

Centre Number	Examination Number



EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level



5124/1

Science

Paper 1

Tuesday

16 NOVEMBER 2021

Additional materials

- Electronic calculator (non programmable)
- Graph paper
- Soft clean eraser
- Soft pencil (type B or HB is recommended)

Marks: 85

Time: 2 hours

Instructions to Candidates

- Write the **centre number** and your **examination number** on **every page** of this question paper and on the separate Answer Booklet/Paper provided. www.eczpastpapers.com
- There are **three** sections in this paper.

(i) Section A

There are **twenty** questions in this section. Answer **all** questions.
For each question, there are four possible answers, **A, B, C** and **D**. Choose the best one and mark it with a cross (X) on the **answer grid** provided in this question paper.

(ii) Section B

Answer **all** questions. Write your answers in the **spaces provided** in this question paper.

(iii) Section C

Answer any **two** questions. Write your answers in a separate **Answer Booklet/Paper provided**.

Information for Candidates

- Any rough working should be done in this question paper.

- At the end of the examination:

(i) Fasten the separate Answer Booklet/Papers used securely to the question paper.

(ii) Circle the numbers of the section **C** questions you have answered in the grid below.

- Cell phones are **not allowed** in the examination room.

Candidate's Use	Examiner's Use
Section A	
Section B	
Section C	1
	2
	3
Total	

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SECTION A [20 marks]

Answer **all** the questions on the answer grid provided.

- A1** When converted to a base unit in scientific notation, 2GB is ...
A $2 \times 10^{-9}\text{B}$.
B $2 \times 10^{-6}\text{B}$.
C $2 \times 10^6\text{B}$.
D $2 \times 10^9\text{B}$.
- A2** Which of the following is a derived unit?
A Ampere
B Kelvin
C Meter
D Pascal
- A3** A car moving at 3m/s increased its velocity uniformly to 9m/s in 4s. Find the uniform acceleration of the car.
A 1.5m/s^2
B 2.25m/s^2
C 3.0m/s^2
D 6.75m/s^2
- A4** A rock weighed 8.0N on the moon where the acceleration due to gravity is 1.6N/kg. Calculate the mass of the rock on earth where the force of gravity is 10N/kg.
A 0.8kg
B 5.0kg
C 12.8kg
D 80.0kg

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- A5** The following diagram shows a pilot in air after jumping from a plane.

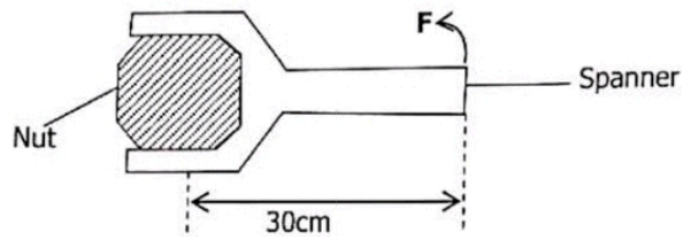


As he falls, how will the size of the forces acting on him change before he attains terminal velocity?

	Downward force	Upward force	Resultant force
A	Increases	Decreases	Increases
B	Increases	Increases	Increases
C	Decreases	Increases	Decreases
D	Decreases	Decreases	Decreases

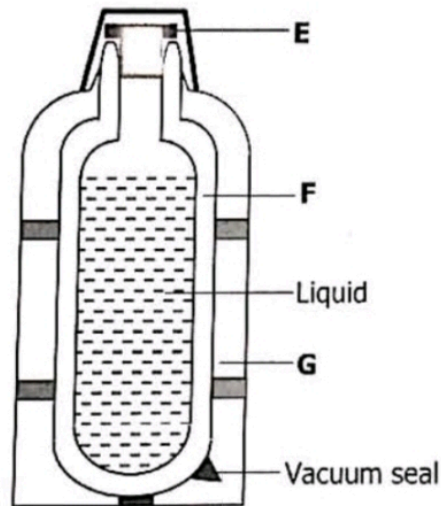
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- A6** The following diagram shows a 30cm spanner used to turn a nut with a force of 60N.



