Questions

Q1.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 19 shows four forces, P, Q, R and S, acting on a rod.
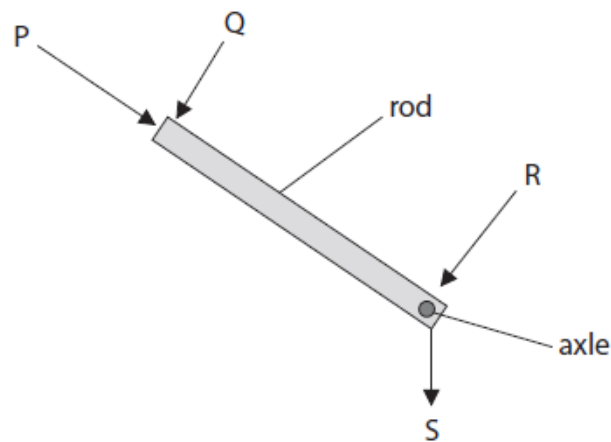
The rod can rotate around an axle.

Figure 19

Which force will make the rod rotate about the axle?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(Total for question = 1 mark)

Q2.

(i) Which of these forces keeps the Moon moving around the Earth?

☒ **A**   contact

☒ **B**   electrostatic

☒ **C**   gravitational

☒ **D**   magnetic

(ii) Which of these is a scalar quantity?
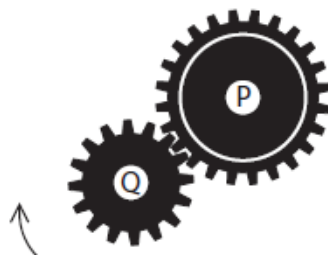
(1)

☒ **A**   velocity

☒ **B**   momentum

☒ **C**   energy

☒ **D**   acceleration

(Total for question = 2 marks)

Q3.

(i) Figure 9 shows two gears.

Gear Q moves clockwise as shown by the arrow.
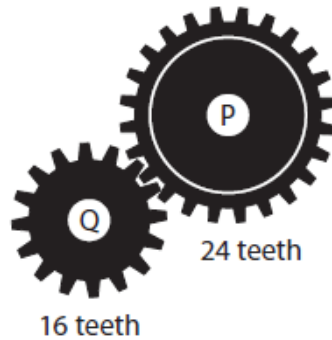

Figure 9

Which of these describes how gear P moves?

(1)

☒ **A**   anticlockwise, slower than gear Q

☒ **B**   anticlockwise, faster than gear Q

☒

C   clockwise, slower than gear Q

☒ **D**   clockwise, faster than gear Q

(ii) Figure 10 shows the number of teeth on the gears.

Gear P has 24 teeth, gear Q has 16 teeth.

24 teeth

16 teeth

Figure 10

Which of these gives the ratio of the number of teeth on gear P to the number of teeth on gear Q?
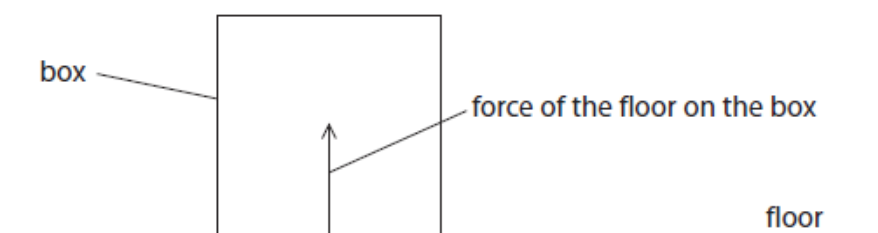
(1)

☒ **A**   24 − 16

☒ **B**   16 + 24

☒ **C**   3 : 2

☒ **D**   2 : 3

(Total for question = 2 marks)

Q4.

Figure 7 shows a box at rest on a floor.

The force that the floor exerts on the box is shown by the vector in Figure 7.

box
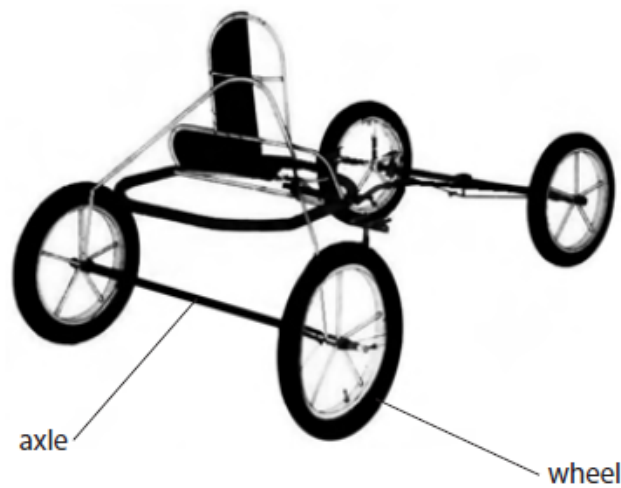
force of the floor on the box

floor

Figure 7

Add another vector to the diagram in Figure 7 to show the weight of the box.

