



OUNDLE

School

EXAMINATION PAPER
Academic Scholarship 2021

Science (Paper 1)

Time allowed: 1 hour

Name: _____

Instructions

- Write your name clearly in the space above.
- Write your answer on the question paper.
- Calculators are allowed.
- Answer ALL the questions in all sections.
- You are expected to write clearly and accurately throughout each of your answers. You should leave some time towards the end of the examination to check your work carefully.
- The maximum number of marks for this paper is 64.

SECTION ONE: BIOLOGY [24 Marks]

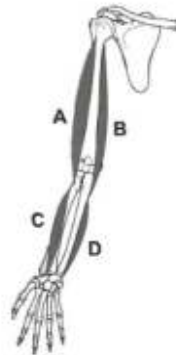
1. When Liam fell off his bike, he dislocated his shoulder. A doctor examined Liam's shoulder joint and the muscle surrounding it.

a. Muscles work in antagonistic pairs. What does this mean?

.....
.....

[2 marks]

b. The diagram below shows the muscles and bones in the arm.



Which of the muscles in the diagram, **A**, **B**, **C** or **D** contracts to bend the arm at the elbow?

.....

[1 mark]

2. Animals get characteristics from their parents. Complete the following sentences.

a. Information about an animal's characteristics is passed on by a molecule called

.....

b. The female's genes are passed in the egg. The male's genes are passed in the

.....

c. The genes are held in the of the cells.

d. The process of passing characteristics by genes has a special name. We say that the children characteristics from their parents.

[4 marks]

3. Keith wants to find out which snack has the highest energy content. He does an experiment to look at the amount of energy in two brands of crisps.



He burns a sample of the food to see how much this raises the temperature of the water in the test tube. This rise in temperature uses the energy from the food.

- a. Suggest two things Keith should have done to make the experiment a fair test.

-
-

[2 marks]

- b. Keith should also take some precautions to increase the safety of the experiment. Give two things he could do to make the experiment safer.

-
-

[2 marks]

c. The table shows the nutritional details from the packets of the different brands.

| | Energy /kJ | Protein /g | Carbohydrate /g | Fat /g | Fibre /g |
|-------------------------|------------|------------|-----------------|--------|----------|
| 100g of Runner's Crisps | 2050 | 6.2 | 52.6 | 28.7 | 4.2 |
| 100g of Health Snacks | 1300 | 9.2 | 45.1 | 10.5 | 9.1 |

Keith repeats his experiment using 10g of each brand. Write down the letter of the correct statement.

- A: The temperature will rise more with the Runner's Crisps.
- B: The temperature change will be the same.
- C: The temperature will rise more with the Health Snacks.

The correct statement is

[1 mark]

d. Neither snack contains vitamin C. Give an example of a food that provides a good source of vitamin C.

.....

[1 mark]

e. Why is fibre important to a balanced diet?

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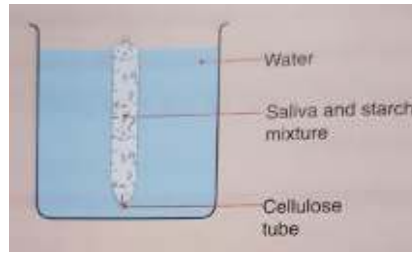
[1 mark]

f. Using the table, give **two** reasons why Health Snacks are healthier than Runner's Crisps.

-
-

[2 marks]

4. Felix and Gena got together to try to make a model gut. They used a cellulose tube, as shown in the diagram. The tube contained a mixture of saliva and starch.



- a. How could they prove that starch was present at the start of the experiment?

.....
.....

[2 marks]

- b. They believed that the saliva contained an enzyme that could break down starch. What would be the best temperature to keep the mixture at, while this breakdown was going on?

.....

[1 mark]

- c. After twenty minutes they tested the contents of the model gut for starch. They got a negative result. Gena thought that this was because the starch had crossed the wall of the gut into the water. How could Felix try to prove that this wasn't the explanation?

.....
.....
.....

[3 marks]

- d. Felix and Gena eventually agreed that starch could not cross the wall of their model gut. Why can't starch cross in this way?

