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7540/01

London Examinations GCE

Physics

Ordinary Level

Paper 1

Thursday 8 May 2008 – Afternoon

Time: 1 hour 15 minutes

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total	

Materials required for examination   **Items included with question papers**
Nil   Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Some questions must be answered with a cross in a box ($\boxtimes$). If you change your mind about an answer, put a line through the box ($\boxtimes$) and then mark your new answer with a cross ($\boxtimes$).

Information for Candidates

Calculators may be used.
Where necessary, assume the acceleration of free fall, $g = 10$ m/s^2.
The total mark for this paper is 70. The marks for parts of questions are shown in round brackets:
e.g. **(2)**.
This paper has 11 questions. All blank pages are indicated.

Advice to Candidates

Write your answers neatly and in good English.
In calculations, show **all** the steps in your working.

N 2 9 6 5 2 A 0 1 1 6

Turn over

edexcel

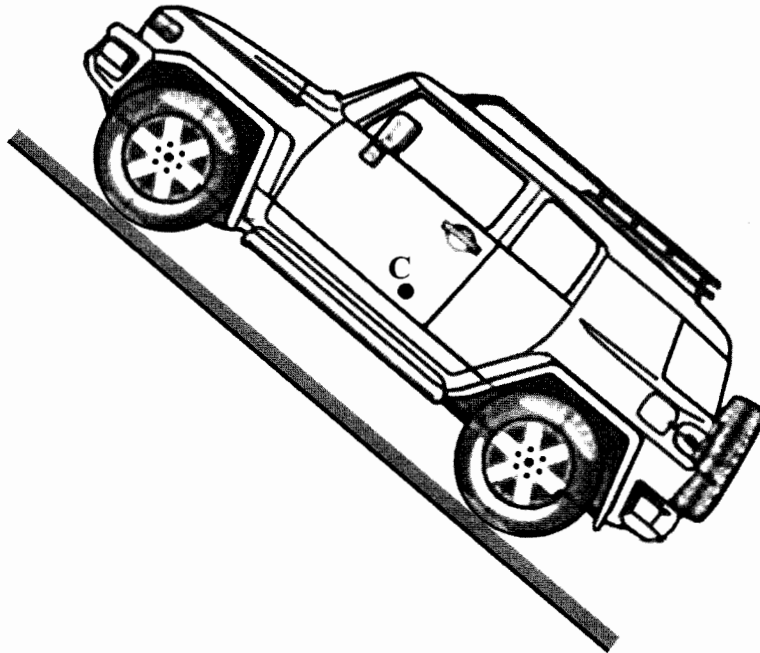advancing learning, changing lives

Answer ALL the questions.

1. The diagram shows a car which can climb extremely steep roads at a constant speed.

(a) Calculate the weight of such a car of mass 2500 kg.

....

(1)

(b) The centre of gravity of the car is marked with a dot **C**. Add an arrow to the diagram to show the direction and line of action of the weight of this car. Label this arrow **W**.

(1)

(c) The ground exerts a frictional force on each wheel of the car. Add an arrow to the diagram to show the direction and line of action of the frictional force acting on the front wheel of the car. Label this arrow **F**.

(2)

(d) The ground exerts a normal reaction force on each wheel of the car. Add an arrow to the diagram to show the direction and line of action of the reaction force acting on the front wheel of the car. Label this arrow **R**.

(2)

(e) Give a reason why it would be unsafe for the centre of gravity to be located nearer the back of such a car on this steep road.
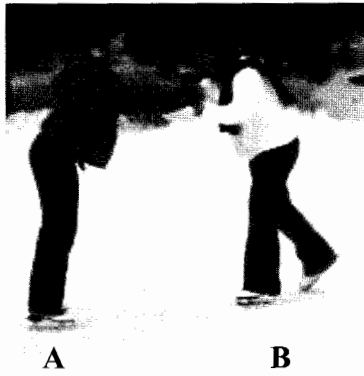
....

....

(1)

(Total 7 marks)

2. The picture shows ice skater **A** facing ice skater **B**. They are at rest on the ice.

A   B

(a) What is the total momentum of the two skaters?

....

(1)

(b) Is momentum a scalar quantity or a vector quantity?

....

(1)

(c) The two skaters push away from each other and move in opposite directions.

 (i) Skater **B** has a mass of 30 kg and moves to the right with a velocity of 3.2 m/s. Calculate the momentum of skater **B**.

  ....

  ....

  ....

  ....

(2)

 (ii) What is the momentum of skater **A**?

  ....

(1)

 (iii) Skater **A** has a mass of 40 kg. Calculate the velocity of skater **A**.

  ....

  ....

  ....

