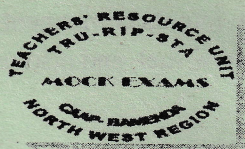


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Paix-Travail-Patrie

MINISTRE DES ENSEIGNEMENTS SECONDAIRES

CELLULE D'APPUI A L'ACTION PEDAGOGIQUE
ANTENNE REGIONALE DU NORD OUEST

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REPUBLIC OF CAMEROON
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MINISTRY OF SECONDARY EDUCATION

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MARCH 2026

The Teachers' Resource Centre and the Regional Inspectorate of Pedagogy in charge of Industrial Techniques. NWAPT	SUBJECT CODE NUMBER 5155	PAPER NO 2
TECHNICAL VOCATIONAL EDUCATION INTERMEDIATE LEVEL REGIONAL MOCK EXAMINATION	SPECIALTY All INDUSTRIAL	
INDUSTRIAL TECHNIQUES.	SUBJECT TITLE ENGINEERING SCIENCE	

Time Allowed: **TWO and a half hours**

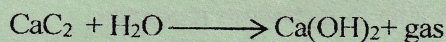
INSTRUCTIONS TO CANDIDATES

Mobile phones are **NOT ALLOWED** in the examination room.

Attempt six questions with question one being compulsory

Either 1a, b or c OR 1d, e, f

1. The decomposition by water of Calcium carbide into its component parts produces slaked lime and a combustible fuel which is used in the Oxyacetylene fuel, and also used in the Oxyacetylene burner.



Calcium Carbide Slaked lime

Carbide

(Ca=40g/mol, C=12g/mol, H=1, O=16g/mol)

- (a) (i) Name the gas obtained and give its formula (2 marks)
 (ii) Balance the equation of the chemical reaction (2 marks)
 (iii) Calculate the mass of slaked lime obtained from 2.5g of calcium carbide (2 marks)

- (b) A current of 2A is passed through molten lithium hydride for 15 minutes. (Molar Volume of gas is 2400 cm^3 at r. t. p) Calculate:

- (i) The number of Faradays used in this experiment. (2 marks)
 (ii) The number of moles of Lithium atoms produced (2 marks)
 (iii) The volume of gas produced at room temperature and atmospheric pressure (r.t.p) (2 marks)

- (c) A refinery wants to increase the production of high-octane petrol.

- (i) Explain how catalytic cracking helps to achieve this increase production of high-octane petrol (2 marks)
 (ii) Name one environmental problem that may arise from increased petrol consumption. (1 mark)

OR 1 d, e, f

- (d) (i) Explain the difference between a strong acid and a weak acid, giving an example of each (2 marks)
 (iii) Calcium carbonate reacts with Hydrochloric acid. Write the equation of this reaction and name the gas. (3 marks)

- (e) The element barium (Ba) is a group II element of the periodic table. An atom of barium is represented as $^{137}_{56}\text{Ba}$

- (i) What is the atomic number of barium, and what does it represent? (2 marks)
 (ii) How many neutrons are present in an atom of barium-137? (1 mark)
 (iii) How many electrons are there in the outer most shell of barium? (1 mark)
 (iv) Why does barium form a Ba^{2+} ion rather than Ba^{+} ? (2 marks)

- (f) 15 g of magnesium reacts with excess oxygen to form magnesium oxide

- (i) Calculate the moles of magnesium used (2 marks)
 (ii) Write the equation to show the formation of magnesium oxide and determine how many moles of MgO are formed (2 marks)

2. (a). The diagram below represents a distance (m) –time (s) graph of a car's journey.

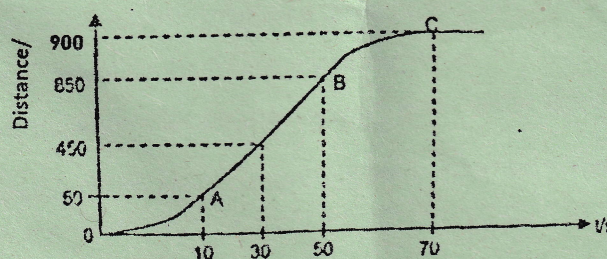


Figure 1

- (i) Describe briefly, the motion of the car represented by 0A, AB, and BC (3 marks)
 (ii) What is the car's average speed during the first 10s? (2 marks)

- (iii) What is the speed of the car after 30s? (2 marks)
 (iv) Determine the total distance travelled by the car (1 mark)

(b) A uniform beam is pivoted at its centre of gravity and different forces are applied to it at different positions as shown in figure 2.

