



CHRISTIAN SOCIAL SERVICES COMMISSION (CSSC)
CSSC JOINT EXAMINATIONS FOR CHURCH SCHOOLS
EASTERN ZONE

FORM II PRE – NATIONAL EXAMINATION 2024
ENGINEERING SCIENCE

CODE: 035

Time: 2:30 Hours

Date: Tuesday, 27th August, 2024 a.m

Instructions

1. This paper consists of sections **A**, **B**, and **C** with a total of **ten (10)** questions.
2. Answer all questions in the spaces provided. Show your work clearly where applicable.
3. Sections **A** and **C** carry **fifteen (15)** marks each and section **B** carries **seventy (70)** marks.
4. All writing must be in blue or black ink **except** diagrams which must be in pencil.
5. Authorized **mathematical tables** may be used.
6. All communication devices, calculators and any unauthorized materials are not allowed in the assessment room.
7. Write your **Assessment Number** at the top right corner of every page.
8. The following constants may be used in your calculations:
 - Density of water, $\rho = 1\text{g/cm}^3$ or 1000kg/m^3 .
 - Acceleration due to gravity 'g' = 10 m/s^2 .
 - Take pie π as $\frac{22}{7}$

FOR EXAMINER'S USE ONLY

QUESTION NUMBER	SCORE	EXAMINER'S INITIALS
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL		
CHECKER'S INITIALS		

SECTION A: (15 Marks)

Answer **all** questions in this section

1. For each of the item (i) – (x), choose the correct answer from the given alternatives and write its letter in the box provided

(i) A professional person who designs and constructs an axchange bridge and other strctures such as road and houses has knowledge in the field of:

- A. Electrical Engineering
- B. Civil Engineering
- C. Mechanical Engineering
- D. Environmental Engineering

(ii) Which instrument is best for measuring small lengths such as the diameter of an electric wire about 0.001cm diameter?

- A. measuring tape
- B. A Vernier calipers
- C. A Micrometer screw gauge
- D. A metre rule

(iii) Which of the following of physical quantities represents a set of vector quantities?

- A. Weight, force, speed, acceleration
- B. Weight, time, velocity, acceleration
- C. Weight, force, temperature, momentum
- D. Weight, force, displacement, acceleration

(iv) Which of the following is not the use of force?

- A. Changing the direction of a pen when writing
- B. Stopping or slowing down a bicycle
- C. Drawing a bucket of water from a well
- D. Lowering a temperature of an object

(v) A form two girl was required to list the instruments that may be used to measure the length of a desk top which is about 90centimetres in long. She listed as follows:

- 1. Micrometer screw gauge
- 2.Vernier Callipers
- 3. Metre ruler
- 4.Tape measure

Which of the letters A, B, C, D and E gives a pair of the most suitable instruments for the measurement?

- A. 3 and 4
- B. 1 and 3
- C. 2 and 4

D. 1 and 2

(vi) Suppose you assigned by your Engineering Science Teacher to measure both the internal and external diameter of a pipe which is about 4cm diameter, which instrument would you use?

- A. A ruler
- B. A tape measure
- C. A Vernier calipers
- D. A micrometer screw gauge

(vii) Which of the following is **not** related to the general behaviours of sound waves:

- A. Refraction
- B. Diffraction
- C. Interference
- D. Rarefaction

(viii) When a cell or battery is supplying an electric current in a circuit:

- A. Potential difference across the terminal of the cell or battery increases
- B. Internal resistance of the cell or battery becomes zero
- C. External resistance of the circuit decreases
- D. Potential difference across the terminal of the cell or battery decreases

(ix) The following statements defines relative density of a substance:

1. Mass of a substance per mass of an equal volume of water
2. Weight of a substance per weight of an equal volume of water
3. Density of a substance per density of water
4. Volume of a substance per volume an equal mass of water.

Which of the following is correct?

- A. 1, 2, and 3
- B. 1, 2, and 4
- C. 2, 3 and 4
- D. 1, 3 and 4

(x) One of the important application of the expansion of solids is bimetallic strip. Which of following sets of devices does **not** use the bimetallic strip?

- A. Ceiling fan, loudspeaker, microphone and transformer.
- B. Electric cooker, heater, traffic lights and oven.
- C. Thermostat, thermometer and electric pressing iron.
- D. Electric pressing iron, Electric cooker and Thermometer.
- E. Thermometer, electric kettle and electric heater.

