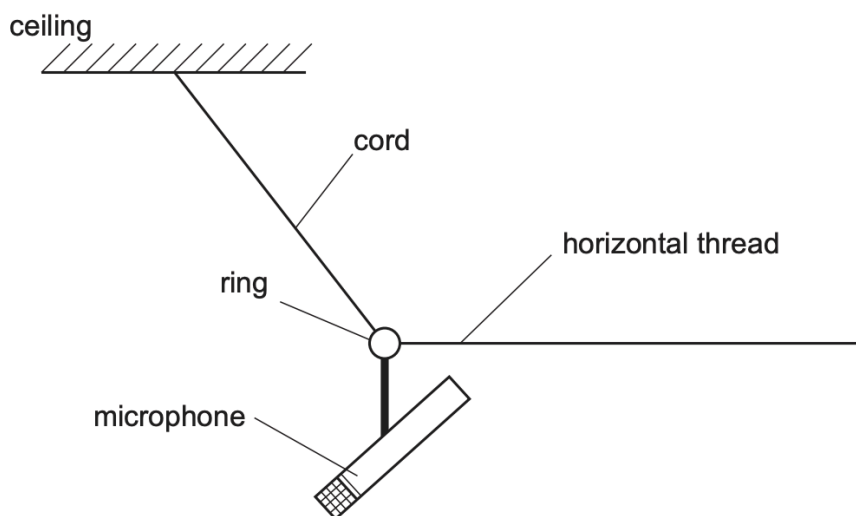


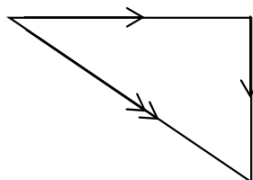
Fig. 1.1 (not to scale)

Mass of microphone = 0.55 kg

The tension T in the horizontal thread is 8.1N.

Determine graphically the magnitude and the direction, relative to the vertical, of the resultant of W and T . Use a scale of 1.0cm to 1.0N or greater.

correct right-angled triangle / rectangle / intersecting arcs seen e.g.



(magnitude from) 9.6 to 10.0 N

(angle to vertical from) 54.0 to 57.5°

State and explain how the magnitude and direction of the resultant in (c)(ii) compares with the force on the ring due to the tension in the cord.

- equal (in magnitude)
- opposite (in direction)
- the ring is in equilibrium // no resultant force on ring // forces on ring balance

46.

Fig. 3.1 shows a collision at very slow speed between two cars travelling along a straight road.

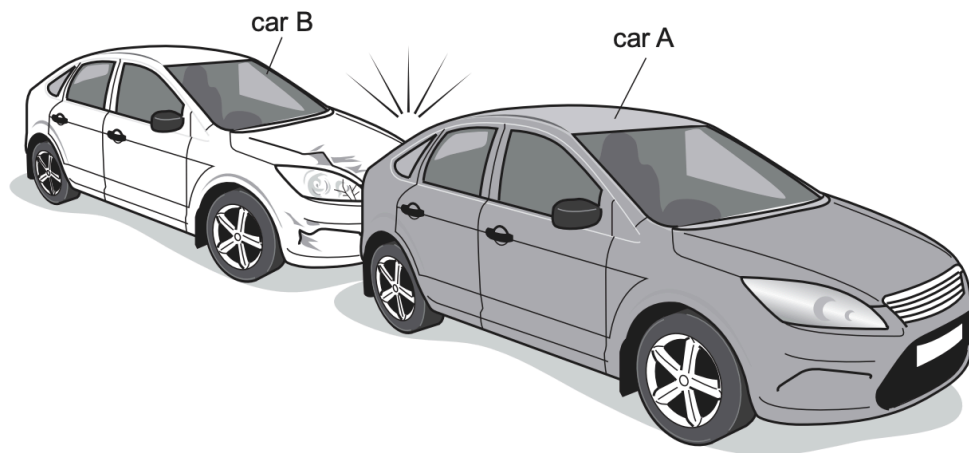


Fig. 3.1

Car B, of mass 800kg, is moving at 2.0m/s and collides with car A, of mass 1000kg, which is stationary. After the collision, both cars travel in the same direction as the initial direction of car B.

(a) After the collision, car A moves at 1.3m/s.

Impulse exerted by car A on car B = 1300 Ns.

State the impulse exerted by car B on car A

Same as car A on B = 1300 Ns

47.

A rock climber, of total mass 62kg, holds herself in horizontal equilibrium against a vertical cliff. She pulls on a rope that is fixed at the top of the cliff and presses her feet against the cliff.