(2)

(Total for question = 2 marks)

Q5.

Figure 8 shows part of a cart.

Figure 8

When the wheels turn the axles become warm.

(i) Explain why the axles become warm when the wheels turn.

(2)

....

....

....

....

(ii) Give **one** way of reducing the heating of the axles when the wheels turn.

(1)

....

....
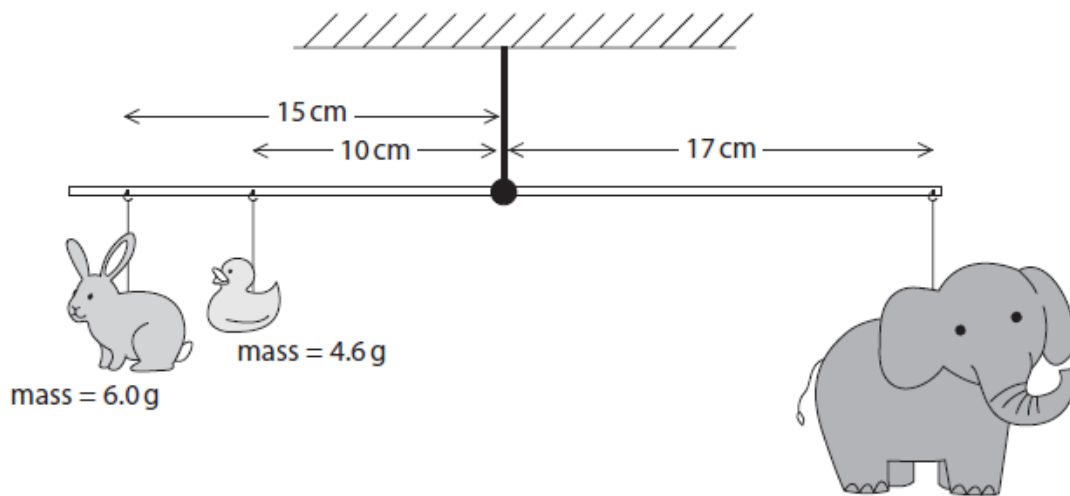
(Total for question = 3 marks)

Q6.

Figure 12 shows three toy animals hanging from a rod.

The rod hangs from the ceiling by a string tied to the centre of the rod.

The system is in equilibrium.

Figure 12

Use the principle of moments to calculate the mass of the toy elephant.

(4)

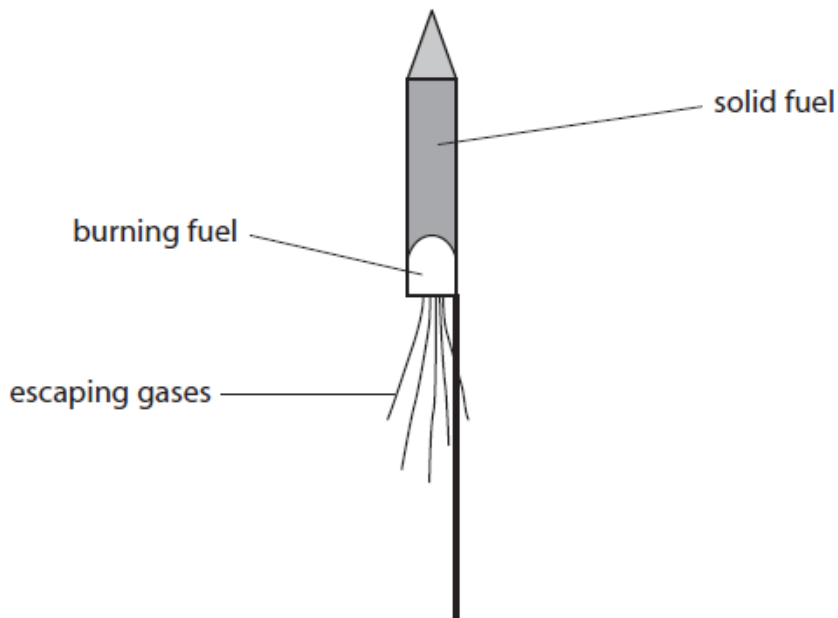mass = ... g
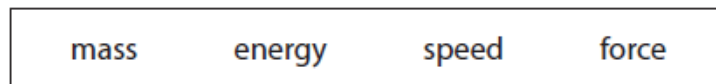
(Total for question = 4 marks)

Q7.

