



XINMIN SECONDARY SCHOOL

新民中学

SEKOLAH MENENGAH XINMIN

Preliminary Examination 1997

SCIENCE (PHYSICS/CHEMISTRY) 5142 / 1
SECONDARY 4 EXPRESS / 5 NORMAL
FRIDAY, 5 SEPTEMBER 1997
SETTERS: M SHONE / J SUNDRARAJ

Name: _____ () Class: _____

INSTRUCTIONS

- 1 Time allowed: 1 hour.
- 2 Answer **all** questions on the OAS provided.
- 3 Ensure all markings on the OAS are made with a 2B pencil. Erase any mistakes carefully with a soft eraser.
- 4 Calculators may be used.
- 5 This booklet consists of 9 numbered pages.

Where necessary assume the following values:

Speed of light, $c = 3 \times 10^8$ m/s

Acceleration due to gravity, $g = 10$ m/s²

Periodic table provided

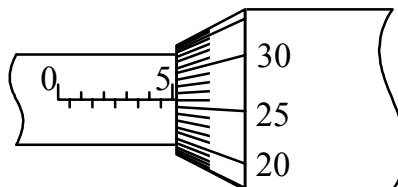
Multiple-Choice Questions

(40 marks)

Answer questions by shading the appropriate box, **A**, **B**, **C** or **D** on the OAS.

- 1 The diagram shows a micrometer screw gauge.
What is the reading on the scale?

- A 2.65 mm
- B 5.26 mm
- C 7.26 mm
- D 7.60 mm



- 2 When a radioactive nuclide ${}^{218}_{88}\text{Ra}$ decays, two alpha particles, one beta particle and gamma rays are emitted. One of the following is the resulting nuclide X. Which one is it?

- A ${}^{210}_{85}\text{X}$
- B ${}^{210}_{83}\text{X}$
- C ${}^{210}_{84}\text{X}$
- D ${}^{223}_{83}\text{X}$

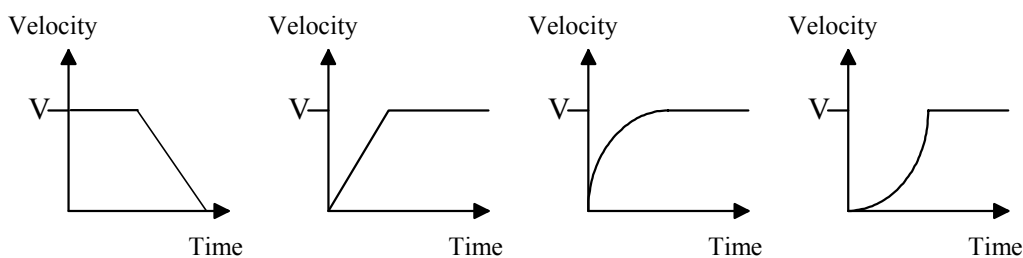
- 3 Why is insulation used in the surrounding walls of a fridge?

- A To stop heat from entering into the fridge.
- B Because it is a good radiator of heat.
- C To stop hot air from entering the fridge.
- D To stop cold air from escaping from the fridge.

- 4 Which of the following sentences **best** explains why the wind blows from the land to the sea at night?

- A At night the sea warms up faster than the land.
- B At night the sea cools down faster than the land.
- C During the day the wind blows from the sea towards the land.
- D At night the land cools faster than the sea.

- 5 One of the graphs below shows a motorcycle starting from rest and accelerating at a constant rate to a velocity of V m/s. It travels at this constant speed for a period of time. Which is it?



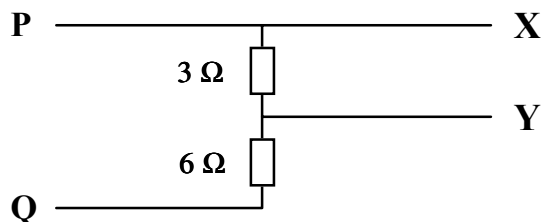
- A
- B
- C
- D

6 To make a drum give a note of lower pitch, a drummer would

- A loosen the drum skin.
- B hit the drum with a greater force.
- C tighten the drum skin.
- D hit the drum skin nearer the edge.