Fig. 3.1 shows her position.

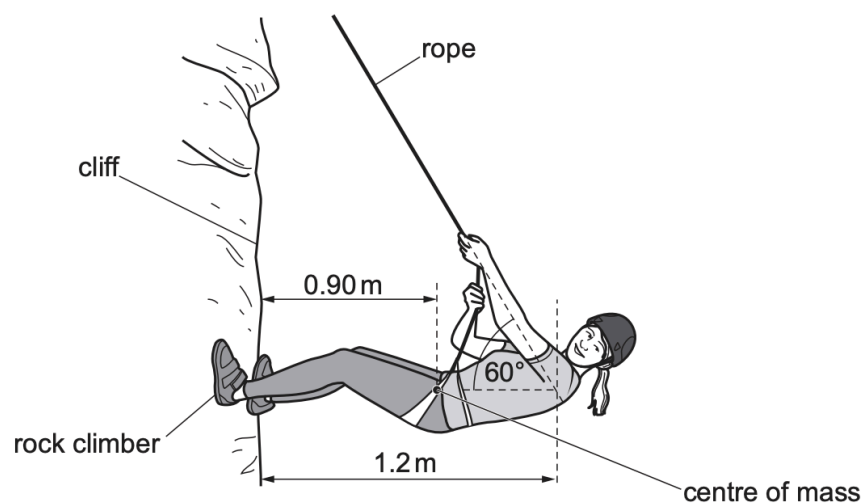
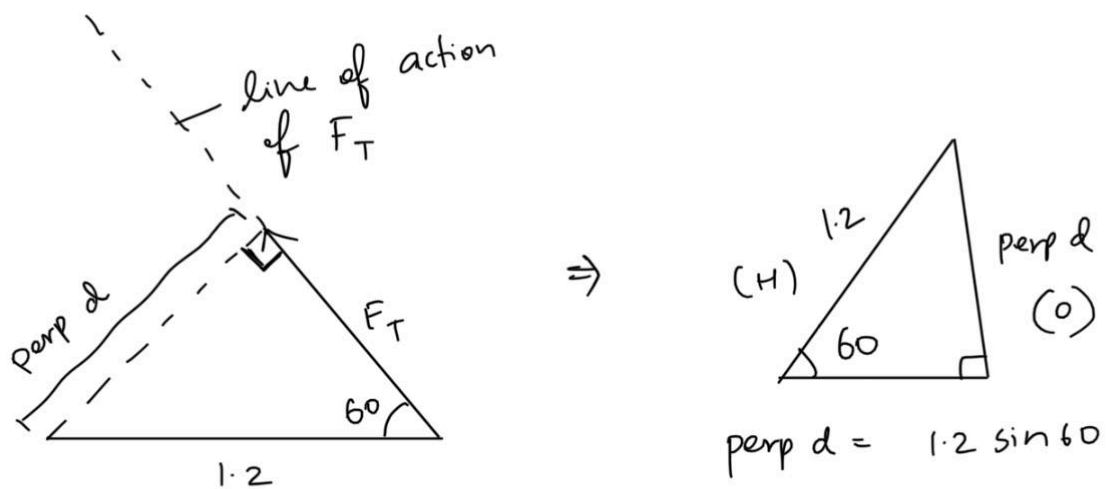


Fig. 3.1 (not to scale)

moment about her feet due to her weight = 560 Nm. What is the tension all force in the string?



$$\begin{aligned} \text{anticlockwise moment of string} &= 560 \text{ Nm} \\ &= 1.2 \sin 60 \times F_T \end{aligned}$$

$$\therefore F_T = \frac{560}{1.2 \sin 60} = \boxed{540 \text{ N}}$$

NOTE: always extend the line of action of force, and find the perpendicular distance between this line of action and the pivot.

48. A pendulum swings with a time period of approx. 1 sec. Describe how to use a stopwatch to determine time period of pendulum.

- (use stop-watch to) time oscillations
- (use of fiduciary) aid to determine a complete cycle
- (use of) multiple oscillations AND division (to determine period)

NOTE: for change in momentum qs, don't give answer in negative; always give unsigned answers.

49.

An aeroplane accelerates along a horizontal runway before take-off. The aeroplane accelerates for 35 s. The speed of the aeroplane when it takes off is 72 m/s.

Fig. 1.1 shows how the speed of the aeroplane varies between time $t = 0$ and $t = 35$ s.

