Centre Number	Examination Number

53006993

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level

Science 5124/1

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)

Time: 2 hours **Marks: 85**

Instructions to Candidates

1 Write the **centre number** and your **examination number** on **every page** of this question paper and on the separate Answer Booklet/Paper provided.

2 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

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

2 **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.

3 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	

This question paper consists of 16 printed pages.

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SECTION A

Answer **all** the questions in this section. Choose the best answer from the letters **A**, **B**, **C** or **D** and then mark the letter with a cross **(X)**.

For example if the answer is **B**, it is shown as:

A	B	C	D

ANSWER GRID

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D

11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D

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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 2×10^{-9}B.
B 2×10^{-6}B.
C 2×10^{6}B.
D 2×10^{9}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

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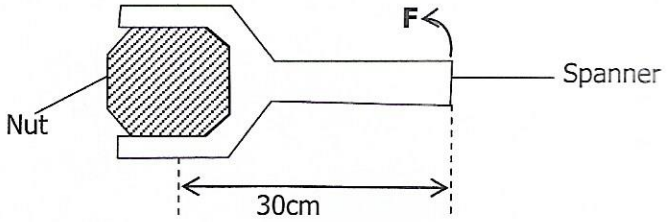
A6 The following diagram shows a 30cm spanner used to turn a nut with a force of 60N.



Find the moment of the force.

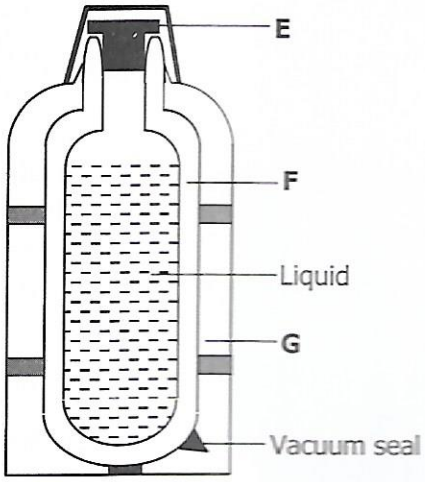
A 1.8Nm

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 ...

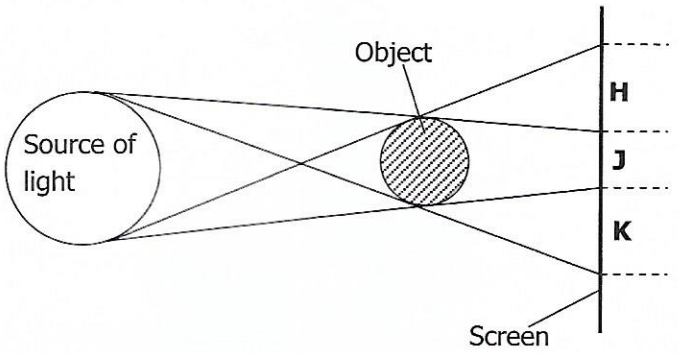
A absorbers of heat.

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 ...

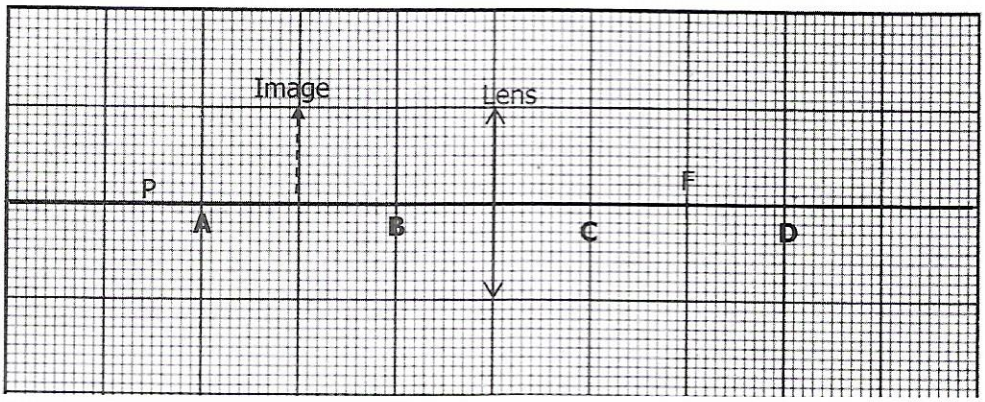
A diminished.

B magnified.

C upside down.

D virtual.

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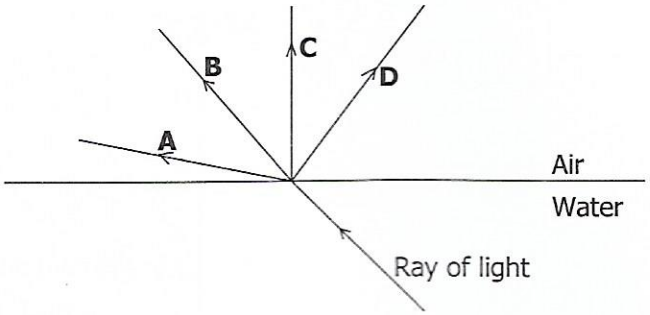
A12 The following diagram shows a ray of light emerging from water into air.



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

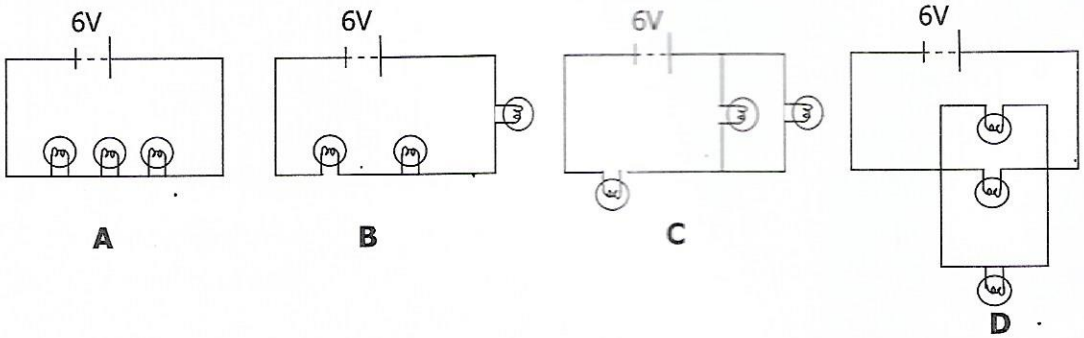
A14 Which of the following materials is most suitable for making permanent magnets?

A Brass
B Copper
C Iron
D Steel

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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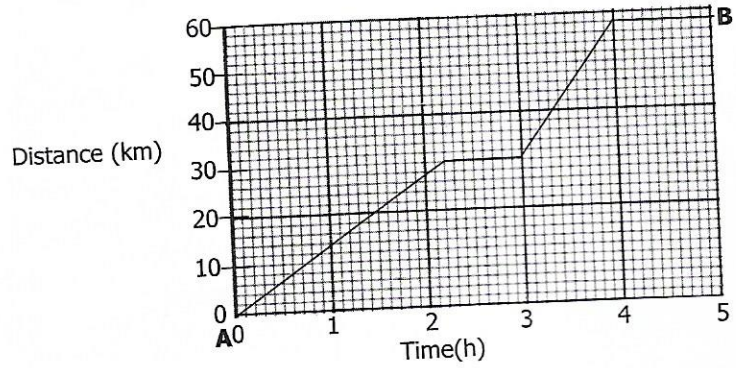
Section B [45 marks]

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]

(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]

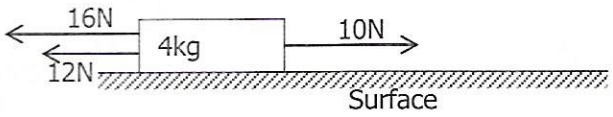
[Total: 7 marks]

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.

Acceleration = ... [2]

[Total: 3 marks]

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

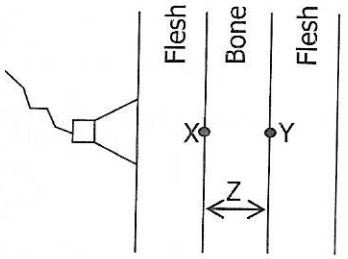


Figure B6.1

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.

Z = ... [2]

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

..... [1]

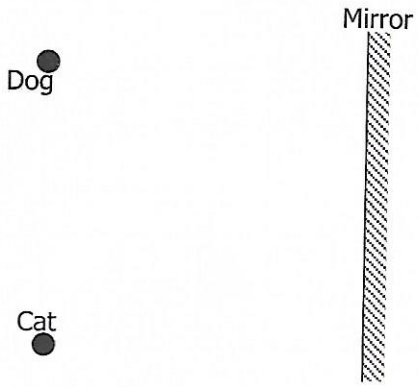
[Total: 4 marks]

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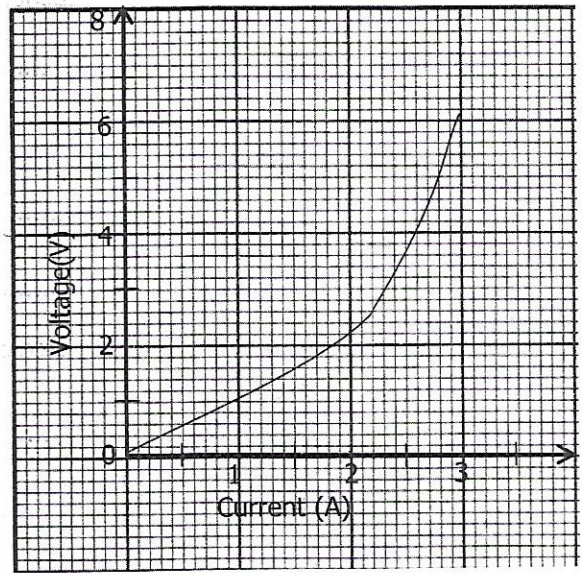
B8 The following diagram shows a graph of voltage against current of a conductor.



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

..... [1]

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

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 $\left({}^{235}_{92}\mathrm{U}\right)$ 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]

(ii) Given that the products of this reaction are $^{144}_{56}Ba$ and $^{90}_{36}Kr$ 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]