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[1 mark]

- e. In the body, what is represented by the water in the beaker?

.....

[1 mark]

SECTION TWO: CHEMISTRY [20 Marks]

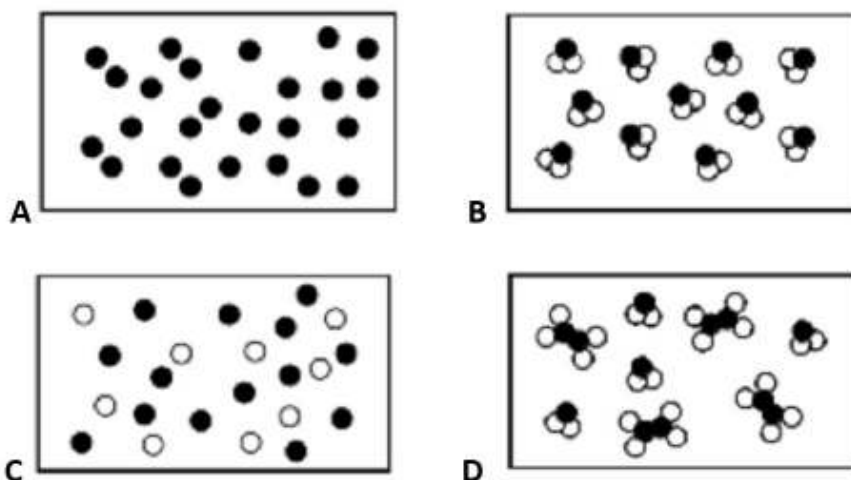
For each question, choose the correct option, A, B, C or D.

[5 marks]

1. Elements are found on the Periodic Table; an element is:
 - a. A substance with more than one type of atom mixed together.
 - b. A substance with more than one type of atom chemically joined together.
 - c. A substance with only one type of atom.
 - d. A substance that only contains individual atoms.
2. Sulphur is a typical non-metal element.

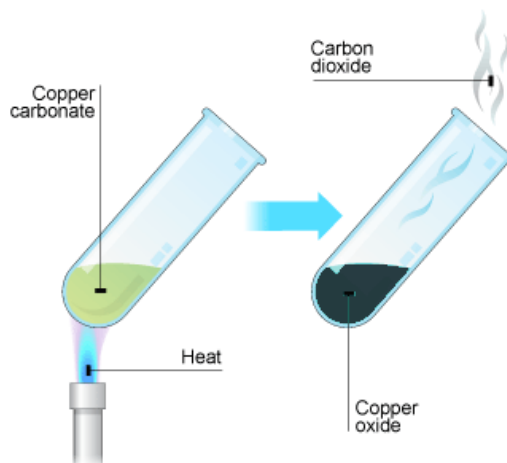
Which of the following properties is **not** that of a typical non-metal?

- a. Low melting point.
 - b. Dull appearance.
 - c. An insulator.
 - d. Malleable.
3. Which of the following diagrams is of a pure compound



4. How many protons, electrons and neutrons are there in an atom of fluorine?
 - a. 9 protons, 10 electrons and 9 neutrons.
 - b. 10 protons, 10 electrons and 9 neutrons.
 - c. 9 protons, 9 electrons and 10 neutrons.
 - d. 10 protons, 9 electrons and 10 neutrons.
5. Which is the correct formula for magnesium hydroxide:
 - a. MgOH
 - b. Mg(OH)₂
 - c. MgO
 - d. Mg(O)₂

6. When copper carbonate is heated strongly, a thermal decomposition reaction occurs and copper oxide and carbon dioxide are produced.



- a. What does the term 'thermal decomposition' mean?

.....

[1 mark]

- b. Write a word equation for this reaction.

.....

[1 mark]

- c. How could you prove that carbon dioxide is one of the products?

.....

.....

[2 marks]

d. Copper oxide is a black solid and a base. It reacts with sulphuric acid, H_2SO_4 , to form a salt and water.

i. How many atoms are there in the formula H_2SO_4 ?

.....

[1 mark]

ii. Name the salt produced in this reaction.

.....

[1 mark]

e. Excess copper oxide is added to ensure all the acid reacts. What does excess mean?