Answers

i	ii	iii	iv	v	vi	vii	viii	ix	x

2. Match the items in **list A** with those in **list B**

LIST A	LIST B
(i) Rate of change of velocity	A. Newton's 3 rd law of motion
(ii) Change of linear momentum	B. Momentum
(iii) Rate of Change of displacement	C. Impulse
(iv) Action and reaction are equal and opposite	D. Newton's 2 nd law of motion
(v) Length covered in specific direction	E. Displacement
	F. Velocity
	G. Acceleration
	H. Speed
	I. Distance

Answers

List A	i	ii	iii	iv	v
List B					

SECTION B: (70 Marks)

Answer **all** questions in this section

3. (a) A farmer wants to measure the diameter of a pipe that he needs for his irrigation scheme. Advise the farmer on which instrument he should use to measure the diameter.

(b) **Figure 1** below shows a part a certain measuring instrument. Give the name of the measuring instrument.

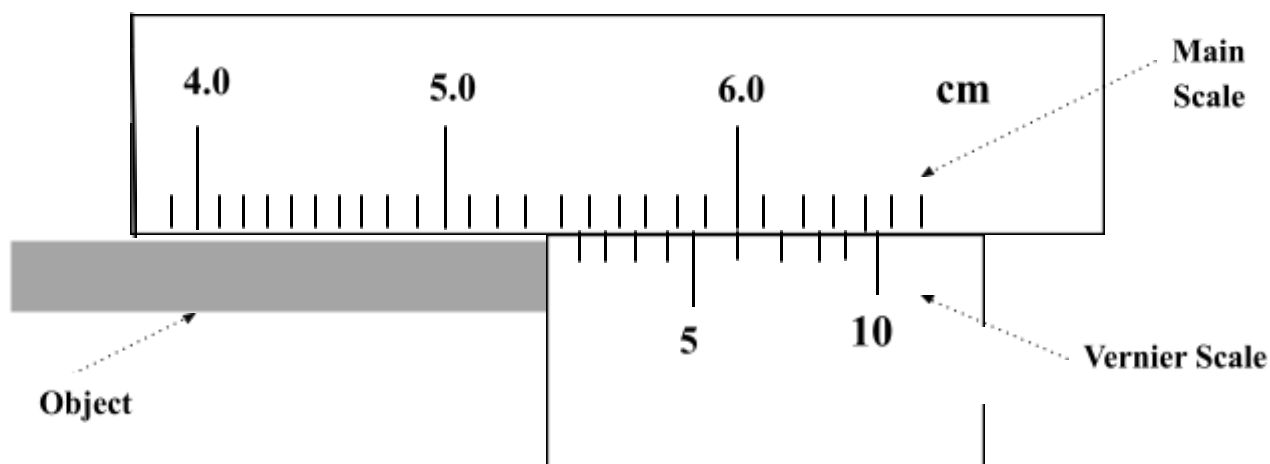


Figure 1

(c) What is the length of the object being measured in **Figure 1**?

(a)-----
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(b)-----

(c)-----

4. The initial volume of water in the measuring cylinder was 80cm^3 . When a certain substance was dropped into the measuring cylinder the level of the water in the measuring cylinder rose to 100cm^3 . If the mass of the substance was 172g, find the:

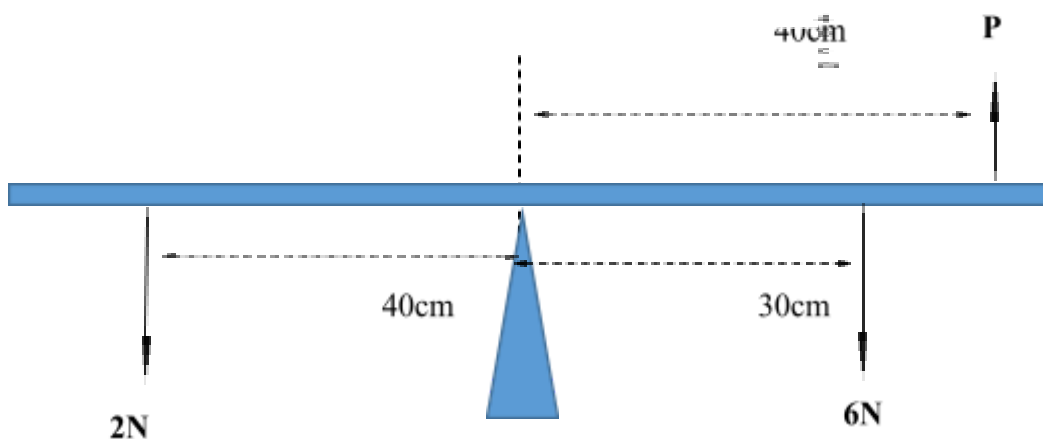
(a) Density of density of the in g/cm^3

(b) Density of the substance in k/gm^3

(c) Relative density of the substance

5. (a) A metal block of 60 kg requires a horizontal force of 255 N to drag it along a horizontal rough bench with a uniform velocity. Calculate the coefficient of friction between the block and the bench (take $g = 9.81 \text{ N/kg}$)

(b) In Figure 2, a beam 100cm long is pivoted at its md-point. Vertical downward forces of 2N and 6N are applied at the 10cm and 80cm marks respectively. What vertical upward force P must be applied at the 90cm mark if the beam is to balance horizontally?



(a)----- **Figure 2** -----

(b)-----

6. (a) Distinguish between the images formed by a plane mirror from those formed by a pin-hole camera. Give two (2) points.
- (b) Draw a well labelled diagram of a plane mirror showing an incident ray, a reflected ray, the normal, the angle of incidence and angle of reflection.

(a) -----

(b) -----

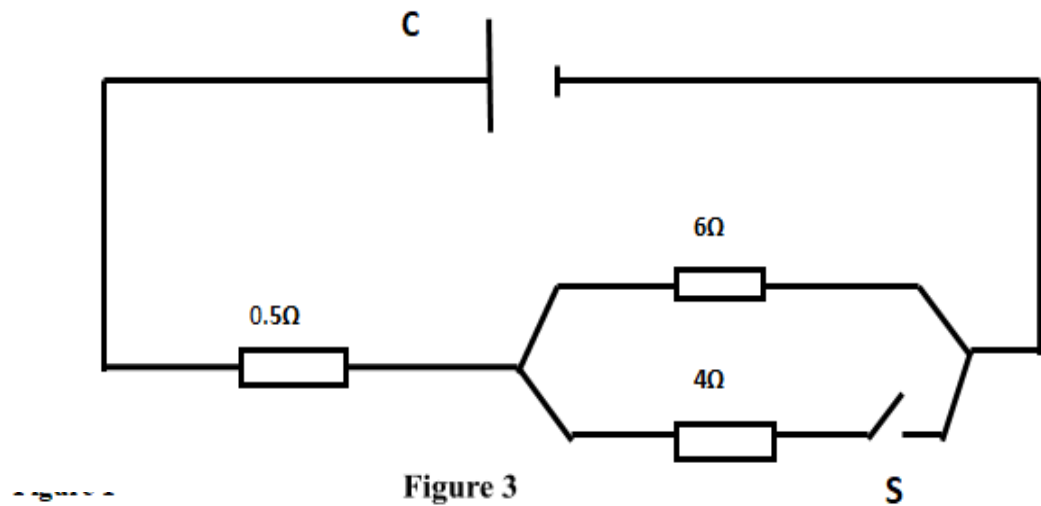
7. (a) Water is cheap but can never be used as a thermometric liquid. Briefly explain why. Give four (4) points.
- (b) A gas has a volume of 600cm^3 at a temperature of 27°C and a pressure of 1atm. Find its volume at a temperature of 127°C and a pressure of 2 atm.

(a)-----

(b)-----

8. A screw jack with a pitch of 4 mm and arm 0.56m long is used to lift a car of mass 880 kg. If the efficiency of the jack is 25% find the effort to be applied to the end of the arm.

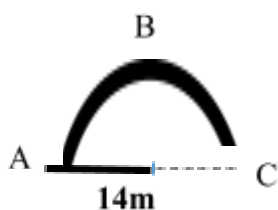
[illegible]

[illegible]

10. (a) A Car is moving with a velocity of 36 kilometres per hour, if its accelerating force is 80N find the power of the car.

(b) As shown in **Figure 1**, a car travelled along a semi-circular track of **radius of 14m** seconds. If it travels from point A to point C through point B calculate the:

- (i) Distance travelled
- (ii) Displacement
- (iii) Average speed
- (iv) Average velocity



Figure

[illegible]

[illegible]

(b)

[illegible][illegible]

(iii).....

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(iv).....

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