7 Below is a diagram of a circuit. The p.d. between P and Q is 12 V. What is the p.d. between X and Y?

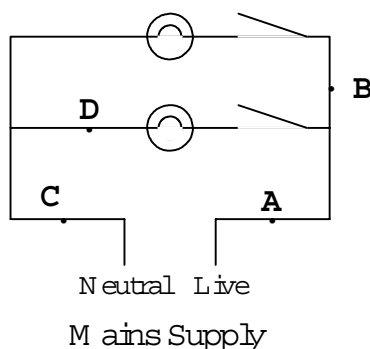
- A 3 V
- B 4 V
- C 8 V
- D 12 V



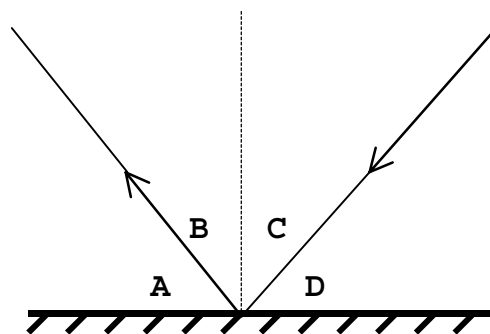
8 A small sample of a radioactive substance, Z, has a mass of 8 mg. If Z has a half-life of 6 days, what is the mass of Z remaining after 18 days?

- A 1 mg
- B 2 mg
- C 3 mg
- D 4 mg

9 Two lamps are connected in a parallel fashion in a lighting circuit as shown below. Which is the best position A-D to place a fuse?



10 The figure below shows a regular reflection.



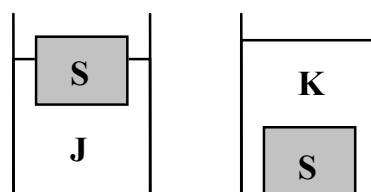
Which angle is the angle of reflection?

11 One of the following describes the effect of water waves passing from deep water into shallow water. Which one is it?

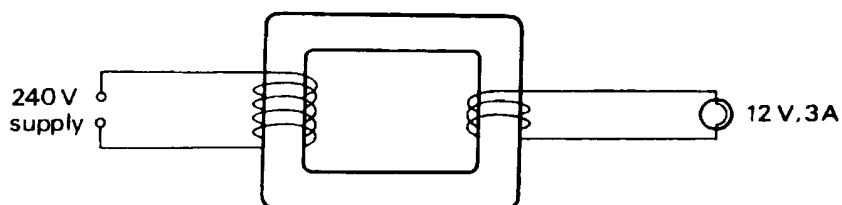
	Wavelength	Frequency	Velocity
A	Increase	Unchanged	Increase
B	Unchanged	Increase	Increase
C	Decrease	Decrease	Increase
D	Decrease	Unchanged	Decrease

12 A solid object **S** floats in liquid **J** but sinks in liquid **K**, as shown in the diagrams below. Choose the correct statement from the following:

- A Liquid **J** is the same density as solid **S**.
- B Liquid **J** is less dense than liquid **K**.
- C Liquid **J** is more dense than liquid **K**.
- D Object **S** is more dense than liquid **J**.



13 The diagram below shows a 12 V, 3 A lamp being operated by a transformer using a 240 V supply. If the transformer is 100% efficient, what current will flow from the supply?

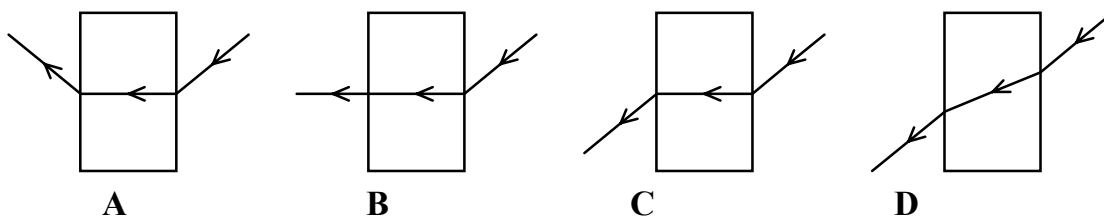


- A 0.013 A
- B 0.15 A
- C 3.0 A
- D 12 A

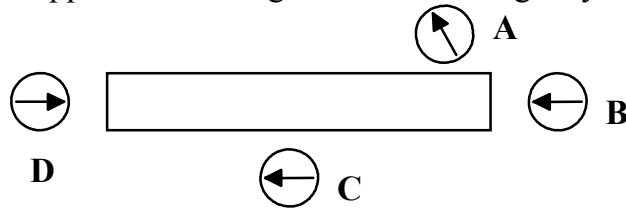
14 The radiators on cars are painted black because

- A a black surface absorbs heat well.
- B a black surface conducts heat well.
- C a black surface is a good emitter of heat.
- D it will not easily get dirty.