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[1 mark]

f. Describe a method to obtain pure salt crystals from the reaction mixture.

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[3 marks]

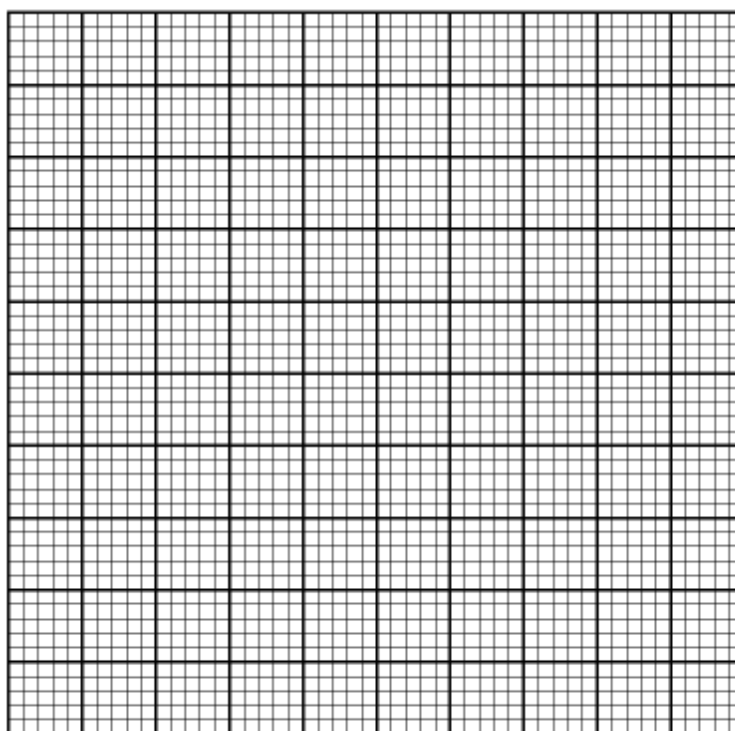
7. Titanium metal, Ti, can be obtained from its ore, rutile. Rutile contains titanium dioxide, TiO_2 . The titanium dioxide is first converted to titanium chloride, TiCl_4 , then the titanium chloride is reacted with sodium to produce titanium and sodium chloride, NaCl .

In a series of experiments Bethany measured the mass of titanium that was obtained from different masses of titanium oxide. The results were:

| mass of titanium oxide used /g | mass of titanium obtained /g |
|--------------------------------|------------------------------|
| 2.0 | 1.2 |
| 4.5 | 2.7 |
| 7.0 | 4.2 |
| 9.0 | 5.4 |
| 12.5 | 7.5 |
| 15.0 | 9.4 |
| 17.0 | 10.2 |
| 19.0 | 11.4 |
| 22.0 | 13.2 |

- a. On the graph paper plot a graph of these results. You should choose scales on the axes so you use as much of the paper as possible; remember to add the units you have used.

mass of titanium
produced



mass of titanium oxide used

[3 marks]

- b. Showing your working on the graph, find the mass of titanium dioxide that must be used to obtain 5.0 g of titanium.

Mass of titanium dioxide/g

[1 mark]

- c. Describe the trend shown on the graph.

