OCR GCSE GATEWAY PHYSICS A · J249

PHYSICS



EXAM QUESTION PACK

P2.3 FORCES IN ACTION

SCORE	PERCENTAGE
/167	%

STEMUP

These questions belong to OCR, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by OCR. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with OCR and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. OCR has not endorsed, approved or been involved in the production of it. OCR and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

OCR publishes its past papers, mark schemes and examiner reports. Always check the current specification at ocr.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Gateway Physics A (9-1)

Forces in action

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

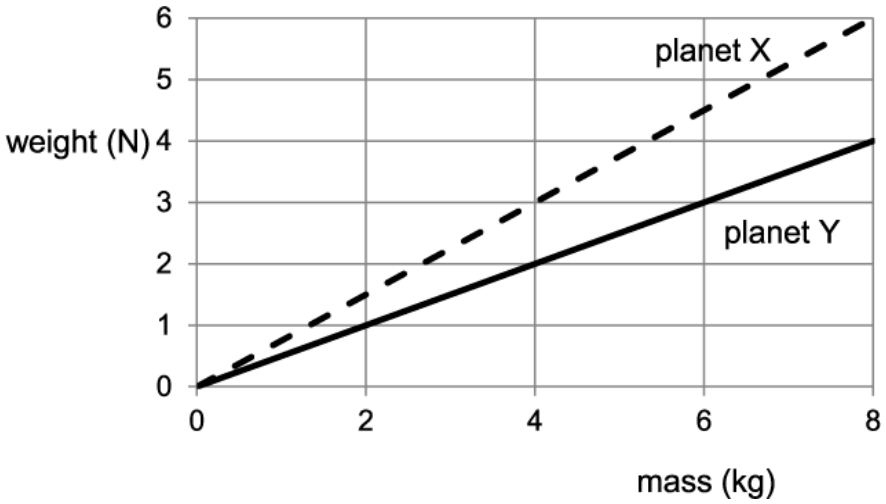
- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **167**.
- The total number of marks may take into account some 'either/or' question choices.

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

1 The graph shows the relationship between mass and weight on two different planets.



The weight of an object on planet **X** is 3 N.

What is the weight of the same object on planet **Y**?

A 1.5 N
B 2.0 N
C 4.0 N
D 6.0 N

Your answer ☐

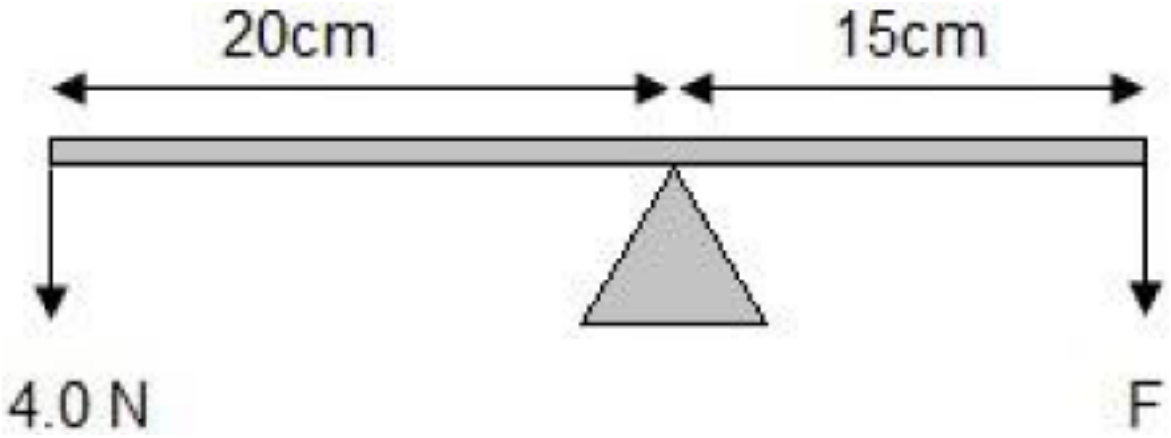
[1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

2 A see-saw is in equilibrium.



What force is needed for the see-saw to be in equilibrium?

A 3.0 N
B 3.5 N
C 5.0 N
D 5.3 N

Your answer ☐

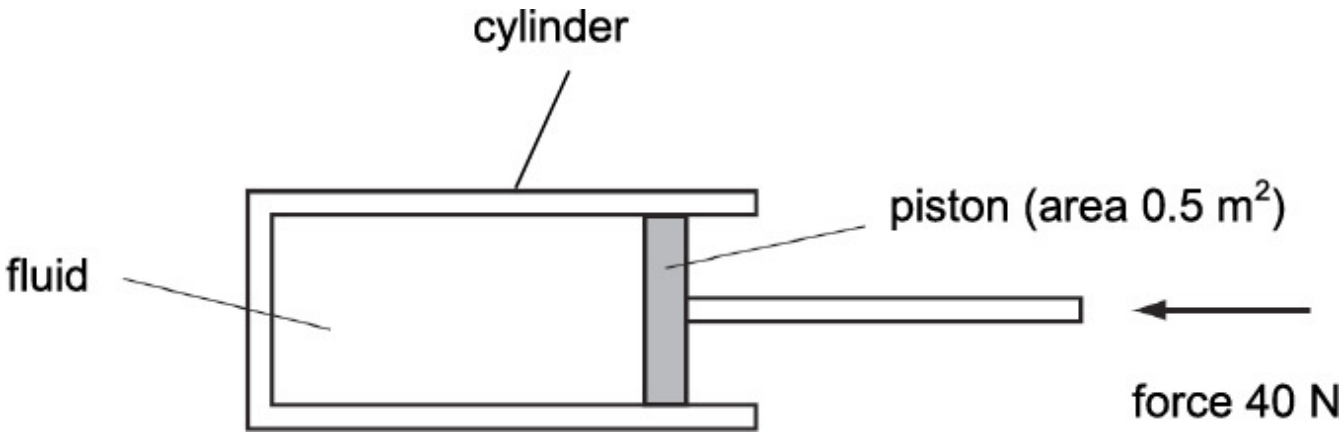
[1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

3 A piston is pushed in a cylinder containing a fluid.



If **pressure = force ÷ area**, what is the pressure exerted on the fluid?

A 20 Pa
B 80 Pa
C 160 Pa
D 200 Pa

Your answer ☐

[1]

4 What is the **minimum** number of forces that are required to compress a spring?

A 1
B 2
C 3
D 4

Your answer ☐

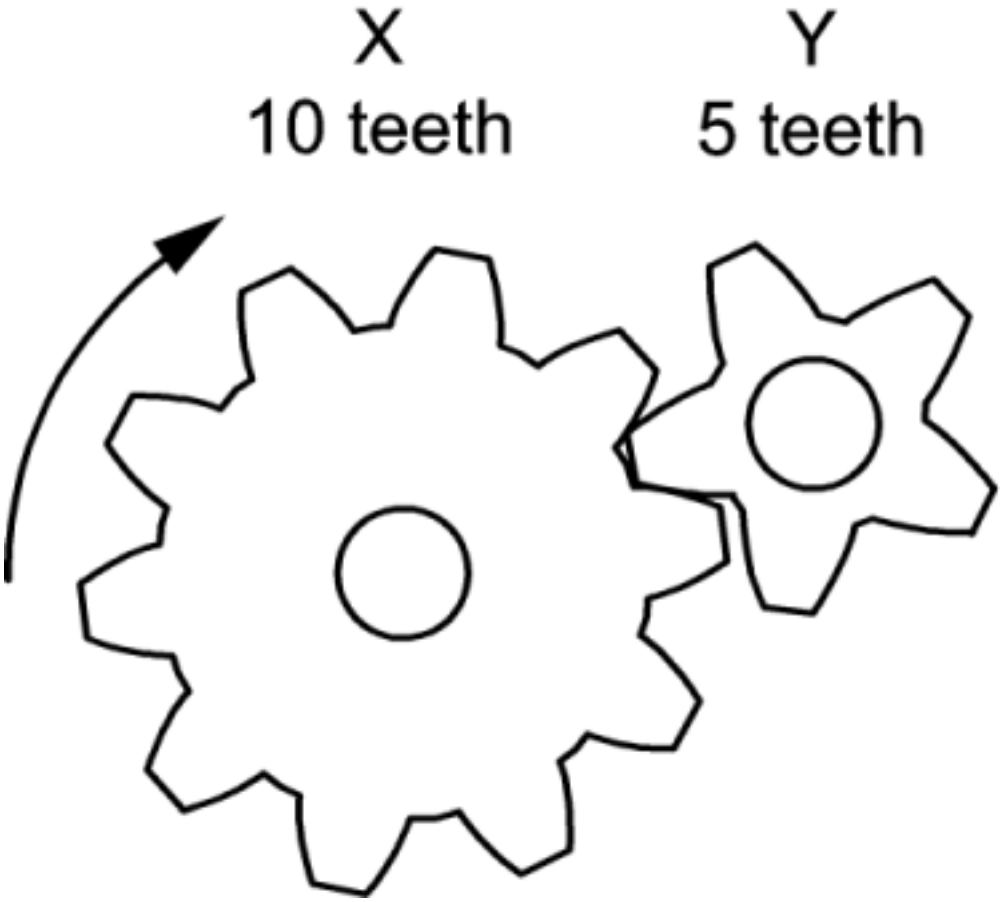
[1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