15 Which diagram best shows the path a light-ray would take through a glass block?



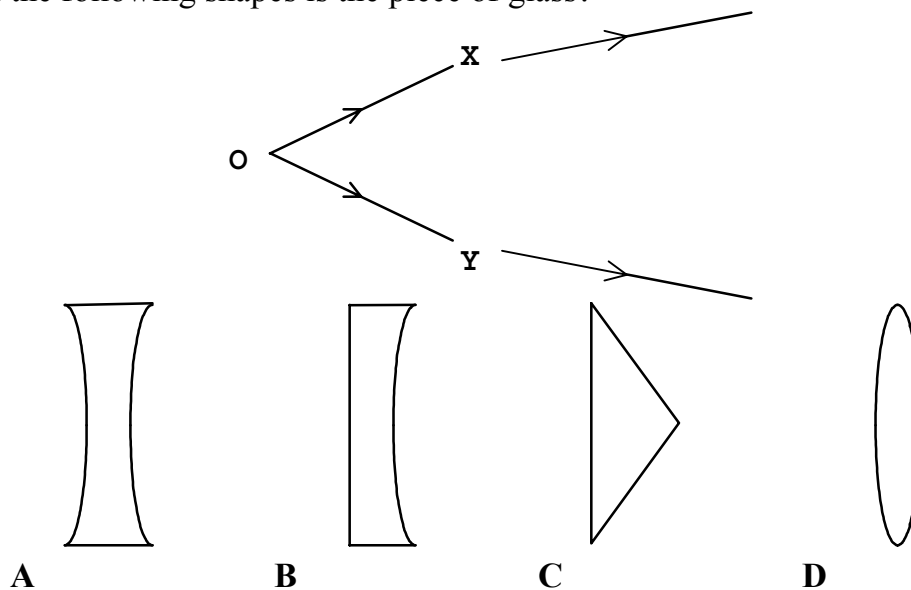
- 16 Below is a diagram showing a piece of magnet with four compasses surrounding it. One of the magnets appears to be magnetised the wrong way. Which one is it?



- 17 Which of the following does not alter the air resistance acting on an object?

- A The speed an object is moving at.
- B The density of the air.
- C The weight of the object.
- D The area of the object.

- 18 Below is a diagram that shows some light rays leaving an object O. As the rays strike a piece of glass placed between X and Y, the rays deviated as shown. Which one of the following shapes is the piece of glass?



- 19 A current of 2 A flows for 1 minute through a lamp. How much charge flows through the lamp in this time?

- A 0.5 C
- B 30 C
- C 60 C
- D 120 C

- 20 One of the following statements about electromagnetic radiation is false. Which one is it?

- A Electromagnetic waves may have different wavelengths.
- B All electromagnetic waves travel at the same speed in a vacuum.
- C All electromagnetic waves are longitudinal waves.
- D Electromagnetic waves may have a wide range of frequencies.

- 21 Which one of the following is likely to be a pure compound?
- A Colourless crystals which all melt at 58 °C.
 - B Blue crystals which melt over the range of 55 – 60 °C.
 - C An oily liquid which gives two fractions when distilled.
 - D A brown dye that gives red, yellow and blue spots in a chromatography experiment.
- 22 Which of the following molecules contains double covalent bonds?
- A Ammonia B Water C Methane D Carbon dioxide
- 23 A metal X forms a chloride with a relative molecular mass of 74.5. Which of the following is likely to be a formula of this chloride?
- A XCl_2 B XCl C X_2Cl D XCl_3
- 24 Two elements A and B have electronic structures of 2.2 and 2.8.7 respectively. It can be predicted that the compound formed between A and B has
- A the formula AB_2 .
 - B a low boiling point.
 - C shared electrons.
 - D the ability to conduct electricity in solid state.
- 25 Which of the following salts can be prepared by adding excess metal to acid?
- A NH_4Cl B CuSO_4 C FeCl_2 D ZnCO_3
- 26 Which of the following observations most strongly suggests that a solid element X is a non-metal?
- A X is a conductor of electricity.
 - B X has a low melting point.
 - C X has more than one valency.
 - D X forms an acidic oxide.
- 27 Which of these would require exactly 25 cm³ of 0.01 mol/dm³ potassium hydroxide for neutralisation?
- A 25 cm³ of 0.01 mol/dm³ sulphuric acid
 - B 50 cm³ of 0.01 mol/dm³ sulphuric acid
 - C 12.5 cm³ of 0.01 mol/dm³ sulphuric acid
 - D 100 cm³ of 0.001 mol/dm³ sulphuric acid