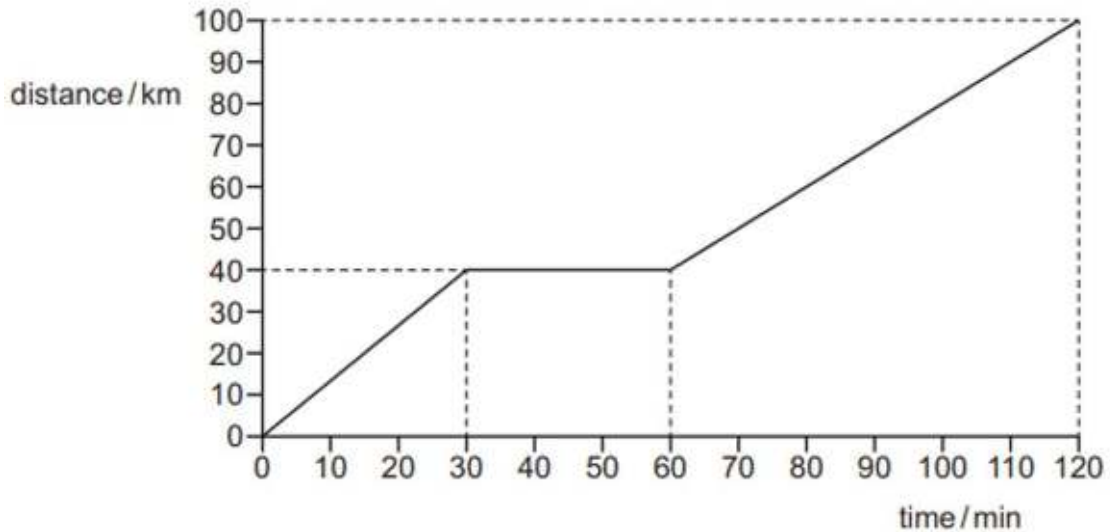
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[1 mark]

SECTION THREE: PHYSICS [20 Marks]

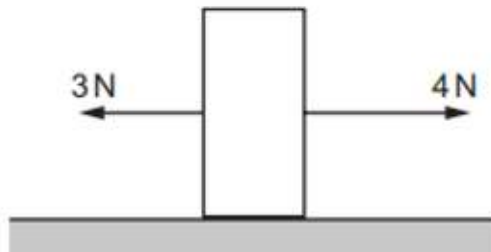
The first seven questions are worth 7 marks in total. For each question, circle the correct answer.

1. The distance-time graph for a motorway journey is shown.



What is the average speed for the journey?

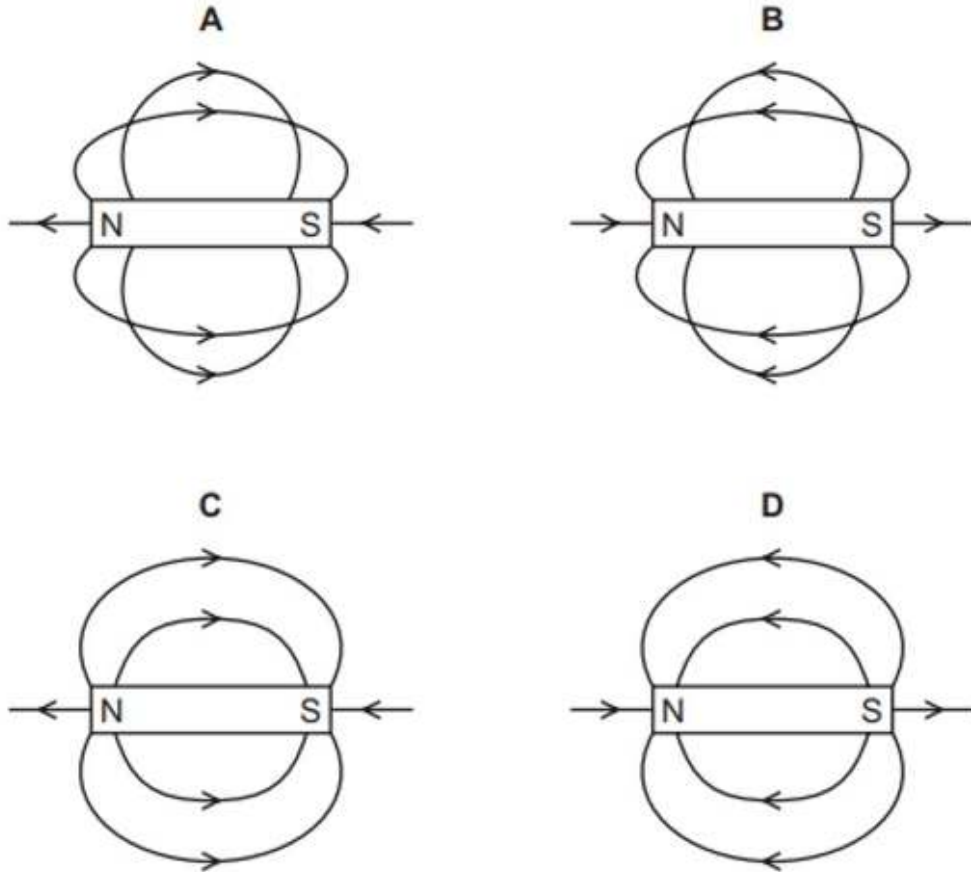
- a. 50 km/h
 - b. 67 km/h
 - c. 70 km/h
 - d. 83 km/h
2. On Mars, the acceleration of free fall g is 3.7 m/s^2 . What is the weight of a 2.0 kg mass on Mars?
- a. 0.54 N
 - b. 1.9 N
 - c. 7.4 N
 - d. 20 N
3. The diagram shows a solid object on a flat surface, with two forces acting on the object.