5 The diagram shows 2 gears.



Gear **X** is rotated clockwise at 1.0 rotation per second.

Which row is the correct description of the movement of gear **Y**?

	direction of rotation	rotations per second
A	anticlockwise	0.5
B	anticlockwise	2.0
C	clockwise	0.5
D	clockwise	2.0

Your answer ☐

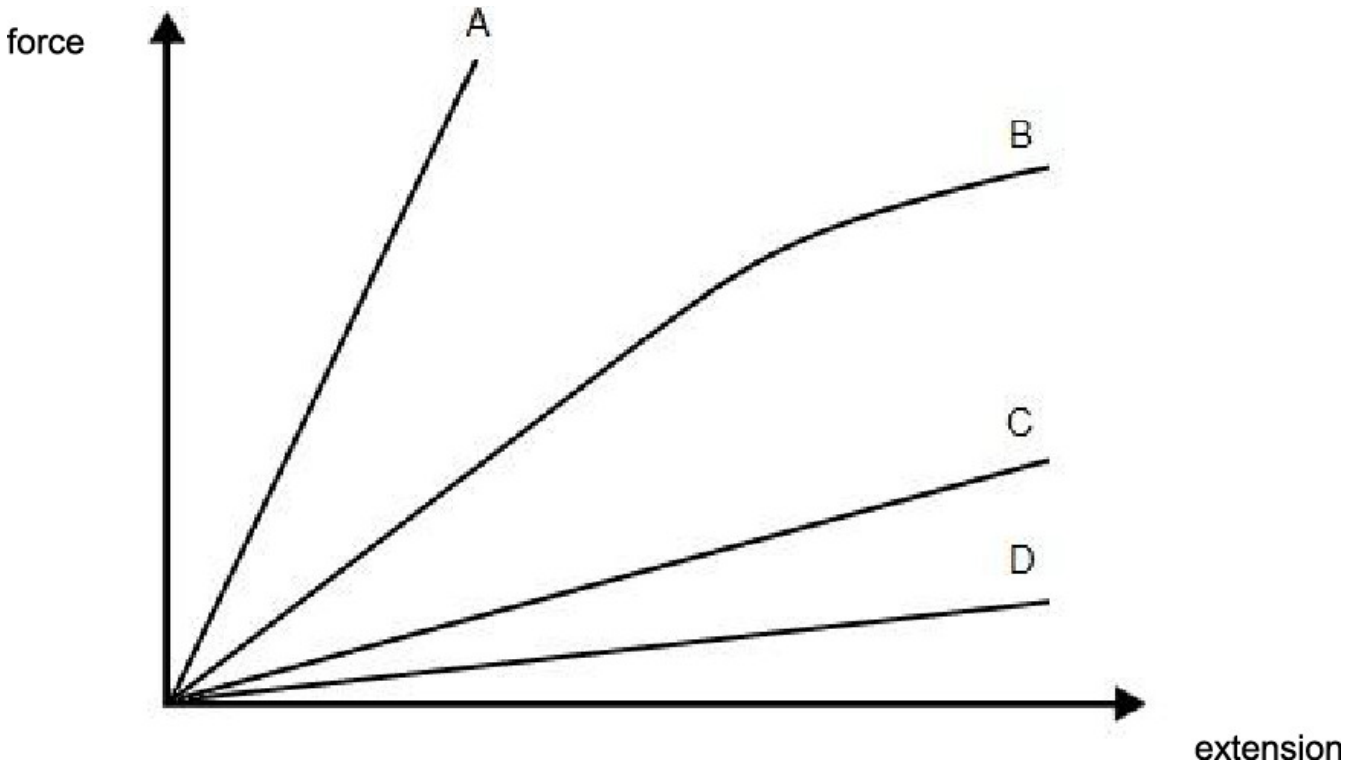
[1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

6(a) The extension of four different springs is shown in the graph.



Explain which of the springs **A**, **B**, **C** or **D** has the highest spring constant?

---

[2]

(b) Explain why the line for spring **B** has a different shape to the others.

---

[2]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

(c)

(i) A spring has a spring constant of 27 N/m.

For an extension of 25 cm, calculate the energy transferred in stretching.

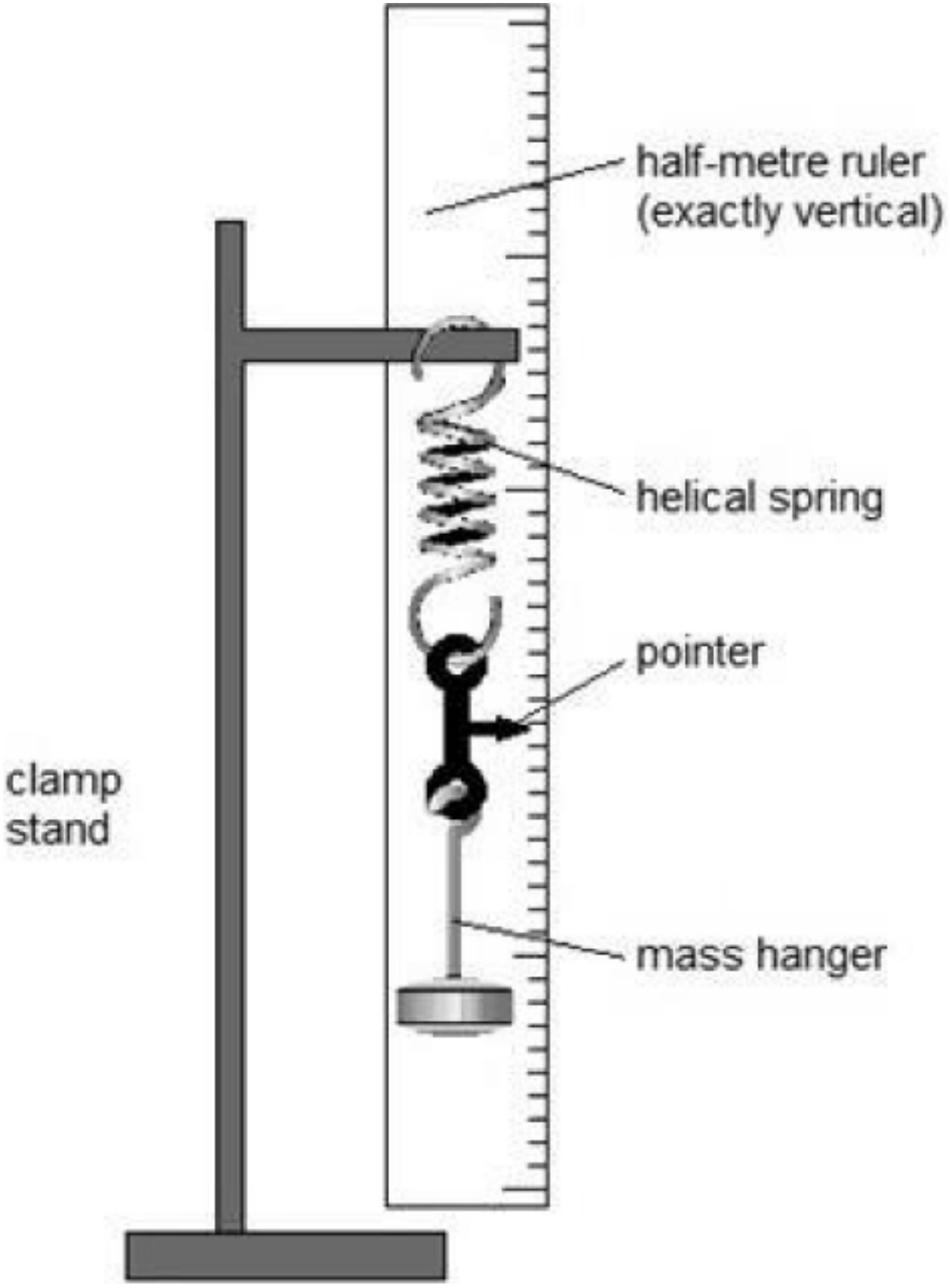
Use the formula: **energy transferred = 0.5 × spring constant × extension^2**.