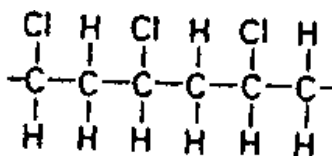
- 33 A pupil was asked to write down four pieces of information that could be obtained from the equation



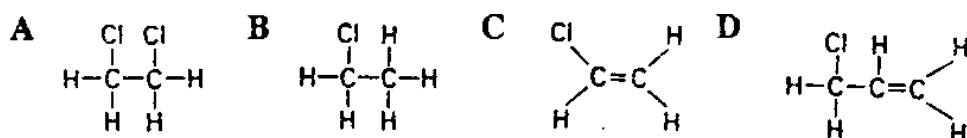
Which one of the following statements is incorrect?

- A Magnesium has been oxidised.
 - B Magnesium chloride is soluble in water.
 - C The total energy of the products is greater than that of the reactants.
 - D Magnesium is above hydrogen in the reactivity series.
- 34 Iron filings were added to a solution of a metal sulphate. Metal X is deposited and a solution of iron(II) sulphate was produced. What would metal X be?
- A Copper B Potassium C Magnesium D Calcium
- 35 Which mixture could be used as an NPK fertiliser?
- A Ammonium nitrate and ammonium phosphate
 - B Potassium sulphate and ammonium nitrate
 - C Ammonium phosphate and potassium sulphate
 - D Potassium nitrate and sodium nitrate
- 36 When animal fat or vegetable oil is boiled with aqueous sodium hydroxide, soap and glycerol are formed. This reaction is an example of
- A hydrolysis B polymerisation C esterification D fermentation

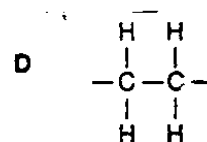
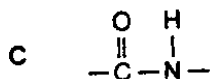
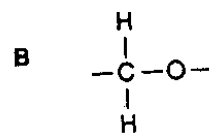
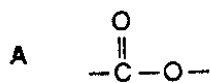
- 37 An addition polymer has the following structure.



What is the structure of the monomer?



38 What is the linkage between the units in fats and in Terylene?



39 Which of the following substances exists as a macromolecular structure?

- A Starch B Copper C Iodine D Ethene

40 In the fractional distillation of crude oil, which product has the highest boiling point?

- A Diesel fuel B Paraffin C Bitumen D Lubricating oil



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Preliminary Examination 1997

SCIENCE (PHYSICS) 5142 / 2
SECONDARY 4 EXPRESS / 5 NORMAL
TUESDAY, 2 SEPTEMBER 1997
SETTER: M SHONE

Name: _____ () Class: _____

INSTRUCTIONS

- 1 Time allowed: 1 hour 15 minutes.
- 2 The paper consists of 2 sections:
 - Section A* Answer **all** questions in the spaces provided.
 - Section B* Answer any **two** of the three questions on the writing paper provided.
- 3 Show all working and calculations clearly. Calculators may be used.
- 4 This booklet consists of 10 numbered pages.
- 5 When handing in, staple the answers of section B to the back of this booklet.

Where necessary assume the following values:

Speed of light, $c = 3 \times 10^8$ m/s

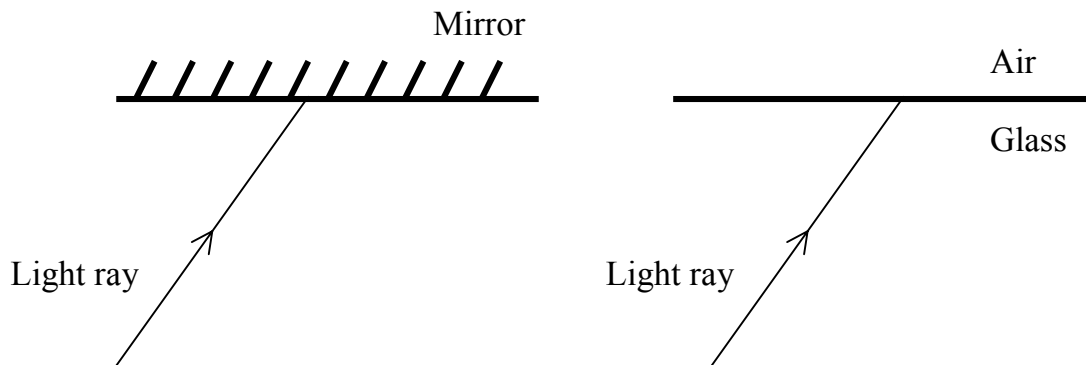
Acceleration due to gravity, $g = 10$ m/s²