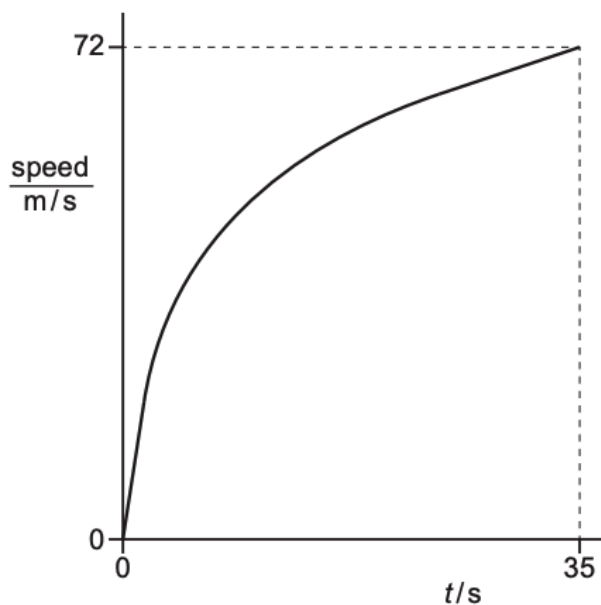
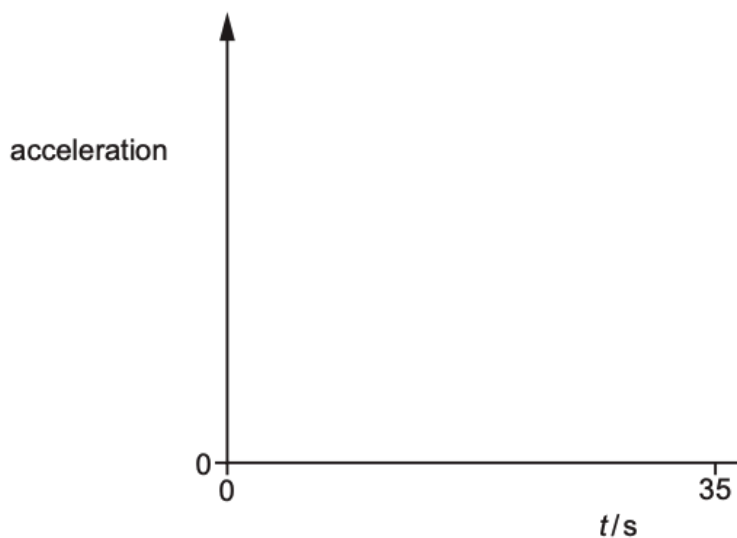


Fig. 1.1

On Fig. 1.2, sketch a graph to show how the acceleration of the aircraft varies between $t = 0$ and $t = 35$ s.



any three from:

- initial acceleration highest value AND horizontal line
- curved or straight line downwards
- curved or straight line downwards AND line not reaching zero by 35 s
- horizontal line before and up to 35 s.

50. Under ideal conditions, a car can travel a maximum distance of 390 km when its battery is fully charged. Suggest why, in normal use, it needs to be recharged after travelling less than 390 km

Repeated acceleration/deceleration // use of brake // varying speeds // uneven road surface // cold weather // headwind

51.

Fig. 3.1 shows a boat stored in a shed. The boat is suspended from the ceiling of the shed by two ropes.

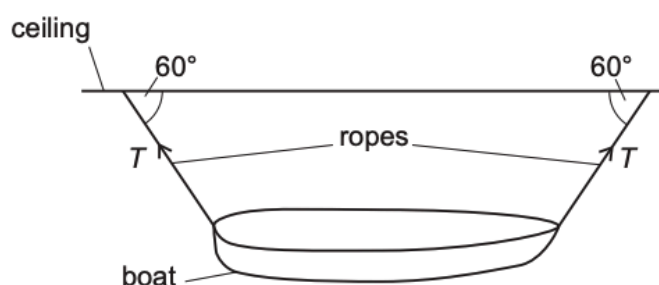


Fig. 3.1

The tension T in each of the ropes is 75 N.

- (i) Draw a vector diagram to determine the resultant of the forces exerted by the two ropes on the boat. State the scale you used.

suitable scale recorded (e.g. 2 cm : 25 N)

two vectors correctly drawn by eye **AND** correct resultant

130 N

(vertically) upwards

52. Water flows down a pipe of constant cross-sectional area. Explain why KE of water in the pipe remains constant as it flows through.