---

answer: _____ J **[2]**

(ii) A student set up the apparatus shown in the diagram.

STEMUP.CO.UK



Describe how they could use this apparatus to collect data to draw a force / extension graph for this spring.

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

---

[4]

(iii) The above spring has a spring constant of 30 N/m, this is replaced by a spring with a spring constant of 10 N/m.

What changes will the student have to make to this method to investigate this spring?

---

[2]

7 A boy kicks a football.



The football has a mass of 400 g.

What is the potential energy of the football when it is 0.8 m above the ground?

Use the constant: gravitational field strength (g) = 10 N/kg.

A 0.032 J
B 3.2 J
C 320 J
D 3 200 J

Your answer ☐

[1]

STEMUP.CO.UK

8(a) A rocket carrying a vehicle called the Mars Rover was sent to Mars.



The Mars Rover has a mass of 185 kg.

The gravitational field strength (g) on Mars is 3.75 N/kg.

Calculate the weight of the Rover vehicle on Mars.

Show your working and give your answer to 3 significant figures.

State the unit for weight.

---

answer: _____ **unit**_____ **[5]**

(b) Why did the Mars Rover weigh more on Earth than on Mars?

---

[1]

9(a) Kate investigates how well different balls bounce.

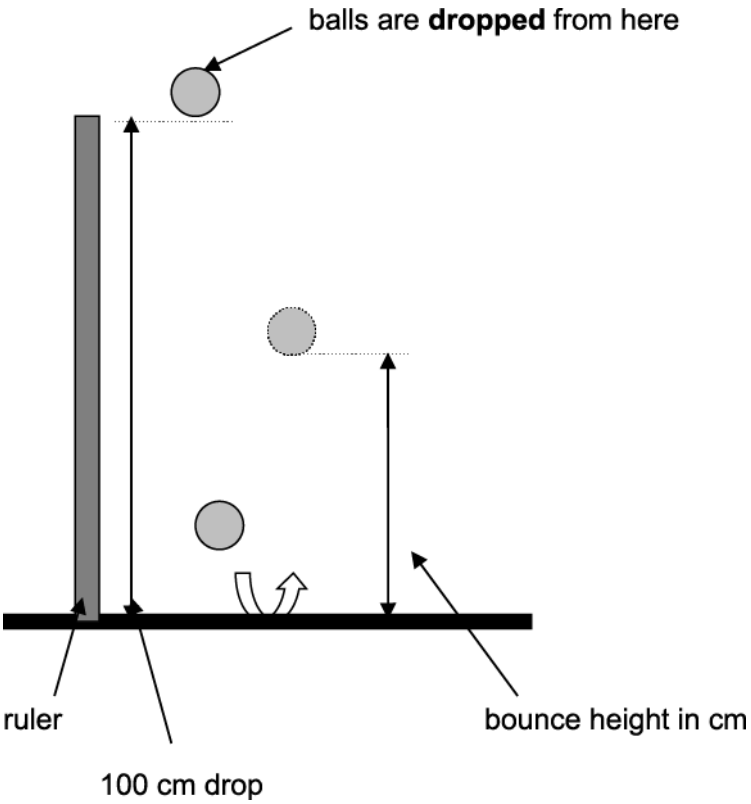
She drops different balls from the same height and measures the height the balls bounce.

She repeats the experiment 3 times for each ball.

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK



Her results are shown in the table.

Ball	Drop height (cm)	1st reading bounce height (cm)	2nd reading bounce height (cm)	3rd reading bounce height (cm)	Mean bounce height (cm)
Red	100	75	77	73	75
Blue	100	61	62	60	61
Green	100	60	31	58	
White	100	84	86	85	85
Yellow	100	26	24		26

Calculate the **mean** bounce height for the **green** ball.

---

[1]

answer:_____ cm

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

(b) Kate missed one result for the **yellow** ball.

Calculate the **missing** result for the **yellow** ball.

---

answer: _____ cm **[1]**

(c) Evaluate the reliability of the results

Suggest how she could have improved her experiment.

---

[3]

(d)

(i) Kate suggests that 15% of the ball's initial energy was not transferred usefully. Use calculations to show that this is correct and suggest where the energy was transferred to.

---

[2]

(ii) How could the efficiency of the ball be improved?

---

[1]

10 A boy kicks a football.



The football has a mass of 400 g.

What is the potential energy of the football when it is 0.8 m above the ground?

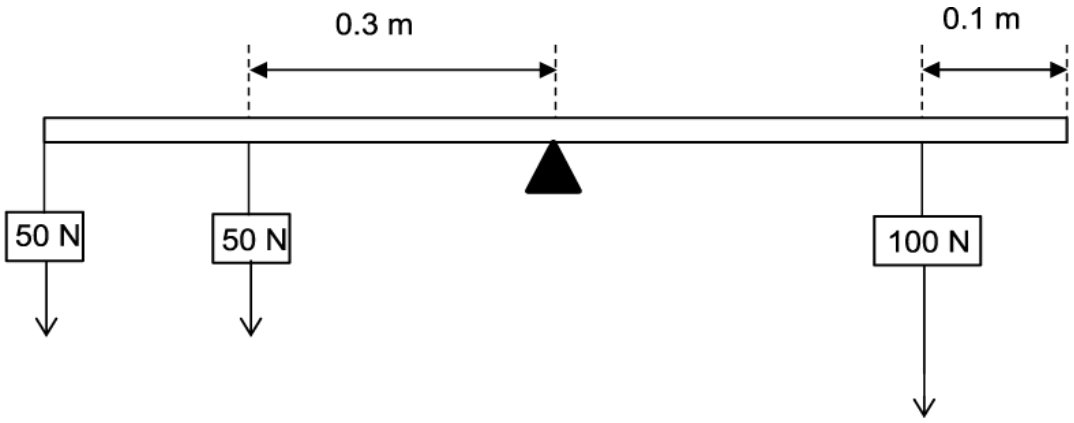
Use the constant: gravitational field strength (g) = 10 N/kg.

A 0.032 J
B 3.2 J
C 320 J
D 3 200 J

Your answer ☐

[1]

11 A uniform 1.0 m rod is pivoted at its centre.



The rod is in equilibrium.

What is the value of the anti-clockwise moment about the pivot?

