Centre Number	Candidate Number

Candidate Name: _____

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level.

Physics 5054/2

PAPER 2

Wednesday 14 OCTOBER 2015

Additional materials:
Graph paper
Electronic calculator/Mathematical tables
Answer Booklet

Time: 2 hours

Instructions to candidates

Write your name, centre number and candidate number in the spaces provided at the top of this page and on any separate Answer Booklet/paper used.

Section A

Answer **all** questions.

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

Section B

Answer **any three** questions.

Write your answers on the separate Answer Booklet provided.

At the end of the examination:

1 fasten separate Answer Booklets used securely to the question paper,

2 tick the numbers of the Section **B** questions you have answered in the grid below.

Information for candidates

The number of marks is given in brackets [ ] at the end of each question or part question. Candidates are reminded that **all** quantitative answers should include appropriate units.

Tick the questions answered in **Section B** in the grid.

Candidates are advised to **show all their working** in a clear and orderly manner, as more marks are awarded for

Candidate's Use	Examiner's Use
Section A	
Section B 9	
10	
11	
12	
TOTAL	

SECTION A
[50 marks]

Answer **all** the questions.

1 **Figure 1.1** shows a simple pendulum suspended from a clamp stand. The bob is pulled slightly to one side at position A and then released.

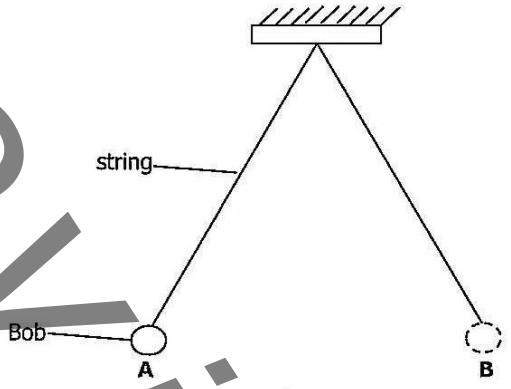


Figure 1.1

(a) What energy changes take place between A and B?

.....[1]

(b) Describe briefly how you would use a stop clock to determine the period of oscillation of the pendulum.

.....

.....

.....

..... [3]

(c) The following values of time for 20 oscillations were obtained:
16.1 15.9 16.0 16.2 15.8
Determine the period of the pendulum.

.....

.....

.....[2]

Total [6]

2 A bus driver saw a boy crossing the road ahead and applied emergency brakes. During his reaction time, the bus travelled at a steady speed and then slowed down until it finally stopped. ***Figure 2.1*** shows the graph of the motion of the bus.

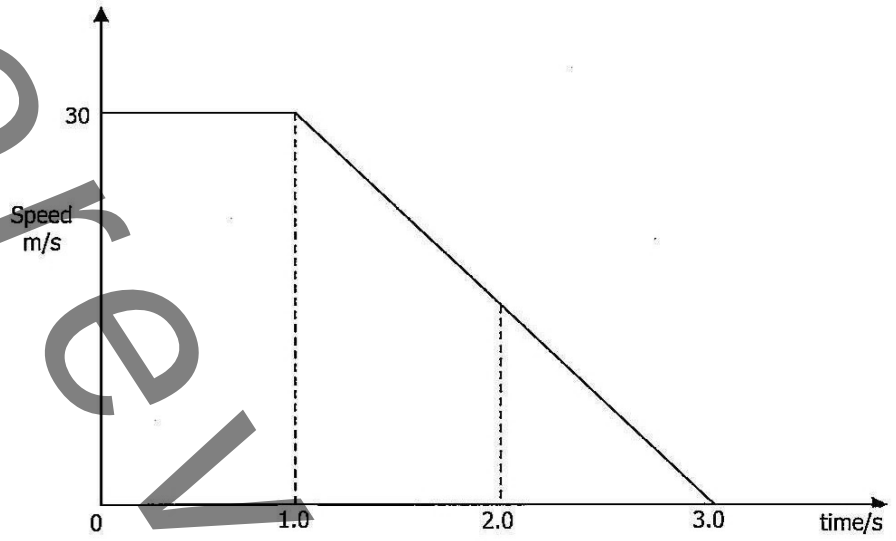


Figure 2.1

From the graph,

(a) calculate the distance covered during the reaction time.