A firework rocket contains a solid fuel inside a cardboard tube.

The burning of the fuel creates a thrust to propel the rocket upwards.

(i) Scientists can refer to several different quantities when describing the motion of the rocket.

mass	energy	speed	force

Only one of these quantities is a vector.

Complete this sentence using **one** of the words from the box.

(1)

The vector quantity is ....

(ii) Before the fuse is lit, the total weight of a rocket including fuel is 0.7N.

The gravitational field strength is 10 N/kg.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The total mass of the rocket including fuel is

(1)

☒ **A** 0.007 kg

☒ **B** 0.07 kg

☒ **C** 0.7 kg

☒ **D** 7 kg

(iii) There is a resultant force on the rocket of 0.5 N upwards when it takes off.

The arrow on the diagram shows the size and direction of the force of gravity acting on the rocket when it takes off.

0.7 N

Add another arrow to the diagram to show the thrust produced by the burning fuel at the time the rocket takes off.

You should label the arrow with the size of the thrust.

(2)

Q8.

Figure 20 shows a person trying to lift a large rock using a metal bar.

pivot

—0.5 m—→|←0.2 m→|
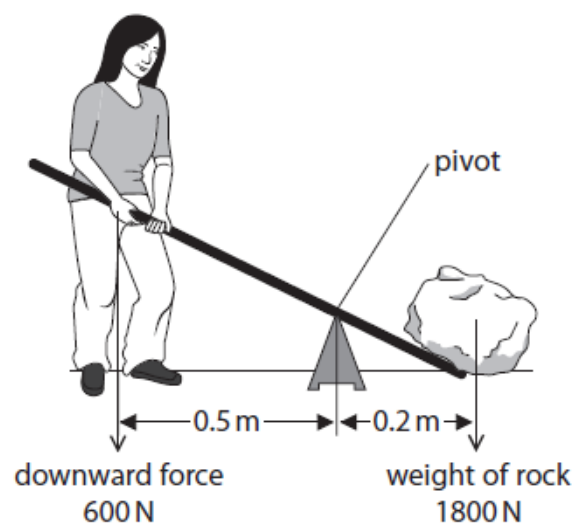
downward force
600 N

weight of rock
1800 N

Figure 20

The rock weighs 1800 N.

The person can only produce a downwards force of 600 N.

The person cannot lift the rock.

(i) Explain, using calculations, why the person cannot lift the rock.

....

....

....

....

....

....

(ii) Explain **one** change to the arrangement that will make it possible for this person to lift the rock.

(2)

....

....

....

....
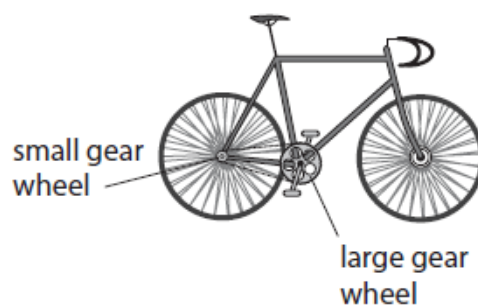
(Total for question = 5 marks)

Q9.

Figure 21 shows a bicycle.

Figure 21

(i) The rider uses the pedals to make the large gear wheel turn.

The large gear wheel moves the chain.

The chain turns the small gear wheel.

The large gear wheel has 48 teeth.

The small gear wheel has 12 teeth.

The large gear wheel turns 2 times each second.

Calculate the number of times that the small gear wheel turns each second.

(2)

.... turns each second

(ii) Oil is applied to the wheel of a bicycle at the point shown in Figure 22.

oil applied here
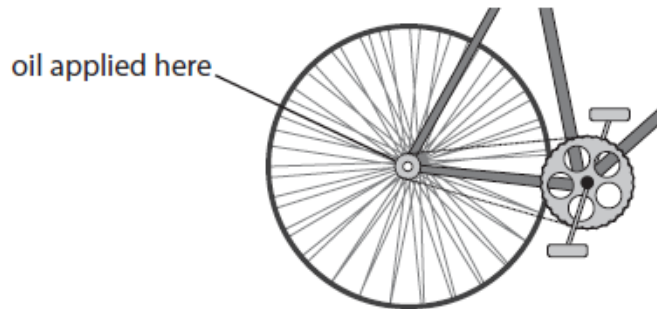
Figure 22

Explain how the oil improves the efficiency of the bicycle.