Find the moment of the force.

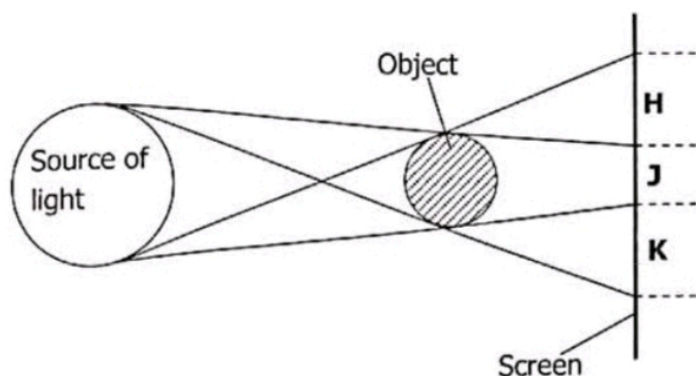
- A** 1.8Nm
 - B** 2.0Nm
 - C** 200Nm
 - D** 1 800Nm
- A7** The following diagram shows a thermos flask.



Identify the part(s) that prevent heat loss by convection.

- A** E only
 - B** F only
 - C** E and G
 - D** F and G
- A8** Which of the following is **not** true about dull black surfaces? They are good ...
- A** absorbers of heat.
 - B** emitters of heat.
 - C** reflectors of heat.
 - D** radiators of heat.

A9 The following diagram shows an object placed in the path of a beam of light.



What terms best describe the shadows **H**, **J** and **K**?

	H	J	K
A	Umbra	Penumbra	Umbra
B	Penumbra	Umbra	Umbra
C	Umbra	Umbra	Penumbra
D	Penumbra	Umbra	Penumbra

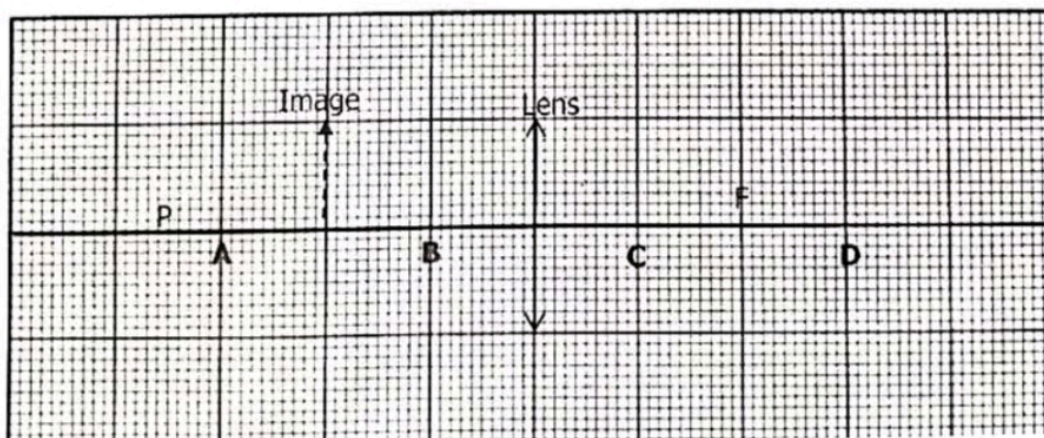
A10 Which of the following is true about images formed by plane mirrors? They are ...

- A** diminished.
- B** magnified.
- C** upside down.
- D** virtual.

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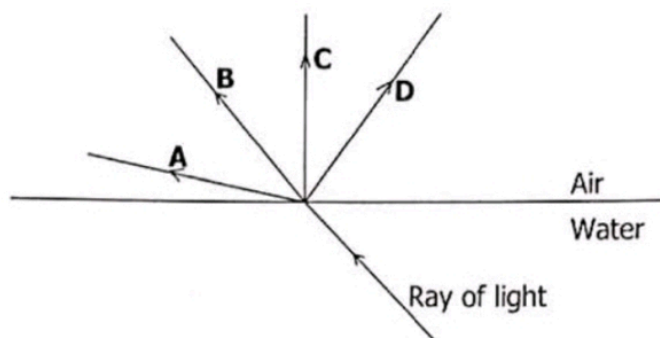
A11 The following diagram shows an image produced by a biconvex lens. (The diagram is drawn to scale).