What is the resultant force on the object?

- a. 1 N to the left
- b. 1 N to the right
- c. 7 N to the left
- d. 7 N to the right

4. Which diagram shows the pattern and direction of the magnetic field lines around a bar magnet? Circle the correct letter.



5. A book has a mass of 400g.

The surface of the book in contact with a table has dimensions 0.10m x 0.20m.

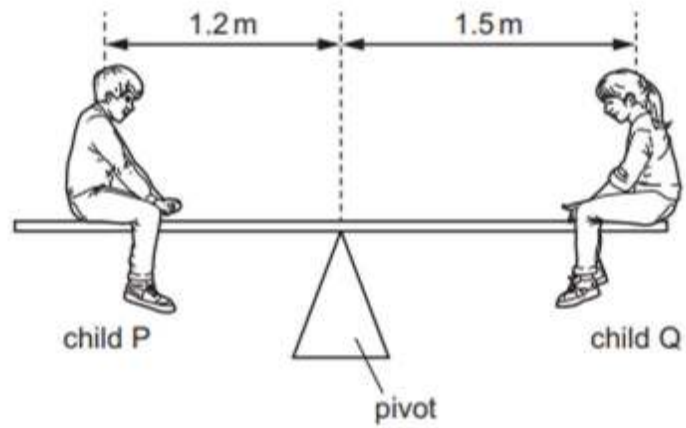
The gravitational field strength is 10 N/kg.

What is the pressure exerted on the table by the book?

- a. 0.08 N/m²
 - b. 8.0 N/m²
 - c. 20.0 N/m²
 - d. 200.0 N/m²
6. The mass of an empty flask is 34g.
- The volume of the flask is 20cm³.
- The total mass of the liquid and flask is 50g.
- What is the density of the liquid?
- a. 0.80 g/cm³
 - b. 1.25 g/cm³
 - c. 2.50 g/cm³
 - d. 4.20 g/cm³

7. A uniform plank rests on a pivot at its centre.

Two children P and Q sit on the plank in the positions shown.



The mass of child P is 25kg.

The plank is balanced. What is the mass of child Q?

