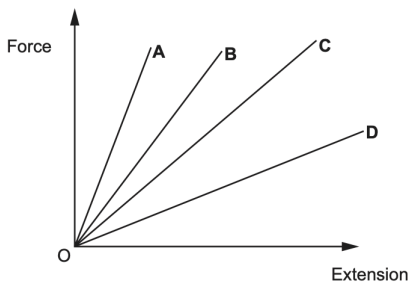


Forces in action

Q1.(2018)

Four springs **A**, **B**, **C** and **D** are made of four different materials.

Use the equation: Force = Extension $\times$ Spring constant



Which of the springs has the **greatest** spring constant?

Your answer

[1]

Q2.(2018)

What is the gravitational field strength on Earth?

- A** 1.0 N/kg
- B** 1.6 N/kg
- C** 10.0 N/kg
- D** 98.9 N/kg

Your answer

[1]

Q3.(2018)

Which of the following transfers the **most** energy?

- A** 1.0 kW over one hour
- B** 2.0 kW over two hours
- C** 3.0 kW over one hour
- D** 500 W over four hours

Your answer

[1]

Q4.(2018)

Which row, **A**, **B**, **C** or **D** shows the **largest** change in thermal energy?

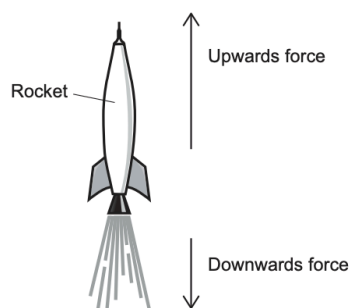
	Mass (kg)	Specific heat capacity (J/kg °C)	Temperature change (°C)
A	1	4200	40
B	1	4200	20
C	2	4200	10
D	2	4200	5

Your answer

[1]

Q5.a(2018)

During launch, a rocket accelerates when the upwards force is greater than the downwards force.



(a) (i) Name the upwards and downwards forces on the rocket during launch.

Upwards force:

Downwards force:

[2]

Q5.b(2018)

At launch, the upwards force is 10000N and the downwards force is 8000N.

Write down the size of the resultant force in Newtons.

Answer = N [1]

Q5.c(2018)

The rocket has a mass of 800 kg.

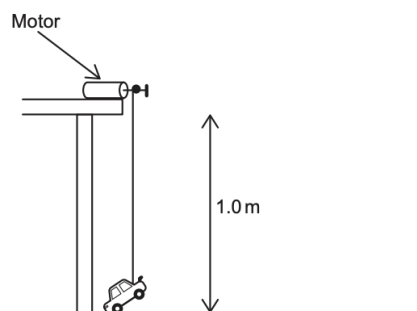
Calculate its acceleration.

Use the equation: Force = Mass × Acceleration

Answer = m/s² [3]

Q6.a(2018)

A student uses a small motor to lift a toy car through a vertical distance of 1.0 m.



The car has a weight of 0.05 N.

- (i) Calculate the work done when lifting the car through this distance.

Answer = J [3]

Q6.b(2018)

Calculate the power of the motor if the car takes 5.0 seconds to travel the 1.0 m distance.

State the unit.

Answer = Unit [4]

Q6.c(2018)

The motor uses 2 cells in series.

Each cell has a potential difference of 1.5 V.

- (i) Write down the total potential difference of the cells.

Answer = V [1]

Q6.d(2018)

The motor has a resistance of 6.0Ω .

Calculate the current in the circuit when the motor is in use.

Use the equation: Potential difference = Current $\times$ Resistance

Answer = A [3]

Q6.e(2018)

The student wishes to increase the time taken to lift this toy car vertically through the 1.0 m distance shown.

Suggest a change he could make to this experiment to achieve this.

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

Q7.(2019)

Which row of the table gives a power of 300 W?

Use the equation: power = work done $\div$ time

	Work done (J)	Time taken (s)
A	600	1.5
B	900	3.0
C	1000	5.0
D	1500	300

Your answer ☐

[1]

Q8.a(2019)

Topic [2]: [Forces]

A student hangs a mass from the end of a spring as shown in **Fig. 13.1**.