(3)

....

....

....

....

....

....
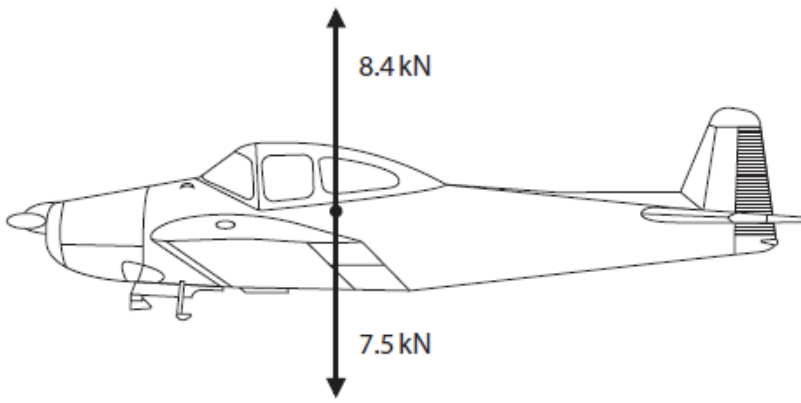
(Total for question = 5 marks)

Q10.

(i) Figure 14 shows the vertical forces on an aeroplane.

8.4 kN

7.5 kN

Figure 14
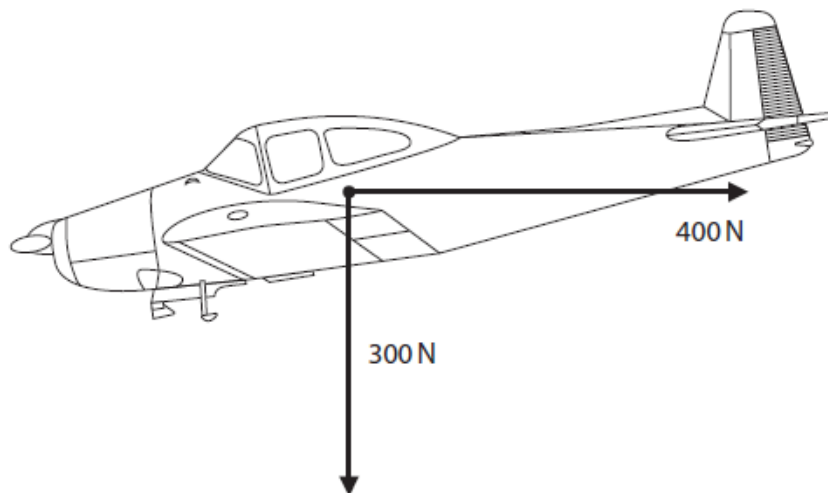
Use information from the diagram to determine the size and direction of the resultant vertical force on the aeroplane.

(2)

size = ... kN, direction is ....

(ii) The aeroplane is descending.

Figure 15 shows a diagram of the resultant vertical and horizontal forces on the aeroplane as it is descending.

400 N

300 N

Figure 15

Complete the diagram to show the resultant of these two forces.

(1)

(iii) The mass of the aeroplane is 750 kg.

Calculate the change in gravitational potential energy of the aeroplane as it descends from 1300 m to the ground.
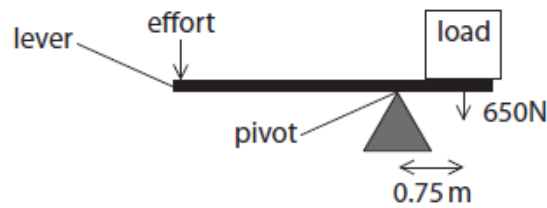
Gravitational field strength (g) = 10 N/kg

(2)

energy = ... J

(Total for question = 5 marks)

Q11.

Figure 11 shows a lever used to lift a heavy load.

Figure 11

(i) The weight of the load is 650 N.

The centre of the load is 0.75 m from the pivot.

Calculate the moment of the load about the pivot.
State the unit.

Use the equation

moment = force × distance from the pivot

(3)

moment = ... unit ....

(ii) State the principle of moments.

(1)

....

....

(iii) An effort of 160 N is applied to the end of the lever to balance the load in Figure 11.

Calculate the distance between the effort and the pivot.

(3)

distance = ... m

(Total for question = 7 marks)