Section A

(45 marks)

Answer all the questions in the spaces provided.

- 1 Complete the diagrams below to show the complete path of each light ray. [2]



- 2 A charged glass rod is suspended by a thread from a support. Explain what you would observe when

a) another charged glass rod is brought near to it, [1/2]

b) a charged polythene rod is brought near to it, [1/2]

c) an uncharged glass rod is brought near to it, [1/2]

d) an uncharged light-weight aluminium ball is brought near to it. [1/2]

3 An advert reads:

“At BMW, we see no reason why deceleration can’t be made just as exciting as acceleration. In fact, it’s something we demand of all of our cars. Designed to bite hard and fast at temperatures of up to 750 °C, the brakes on our BMW M3 can take you from 100 km/h to a complete standstill in just 2.8 seconds.”

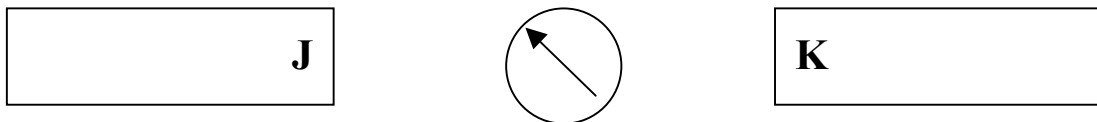
a) Calculate the deceleration that the brakes can produce. [2]

b) Calculate the minimum distance the car needs in front of it to stop if it is travelling at 100 km/h. [2]

c) Assuming that the BMW has a mass of 1500 kg, calculate the power produced by the brakes in stopping the car. [2]

- d) The advert mentions that the brakes can operate up to 750 °C. Why do you think this is important for brakes? [1]

- 4 The following diagram shows two magnets placed next to each other with a compass between them.

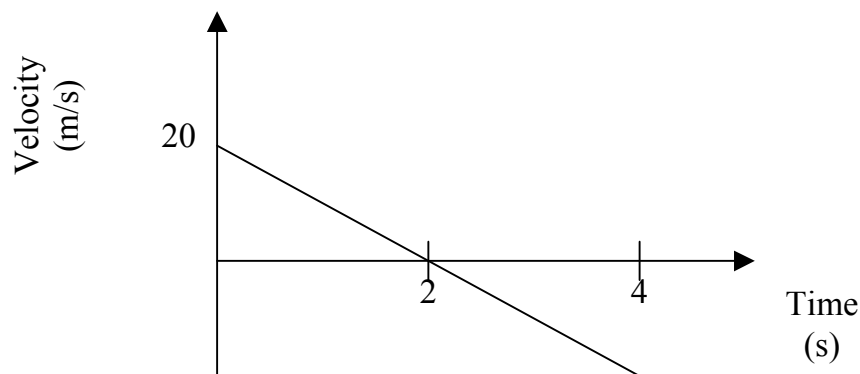


- a) Assuming that the Earth's magnetic field is negligible, what does the position of the compass needle tell you about the poles at **J** and **K**? [1]

- b) Complete the above diagram to show the possible field-lines produced around **J** and **K**. [2]

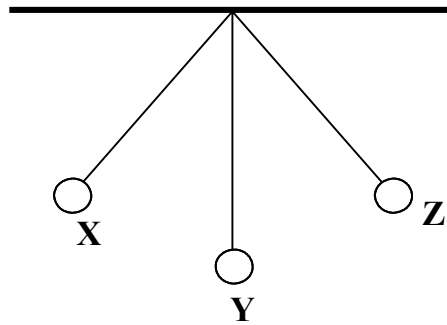
- 5 A ball is thrown vertically into the air and remains in the air for 4 seconds before being caught.

