PHYSICS FORM 2

OPENER EXAM TERM 2 2023

MARKING SCHEME

INSTRUCTIONS TO CANDIDATES:

(a) Write your **Name** and **Adm .Number** in the spaces provided **above**.
(b) **Sign** and write the **date** of examination in the spaces provided **above**.
(c) This paper consists of **two** Sections; **A** and **B**.
(d) Answer **ALL** the questions in Sections **A** and **B** in the spaces provided.
(e) All workings must be clearly shown.

FOR EXAMINER'S USE ONLY:

Section	Question	Maximum Score	Candidate's Score
A	1 – 11	25	
	12	09	
	13	11	
B	14	11	
	15	10	
	16	13	
Total Score		80	

SECTION A (25 MARKS)

1. Write down the vernier calliper's reading shown in figure1 below: (1 mark)

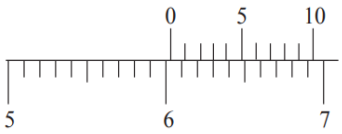


Figure 1

6.0 + 0.03 = 6.03 cm. ✓1

2. Figure 2 below represents a simple gas thermometer set-up by a student.

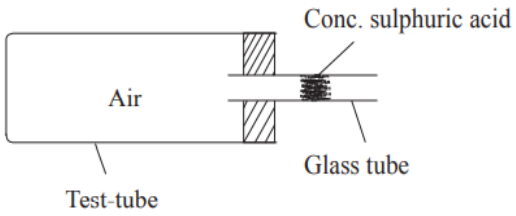


Figure 2

(a) State any one adjustment to increase the sensitivity of the apparatus. (1 mark)

Using a narrower glass tube. ✓1 • Using a bigger test-tube. ✓1 (Any one)

(b) State one advantage of gas thermometer over mercury in glass thermometer. (1 mark)

Gas thermometer will detect a small change in temperature unlike the mercury thermometer. ✓1

3. The pressure at the top of a mountain is found to be 700 mmHg. Calculate the height of the mountain given that the density of mercury is 13 600 kg/m^3 , density of air 1.25kg/ $m^3$and the pressure at sea level is 760 mmHg. (3 marks)

$Pressure\ difference\ =\ (760-700)mmHg\ =\ 60\ mmHg$✓1

$h\ \times\ 1.25\ \times\ 10\ =\frac{60}{1000}\ \times\ 13\,600\ \times\ 10$✓1

$h\ =\frac{0.06\times 13600}{1.25}\ \ h\ =\ 652.8\,m$✓1

4. Figure 3 below shows a paint brush dipped in a clear paint and when removed from the paint

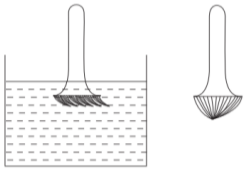


Figure 3

Explain the shape of the bristles. (2 marks)

Inside: Molecules of the paint attract the bristles evenly all round, hence spread apart. ✓1

Outside: Surface tension of the paint draws the bristles together✓1

5. State two factors that determine pressure in a liquid at a particular place. (2 marks)

• Density. ✓1 • height /depth. ✓1

6. Two metals X and Y welded together are heated so that they break the contact shown at P in the figure 4.

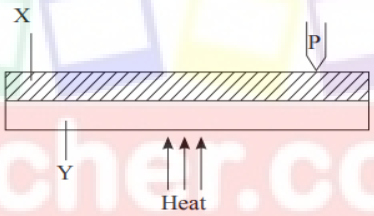


Figure 4

Explain how the contact is broken. (2 marks)

Metal X expands more than Y, ✓1 causing the strip to bend downwards thus breaking contact.✓1

7. Explain how a positively charged electroscope can be used to determine the charge on charged rod. (2 marks)

Increase in leaf divergence implies a positively-charged rod. ✓1 Decrease of leaf divergence implies a negatively charged rod. ✓1