Which position **A**, **B**, **C** or **D** shows the correct position of the object?



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A12 The following diagram shows a ray of light emerging from water into air.



Which labelled arrow shows the direction of the ray in air?

A13 A siren from an ambulance or police car has a very high pitch. Which of the following can change the pitch of a sound wave?

- A** Amplitude
- B** Frequency
- C** Velocity
- D** Wavelength

A14 Which of the following materials is most suitable for making permanent magnets?

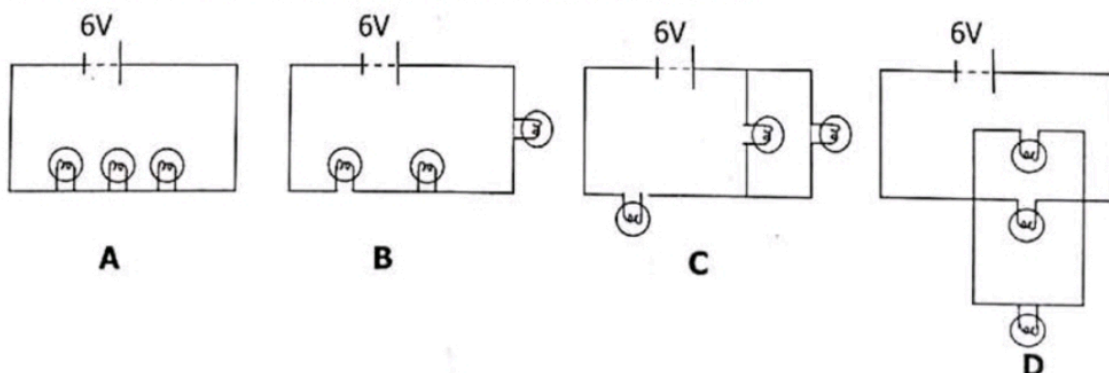
- A** Brass
- B** Copper
- C** Iron
- D** Steel

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A15 The leaves of a positively charged electroscope diverged when a charged body was brought near it. This proves that the body was ...

- A** positively charged.
- B** negatively charged.
- C** neutral of charge.
- D** a good conductor.

A16 The following circuit diagrams show three bulbs of equal resistance connected to a 6V power supply. Which diagram will all the bulbs light brightest?



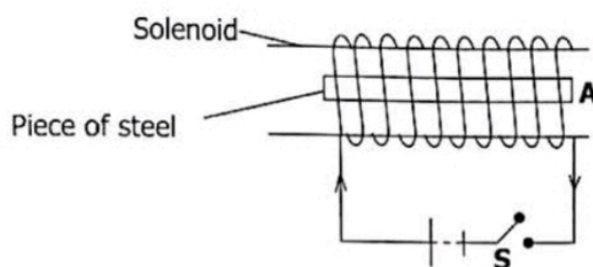
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- A17** A hair dryer is made of two heaters with a power rating of 400W each and a fan motor with a power rating of 100W.

Calculate the cost of using the hair dryer for two hours if a unit of electricity costs 50n.

- A** K0.45
- B** K0.90
- C** K9.00
- D** K90.00

- A18** The following diagram shows a piece of steel placed inside a solenoid.



If the switch, **S**, is closed and opened several times, the end **A** of the steel bar becomes ...

- A** temporal north pole.
- B** permanent north pole.
- C** permanent south pole.
- D** temporal south pole.

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- A19** What is the use of the hot filament in a Cathode Ray Oscilloscope (CRO)? It is to ...

- A** heat the anode.
- B** heat the cathode.
- C** produce light.
- D** produce protons.