.....

.....

..... [2]

(b) find the deceleration of the bus.

.....

.....

..... [2]

(c) determine the force provided by the brakes if the average mass of the bus was 1 600kg.

.....

.....

3 A journey consists of two displacements. The first is 500m in the northerly direction and the second is 200m in an easterly direction.

(a) In the space below, draw to scale a vector diagram of these displacements. [2]

State the scale of your diagram. On your diagram, show the two displacements and the resultant displacement.

Determine the size (magnitude) and direction of the resultant displacement.

Scale .....

Size .....

Direction ..... [3]

(b) Another journey covers a distance of 700m. Describe how possible it is that this journey has no resultant displacement.

.....

..... [1]

Total [6]

4 ***Figure 4.1*** shows a ball just before sliding down a smooth slope.

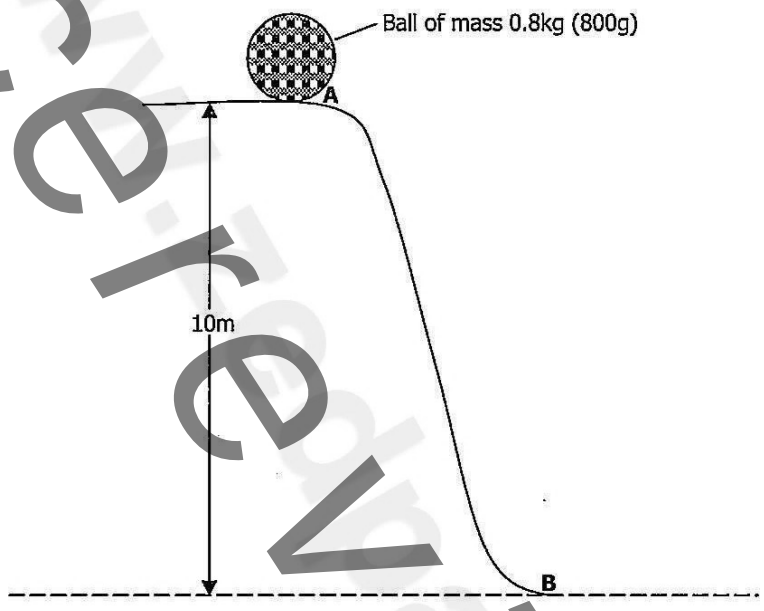


Figure 4.1

(a) What is the potential energy of the ball at A?

.....

..... [2]

(b) What is the kinetic energy of the ball as it reaches B?

.....

..... [1]

(c) Find its velocity as it reaches B.

.....

..... [2]

(d) State the law of conservation of energy.

.....

..... [1]

5 **(a)** In an experiment to determine the specific heat capacity of substance K, 50g of the substance was heated and the temperature rose from 20°C to 65°C in 20 minutes. 9180J of heat energy was used during the process.

(i) What is meant by specific heat capacity?

.....

..... [1]

(ii) Calculate the specific heat capacity of substance K.

.....

.....

.....

.....

..... [2]

(b) An immersion heater was inserted in a large block of ice at 0°C. If the heater was rated at 150W and the specific heat capacity of fusion of ice is 300J/g, how long does it take to melt 10g of the ice?

.....

.....

.....

.....

6 ***Figure 6.1*** shows an electrical circuit containing two resistors.

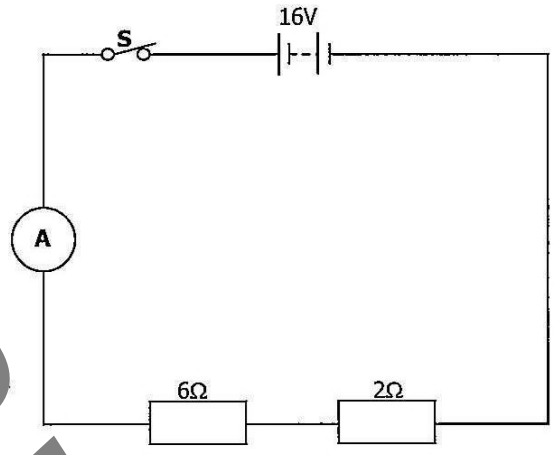


Figure 6.1

(a) **(i)** On the diagram above, draw a voltmeter to measure the potential difference across the 6Ω resistor. [1]

(ii) When the switch **S** is closed, calculate the current through the ammeter **(A)**.