- a. 20kg
- b. 25kg
- c. 31kg
- d. 45kg

8. Fig. 8.1 shows a speed–time graph for a car.

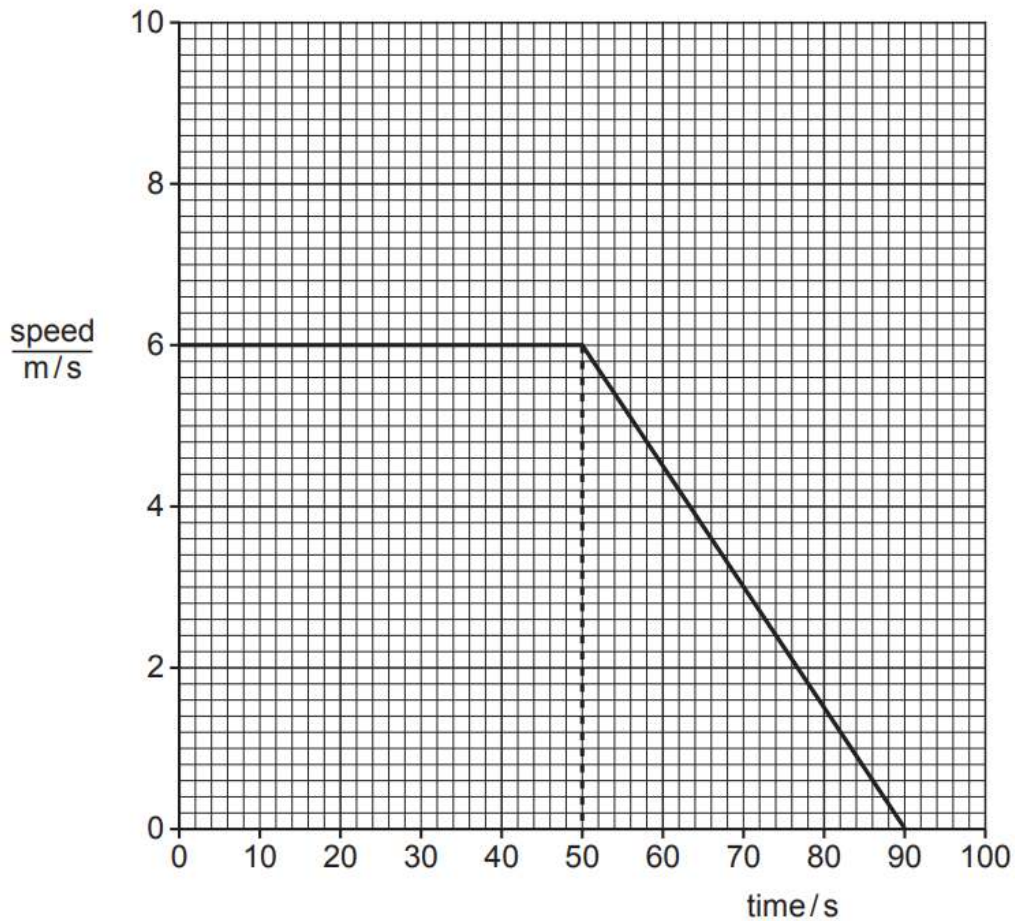


Figure 8.1

a. Describe the motion of the car from 0 to 50s, as shown in Fig. 8.1.

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[1 mark]

b. Describe the motion of the car from 50s to 90s, as shown in Fig. 8.1.

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[1 mark]

c. Calculate the distance, in m, travelled by the car between 50s and 90s.

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[3 marks]

- d. A motorcycle travels at a constant speed. The motorcycle travels 710m in 87s.
Calculate the speed of the motorcycle and show that it is close to 8m/s.

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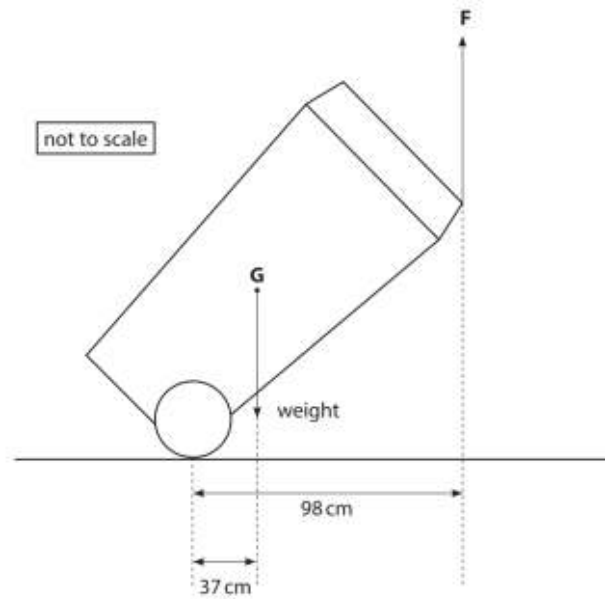
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[3 marks]

9. The diagram shows some of the forces acting on a large rubbish bin on wheels.



The mass of the bin is 23kg.

a. What is the weight of the bin?

- A: 23kg
- B: 230kg
- C: 230N
- D: 23,000N

[1 mark]

b. State the principle of moments.

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[2 mark]

c. A person applies force F to the bin to keep it stationary.

Calculate the magnitude of force F .

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[2 marks]