- A20** Strontium 90 ($^{90}_{38}\text{Sr}$) undergoes a beta decay to produce element **Y**. Which of the following shows the decay equation?

- A** $^{90}_{38}\text{Sr} \rightarrow ^{90}_{37}\text{Y} - ^0_1\text{e}$
- B** $^{90}_{38}\text{Sr} \rightarrow ^{90}_{38}\text{Y} + ^0_1\text{e}$
- C** $^{90}_{38}\text{Sr} \rightarrow ^{90}_{39}\text{Y} + ^0_1\text{e}$
- D** $^{90}_{38}\text{Sr} \rightarrow ^{90}_{39}\text{Y} - ^0_1\text{e}$

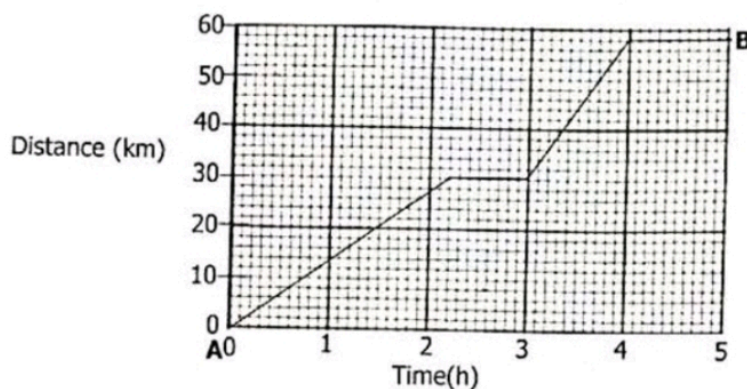
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Section B [45 marks]

Answer **all** questions in this section.

Write your answers in the spaces provided in the question paper.

B1 The following graph shows a distance/time graph of a bus moving from town **A** to town **B**.



(a) What is the total distance between town **A** and town **B**?

..... [1]

(b) The bus stopped at a station between town **A** and town **B**. For how long did the bus stop at this station?

..... [1] www.eczpastpapers.com

(c) Calculate the speed of the bus between town **A** and the first station.

Speed = [2]

(d) Calculate the average speed for the whole journey.

Average speed = [2]

(e) Mention **one** consequence of over-speeding.

..... [1]

[Total: 7 marks]

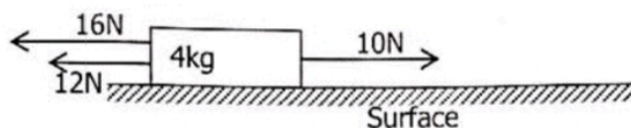
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B2 (a) State Newton's Second Law of motion.

.....

..... [1]

(b) The following diagram shows a 4kg box resting on a frictionless surface with forces acting on it as shown.



Calculate the uniform acceleration caused by the forces.

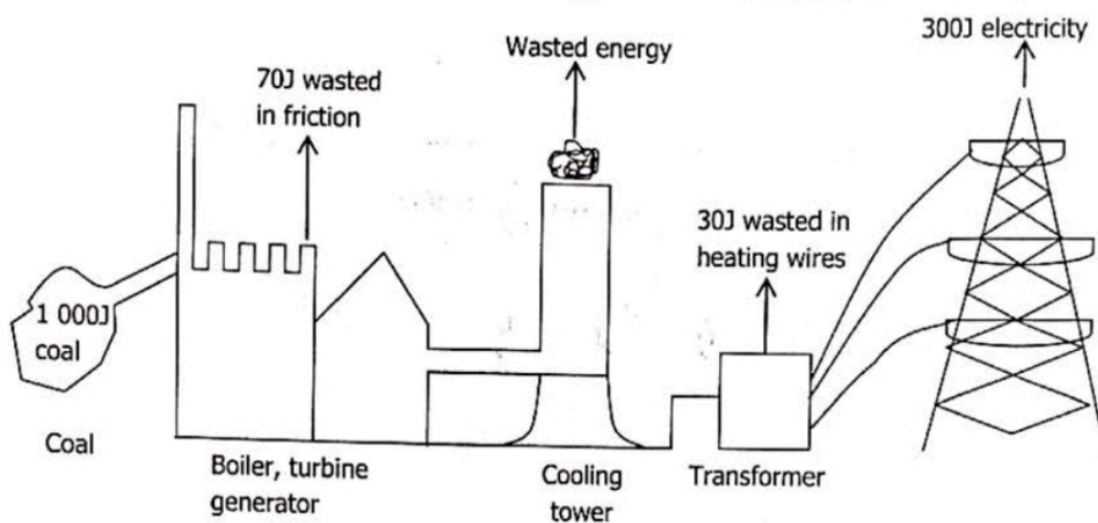
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Acceleration = [2]