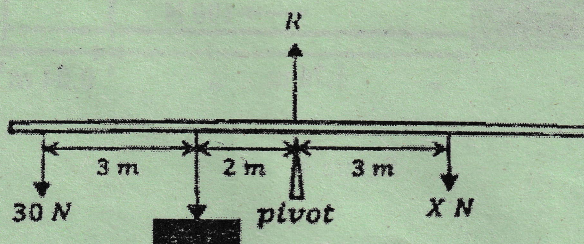


Figure 2

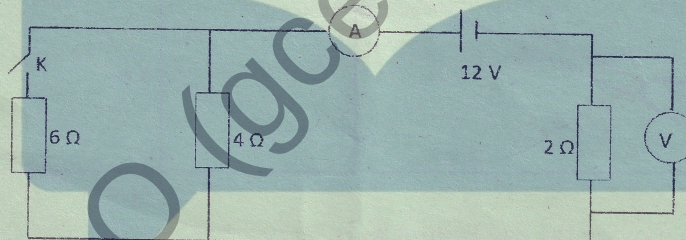
- (i) State the principle of moments. (2 marks)
 (ii) Determine the value of X, assuming that the beam is balanced. (2 marks)
 (iii) Calculate the reaction force acting at the pivot, given that the beam is balanced. (2 marks)

(c) State one difference between mass and weight. (1 mark)

3. (a) A fuse in a circuit is rated at 5A.

- (i) Explain what happens if a device that draws 8A is used (2 marks)
 (ii) Why are household circuits wired in parallel instead of series? (1 mark)

(b) Figure 3 below shows a simple d.c circuit.



Consider when the key, K is open,

- (i) What will be the ammeter reading? (2 marks)
 (ii) What will be the voltmeter reading? (1 mark)

(c) Calculate the combined resistance of the circuit when the key, k is closed (2marks)

(d) Determine the ammeter reading when the key K, is closed. (2 marks)

(c) ENEO charges electrical energy in KWh

- (i) What is the equivalence of 1KWh in joules? (2 marks)
 (ii) 1000W electric cooker and a 3000W immersion heater are allowed to function for 10 hours in a day. Calculate the cost of electricity used given that 1kWh cost 75frs (3 marks)

4. (a) (i) Give two properties of plastics, which make them useful as engineering materials (2 marks)
 (ii) Give the difference between thermoplastics and thermosetting plastics (2 marks)
 (iii) Explain why thermoplastics can be recycled but thermosets cannot. (1 mark)

- b) Figure 4 consists of a copper wire which has a diameter of 0.24 mm, and was stretched using a force of 100 N.

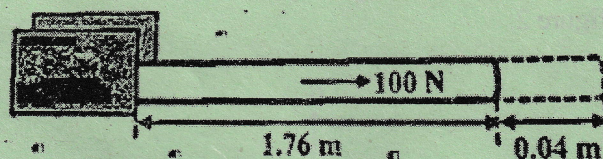


Figure 4

Calculate:

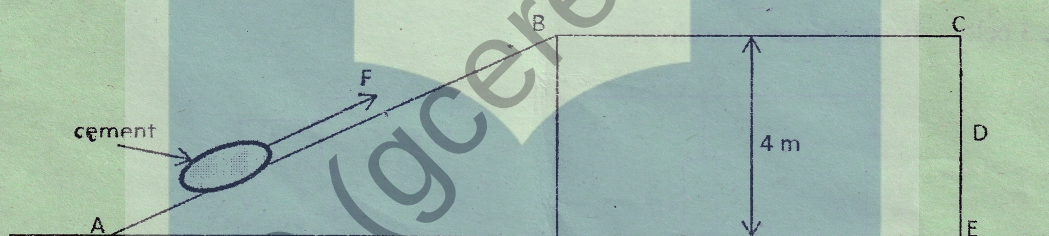
- (i) The stress in the wire (2 marks)
- (ii) The strain in the wire (2 marks)
- (iii) The modulus of elasticity of the material (2 marks)

- (c) A metal wire of natural length 1.2 m and cross-sectional area $2 \times 10^{-2} \text{ m}^2$ is hung vertically.

A mass of 5.0 kg is attached to its end, and it stretches by 4.0 mm.

- (i) Calculate the tension in the wire (2 marks)
- (ii) Determine the spring constant (k) of the wire (2 marks)

5. (a) Figure 5 below shows a 50 kg bag of cement that has to be raised by a man using an applied force F, from a level AE onto the platform BC through the distance AB, which is 10 m long by applying the constant force of 250 N parallel to the plank AB. Calculate:



- (i) The work done in moving the bag from A to B (2 marks)
 - (ii) The useful work done (2 marks)
 - (iii) What is the efficiency of the arrangement? (2 marks)
 - (iv) Give one reason why the efficiency is less than 100% (1 mark)
- (b) A car of mass 1000 kg moving at 20 m/s accelerates uniformly and triples its speed in 14.5 seconds.
- Calculate:
- (i) The change in the kinetic energy (2 marks)
 - (ii) The power developed (2 marks)
- (c) Alternative energy sources to fossil fuels include sun, wind. For each source, give an example of how energy may be obtained from it. (2 marks)
- (d) (i) Identify the safety symbols A and B in figure 6. (1 mark)

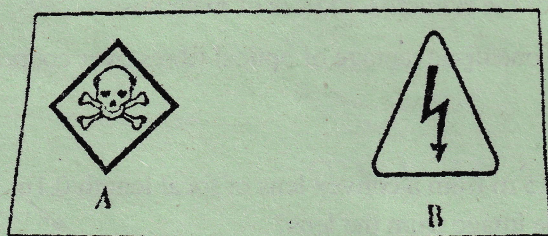


Figure 6

(ii) What security measure would you take when you see safety symbol B?