8. State two advantages of the lead-acid accumulator over the dry cell. (2 marks)
• Draws larger current. ✓1 • Lower internal resistance. ✓1

9. A soft iron rod and a steel bar are placed in turns in a solenoid connected as in figure 5 below.

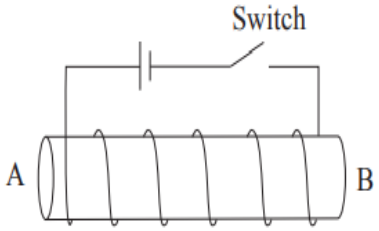


Figure 5

(i) Show the polarity of end B of the coil when the switch is closed. (1 mark)

End B is a north pole ✓1

(ii) Describe what happens to the two rods when current is switched on for some time, then turned off. (2 marks)

The steel bar becomes a magnet when current is on and also when current is switched off. ✓1

The soft iron core becomes a magnet when current is on but loses it when current is switched.✓1

10. (a) State the effect on the image formed by a pinhole camera if:

(i) The size of the pinhole is increased. (1 mark)

When the size of the hole is increased, a brighter but blurred image is formed..✓1

(ii) The object is moved closer to the pinhole. (1 mark)

If the camera is moved closer to the object, a bigger image is formed.

If the camera is moved closer to the object, a bigger image is formed. ✓1

(iii) The screen is moved farther from the pinhole (1 mark)

If the screen is moved farther, a bigger image is formed. ✓1

11. Describe experiments to determine the density of a liquid. (3 marks)

To find the density of a liquid:

- *Determine the mass m1 of a clean beaker.*
- *Pour the liquid into a measuring cylinder and note the volume V.*
- *Determine the mass m2 of the beaker and water. ✓1*

Mass of liquid = m2 – m1 ✓1

Density of liquid = $\frac{m2 - m1}{V}$ ✓1

SECTION B (55 MARKS)

Answer ALL the questions in this section in the spaces provided

12. The diagram below shows two steel pins held at the poles of two magnets.

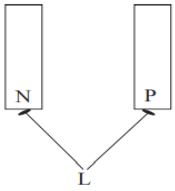


Figure 6

(a) State the polarity at:

P _____ (1 mark)

P is also South pole. ✓1

b) (i) By what process are the pins magnetized`? (1 mark)

By induction. ✓1

(iii) State the law illustrated by the two pins. (1 mark)

Like poles repel, unlike poles attract. ✓1

(c) The figure 7 below shows a U-shaped magnet with a plotting compass placed between its poles. The arrow at the compass represents its north pole.

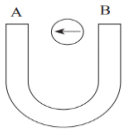
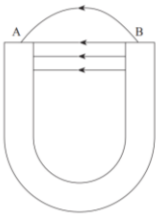


Figure 7

(i) State the polarities at A and B. (1 mark)

A – South, B – North ✓1

(ii) Draw on the diagram to indicate the magnetic field pattern around the U-shaped magnet. (1 mark)



✓*1check for correct direction of arrows and none should cross/ intersect.*

(d) The graph below shows the variation of magnetic strength against magnetizing current.

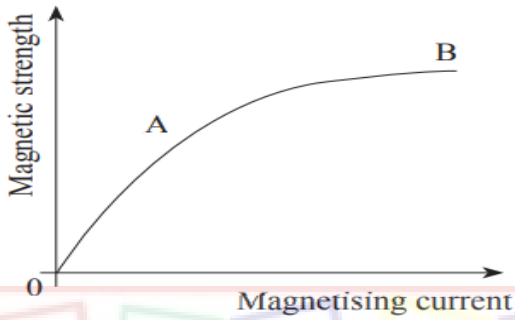


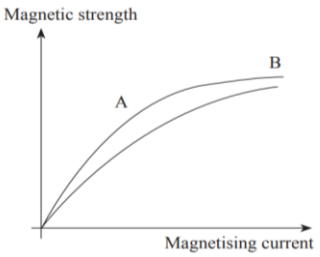
Figure 8

(i) Explain the sections OA and AB. (2 marks)