[Total: 3 marks]

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B3 The following diagram shows how energy flows into and out of a coal-fired power station.



(a) How much useful electrical energy is produced by the power station?

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Useful energy = [1]

(b) Calculate how much energy is wasted from the cooling tower.

Wasted energy = [2]

(c) Calculate the efficiency of the power station in producing electricity.

Efficiency = [2]
[Total: 5 marks]

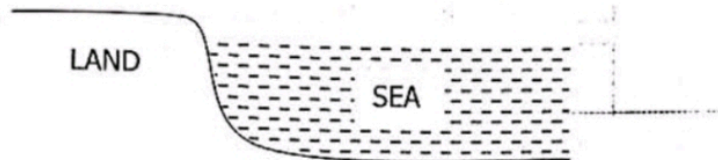
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B4 (a) Define convection.

.....

..... [1]

(b) The following diagram shows an incomplete diagram of convection currents occurring in nature at night.



(i) Name the breeze. [2]

.....

..... [1]

(ii) On the diagram, draw convection currents for this breeze. [2]

[Total: 4 marks]

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B5 (a) List the components of the electromagnetic spectrum in order of increasing frequency. (Least to highest).

.....

..... [2]

(b) Mention **one** similarity among the components of the spectrum.

..... [1]

(c) Mention **one** difference among the components of the spectrum.

..... [1]

(d) Give **one** harmful effect of the spectrum.

..... [1]

[Total: 5 marks]

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- B6** The following diagram shows an ultrasound source sending a sound wave into the human body.

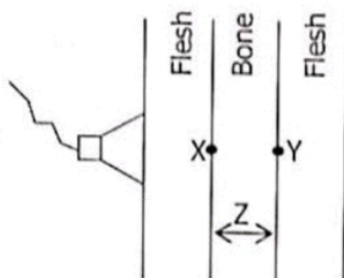


Figure B6.1

The total time for the ultrasound to travel in the bone from **X** to **Y** and back to **X** is 9.0×10^{-6} s.

- (a)** What does the term ultrasound mean?

..... [1]

- (b)** If the speed of the ultrasound in bone is 4 100m/s, calculate **Z** the thickness of the bone.

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Z = [2]

- (c)** Mention another use of ultrasound other than medical use.

..... [1]

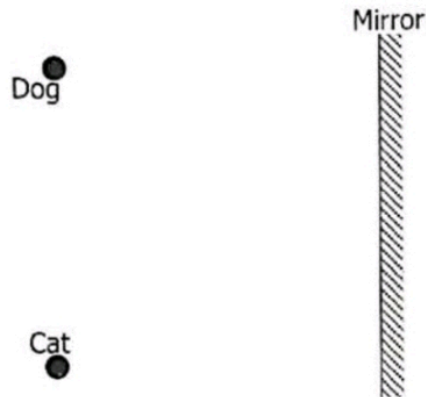
[Total: 4 marks]

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B7 (a) Define reflection of light.

.....
 [1]

(b) The following diagram shows a dog and a cat standing in front of a plane mirror.