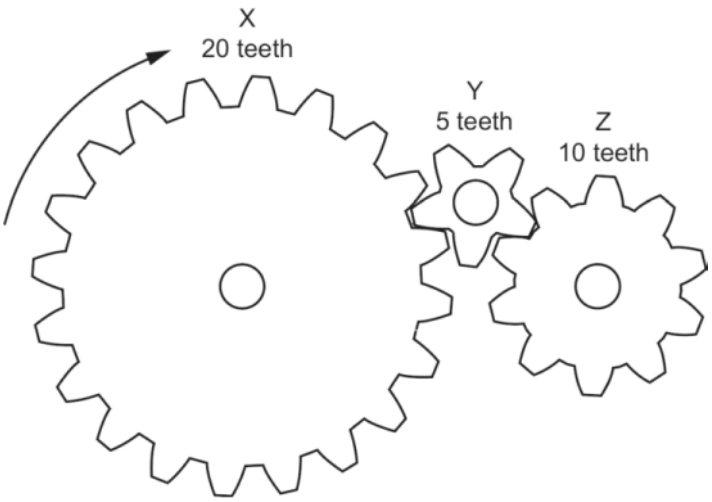
A 10 Nm
B 15 Nm
C 40 Nm
D 100 Nm

Your answer ☐

[1]

STEMUP.CO.UK

12 The diagram shows 3 gears.



Gear **X** is rotated clockwise at 1.0 rotations per second.

Which row is the correct description of the movement of gear **Z**?

	direction of rotation	rotations per second
A	anticlockwise	0.5
B	anticlockwise	2.0
C	clockwise	0.5
D	clockwise	2.0

Your answer ☐

[1]

13 How much work is done on a spring, of spring constant 16 N/m, when it is stretched 50 cm?

A 2.0 J
B 8.0 J
C 12.5 J
D 25.0 J

Your answer ☐

[1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

14 The seat belt exerts a force on the passenger when a car is stopping.

This force causes a change in momentum of the passenger.

Look at the table for four different passengers when their car stops.

Passenger	Change in momentum of passenger in kg m/s	Passenger stopping time in seconds
A	1440	4
B	1224	2
C	1200	3
D	1000	1

Which passenger experiences the greatest **force** from their seat belt?

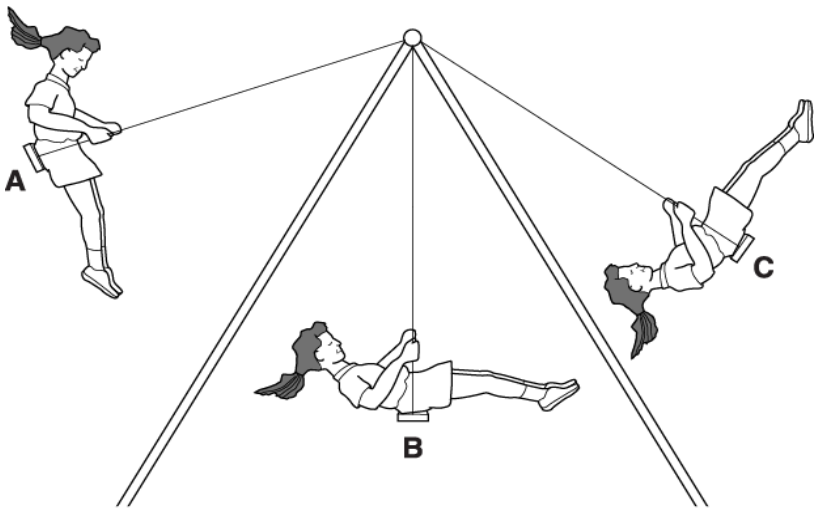
Choose from: A B C D

answer _____

[1]

15 Julie uses the swing.

Look at the diagram showing different positions during the swing.



(i) Which position shows where Julie has the greatest kinetic energy?

Choose from: A B C

answer _____

[1]

(ii) Which position shows where Julie has the greatest gravitational potential energy?

Choose from: A B C

answer _____

[1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

16 A rocket was sent to Mars.

The rocket carried a vehicle called the Mars Rover.



The Mars Rover has a mass of 185 kg.

Its wheels are designed to carry a total weight of up to 1800 N.

The gravitational field strength (g) on Mars is 3.8 N/kg.

This means a mass of 1 kg on Mars weighs 3.8 N.

(i) Calculate the weight of the Rover vehicle on Mars.

---

answer _____ N **[2]**

(ii) Look at the table showing how gravitational field strength varies.

Place	Gravitational field strength in N/kg
Moon	1.6
Earth	10.0
Mars	3.8

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Scientists are happy for the Rover to be used on the Moon or Mars.

They are very careful when using the Rover on Earth.

Use the data and information about the Rover to explain why.

---

[2]

17

(i) A rocket is in a stable orbit.

To keep the rocket in this orbit its speed needs to stay at 8000 m/s.

Suggest, by using ideas about gravitational and centripetal forces, why this speed needs to be maintained to keep it in this stable orbit.

---

[3]

(ii) The rocket re-enters the Earth's atmosphere safely.

In the final part of the descent its speed reduces steadily from 2000 m/s to 120 m/s just before touchdown. This takes place over a distance of 5×10^5 m.

Calculate the average **deceleration** over this distance.

---

answer _____ m/s^2

[3]

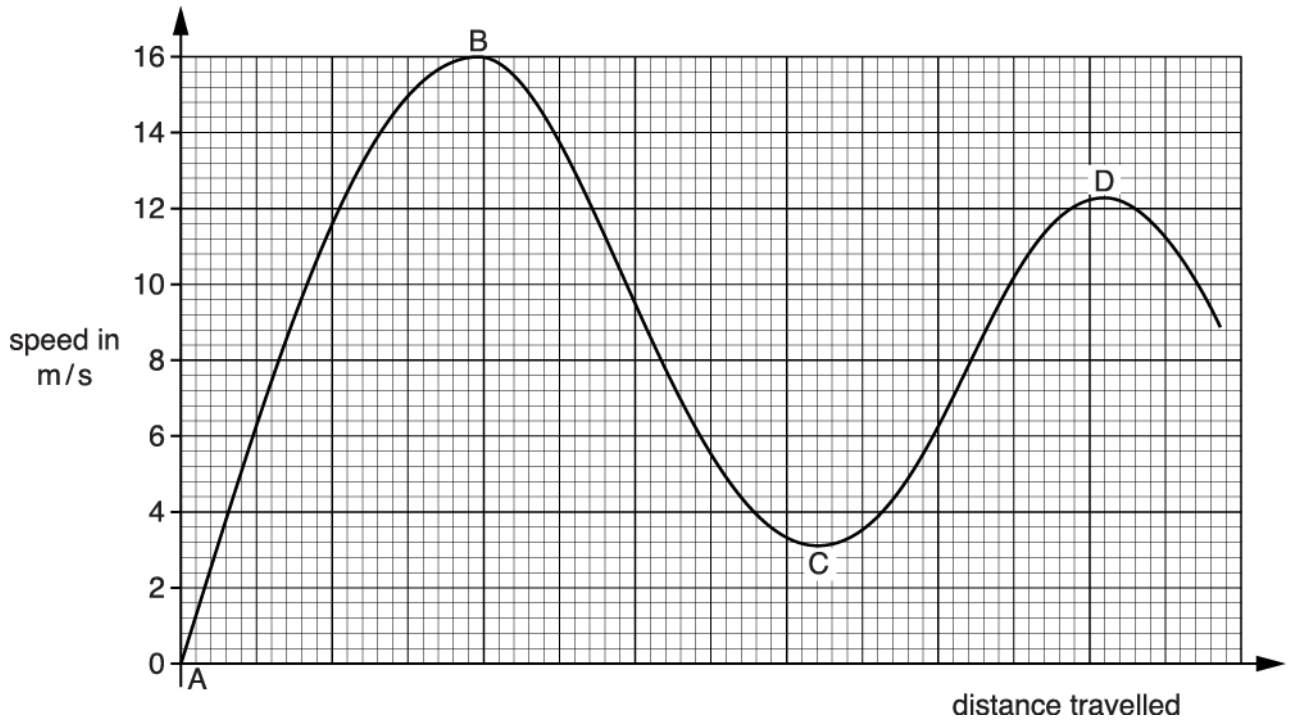
18 This question is about kinetic and gravitational potential energy.