(1 mark)

6. (a) Explain why:

(i) Newspaper wrappers with a modified layer, can keep roasted fish hot for a long time. (2 marks)

(ii) A glass bottle full of water and corked will crack if forgotten in the fridge for long (2 marks)

(iii) $2.26 \times 10^5 \text{ J}$ of energy are required to convert 1kg of water to steam at its normal boiling point, while only $3.36 \times 10^5 \text{ J}$ of energy are required to convert 1kg of water to ice at the ice point.

(2 marks)

(iv) Give the difference between specific heat capacity and specific latent heat of of a body (2 marks)

(b) (i) A 5 KW electric heater is left on for 2.5 minutes after the water starts to boil. What mass of water boils off in this time? The specific latent heat of vaporization of water is $2.3 \times 10^6 \text{ J/Kg}$

(2 marks)

(ii) Give two reasons why the boiling point of water is sometimes greater than 100°C (2 marks)

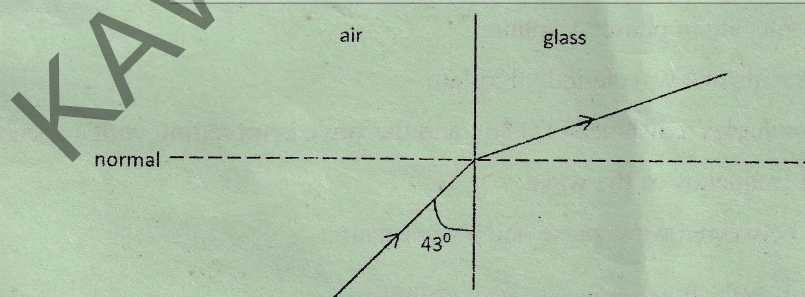
(c) Name the logic gate in figure 7 and draw its truth table

(3marks)



Figure 7

7. (a) Figure 8 shows a ray of light traveling from air to glass.



(i) Determine the angle of incidence

(1 mark)

(ii) Calculate the angle of refraction, if the refractive index of glass is 1.5

(2 marks)

(iii) Can total internal reflection occur for light traveling from air to glass?

(2 marks)

- (iv) Name one practical use of the refractive indices of materials (1 mark)
- (v) State two advantages and one disadvantage of optical fibres over copper cable in telecommunication (3 marks)
- (b) An object of height 0.2m is 0.5 m from a convex lens of focal length 0.1m
- (i) What is the distance of the image from the lens? (2 marks)
- (ii) Determine its magnification (1 mark)
- (c) A transformer in a radio set delivers 5A at a voltage of 6V from a socket connected to a 240V line.
- (i) State whether the transformer is a step-up or a step- down transformer (1 mark)
- (iii) Assuming that the transformer is 100% efficient, calculate the amount of current that enters the socket. (2 marks)

8. (a) A bar magnet is moved into a solenoid connected to a centre zero galvanometer G as shown in f

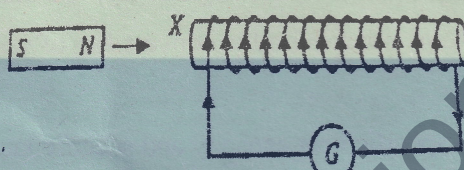


Figure 9

- (i) State and explain two ways to increase the current flowing through the galvanometer (4 marks)
- (ii) Identify the polarity of the end X of the solenoid by applying Lenz's law (1 mark)
- (b) Figure 10 shows a wave profile

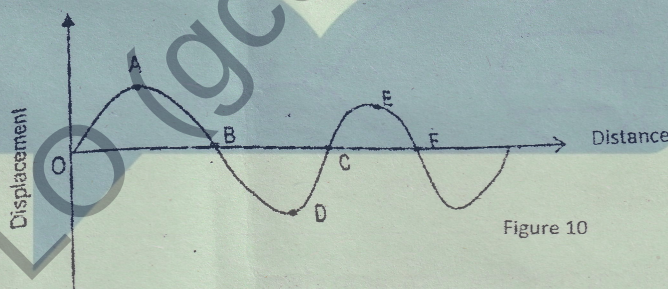


Figure 10

- (i) Which two-labeled points are in phase? Explain (2 marks)
- (ii) Which distance represents one wavelength? Explain (2 marks)
- (iii) If one wave length occupies a distance of 0.8m, and the wave is travelling with a speed of 20m/s. calculate the frequency of the wave (2 marks)
- (iv) Give the difference between a wave pulse and a wave train (2 marks)
- (c) Suggests two methods of controlling environmental pollution (2 marks)

END