Using the diagram, show by construction, how the dog sees the cat's image. [3]

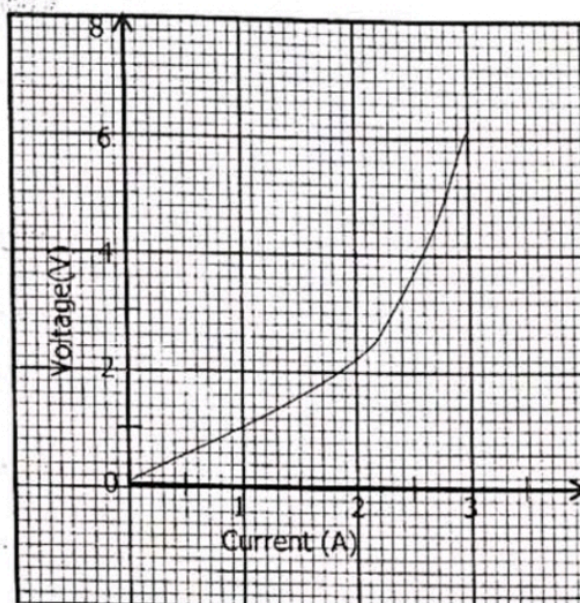
(c) Give **two** characteristics of the images formed by plane mirrors.

.....
 [2]

[Total: 6 marks]

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B8 The following diagram shows a graph of voltage against current of a conductor.



(a) What is the maximum current through the conductor?

..... [1]

(b) Calculate the resistance of the conductor when the current was 1.0A.

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Resistance = [2]

(c) Calculate the power in the conductor when the voltage was at 6V.

Power = [2]

[Total: 5 marks]

B9 (a) Define nuclear fission.

.....
 [1]

(b) Uranium-235 ($^{235}_{92}\text{U}$) when bombarded by a slow moving neutron disintegrates into barium and krypton plus two neutrons.

(i) What term is used to describe the products of nuclear fission?

..... [1]

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- (ii) Given that the products of this reaction are $^{144}_{56}\text{Ba}$ and $^{90}_{36}\text{Kr}$ plus two neutrons, write the equation for this reaction.

..... [2]

- (c) Mention **one** harmful effect of fission reactions.

..... [1]

- (d) Give **one** advantage of nuclear reactors as a source of energy.

..... [1]

[Total: 6 marks]

Section C [20 marks]

Answer any **two** questions from this section in the separate Answer Booklet provided.

- C1** (a) Describe an experiment on how you can determine the lower fixed point of a thermometer. [2]
- (b) Give **two** differences between a laboratory thermometer and a clinical thermometer. [2]
- (c) Mention **one** way in which you can improve the
- (i) sensitivity of a thermometer,
 - (ii) accuracy of a thermometer. [2]
- (d) (i) Name a device that can be used to measure very high temperatures and those that vary considerably. [2]
- (ii) Mention **two** devices that use the device you have mentioned in (d) (i) above. [2]

[Total: 10 marks]

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- C2** The following data was obtained from an experiment to determine the focal length of a biconvex lens.

U (cm)	30.0	35.0	40.0	45.0	50.0
V (cm)	44.0	37.0	32.0	31.0	28.0
M $\left(\frac{v}{u}\right)$					

- (a) Copy and complete the table to get all the values of **M** (magnification). [2]
 (b) Plot a graph of **M** against **V**. [4]
 (c) Determine **G** the slope of the graph. [2]
 (d) Use the slope **G** of your graph to determine **f** (focal length) of the lens using $G = \frac{v}{f} - 1$. [1]
 (e) Mention **one** use of this type of lens. [1]

[Total: 10 marks]

- C3** (a) State Hooke's Law. [1]
 (b) The following table shows the readings of a pointer of a scale for different masses attached to it at different intervals.

Mass (kg)	0	0.2	0.4	0.6	0.8
Pointer reading (mm)	120	126	132	138	144
Force (N)					

- (i) **Copy and complete** the table to determine the force acting on each mass on the spring. [2]
 (ii) Plot a graph of force against extension. [4]
 (iii) Determine the extension for a force of 5N. [2]
 (c) Differentiate between plasticity and elasticity. [1]

[Total: 10 marks]