The velocity-time graph for the ball has the following shape:



- a) How long does it take for the ball to reach its maximum height? [1]
- b) Calculate the maximum height reached by the ball. [2]
- 6 Messages travelling from the NASA Pathfinder Probe on Mars to Earth take approximately 10 minutes to travel from Mars to the Earth.
- a) What form of electromagnetic wave are the messages most likely to consist of? [1]
-
- b) Calculate the approximate distance of Mars from the Earth. [2]
- c) The mass of the probe was measured at 120 kg on Earth. If the weight of the probe was calculated at 400 N on Mars, what is the acceleration due to gravity on Mars? [2]

- 7 The following diagram shows several positions of a pendulum as it swings back and forth.



- a) Describe what are meant by the terms **oscillation** and **period** of a pendulum. [2]
- b) Given that the time taken to move from **X** to **Z** is 0.25 seconds, state the period of the pendulum? [1]
-
- c) Calculate the frequency of oscillation of the pendulum. [1]
- d) State what is meant by the **Principle of Conservation of Energy**. [2]
-
-
-
- e) Assuming the point **X** is 20 cm higher than the point **Y** and the mass of the bob is 400 g, calculate the difference in gravitational potential energy between the two points. [2]

8 A girl of mass 40 kg is carried up by an escalator a height of 5.5 m in 8 s.

a) Calculate the work done by the escalator, on the girl, against gravity. [2]

b) Calculate the average power developed by the escalator. [2]

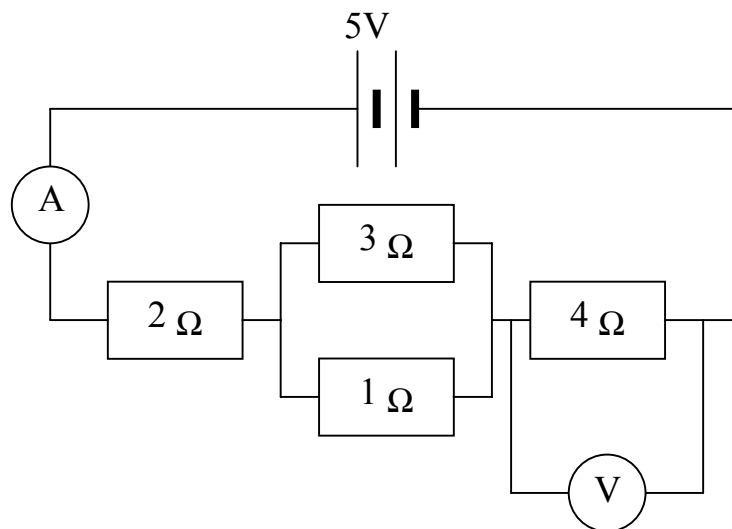
c) Assuming that the escalator had a power rating of 450 W, find the efficiency of the escalator. [2]

9 A man standing between two buildings claps his hands and hears the first echo of the clap after 2.0 seconds and the second one after a further 0.5 seconds. The speed of sound was known to be 340 m/s.



What is the distance between the two buildings? [3]

10 The following shows an electric circuit.



a) Calculate the total resistance of the circuit. [2]

b) State the reading on the ammeter. [1]

c) State the currents in
(i) the 3 Ω resistor

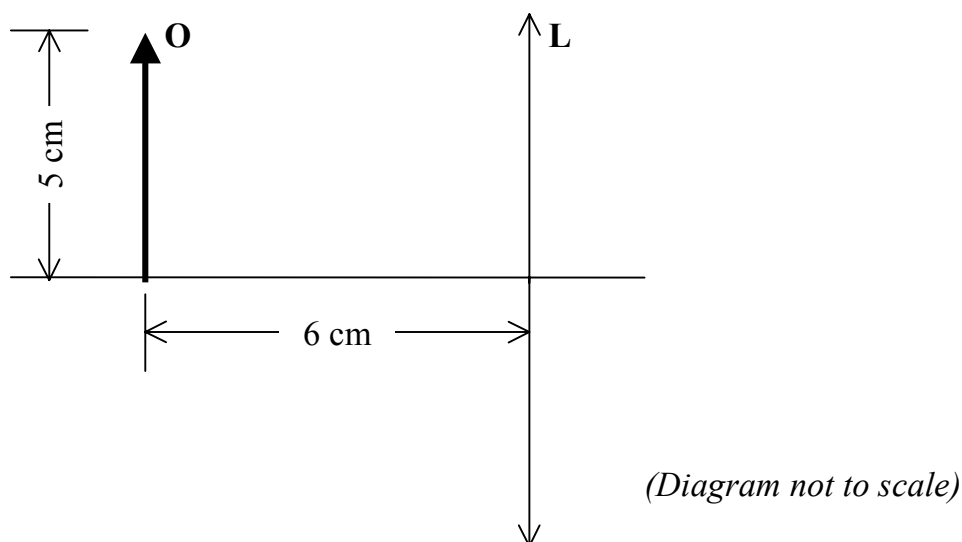
(ii) the 1 Ω resistor

d) State Ohm's law. [2]
[1]