Look at the graph.

It shows how the speed of a roller coaster car changes with the distance travelled along part of the track.

The roller coaster car starts from rest at the top of the track at **A**.

The car and its passengers have a total mass of 400 kg.



Describe how the kinetic energy and the gravitational potential energy of the car change in sections AB and BC of the journey, and calculate the difference in height of the roller coaster between A and B assuming no energy is lost.

The acceleration due to gravity is 10 m/s^2.

The quality of written communication will be assessed in your answer to this question.

[6]

19(a) Emma drops a rock from the top of a cliff.

The rock has a mass of 0.5 kg.

As the rock falls it loses potential energy and gains kinetic energy.

The rock is travelling at a speed of 15 m / s just before it hits the ground.

Calculate the distance the rock falls.

Take the value of g to be 10 N / kg.

Ignore the effect of air resistance.

---

answer answer _____ metres

[3]

(b) Emma drops another rock.

This rock has a mass of 1.0 kg.

The rock hits the ground at the same speed.

Explain why.

---

[1]

20 A rocket was sent to Mars.

The rocket carried a vehicle called the Mars Rover.



The Mars Rover has a mass of 185 kg.

Its wheels are designed to carry a total weight of up to 1800 N.

The gravitational field strength (g) on Mars is 3.8 N / kg.

This means a mass of 1 kg on Mars weighs 3.8 N.

(i) Calculate the weight of the Rover vehicle on Mars.

---

answer _____ N **[2]**

(ii) Look at the table showing how gravitational field strength varies.

Place	Gravitational field strength in N / kg
Moon	1.6
Earth	10.0
Mars	3.8

Scientists are happy for the Rover to be used on the Moon or Mars.

They are very careful when using the Rover on Earth.

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Use the data and information about the Rover to explain why.

---

[2]

21 Hossein is a weightlifter.

His best lift in training is a bar with a mass of 250kg.

He does 5000 J of work on the bar with a mass of 250kg when he lifts it.

The gravitational field strength (g) on Earth is 10 N/kg.



Calculate the weight of this 250kg mass, and how high Hossein lifts the bar.

---

weight = _____ N

---

height lifted = _____ m

[3]

22 Hossein is a weightlifter.

His best lift in training is a bar with a mass of 250kg.

He does 5000 J of work on the bar with a mass of 250kg when he lifts it.

The gravitational field strength (g) on Earth is 10 N/kg.



Calculate the weight of this 250kg mass, and how high Hossein lifts the bar.

---

weight = _____ N

---

height lifted = _____ m

[3]

23 Look at the table below.

It shows different stones dropped from different heights.

Stone	Mass of stone in g	Height dropped from in m
V	100	20
W	100	40
X	200	20
Y	200	40

Which stone has the greatest gravitational potential energy (GPE) when it is dropped?

answer _____

Explain your answer.

_____

_____

_____

_____ [3]

24 Susie practises her landings by jumping from a low platform.

She is attached to straps which act like a parachute.





A Susie **standing still** on platform.

B Susie is **exactly half way** down.

C Susie is **on** the ground.

Look at the statements about Susie's energy as she does her practice fall.

Put a tick (✓) in the box beside any correct statement and a cross (✗) beside any incorrect statement.

The first one has been done for you.

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

At **A** all of Susie's energy is GPE.	✓
Between **A** and **B** Susie gains **both** GPE and KE.	
Between **A** and **B** Susie gains **only** KE.	
At **B** her KE is **exactly** half her GPE at **A**.	
Just before touching the ground at **C** Susie has her maximum KE.	
On the ground at **C** Susie has zero KE.	
On the ground at **C** Susie has her maximum GPE.	

[3]

© OCR 2022. You may photocopy this page.

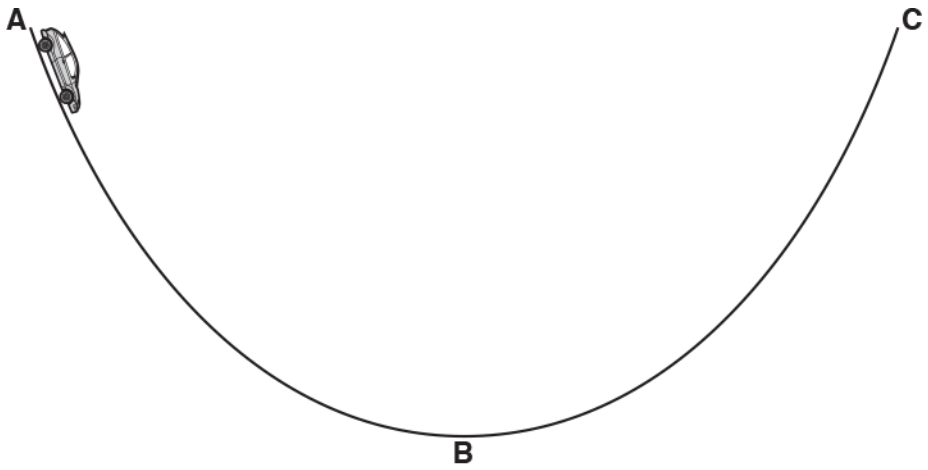
Created in ExamBuilder

STEMUP.CO.UK

25 Rosie investigates the motion of a toy car along a curved track.

Rosie releases the toy car from **A**.

Look at the diagram of the curved track.



Describe how the kinetic energy and the potential energy of the toy car change as it moves from **A** to **B** and from **B** to **C**.

The quality of written communication will be assessed in your answer to this question.

[6]

STEMUP.CO.UK

26 What is the gravitational field strength at the Earth's surface?

A 10 N/kg

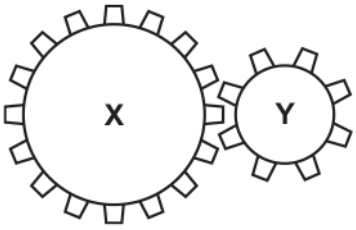
B 16 N/kg

C 50 N/kg

D 230 N/kg

Your answer ☐ [1]

27 Cog **X** has 16 teeth and cog **Y** has 8 teeth.



Cog **X** is turned around **two** times.

How many times does cog **Y** turn around?

A 1

B 2

C 4

D 8

Your answer ☐ [1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

28 What is the **smallest** number of forces needed to bend an object?

A 1

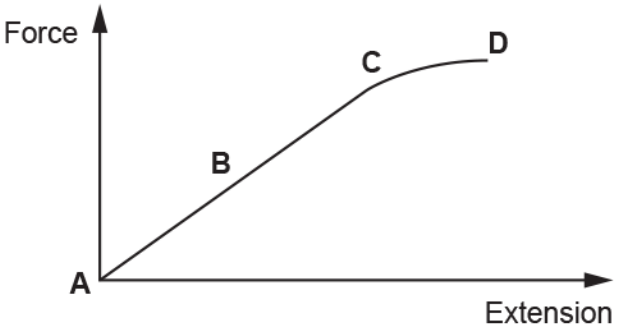
B 2

C 3

D 4

Your answer ☐ [1]

29 The diagram shows the relationship between force and extension for a spring.



Which letter on the graph shows the **elastic limit** of the spring being stretched?