OA–The material is being magnetised. ✓

AB – All domains have been aligned, the material is magnetised. ✓

(ii) On the same axes, sketch the graph of a harder magnetic material. Explain your answer. (2 marks)



✓

The material takes longer time to magnetise. ✓

13. (a) The figure 9 below shows a dry cell

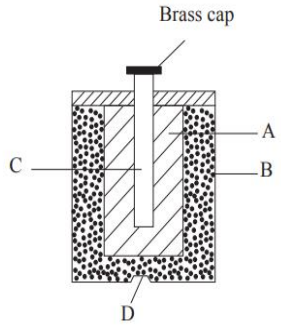


Figure 9

(i) Name the parts labelled A, B and C. (3 marks)

A – Manganese (IV) Oxide. ✓

B – Ammonium chloride. ✓

C – Carbon rod ✓

(ii) Explain the purpose of parts A, C and D in the cell. (3 marks)

A – Depolarizer. ✓

C – Positive terminal. ✓

D – Acts as a container as well as negative terminal. ✓

(iii) State the polarity of end marked D. (1 mark)

Negative terminal. ✓

(iv) Explain why the terminal voltage of the cell is likely to be less than its EMF when in use. (1 mark)

Because of internal resistance. ✓

(c) (i) lead-acid cell is rated 50 Ah and supplies a steady current of 2 A. What does the term '50 Ah' mean? (3 marks)

capacity = current in amperes × time in hours ✓

50 AH = 2A × time

time = 50 AH÷ 2A = 25 hours✓

The battery will supply current of 2A for 25 hours. ✓

14. The figure 10 below shows a hydraulic brake system for a car. The area of the master piston A is $0.75cm^2$ while the slave pistons attached to the tyres P, Q, R and S are of area $3cm^2$ each. A force of 500 N is applied on the master cylinder.

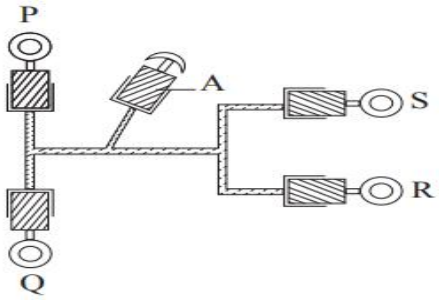


Figure 10

(a) Define pressure and give its SI units. (2 marks)

Pressure is the force normally acting per unit area. ✓

The SI unit is N/m^2 /Pascals. ✓

(b) (i) State the principle of transmission of pressure in liquids. (1 mark)

Pressure applied to an enclosed liquid is transmitted equally to every part of the liquid. ✓

(iii) State two important properties of the fluid used in the system. (2 marks)

- *Non-compressibility* ✓
- *Non-viscous* ✓
- *Non-corrossiveness (Any two)*

(iv) Explain why the slave cylinders are of the same size. (1 mark)

For equal distribution of braking force. ✓

(c) Calculate:

(i) The pressure generated in the master cylinder. (2 marks)

$P = \frac{F}{A} = \frac{500}{0.75\times10^{-4}}$ ✓

$= 6.667 \times 10^6\ N/m^2$ ✓

(iii) Braking force on each tyre. (3 marks)

$Force = P \times A$ ✓

$= (6.667 \times 10^6) \times (3 \times 10^{-4})$ ✓

$= 2.001 \times 10^3 N$ ✓

15. The motion of smoke particles enclosed in a smoke cell can be studied using the set-up shown below

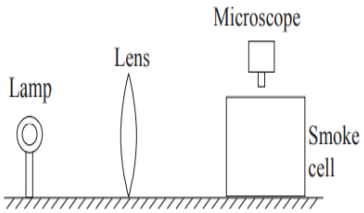


Figure 11

(a) What observation is made in the smoke cell? (2 marks)