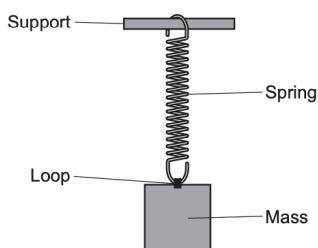


Fig. 13.1

- (a) The spring in **Fig. 13.1** extends by 0.06 m. The spring constant is 25 N/m.

Calculate the force on the spring.

Use the equation: force = extension $\times$ spring constant

Force = N [2]

Q8.b(2019)

Fig. 13.2 shows the forces acting on the mass.

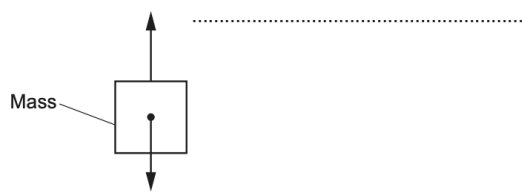


Fig. 13.2

- (i) Label the forces on the diagram in **Fig. 13.2**.

[2]

Q8.c(2019)

The loop at the end of the spring breaks and the mass falls.

Explain why the mass falls and describe its motion as it falls.

.....

 [2]

Q8.d(2019)

The mass is placed on a bench, as shown in Fig. 13.3.

This is a diagram showing the force of the bench on the mass.

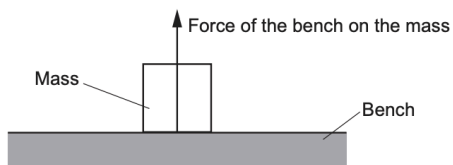


Fig. 13.3

Newton's third law is about how forces come in pairs.

Complete the table to describe the other force in this pair.

	Force in diagram	Other force in this pair
Name	Force of the bench on the mass	
Type of force	Contact force	

[2]

Q9.a(2019)

A student measures the acceleration of a trolley on a horizontal surface.

Fig. 15.1 is a diagram of her experiment.

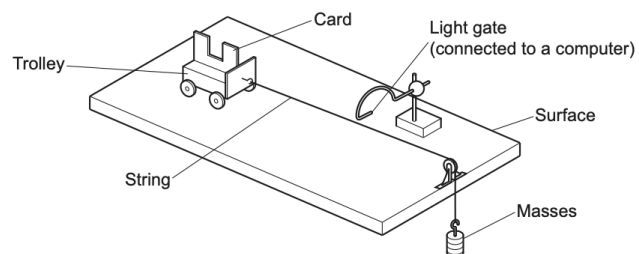


Fig. 15.1

(a) The weight of the masses accelerates the trolley.

(i) Define the term weight.

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

Q9.b(2019)

Show that the weight of a 100g mass is 1 N.

[3]

Q9.c(2019)

Friction can change the results of this experiment.

Suggest **one** way friction can be reduced.

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

Q9.d(2019)

- (i) The tall parts of the card on the trolley (U and V) pass through the light gate, as shown in Fig. 15.2.

The velocity of U is 0.5 m/s.

The velocity of V is 1.0 m/s.

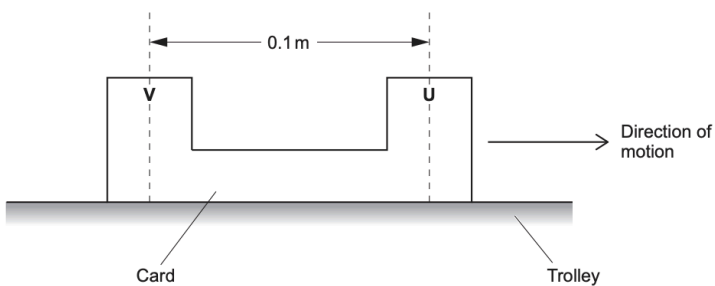


Fig. 15.2

Calculate the acceleration of the trolley.

Use the equation: $(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$

Acceleration = m/s² [3]

Q9.e(2019)

When the trolley reaches the edge of the surface, it is moving at 1.2 m/s.

The mass of the trolley is 1.0 kg.