Your answer ☐ [1]

30 In which situation does the force cause a rotation?

A Bouncing on a trampoline

B Hitting a nail with a hammer

C Pushing a friend on a swing

D Sitting on a chair

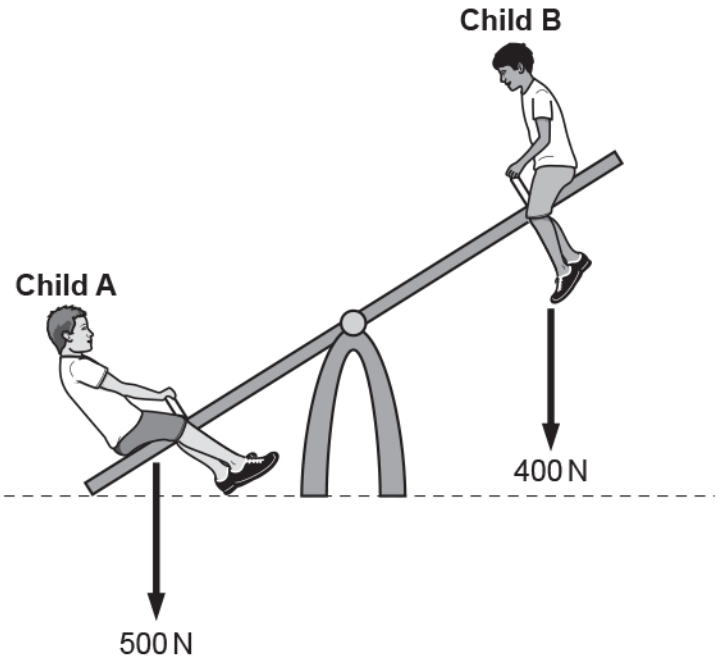
Your answer ☐ [1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

31(a) Two children play on a seesaw.



Both children sit **2 m** from the pivot.

Calculate the clockwise and anti-clockwise moments around the pivot when the seesaw is horizontal.

Clockwise moment = ... Nm

Anti-clockwise moment = ... Nm

[3]

Calculate where **Child A** should sit to balance the seesaw.

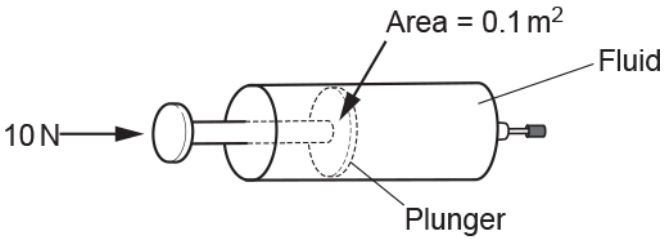
Answer = ... **[3]**

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

(b) A student tries to compress the fluid in a sealed syringe with a force of 10 N.



The area of the end of the syringe is 0.1 m^2.

(i) Calculate the pressure in the fluid.

Answer = ... Pa **[3]**

(ii) Write down the direction of the force produced by the fluid on the plunger.

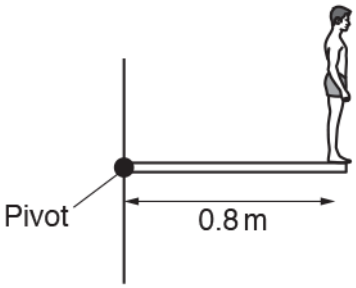
..... **[1]**

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

32 A diver stands on a diving board. He weighs 400 N.



What is the moment of the force provided by the diver around the pivot?

A 320 Nm anti-clockwise

B 320 Nm clockwise

C 500 Nm anti-clockwise

D 500 Nm clockwise

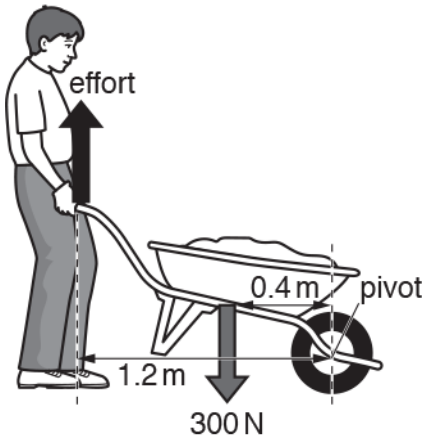
Your answer [ ] [1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

33 A man lifts a load using a wheelbarrow.



What is the effort needed to lift the load using the wheelbarrow?

A 100 N

B 120 N

C 250 N

D 144 N

Your answer [1]

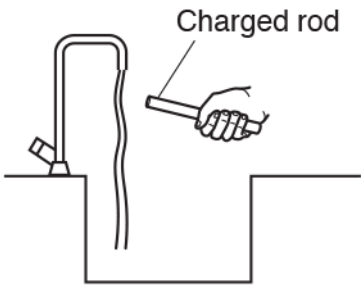
© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

34 This question is about electrostatic charges.

A charged rod is brought towards a gentle stream of water from a tap.



Explain how the charged rod affects the stream of water.

--- [3]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

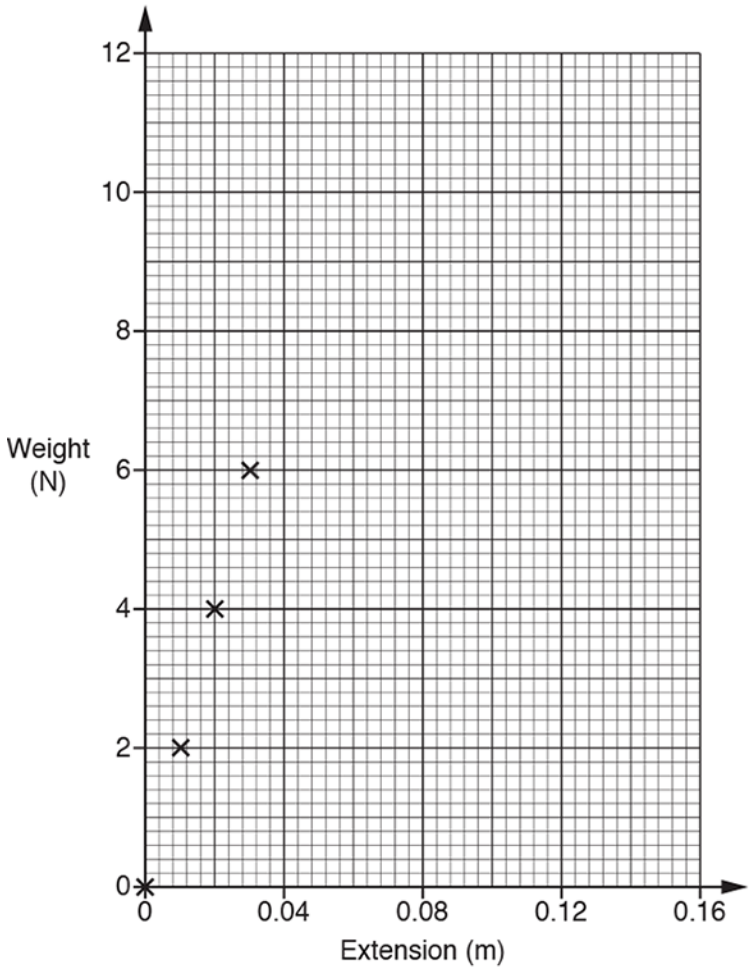
35(a) A student hangs a length of copper wire from the ceiling.

She adds weights to the bottom of the wire and measures the extension of the wire.

Look at a table of some of her results.

Weight (N)	Extension (m)
0	0
2	0.01
4	0.02
6	0.03
8	0.04
10	0.08
12	0.16

(i) Plot the values on the graph. Some have been done for you.



[2]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

(ii) Draw a line of best-fit on the graph.

[1]

(iii) Describe **and** explain the shape of the graph.

---

[3]

(b) Calculate the spring constant for the 0 – 6 N part of the graph.

Use the equation: Force = Spring constant × Extension

Answer = ... N/m **[3]**

(c) Calculate the work done in stretching the wire to 0.04 m.

Answer = ... J **[2]**

36(a)

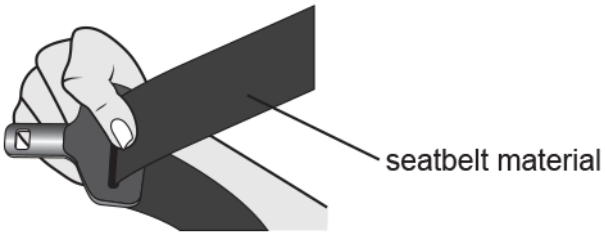
A car has a total weight of 12 000 N. It has four tyres which each have an area of 25 cm^2 in contact with the road.

Calculate the pressure of the car on the road.

Answer = _____ N/cm^2

[3]

(b) Seatbelts in cars are made of a wide material that stretches in a crash.