The bright specks ✓ are observed moving randomly in the smoke cell. ✓

(b) (i) Explain what happens in the smoke cell. (2 marks)

The bright specks are the smoke particles which scatter / reflect light shining on them. ✓

They move randomly due to continuous collision with invisible air particles which are in continuous random motion. ✓

(ii) What is the purpose of the microscope? (1 mark)

To magnify the bright specks. ✓

(a) State two factors that affect the motion of the particles in the smoke cell. (2 marks)

- *Temperature of the environment. ✓*
- *Density of the particles. ✓*

(b) The diagram shows different states of matter:

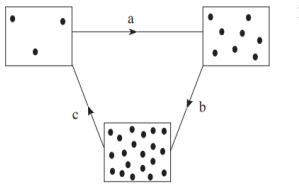


Figure 12

(i) Name the processes labelled a and c. (2 marks)

a – Condensation , ✓

c – Sublimation ✓

(ii) Explain why solids have a definite shape but liquids take the shape of the container in which they are put. (2 marks)

Solids have a stronger force of attraction between the particles than liquids✓hence the intermolecular distance in solids is smaller than that of liquids. ✓

16. The figure 13 below shows a liquid in a container

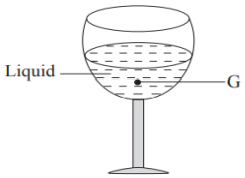


Figure 13

(a)Explain what happens to the stability of glass when more liquid is added. (2 marks)

The stability reduces ✓because of the rise in the point of centre of gravity. ✓

(b) If the glass is empty, what is its state of equilibrium? (1 mark)

- Unstable✓

(c) A cylindrical block of metal with a curved section is placed to rest in two different positions as shown in the following figure 14.

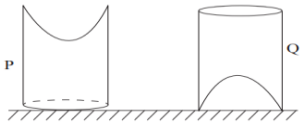
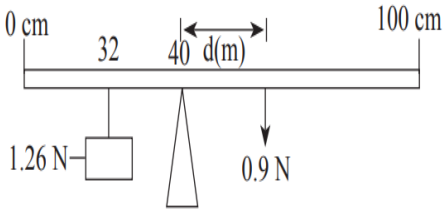


Figure 14

State and explain which of the positions is more stable. (2 marks)

Position P✓because of low COG✓

(d) A non- uniform meter rule weighing 0.9 N is balanced horizontally on a sharp pivot placed at the 40 cm mark, when a load of 1.26 N is placed at the 32 cm mark. Determine the position of the center of gravity of the meter rule. (3 marks)



At equilibrium, Clockwise moment = Anticlockwise moment ✓

$0.9 \times d = 1.26 \times 8$

$d = 1.26 \times 8\ 0.9 = 11.2$ ✓

Centre of gravity should be at, 40 + 11.2 = 51.2 cm ✓

(e) Suppose the student was given a flat irregularly-shaped object shown in figure 15, how would the center of gravity be determined? (3 marks)

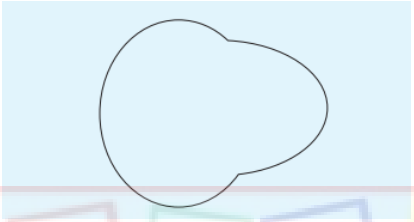
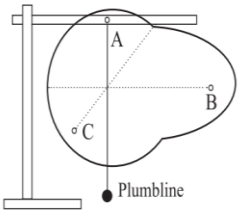


Figure 15

Make three holes A, B, and C on the irregular object and suspend it from each of the holes as shown below. ✓



With the help of a plumbline, draw the vertical line through the hole. ✓

Repeat with the other two holes.

The intersection of the lines is the centre of gravity. ✓

f) What modifications are introduced to the buses to ensure stability?

The upper parts of the buses are made of lighter materials, ✓

While the engine, heavy chassis and luggage compartments on the lower part are heavy to ensure low centre of gravity. ✓

END#