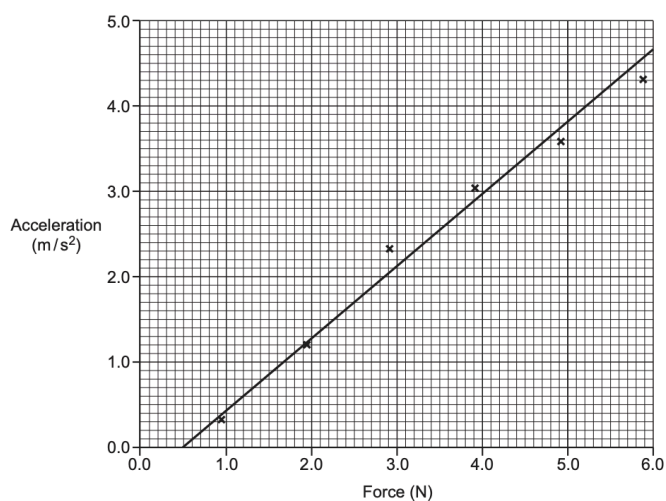
Calculate the kinetic energy of the trolley.

Kinetic energy = J [3]

Q9.f(2019)

(d) The student repeats the experiment with different masses.

This is a graph showing her results.



The student says, 'The graph shows that the acceleration of the trolley is directly proportional to the force.'

Is the student correct?

Explain your answer.

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

Q10.(2020)

OCR [Physics] | Foundation
Topic [2]: [Forces]

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A man has a mass of 70 kg.

What is the weight of the man?

Use the equation: gravity force = mass $\times$ gravitational field strength

The gravitational field strength on Earth = 10 N/kg.

- A 0.7 N
- B 7 N
- C 700 N
- D 700 000 N

Your answer

[1]

Q11.(2020)

The unit of force is the newton (N). The unit of distance is the metre (m).

Which unit is the same as the newton-metre (Nm)?

Use the equation: work done = force $\times$ distance

- A Joules (J)
- B Kilograms (kg)
- C Newtons per kilogram (N/kg)
- D Watts (W)

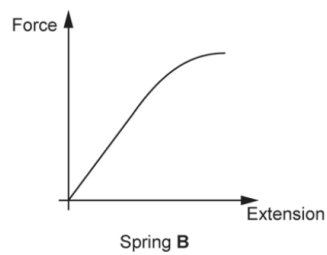
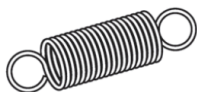
Your answer

[1]

Q12.(2020)



Here are graphs of his results:



Use the graphs to describe the properties of spring **A** and spring **B**.

Write about Hooke's law in your answer.

[6]

Each planet, **A–D**, has the same diameter (width).

Which planet has the largest gravitational field strength?

- A**  Mass = 1×10^{24} kg
- B**  Mass = 2×10^{24} kg
- C**  Mass = 1×10^{26} kg
- D**  Mass = 2×10^{26} kg

Your answer

[1]

Q14.(2021)

Which statement describes power?

- A** The rate of flow of charge.
- B** The rate of flow of current.
- C** The rate of stretching of a spring.
- D** The rate of transfer of energy.

Your answer

[1]

Q15.a(2021)

Fig. 12.1 shows a picture of a ball on a field. The ball is not moving.

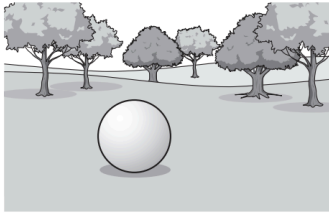


Fig. 12.1

(a) **Fig. 12.2** shows part of a free-body force diagram for the ball.

The force is drawn to scale. $1\text{ cm} = 1\text{ N}$.

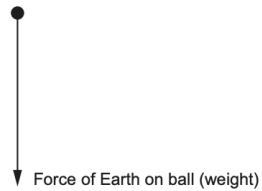


Fig. 12.2

(i) Complete the free-body force diagram by adding in the missing force.

[1]

Q15.b(2021)

Which word describes this missing force?

Put a ring around the correct answer.