(i) Explain why it is important that the material is **wide.**

---

[1]

(ii) Explain why it is important that the material is **stretchy.**

---

[1]

37 Which one of the following uses of forces causes a rotation?

A Lowering a book vertically from a shelf

B Opening a door

C Lifting a book vertically onto a shelf

D Sitting in the centre of a see-saw

Your answer ☐ [1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

38

Children in cars use special seats with their own seatbelts.



The seatbelts for children are narrower than adult seatbelts.

Why is it safe for children's seatbelts to be **narrower** than adult seatbelts?

---

[2]

39 On the Moon, a 10 kg mass has a weight of 16 N.

What is the gravitational field strength on the Moon?

A 1.6 N / kg

B 6.0 N / kg

C 26 N / kg

D 160 N / kg

Your answer ☐ **[1]**

40 Which object has the **most** gravitational potential energy?

A 1 kg bag on a shelf 1 m above the ground

B 2 kg bag on a shelf 1 m above the ground

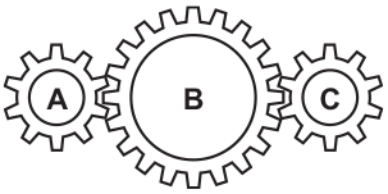
C 2 kg bag on a shelf 2 m above the ground

D 1 kg bag on a shelf 2 m above the ground

Your answer ☐ **[1]**

41 A student investigates cogs and gears.

Cogs **A** and **C** have 10 teeth. Cog **B** has 20 teeth.



Cog **A** is turned 5 times.

How many times does cog **C** turn?

A 5 times

B 10 times

C 20 times

D 50 times

Your answer ☐ **[1]**

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

42 A spring stretches by 2.0 cm when a force is added.

The spring constant is 60 N / m.

Calculate the energy transferred to the spring when it is stretched.

A 0.012 J

B 0.024 J

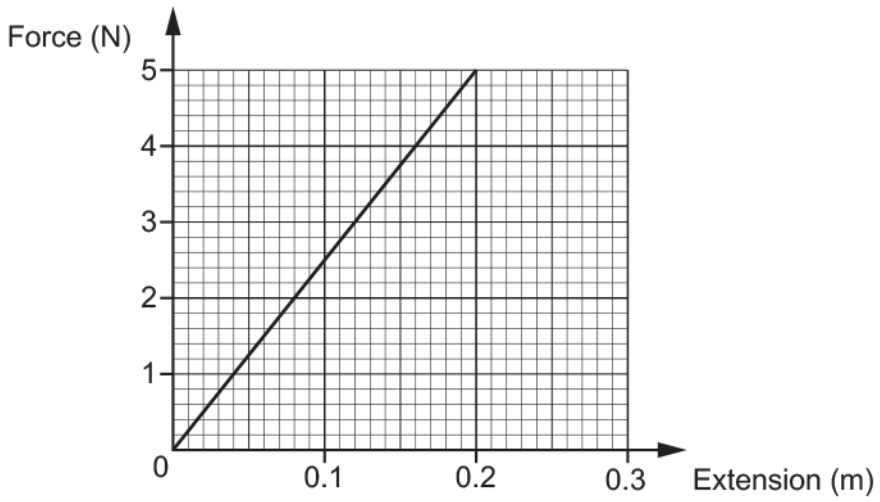
C 120 J

D 240 J

Your answer [ ] **[1]**

43(a) A student investigates how a spring stretches when a force is added.

Look at a graph of his results.



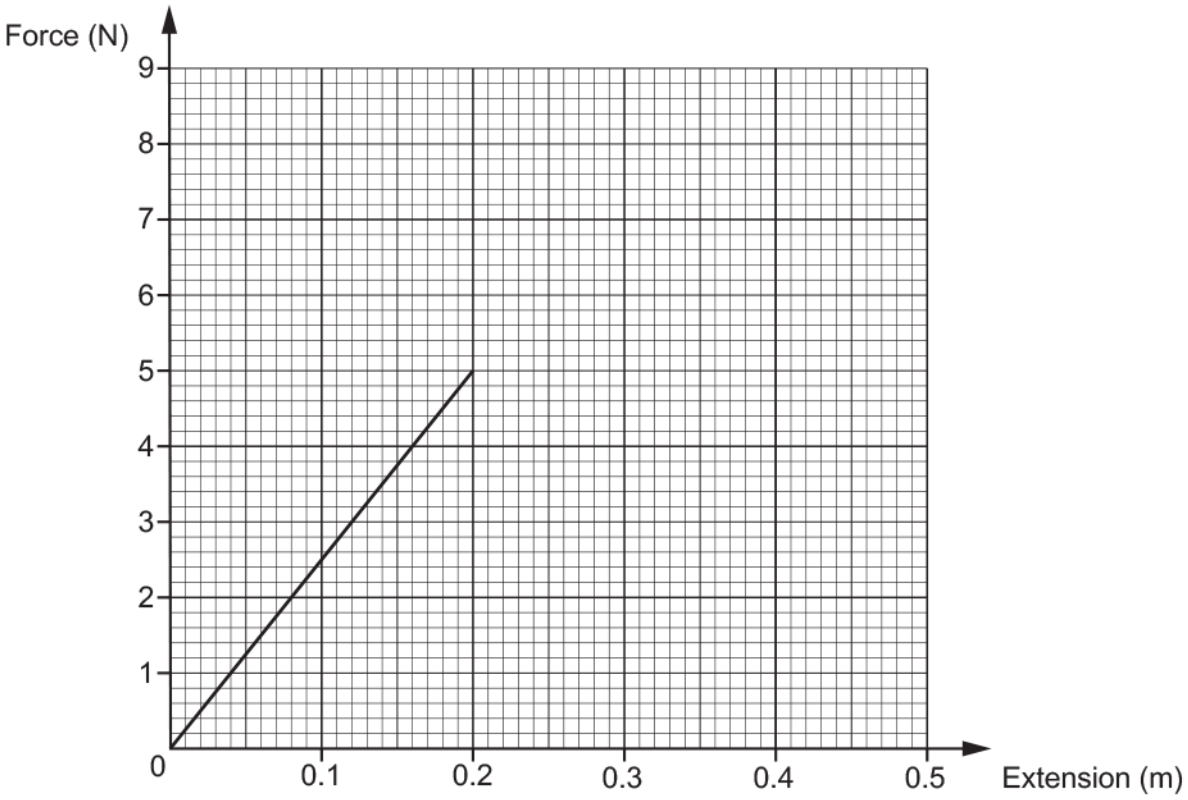
Calculate the spring constant of the spring.

Spring constant = ... N / m **[3]**

(b) A student investigates how a spring stretches when a force is added.

The student continues to load the spring until it passes its elastic limit.

Complete the force-extension graph and label the elastic limit.



[2]

(c) The student puts a small load on the spring. It is in equilibrium.

Draw and label a free body force diagram for the load at the end of the spring.

[3]

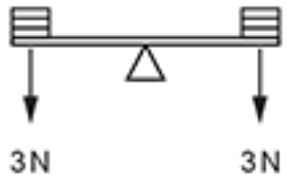
© OCR 2022. You may photocopy this page.

Created in ExamBuilder

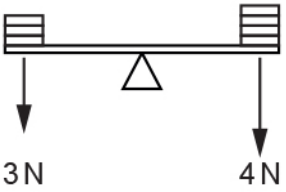
STEMUP.CO.UK

44 A student puts different weights on four balances.

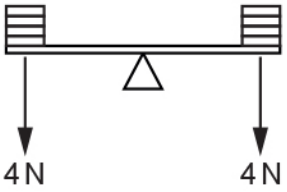
A



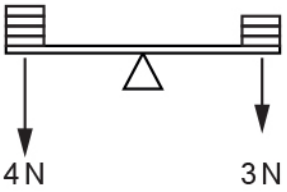
B



C



D



Which balance will give a **clockwise** moment?