- Speed of water remains constant
- Volume/density does not change // quantity of water remains constant

NOTE: for scale diagrams, try to fill in as much of the space as possible.

Eg. use 2 cm: 1m/s instead of 1cm: 1m/s

NOTE: power and time are inversely related; inverse variation

Eg. When fully charged the battery of a bicycle can deliver a power of 600W for 60 min. A bicycle has a motor with an electrical input power of 250W. Calculate the time for which the battery can power the bicycle.

$$t = (600/250) \times 60 = 144 \text{ min} = 8600\text{s}$$

53.

Fig. 2.1 shows an object of mass 2.0 kg on a bench. This object is connected by a cord, passing over a pulley, to an object of mass 3.0 kg.

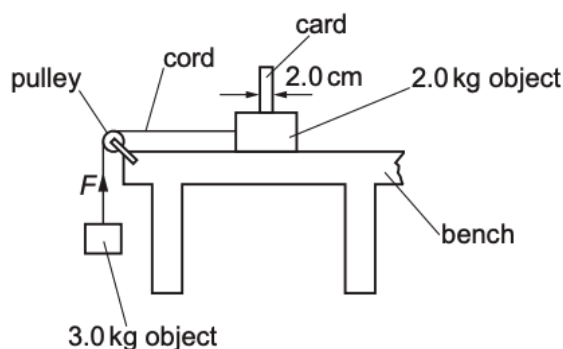


Fig. 2.1

The 2.0 kg object is released from rest and accelerates at 4.0 m/s^2 .

Calculate the upward force F exerted by the cord on the 3.0 kg object.

Resultant force acting on 3 kg mass = $ma = 3 \times 4 = 12 \text{ N}$ (downwards)

Resultant = weight - upward force $\Rightarrow 12 = 30 - (\text{upward force})$

So upward force = $30 \text{ N} - 12 \text{ N} = 18 \text{ N}$

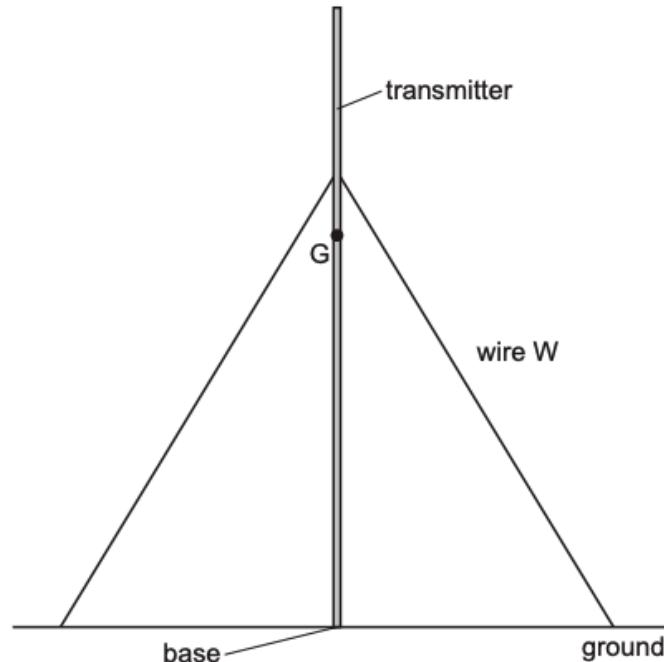
54. Water in a river flows from right to left at a speed of 0.54 m/s . A swimmer swims at a constant speed of 0.72 m/s relative to the water, and at right angles to the current. When the swimmer is crossing the river, his actions produce a constant forward force on his body. Explain why he moves at a constant speed.

- friction (of water backwards) OR resistance (on swimmer backwards)
- (friction / resistance) balances forward force OR (there is) no resultant force

55.

A radio transmitter is a very tall, thin cylinder. It is prevented from falling over by wires which have one end fixed to the transmitter and the other end fixed in the ground. The ends of the wires in the ground are a long distance from the transmitter.

Fig. 4.1 shows the transmitter and two of the wires.



Centre of gravity = G

Explain why the radio transmitter without wires is a very unstable structure

- Small tilt/ rotation makes G no longer vertically above the base // small tilt/rotation produces a moment that topples the transmitter.

56. Describe a method of generating electrical power from energy stored in water

- Name of method: electricity generation by HEP
- Water stored at a height in a reservoir/ behind dam is released through gates
- Energy is transferred from gravitational potential store to kinetic store
- Moving water turns turbine
- Turbine drives generator