Contact **Electrostatic** **Gravity** **Magnetic**

[1]

Q15.c(2021)

Topic [2]: [Forces]

A person kicks the ball.

Complete the sentences explaining what happens to the ball.

Choose words from the list.

You may use each word once, more than once or not at all.

balanced

forces

gravity

masses

speed

unbalanced

The on the ball are

Therefore the of the ball changes.

[2]

Q15.d(2021)

The mass of the ball is 0.4 kg.

How much force is needed to accelerate the ball at 400 m/s^2 ?

Use the equation: force = mass $\times$ acceleration

Force = N [2]

Q15.e(2021)

Fig. 12.3 shows the person placing the ball so it touches a wall.



Fig. 12.3

He now kicks the ball directly at the wall.

The ball changes shape. Explain why.

.....
.....
..... [2]

Q16.a(2021)

A teacher lifts a weight of 45 N through a height of 1.8 m.

Calculate the work done by the teacher.

Use the equation: work done = force $\times$ distance

Work done = J [2]

Q16.b(2021)

Another teacher does 1500 J of work.

They take 5 seconds to do the work.

Calculate their power.

Give the unit in your answer.

Use the equation: power = work done / time

Power = Unit [3]

Q17.a(2021)

Topic [2]: [Forces]

A student carries out an experiment to calculate the spring constant of a spring.

Here are the student's results.

Mass (g)	Force (N)	Extension (m)	Spring constant (N/m)
100	0.98	0.05	20
200		0.11	18
300	2.94	0.15	20
400	3.92	0.21	19
500	4.91	0.25	

(a) Calculate the force when the mass is 200g.

Use the equation: gravitational force = mass $\times$ gravitational field strength

Assume gravitational field strength = 10 N/kg.

Force = N [3]

Q17.b(2021)

Calculate the spring constant when the mass is 500g.

Use the equation: force exerted by a spring = extension $\times$ spring constant

Give your answer to the **nearest whole number**.

Spring constant = N/m [3]

Q17.c(2021)

Calculate the mean value of the spring constant.

Use the values in the table from 100g to 400g only.

Mean spring constant = N/m [1]

Q17.d(2021)

Topic [2]: [Forces]

The teacher says that calculating the mean is a poor method to find the spring constant, even though the student's calculations are correct.

Describe a better way to find the spring constant using the student's measurements.

.....

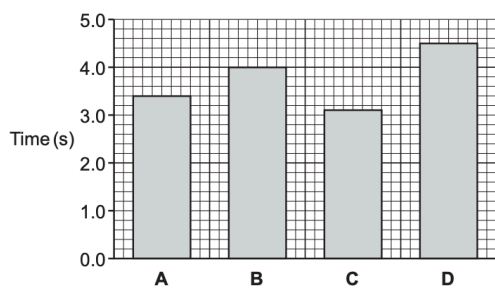
.....

..... [2]

Q18.(2022)

Four weightlifters **A**, **B**, **C** and **D**, each do 2000 J of work lifting a weight.

The time taken for each of them to do their lift is shown in the graph.



Which weightlifter has the **highest** power?
Use the Data Sheet.

Your answer

[1]

Q19.(2022)

Which force is a **contact** force?

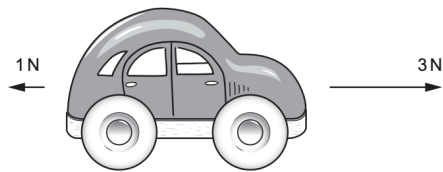
- A Electrostatic
- B Friction
- C Gravity
- D Magnetic

Your answer

[1]

Q20.(2022)

The diagram shows some forces acting on a toy car.



Which row in the table describes the motion of the toy car?

	Resultant force	Motion
A	2 N forwards	acceleration
B	2 N forwards	constant velocity
C	3 N forwards	acceleration
D	3 N forwards	constant velocity

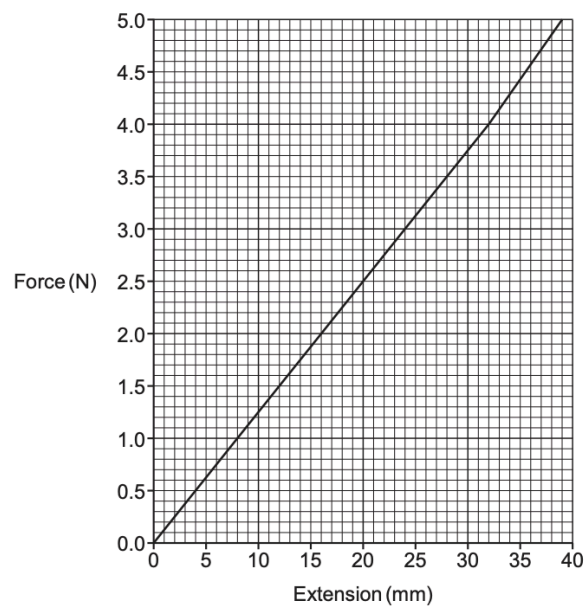
Your answer

[1]

Q21.a(2022)

A student stretches **one** spring by applying a force to it. **Fig. 11.1** shows the results.

Fig. 11.1

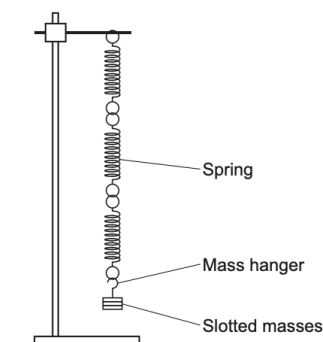


The student makes a prediction:

'The more springs I join together, the greater the total extension when the same force is applied.'

Fig. 11.2 shows a diagram of the springs.

Fig. 11.2



(i) Explain why the student makes this prediction.

.....
.....
..... [2]

Q21.b(2022)

The student has the equipment shown in Fig. 11.2.

What **other** piece of equipment do they need to test this prediction?

..... [1]

Q21.c(2022)

What do they change to test the prediction?

..... [1]

Q21.d(2022)

What do they measure to test the prediction?

..... [1]

Q21.e(2022)

What do they keep the same to test the prediction?

..... [1]

Q22.a(2022)

Topic [2]: [Forces]

Children often make models with clay. Clay and rubber bands behave differently.

Draw lines to connect each **property** to its correct **description**, and each **description** to the correct **example**.

Property	Description	Example
Elastic	Keeps its new shape when force removed	Rubber band
Plastic	Regains original shape when force removed	Clay

[2]

Q22.b(2022)

Some children are talking about squashing a lump of clay on a desk.

- Child **A** says, 'Forces are not required to squash the clay.'
- Child **B** says, 'There is only one force acting on the clay when I squash the clay.'
- Child **C** says, 'There are three forces acting on the clay when I squash the clay.'

Who is correct?

Tick (✓) **one** box.

Child **A** ☐

Child **B** ☐

Child **C** ☐

[1]

Q22.c(2022)

The mass of a lump of clay is 150 grams. 1 gram = 0.001 kg.

(i) What is the mass of the lump of clay in kg?

Mass = kg [1]

Q22.d(2022)

The mass of another lump of clay is 0.35 kg.

Calculate the weight of this lump of clay.

Use the equation: gravitational force = mass $\times$ gravitational field strength

Gravitational field strength = 10 N/kg.

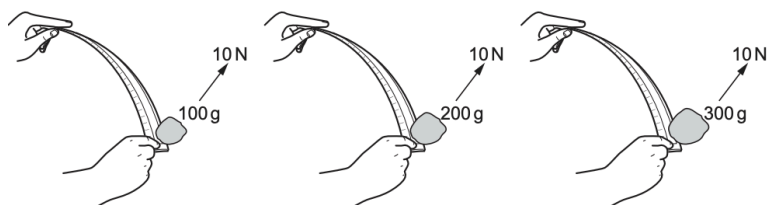
Weight = N [2]

Q22.e(2022)

One child uses a ruler to hit lumps of clay across the desk.

Fig. 11.3 shows the child hitting three different lumps of clay.

Fig. 11.3



- (i) Which lump of clay has the **greatest** acceleration?
Use the Data Sheet.
Tick (✓) **one** box.

100 g	☐
200 g	☐
300 g	☐

[1]

Q22.f(2022)

Explain the reason for your answer to (e)(i).

.....

..... [1]

Q23.(2023)

A spaceship travels from planet **P** to planet **Q**.
The diagram shows the size of the forces acting on the spaceship.



Which sentence describes the motion of the spaceship?

- A It is accelerating.
- B It is decelerating.
- C It is staying at a constant speed.
- D Its speed is decreasing then increasing.

Your answer ☐

[1]

Q24.(2023)

Topic [2]: [Forces]

The mass of an astronaut is 80 kg.

Calculate the weight of the astronaut on the Moon.

Use the equation: gravitational force = mass $\times$ gravitational field strength

The gravitational field strength on the Moon is 1.6 N/kg.

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

Your answer

[1]

Q25.(2023)

The table shows the results from measuring the extension of a spring for different forces.

Force (N)	Extension of a spring (m)
0.0	0.00
0.9	0.05
1.8	0.10
2.7	0.15
3.6	0.20

Calculate the spring constant of the spring.

Use the equation: force exerted by a spring = extension $\times$ spring constant

- A 0.045 N/m
- B 0.060 N/m
- C 0.72 N/m
- D 18 N/m

Your answer

[1]

Q26.(2024)

A spring has a spring constant of 20 N/m and its extension is 0.4 m.

What is the force exerted on the spring?

Use the equation: force exerted by a spring = extension $\times$ spring constant

- A 0.8 N
- B 5.0 N
- C 8.0 N
- D 20.4 N

Your answer

[1]

Q27.(2024)

An object of mass 2.0 kg accelerates. The force acting on the object is 5.0 N.

Calculate the acceleration of the object.

Use the equation: force = mass $\times$ acceleration

- A 0.4 m/s²
- B 2.5 m/s²
- C 3.0 m/s²
- D 10.0 m/s²

Your answer

[1]

Q28.(2024)

A student stretches four different springs as shown in the table.

The student measures the length of each spring:

- before the stretching force is applied
- during the time that the stretching force is applied
- after the stretching force has been removed.

Which spring shows **plastic** deformation?

	Length before (cm)	Length during (cm)	Length after (cm)
A	2.4	2.9	2.4
B	2.5	5.0	2.5
C	2.5	2.9	2.9
D	2.6	2.6	2.6

Your answer

[1]

Q29.(2024)

The diagram shows some forces acting on a moving object.



Which statement describes the motion of the object?

- A The object accelerates towards E.
- B The object accelerates towards W.
- C The object changes direction.
- D The object moves at constant velocity.

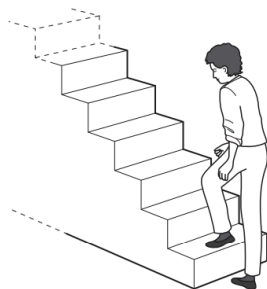
Your answer

[1]

Q30.a(2024)

Topic [2]: [Forces]

Two students do an experiment to measure their power by walking up steps.



This is the data from student **P**:

- Weight = 600 N
- Number of steps = 250
- Height of each step = 0.20 m

Calculate the work done by student **P**.

Work done = J [3]

Q30.b(2024)

This is the data from student **Q**:

- Work done = 36 000 J
- Time taken = 240 s

Calculate the power of student **Q**.

Use the equation: power = $\frac{\text{work done}}{\text{time}}$

Give your answer in kW.

Power = kW [3]

Q30.c(2024)

Describe how the students carry out this experiment. Include any equipment they use.

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

Q30.d(2024)

Student **P** carries out the experiment five more times and calculates their power.

Here are student **P**'s results.

	Try 1	Try 2	Try 3	Try 4	Try 5
Power (W)	120	121	122	121	123

How can student **P**'s results be described?

Tick **one** (✓) box in each row.

	Yes	No
Precise		
Repeatable		

[1]

Q30.e(2024)

Explain your answer to (d)(i).

.....

.....

..... [2]