.....

..... [2]

(b) **(i)** What is the potential difference across the 6Ω resistor?

.....

..... [2]

(ii) If the 6Ω resistor is replaced with two 4Ω resistors in parallel, find the current in the circuit.

.....

.....

..... [3]

Total [8]

7 One end of a long spring was fixed to a wall. The free end of the spring is moved up and down.

(a) Draw a diagram to show the wave generated.

[2]

(b) Name the type of the wave generated.

..... [1]

(c) Describe the motion of a particle that is part of a

(i) longitudinal wave .....

..... [1]

(ii) transverse wave .....

..... [1]

Total [5]

8 Uranium $^{238}_{92}U$ decays to form a nucleus of thorium by emission of an alpha particle. Thorium has the symbol, $^{234}_{90}Th$.

(a) What is the meaning of nucleon number?

.....

..... [1]

(b) State the proton number and nucleon number of an alpha particle.

Proton number.....

Nucleon number..... [2]

(c) Write a decay equation to show how Uranium $^{238}_{92}U$ decays to $^{234}_{90}Th$ after emitting an alpha particle.

.....

..... [2]

(d) Thorium -234 ($^{234}_{90}Th$) decays to an isotope of protoactinium (Pa) by beta decay. Write the decay equation to show this process.

.....

..... [2]

Total [7]

SECTION B

(45 marks)

There are **four (4)** questions in this section.

Answer any **three (3)** questions.

Each question carries 15 marks.

9 **(a)** Define the lower fixed point and the upper fixed point of a laboratory thermometer. [2]

(b) Describe how you would check for the accuracy of the fixed points on a mercury-in-glass thermometer. [3]

(c) State the difference between heat and temperature. [2]

(d) Draw and label a mercury-in-glass clinical thermometer. [4]

(e) Explain why a clinical thermometer has a

(i) Small bulb

(ii) Constriction

(iii) Bulb made of thin glass

(iv) Short range [4]

Total [15]

10 **(a)** Describe an experiment which demonstrates that light is refracted when it passes through a denser medium. [5]

(b) ***Figure 10.1*** shows a table that was obtained from an experiment done to determine the refractive index of glass.

Angle of incidence (i)	Angle of refractive (r)	Sin i	Sin r
15°	10°		
30°	19°		
45°	28°		
60°	35°		
70°	39°		
80°	41°		

Figure 10.1

(i) Copy and complete the table. [3]

(ii) Plot a graph of *Sin i* against *Sin r.* [3]

(iii) Using the graph, determine the refractive index (n) of the glass. [2]

(iv) Calculate the critical angle of the material above. [2]

Total [15]

11 **(a)** ***Figure 11.1*** below shows an electric kettle which is rated 2400W, 240V.

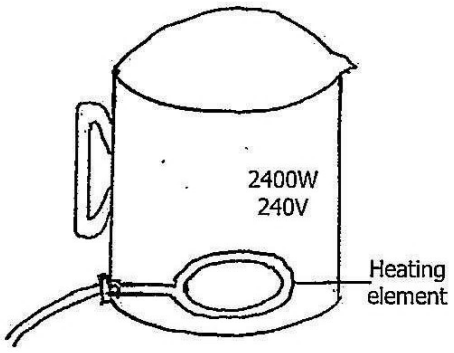


Figure 11.1

(i) State the power rating of the kettle in kilowatts. [2]

(ii) How many units of electric energy would the kettle use in 4 hours when connected to a 240V mains? [2]

(iii) The cost of one unit of electricity is 30n. How much would it cost to use the kettle for four (4) hours? [3]

(iv) Calculate the current flowing through the element of the kettle when in use. [2]

(v) Suggest the size of a fuse suitable for the plug of this electric kettle. [2]

(b) ***Figure 11.2*** below shows an electric kettle which is rated 2400W, 240V.