Your answer [1]

45 On Mars the gravitational field strength is 4.0 N / kg.

How much would a 60 kg person weigh on Mars?

Use the equation: weight = mass × gravitational field strength

A 15 N

B 64 N

C 240 N

D 600 N

Your answer [1]

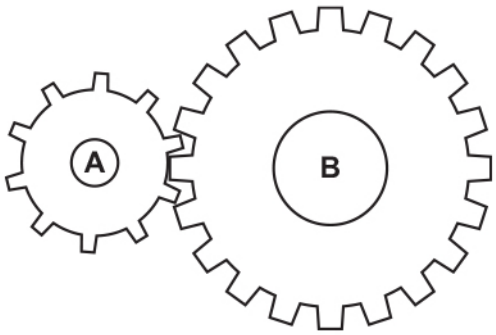
© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

46 A student sets up two cogs.

Cog **A** has 10 teeth and cog **B** has 20 teeth.



Cog **A** is turned **2** times.

How many times does cog **B** turn?

A 0.5 times

B 1 time

C 2 times

D 20 times

Your answer [1]

47 Which one of the following uses of forces causes a rotation?

A Lowering a book vertically from a shelf

B Opening a door

C Lifting a book vertically onto a shelf

D Sitting in the centre of a see-saw

Your answer [1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

48(a) A student has a spring, a ruler and a 2.0 N weight.

Describe how the student can use this equipment to determine the **spring constant** of the spring.

---

[3]

(b) The 2.0 N weight has a surface area of 0.005 m^2.

Calculate the **pressure** when it is placed on a surface.

Use the equation: pressure = force normal to a surface ÷ area of that surface

Pressure = ... Pa **[2]**

(c) Describe how to change the shape of an object.

Use the idea of forces in your answer.

---

[2]

(d) Describe the differences between elastic and plastic deformation.

---

[2]

---

49 A boy of mass 65 kg climbs a ladder of height 3.0 m.

Calculate the gain in potential energy of the boy.

Use the equation: potential energy = mass × height × gravitational field strength

Gravitational field strength = 10 N / kg.

A 30 J
B 195 J
C 650 J
D 1950 J

Your answer ☐ [1]

50 An elephant has a weight of 60 kN. Its four feet have a total area of 0.75 m^2 in contact with the ground.

Calculate the total pressure the elephant exerts on the ground.

Use the equation: pressure = force normal to a surface / area of that surface

A 45 Pa
B 80 Pa
C 45 000 Pa
D 80 000 Pa

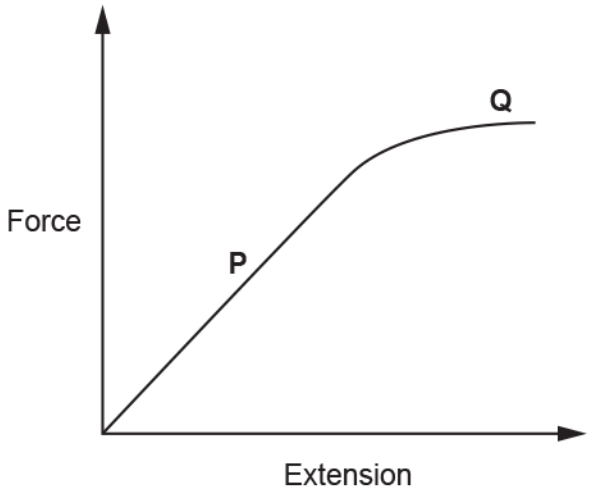
Your answer ☐ [1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

51 A student plots a force-extension graph for a material.



Which row in the table correctly identifies part **P** and part **Q** of the graph?

	Part P	Part Q
A	Elastic	Elastic
B	Elastic	Plastic
C	Plastic	Elastic
D	Plastic	Plastic

Your answer [1]

52 An astronaut on the Moon lifts a 5.5 kg object a vertical distance of 50 cm.

Calculate the potential energy gained by the object.

Gravitational field strength on the Moon = 1.6 N / kg.

A 4.4 J
B 8.8 J
C 17.6 J
D 440 J

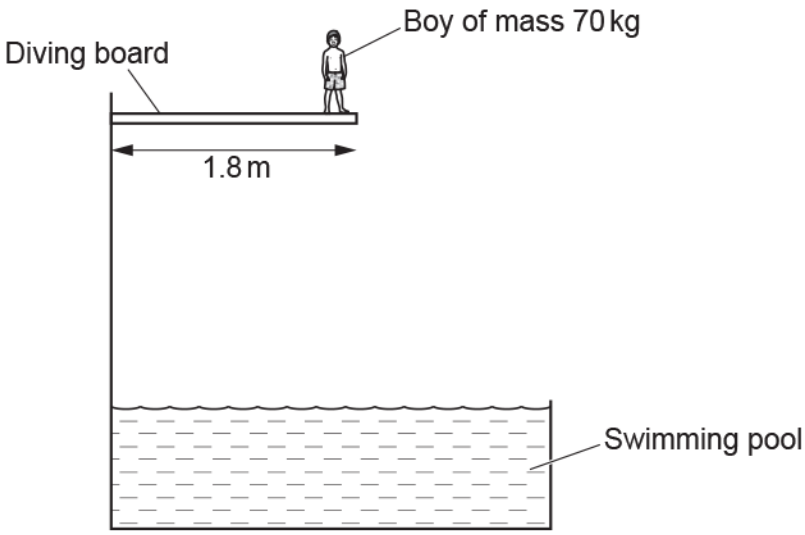
Your answer [1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

53 A boy of mass 70 kg stands on the end of a diving board at a distance of 1.8 m from the wall.



Calculate the moment of the boy standing on the diving board.
Gravitational field strength on Earth = 10 N / kg.

Moment = ... N m **[4]**

STEMUP.CO.UK

54 A skydiver falls from a plane.



What is the name of the **downward** force in the diagram?

A Drag
B Electrostatic
C Mass
D Weight

Your answer ☐ **[1]**

55 On the Moon the gravitational field strength is 1.6 N / kg.

Calculate the gravity force for an 80 kg astronaut.

Use the equation: gravity force = mass × gravitational field strength

A 50 N
B 128 N
C 800 N
D 1280 N

Your answer ☐ **[1]**

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

56 A student measures the weight of four boxes and the area in contact with the ground.

Box	Weight (N)	Area (cm^2)
A	50	100
B	75	250
C	90	400
D	100	500

Which box exerts the greatest pressure on the ground?

Your answer ☐ [1]

STEMUP.CO.UK

57(a) A student investigates how a spring stretches.

She measures the original length of the spring, adds a 2.0 N weight, and then measures the extended length of the spring.

Look at her data in the table.

Force used	2.0 N
Original length	3.0 cm
Extended length	7.0 cm
Extension	4.0 cm

(i) Calculate the spring constant for the spring.

Use the equation: force = spring constant × extension

Spring constant = ... N / cm **[3]**

(ii) Suggest **two** ways that the student could improve and develop their method to find the spring constant.

---

[2]

(b) The spring constant of a different spring is 40 N / m.

Calculate the energy stored in the spring when it is stretched 0.20 m.

Use an equation from the data sheet to help you.

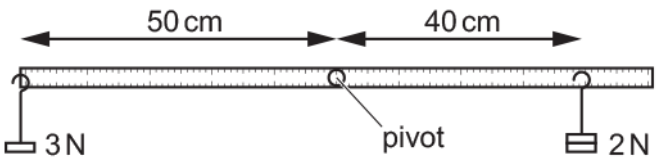
Energy stored = ... J **[4]**

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

(c) The diagram shows an experiment a student set up to study moments.



The student:

- holds the metre rule so that it is horizontal
- adds weights to the metre rule at different distances from the pivot.

(i) Calculate the moments of the 2 N weight and the 3 N weight about the pivot.

Use the equation: moment = force × distance from pivot

Moment of 2 N weight = ... N cm

Moment of 3 N weight = ... N cm

[2]

(ii) Which way will the metre rule rotate when it is released by the student?

[1]

END OF QUESTION PAPER

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK