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0103/202 0305/202  
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0202/202 0404/202  
0301/202 0405/202

SCIENCE  
June/July, 1992  
TIME: 2½ hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

## ARTISAN CERTIFICATE

GENERAL FITTER  
CARPENTRY AND JOINERY  
MOTOR VEHICLE MECHANIC  
MASONRY  
AGRICULTURAL MECHANICS  
PLUMBING  
AGRICULTURE

WELDING AND FABRICATION  
GARMENT MAKING  
ELECTRICAL INSTALLATION  
FOOD BEVERAGE  
PRODUCTION AND SERVICES  
LEATHER WORK TECHNOLOGY

SCIENCE

2½ hours

### INSTRUCTIONS TO CANDIDATES:

You should have the following for this examination:

Answer booklet  
Drawing Instruments  
Mathematical Tables

*This paper contains **THREE** sections A, B and C.*

*Section A: Answer **ALL** the questions.*

*Section B: Answer any **TWO** questions.*

*Section C: Answer any **ONE** question.*

Take acceleration due to gravity to be  $10\text{m/s}^2$   
Electronic calculators **MUST** not be used.

This paper consists of 10 printed pages

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SECTION A (55 marks)

Answer **ALL** the questions in this section.

1. (a) Figure 1 shows a displacement can used to measure the volume of an irregularly shaped object.

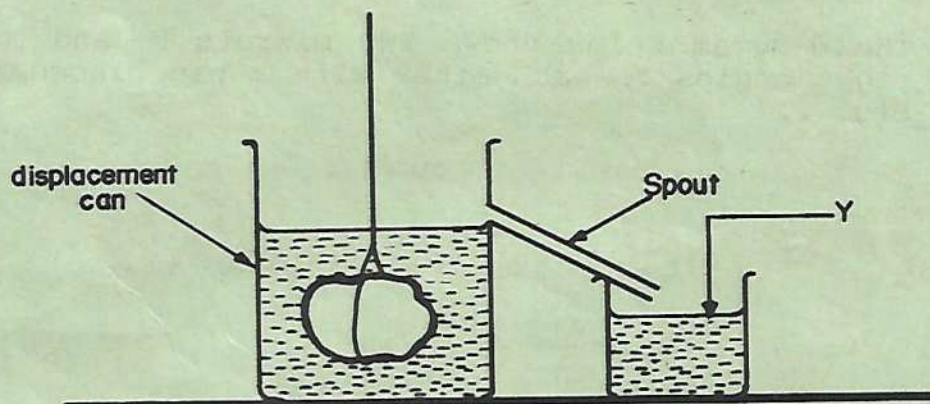


FIGURE 1

- (i) If the volume of the liquid collected in the measuring cylinder is 25ml, what is the volume of the object?  
(1 mark)
- (ii) Identify the surface marked Y and give an example of a liquid with such type of surface.  
(1 mark)
- (b) A farmer measures his land using a tape and finds it to be 1500m long by 1200m wide. What is the size of his land in hectares.  
(1 mark)
2. (a) The current passing through an electric item was measured with a milliammeter and found to be 100 milliamperes. Express this result in amperes.  
(1 mark)
- (b) Give ONE example where friction is not helpful and suggest ONE way of reducing it.  
(2 marks)
3. A crane is used to lift a body of mass 1000kg through a vertical distance of 1.5m. Calculate the work done against gravity.  
(2 marks)

4. (a) (i) State ONE law of refraction: (1 mark)
- (b) Give TWO practical cases where refraction is seen in everyday life. (2 marks)
5. The diagram below shows TWO mirrors  $M_1$  and  $M_2$  placed at right angles to each other with a pin placed as shown in Fig. 2.

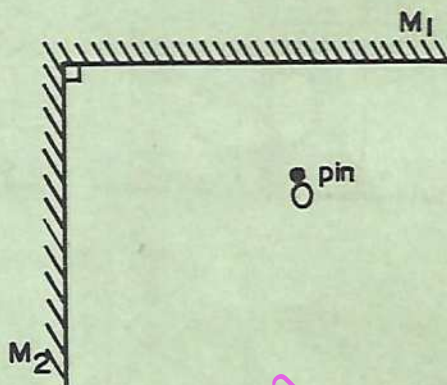


FIGURE 2

- Copy the diagram and draw a ray diagram to show the images formed assuming a single reflection. (3 marks)
6. (a) Define frequency. (1 mark)
- (b) Give TWO properties of sound. (2 marks)
7. (a) What are compounds? (1 mark)
- (b) Give TWO differences between mixtures and compounds. (2 marks)
8. (a) Give ONE property of an acid. (1 mark)
- (b) With the aid of a sketch show the atomic structure of chlorine and state its atomic number. (2 marks)
9. (a) (i) Name the type of reaction that occurs when a base reacts with an acid.
- (ii) Name TWO products that are formed as a result. (1½ marks)

- (b) Name THREE indicators commonly used to identify acids or bases. (1½ marks)
10. (a) Distinguish between velocity and speed. (1 mark)
- (b) A trolley of mass 5.0kg rests on a smooth horizontal track. A forward force of 4.5N is then applied. If friction is ignored, determine the acceleration of the trolley. (2 marks)
11. The apparatus shown in Figure 3 was used to find the density of air.

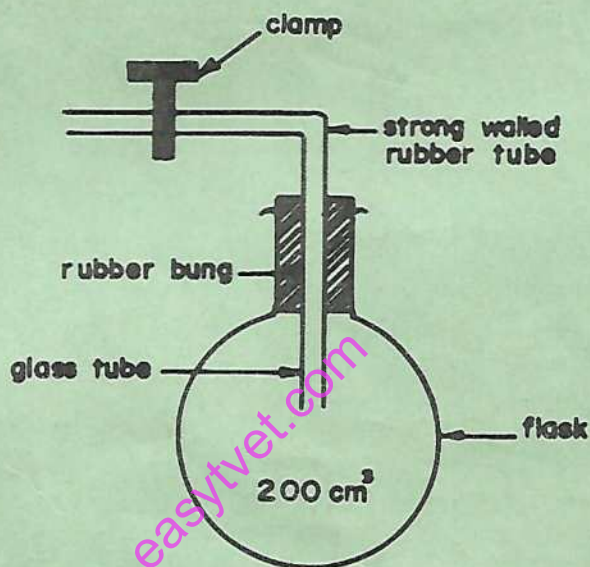


FIGURE 3

- When all the air has been pumped out its mass was 203g and when air was re-admitted its mass was 204g. Calculate the density of air. (3 marks)
12. (a) State the Archimedes' principle. (1 mark)
- (b) A boat floating in sea water of density 1030kg/m<sup>3</sup> displaces 2500m<sup>3</sup> of water. Calculate the mass of the boat. (2 marks)
13. (a) Name the instrument used to measure atmospheric pressure and give TWO examples. (1½ marks)

- (b) A vehicle travelling at 72km/h suddenly comes to rest after only 2.5 seconds. Determine the distance it had covered before it came to rest.

(1½ marks)

14. (a) Define moment of a force.

(1 mark)

- (b) Figure 4 below shows a hinged gate being pulled by three boys at the distances shown. The gate is in equilibrium.

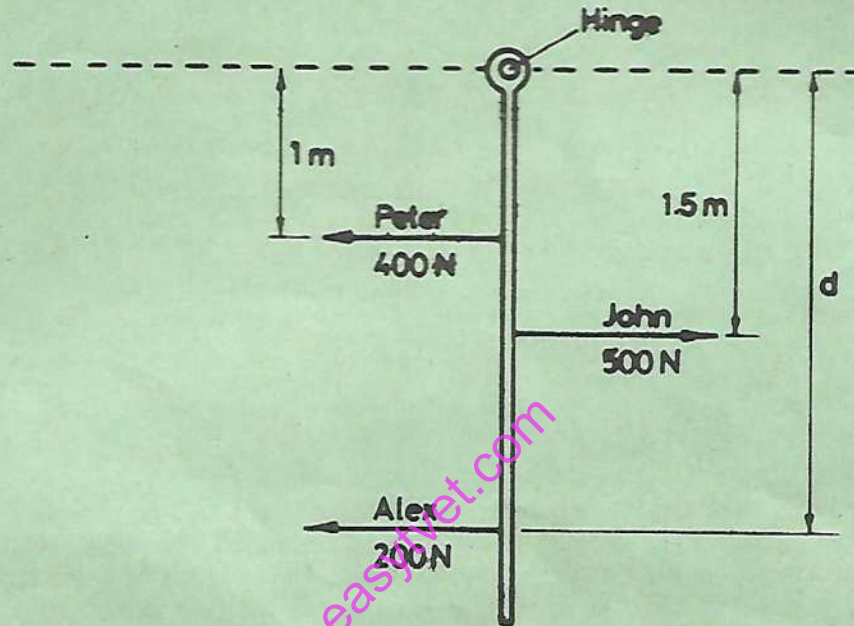


FIGURE 4

Determine the distance from the hinge (d) at which ALEX is pulling.

(2 marks)

15. Outline THREE methods used in the industrial extraction of metals.

(3 marks)

16. Give the expressions for the velocity ratios of the following:-

(a) Wheel and axle

(b) Bolt and nut.

(2 marks)

17. (a) What is a magnetic material?

(1 mark)

(b) Give TWO examples of magnetic materials.

(1 mark)

18. An accumulator is used to light 3 bulbs of resistances  $1\Omega$ ,  $3\Omega$  and  $4\Omega$  arranged in series.

Calculate the current flowing if the voltage is 4V.

(2 marks)

19. Distinguish between kinetic and potential energies.

(2 marks)

20. (a) State TWO practical uses of thermal expansion and contraction.

(2 marks)

- (b) Name TWO forms in which iron is available.

(1 mark)

### SECTION B (30 marks)

Answer any TWO questions from this section.

21. (a) Define the terms:-

(i) work

(ii) efficiency.

(2 marks)

- (b) A man using a screw jack applies a force of 300N to the end of the jack handle and moves this force through a distance of 0.6m along its line of action. The screw jack is then able to raise a load of 40000N through a vertical distance of 2mm. Calculate

(i) the work input

(ii) the work output.

(3 marks)

- (c) The following data represent the velocity of a body from rest.

Time (s)	0	1	2	3	4	5	6	7	8	9	10
Velocity(m/s)	0	5	10	15	20	20	20	17.5	15	12.5	10

Plot a graph of velocity against time and from the graph determine,

(5 marks)

(i) the total distance travelled

(3 marks)

(ii) the uniform acceleration in the first 4 seconds.

(2 marks)

22. (a) Figure 5 shows sets of bar magnets placed facing each other. In each case copy the bar magnets and draw lines of magnetic force between the poles.

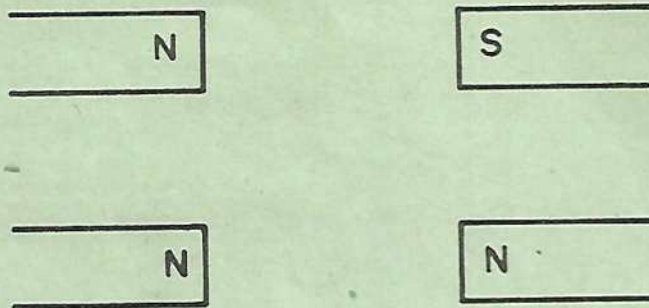


FIGURE 5

(4 marks)

- (b) State THREE applications of magnetization in everyday life.

(3 marks)

- (c) The diagram of Fig. 6 shows the sectional view through a Leclanche' cell.

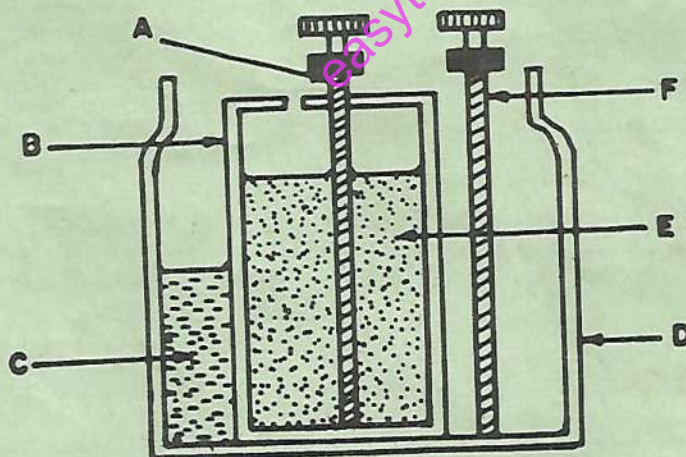


FIGURE 6

- (i) Label all the parts indicated. (6 marks)
- (ii) State TWO advantages of a dry cell over a wet cell. (2 marks)

23. (a) The diagram of Fig. 7 shows a bimetallic strip used as a thermostat.

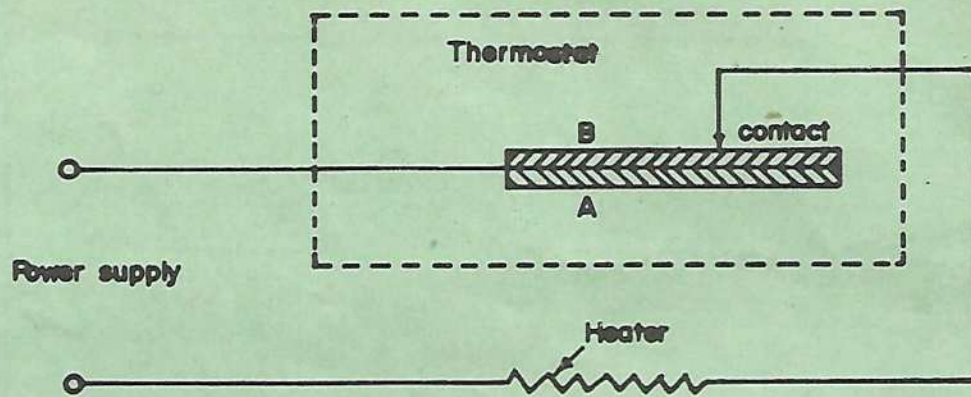


FIGURE 7

- (i) Which of the metals A and B expands more than the other. (1 mark)
- (ii) Briefly explain how the thermostat works. (5 marks)
- (iii) Name TWO other uses of a bimetallic strip in everyday life. (1 mark)
- (b) (i) Briefly explain the convection method of heat transfer. (5 marks)
- (ii) State THREE uses of convection in everyday life. (3 marks)



SECTION C (15 marks)

Answer ONE question from this section.

24. (a) The diagram in Fig. 8 shows a simple way of preparing oxygen in a laboratory.

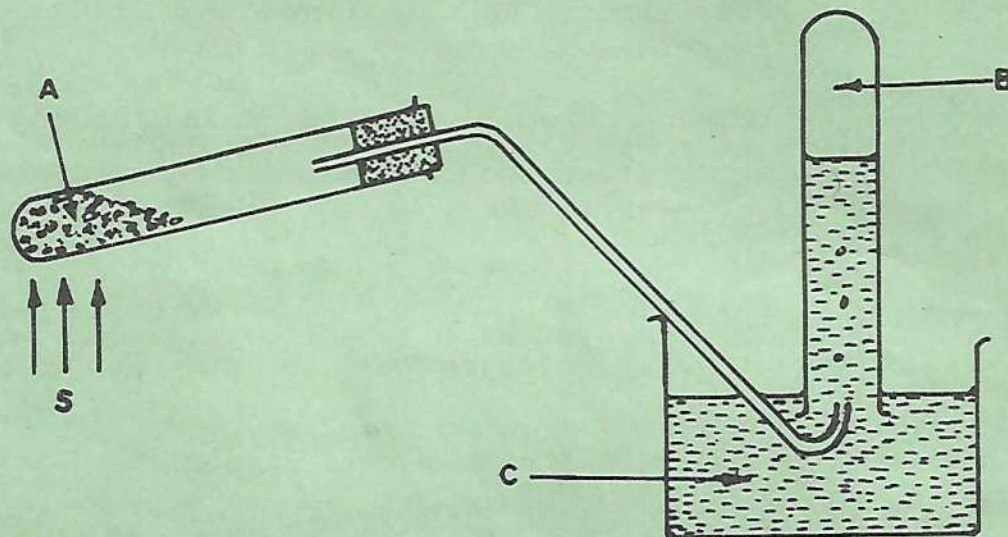


FIGURE 8

- (i) State what is applied at the arrows "S". (1 mark)
- (ii) Name the substances A, B and C. (3 marks)
- (iii) State THREE products formed when carbon compounds burn in insufficient air. (3 marks)
- (b) (i) State TWO properties of hydrogen. (1 mark)
- (ii) State TWO uses of hydrogen. (2 marks)
- (iii) State what happens when a balloon is filled with hydrogen and why this happens. (2 marks)
- (c) Name TWO forms in which pure carbon exists. (2 marks)
- (d) What is meant by pH value? (1 mark)

25. (a) (i) State the metals that combine to form the alloy brass. (2 marks)
- (ii) State ONE use of brass and ONE use of steel. (1 mark)
- (iii) State ONE reason that makes chrome suitable as an alloying element for steel. (1 mark)
- (b) (i) State TWO reasons why copper is used in making items such as boilers, car radiators and heating appliances. (2 marks)
- (ii) Explain how blister copper is produced in a converter of the Bessemer type and state why it is referred to as blister copper. (3 marks)
- (c) Describe the chemical extraction of iron. (6 marks)

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