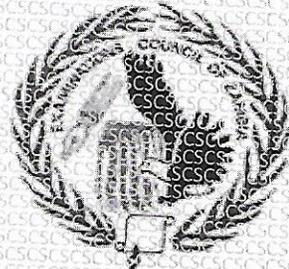




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EXAMINATIONS COUNCIL OF ZAMBIA



Examination for School Certificate Ordinary Level

Physics

Paper 1 Multiple Choice

5054/1

2020

Additional Materials:

- Multiple Choice answer sheet
- Soft clean eraser
- Soft pencil (type B or HB is recommended)
- Electronic Calculator (non-programmable)

Time: 1 hour

Marks: 40

Instructions to Candidates

- 1 Ensure that the **school/centre name, subject paper, subject code, paper number, centre code, your examination number** and the **year** are correctly printed and shaded on the Answer Sheet. Do not change the already printed information.
- 2 There are **forty** questions in this paper. **Answer all questions.**
- 3 For each question there are four possible answers: **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the Answer Sheet provided.

Information for Candidates

- 1 Each correct answer will score one mark.
- 2 Any rough working should be done in this Question Paper.
- 3 **Cell phones are not allowed in the examination room.**

1 Which instrument below can accurately measure the length of 0.023m?

- A Metre ruler
- B Measuring tape
- C Micrometer screw gauge
- D Vernier callipers

2 What is the name and value of the unit of current written as mA?

	Name	Value
A	Mega Amp	$10^{-3}A$
B	Milli Amp	$10^{-3}A$
C	Mega Amp	10^6A
D	Milli Amp	10^6A

3 Ten identical steel balls, each of mass 27g, were immersed in a measuring cylinder containing 20cm³ of water. If the water level rose to 50cm³, what was the density of the steel?

- A 13.5g/cm³
- B 9.0g/cm³
- C 8.1g/cm³
- D 0.9g/cm³

4 A learner was given a beaker containing 1 000 cubic centimetres of mercury. Given that the density of mercury is 13.6g/cm³, what was the mass of the mercury?

- A 1.36g
- B 13.6g
- C 1 360g
- D 13 600g

Handwritten notes: 10 x 270 = 2700 grams or 270 / 30

5 Which combination below shows vector and scalar quantities?

	Scalar	Vector	Scalar
A	Momentum	Weight	Power
B	Work	Current	Power
C	Momentum	Weight	Moment
D	Work	Current	Moment

Handwritten notes: 2.30m

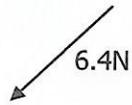
Handwritten notes: P = F x d / 10 = 2.3

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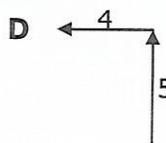
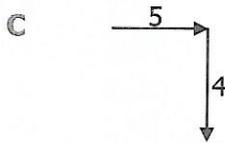
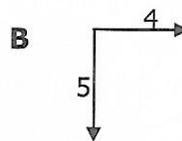
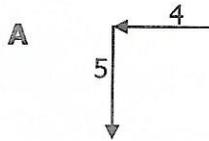
Physics/5054/1/2020

Handwritten notes: 2.30m, 0.1mm, 0.01cm, 0.001cm, 1000m, 0.0023, 1000cm³, A = m/r

6 The diagram below shows a resultant vector of magnitude 6.4N in the direction shown.



Which diagram shows the components of the above vector?



7 A learner drops a table tennis ball in air. What happens to the velocity and to the acceleration of the ball during the first few seconds after being released?

	Velocity	Acceleration
A	Increases	Decreases
B	Decreases	Increases
C	Increases	Remains the same
D	Decreases	Remains the same

$$s = \frac{\text{distance}}{\text{time}} = \frac{45}{4} \times 2$$

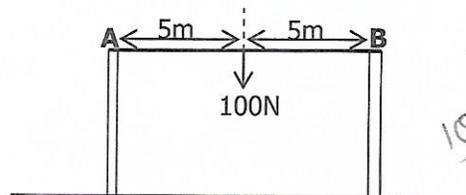
8 A car starting from rest travels 45m in 4s. What is the car's acceleration and velocity at this time?

	Acceleration (m/s ²)	Velocity (m/s)
A	3.000	20.0
B	5.625	22.5
C	6.000	25.0
D	10.625	32.5

$$s = \frac{d}{t} = \frac{45}{4} = 11.25$$

$$a = \frac{v-u}{t}$$

9 The diagram below shows a uniform metal bar **AB** on a goal post of length 10m and weight 100N.



$$T \times d = F \times d$$

$$\frac{100 \times 10}{5} = 5d$$

What is the upward force at **B**?

- A 4N
- B 10N
- C 20N
- D 50N

5.625

Resultant

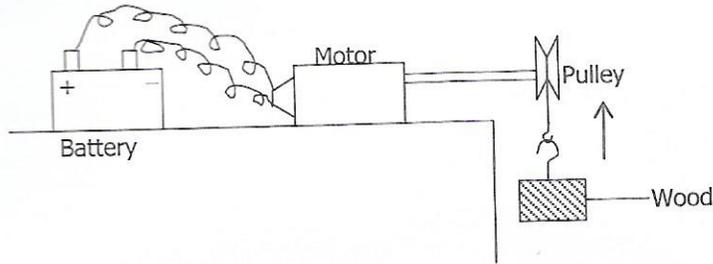
acceleration

$$\frac{45}{6} = 7.5$$

$$\frac{7.5}{t}$$

- 10 A body of mass 25kg was pulled across a level ground with a horizontal force of 60N. If the constant frictional force was 20N, what was the acceleration of the body?
- A 1.2m/s^2
 B 1.6m/s^2
 C 2.4m/s^2
 D 3.2m/s^2

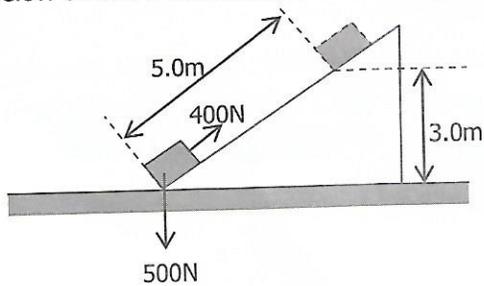
- 11 The diagram shows a battery-operated motor lifting a block of wood at constant speed.



What is the overall energy change taking place?

- A Chemical \rightarrow gravitational potential \rightarrow mechanical
 B Gravitational potential \rightarrow electrical \rightarrow mechanical
 C Chemical \rightarrow electrical \rightarrow mechanical
 D Kinetic \rightarrow electrical \rightarrow mechanical

- 12 The diagram below shows a load being pulled along an inclined plane.



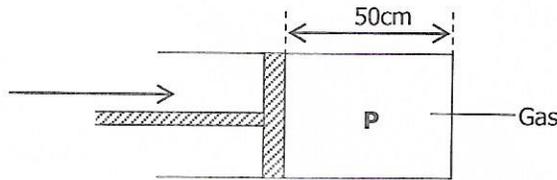
What is the gravitational potential energy (E) and the work done (W) against friction?

	E/J	W/J
A	1 200	2 500
B	1 500	2 000
C	2 000	1 500
D	2 500	2 500

- 13 Which formula gives the efficiency of an energy conversion?

- A Efficiency = total energy input - useful energy output
 B Efficiency = useful energy output - total energy input
 C Efficiency = $\frac{\text{useful energy output}}{\text{total energy input}}$
 D Efficiency = $\frac{\text{total energy input}}{\text{useful energy output}}$

- 14 A gas is trapped inside a cylinder by a movable piston. The length of the gas column is 50cm and the pressure inside the cylinder is P . The piston is pushed in a distance of 30cm, so that the length of the gas column is now 20cm. The temperature of the gas does not change.



What is the new pressure of the gas?

- A 2.5P
- B 1.5P
- C 0.6P
- D 0.4P

Handwritten notes for question 14:

$$P_1 V_1 = P_2 V_2$$

$$P \times 50 = P_2 \times 20$$

$$P_2 = \frac{P \times 50}{20} = 2.5P$$

- 15 Which statement is incorrect when a liquid is heated? The molecules ...

- A expand.
- B gain energy.
- C move faster.
- D move further apart.

Handwritten notes for question 15:

$$P = 0.4P$$

$$2.5P$$

- 16 A metal lid fits tightly on a glass jar. Which process makes it easier to remove the lid from the jar?

- A Cool the lid only
- B Warm the jar only
- C Warm the lid only
- D Put the jar in a refrigerator

Handwritten notes for question 16:

$$Q = mc\Delta T$$

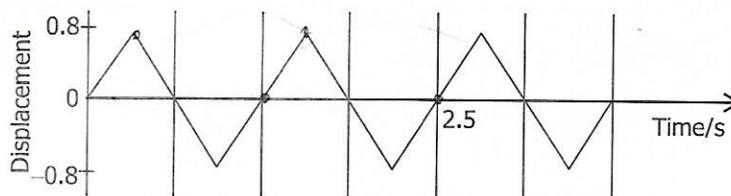
$$2400 = 2 \times 800 \Delta T$$

$$\Delta T = \frac{2400}{16} = 150$$

- 17 A block of metal has a mass of 2.0kg. Its specific heat capacity is 800J/(kg°C). The block is supplied with 2 400J of energy. What is the rise in temperature?

- A 1.5°C
- B 3.0°C
- C 4.5°C
- D 6.0°C

- 18 The diagram below shows variation of displacement of a wave with time at a particular point along the wave.



What is the frequency of the wave?

- A 0.625Hz
- B 0.800Hz
- C 1.250Hz
- D 2.500Hz

Handwritten notes for question 18:

$$f = \frac{1}{T}$$

$$f = \frac{1}{1} = 1 \text{ Hz}$$

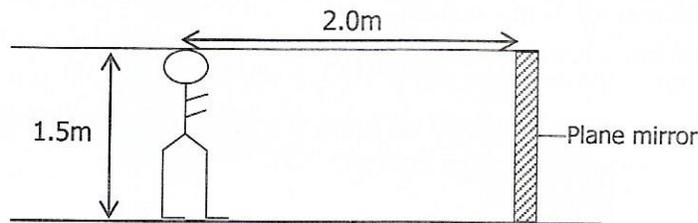
24 Which expression gives the distance travelled by an echo?

- A Distance = $2 \times \text{speed} \times \text{time}$
- B Distance = $\frac{2 \times \text{speed}}{\text{time}}$
- C Distance = $\frac{2 \times \text{time}}{\text{speed}}$
- D Distance = $\frac{\text{speed} \times \text{time}}{2}$

25 Which row shows parts of the electromagnetic spectrum in order of increasing wavelength?

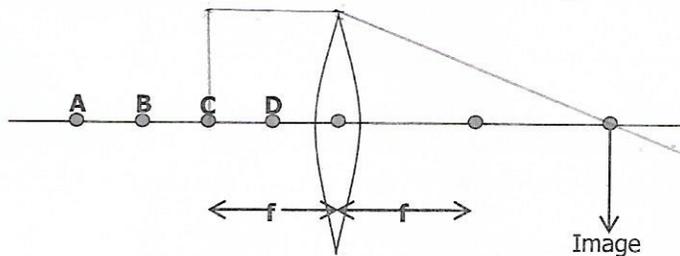
A	Ultra violet	Infra-red	Microwaves
B	Infra-red	Microwaves	Ultra violet
C	Ultra violet	Microwaves	Infra-red
D	Microwaves	Infra-red	Ultra violet

26 The diagram below shows a learner standing 2.0m in front of a plane mirror.



How far from the person is the image?

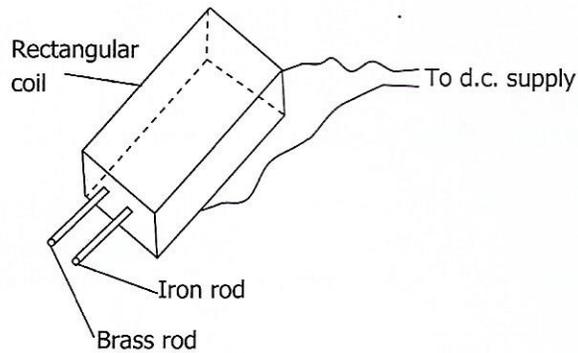
- A 2.0m
 - B 3.0m
 - C 3.5m
 - D 4.0m
- 27 The diagram below shows a converging lens of focal length f .



Where should the object be placed in order to produce the image shown?

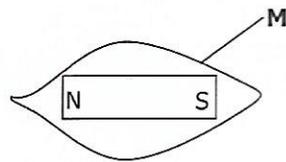
Handwritten notes:
 IR Gamma Radio
 Ultra Visual infra micro Radio
 IR Gamma Radio
 Ultra Visual infra micro Radio

- 28 The diagram below shows a brass rod and an iron rod beside each other at the bottom of a rectangular coil.



What happens when a direct current (d.c) passes through the rectangular coil?

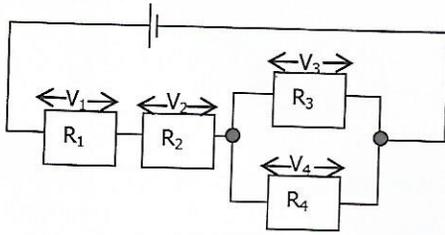
- A The two rods attract each other.
 - B The two rods repel each other.
 - C Only the iron rod is magnetised.
 - D Only the brass rod is magnetised.
- 29 The diagram below shows a magnet enclosed in a piece of metal **M**. A compass brought near the metal is unaffected by the magnet.



What material is metal **M** made of?

- A Copper
 - B Iron
 - C Silver
 - D Zinc
- 30 When a charge of 10C flows through a lamp, a current of 2A is observed on the ammeter. How much time does the charge take to flow through the lamp?
- A 5s
 - B 12s
 - C 20s
 - D 40s

- 31 The diagram below shows a circuit with a battery. Resistors R_1 and R_2 are connected in series while R_3 and R_4 are connected in parallel. The potential difference across the resistors are V_1 , V_2 , V_3 and V_4 .



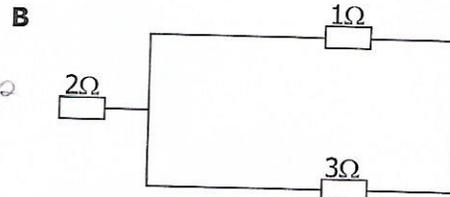
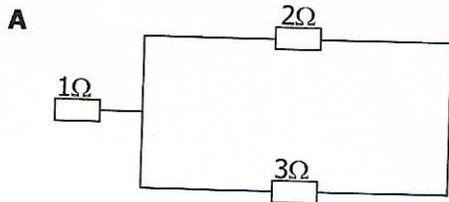
What is the potential difference (p.d) supplied by the battery?

- A $V_1 + V_2 + \frac{1}{V_3} + \frac{1}{V_4}$
- B $V_1 + V_2 + V_3 + V_4$
- C $V_1 + V_2 + V_3$
- D $V_1 + V_2$

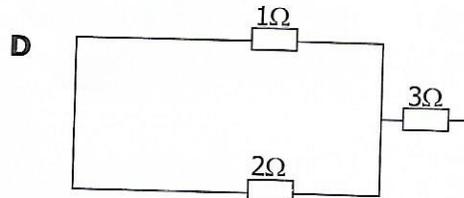
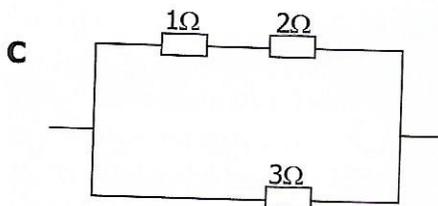
1.5 Ω

$R_1 R_2 = \frac{V_3 \times V_4}{V_3 + V_4}$

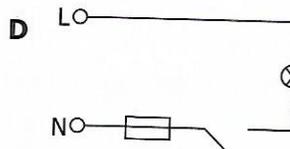
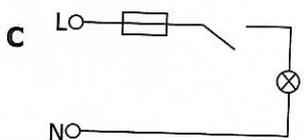
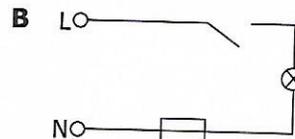
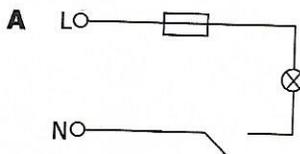
- 32 In an experiment, a resistance of 1.5Ω is required to determine the current, but resistors available are 1Ω , 2Ω and 3Ω . Which one of the following arrangements **A**, **B**, **C** or **D** would give the required resistance?



$R_1 R_2$



- 33 Which circuit shows the correct positions for the fuse and the switch in the lighting circuit of a house?

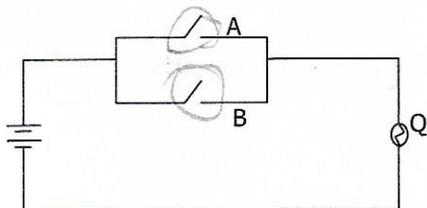


Key:
L = Live wire
N = Neutral wire

- 34 A household uses an electric fire rated 3kW and an electric kettle rated 2kW. If electrical energy costs K5.00 per unit, how long did it take the household to accrue a bill of K70.00?
- A 2 hours
 B 4 hours
 C 5 hours
 D 6 hours

Handwritten notes:
 3kW
 2kW
 $P \times t = 15 + 10$
 3kW
 2kW
 $E = P \times t = 5\text{kWh} \times 70$
 $5\text{kWh} = 70 / 5$
 $t = 14$

- 35 The diagram below shows a circuit diagram for a logic gate.



Which of the following truth tables has such a circuit?

A

A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

B

A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

C

A	B	Q
0	0	1
0	1	0
1	0	0
1	1	0

D

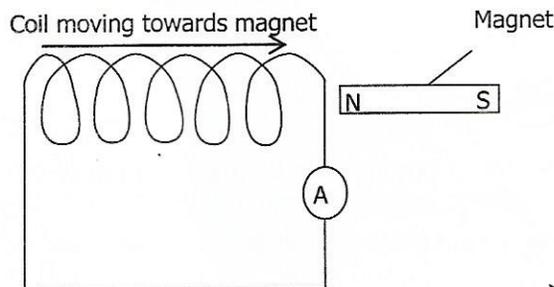
A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

Handwritten note: $E = P \times t \times 5$

Handwritten notes:
 $P \times t \times 5 = 70$
 $25t = 70$
 $t = 70 / 25$

Handwritten note: 2.8

- 36 The diagram shows how a magnet and a coil may be used to induce an electric current.

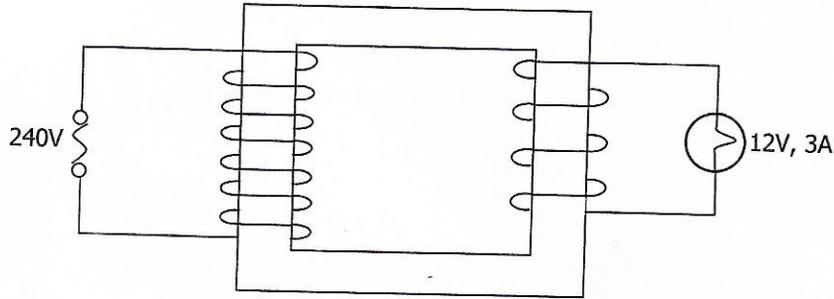


How could the ammeter reading be increased?

- A Use a coil with more turns.
 B Move the coil more slowly.
 C Put a resistor in series with the ammeter.
 D Turn the magnet round, then move the coil.

Handwritten notes:
 $P \times t \times 5 = 70$
 $5t \times 5 = 70$
 $25t = 70$
 $t = 70 / 25 = 2.8$

- 37 The diagram below shows a transformer that operates a lamp rated 12V, 3A.



$$V_s = V_p$$

$$\frac{V_s}{I_s} = \frac{V_p}{I_p}$$

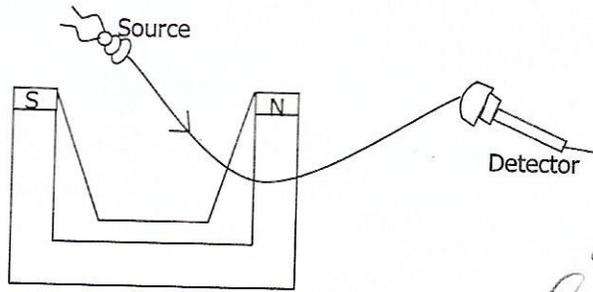
If the transformer has a 240V supply and it is 100% efficient, what current will flow in the supply?

$$V_1 I_1 = V_2 I_2$$

$$240 I_1 = 12 \times 3$$

- A 12A
- B 3.0A
- C 0.15A
- D 0.013A

- 38 The diagram shows one type of radiation passing between the poles of a strong magnet and being detected.



88p

Which type of radiation is being detected?

- A Alpha-particles only
- B Beta-particles only
- C Gamma rays only
- D Alpha and beta-particles

- 39 How many protons, neutrons and electrons are there in an atom of Radium (${}^{226}_{88}\text{Ra}$)?

	No. of protons	No. of neutrons	No. of electrons
A	138	226	88
B	88	88	138
C	138	88	88
D	88	138	88

138 neutrons

40 The half life of a radioactive substance is 3 minutes. What fraction of the radioactive substance will remain after 15 minutes?

- A $\frac{1}{4}$
- B $\frac{1}{8}$
- C $\frac{1}{16}$
- D $\frac{1}{32}$

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