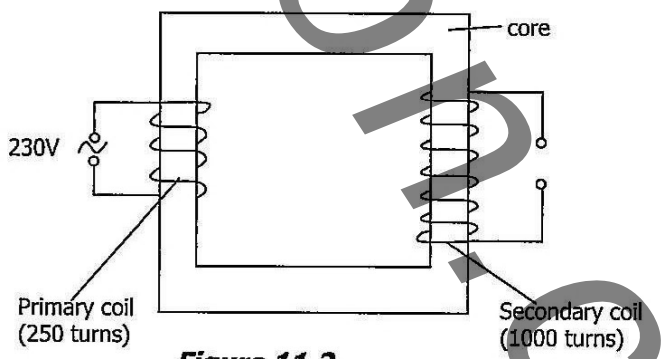


Figure 11.2

(i) How can you tell from the diagram that this is a step-up transformer? [1]

(ii) Calculate the output voltage of the transformer. [2]

(iii) Suggest a suitable material that could have been used to make the core of the transformer.

Total [15]

12 **(a)** Three locks are used to unlock a safe in a bank. The bank manager can unlock alone, or his assistant managers together or all of them. ***Figure 12.1*** shows the circuit which is used.

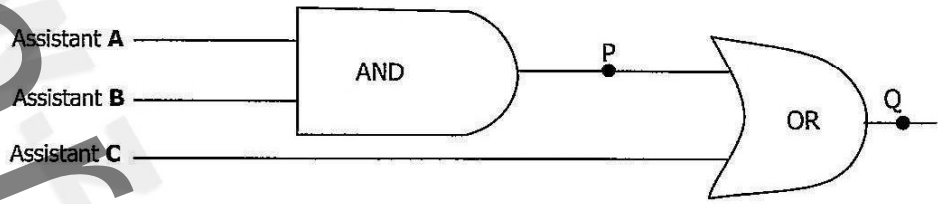


Figure 12.1

(i) Copy and complete the truth table below which shows the operation of the locks.
Use 0 for lock closed and 1 for lock opened. [2]

INPUT			OUTPUT	
A	B	C	P	Q
0	0	0		
0	0	1		
1	0	0		
0	1	0		
1	1	0		

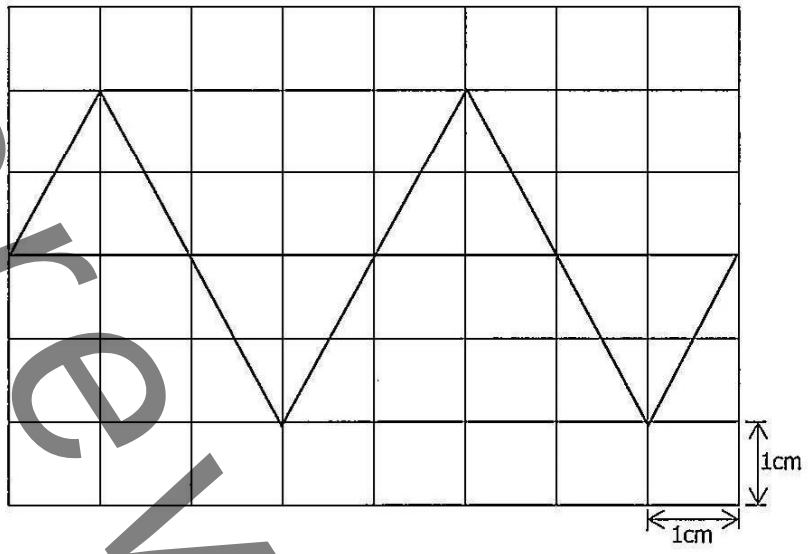
(ii) Briefly describe what should happen for the safe to open. [2]

(iii) Describe the action of a NAND gate. [3]

(iv) Copy and complete the truth table of a NAND gate. [2]

INPUT A	INPUT B	OUTPUT P

(b) ***Figure 12.2*** below shows the waveform obtained on a Cathode Ray Oscilloscope (CRO)



Calculate the

(i) Peak voltage

(ii) Period of the wave

(iii) Frequency of the wave [6]

Total [15]