Section B**(20 marks)**

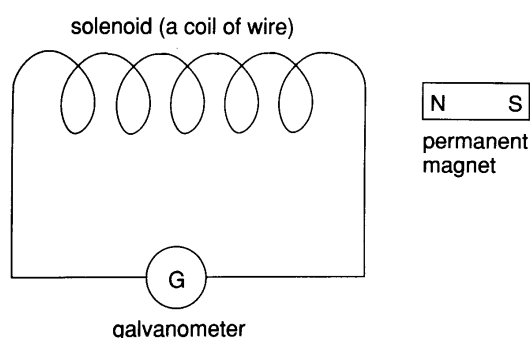
Answer **TWO** of the three questions. Answer each question on a separate piece of paper. All questions carry equal marks.

- 1 a) An object, **O**, of height 5 cm is placed 6 cm from a lens, **L**, of focal length 4 cm, as shown below.



- (i) On the piece of graph paper provided draw an accurate full scale diagram showing **O**, **L** and the image produced by the lens, **I**. Clearly show all construction lines used.
- (ii) State the image properties of the image, **I**. [5]
- b) (i) Explain what is meant by **centre of mass**.
- (ii) Describe an experiment that can be performed to accurately determine the centre of mass of a flat irregular-shaped piece of cardboard. [5]
- 2 a) Explain with the help of a labelled diagram how the vacuum flask is designed to keep heat from entering. [4]
- b) A laboratory thermometer is found to have a mercury bead 4 cm long when at the ice point and 17 cm long when at the steam point.
- (i) Explain what is meant by **ice point** and the **steam point**.
- (ii) If the mercury bead has a length of 11 cm what temperature is the thermometer measuring? [3]
- c) A rectangular piece of wood is 1 m long, 35 cm wide and has a thickness of 3 mm. The weight of the piece of wood is 5 N.
- (i) Calculate the density of the wood.
- (ii) State with a brief explanation whether the material would float or sink on water. [3]

3 The diagram below shows a galvanometer with a coil of wire connected to it.



The magnet is pushed slowly towards the solenoid.

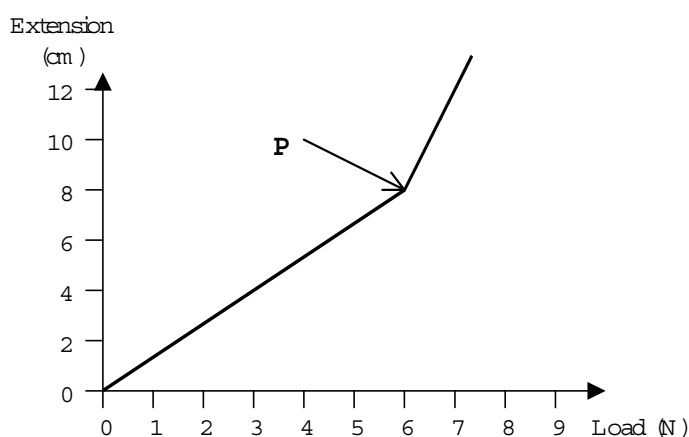
a) Explain what will happen in the circuit and how this is detected? [2]

b) Explain what will happen

(i) if the magnet is held stationary inside the coil,

(ii) if the magnet is pulled out of the solenoid coil. [2]

c) The graph below shows the extension produced in a spring for different loads attached to it.



(i) What is the name of the point labelled **P** on the graph? [1]

(ii) Does the spring obey Hooke's Law? Give reasons to support your answer. [1]

(iii) If the total length of the spring is found to be 16 cm when a load of 3 N is attached to the spring, how long is the unstretched length of the spring? [2]

(iv) What will be the extension in the spring if a mass of 0.5 kg is hung on the end of the spring? [2]