  ....
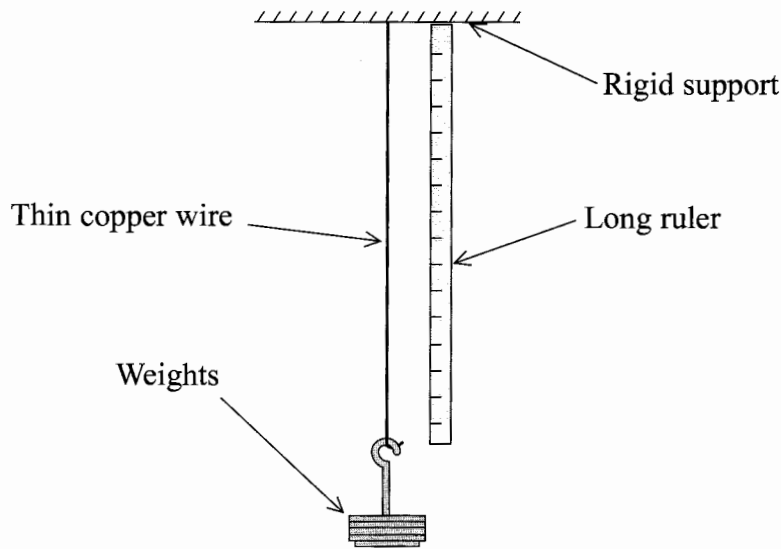
(2)

(Total 7 marks)

3. The diagram shows an arrangement for stretching a thin copper wire.

The results obtained were as follows:

Weight / N	0	4	8	12	16	20
Extension / mm	0.0	0.5	1.0		2.0	3.4

(a) What was the extension when the weight was 12 N?

....

(1)

(b) (i) Over what range of readings is it certain that the wire obeys Hooke's law?

....

(1)

(ii) Give a reason for your answer.

....

(1)

(c) What would be the effect on the length of the wire if the weight is removed after

(i) an extension of 1.0 mm is reached

....

(1)

(ii) an extension of 3.4 mm is reached?

....

(1)

(d) Explain your answers to c(i) and c(ii).

....

....

....

....

(2)

Q3

(Total 7 marks)

4. The diagram shows an apparatus which demonstrates how a hydroelectric power station works. The water from the reservoir flows at a steady rate and the lamp works normally.
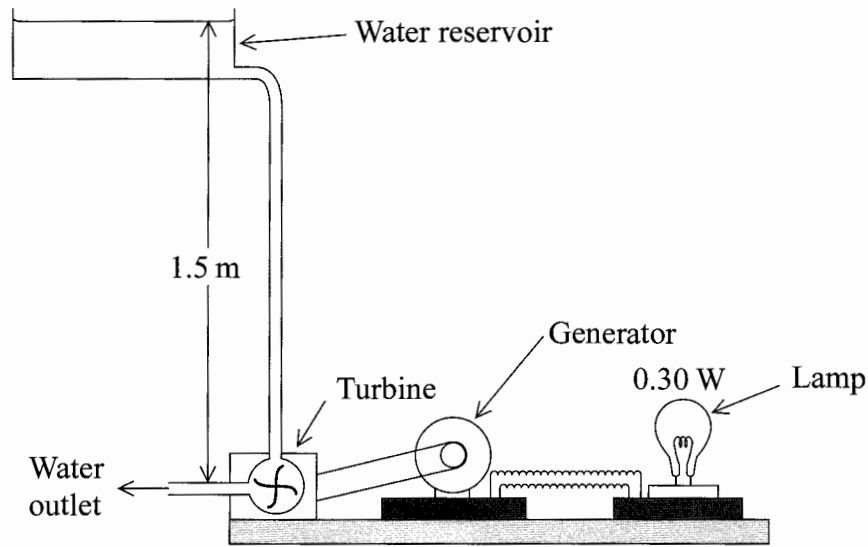
(a) The power of the lamp when working normally is 0.30 W.

(i) How much electrical energy is supplied to the lamp in one second?

....

(1)

(ii) The turbine and the generator have a combined efficiency of 40%. Show that 0.75 J of energy must be supplied to the turbine in one second, when the lamp is working normally.

....

....

....

(1)

(iii) Calculate the mass of water which flows through the turbine in one second when the lamp is working normally.

....

....

....

(3)

(b) When the lamp is working normally the amount of light energy emitted per second is only 0.075 J. What other form of energy is emitted by the lamp?
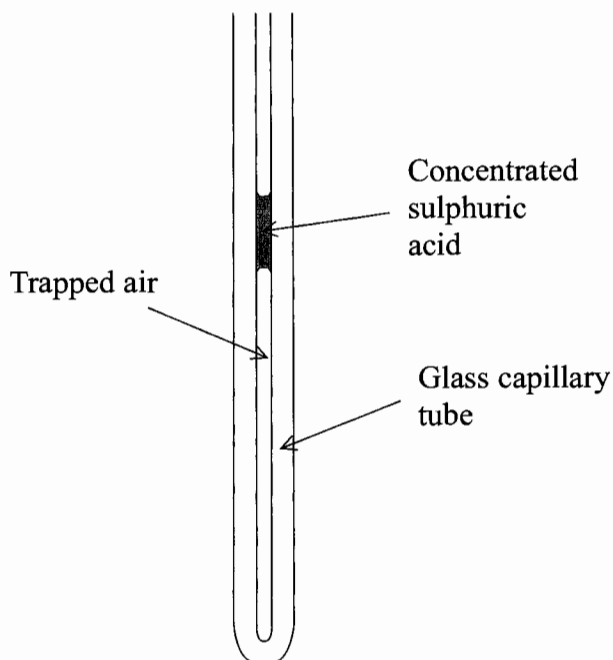
....

(1)

(Total 6 marks)

5. The diagram shows a small amount of air trapped in an open capillary tube by a pellet of concentrated sulphuric acid.

Concentrated sulphuric acid

Trapped air

Glass capillary tube

(a) How will the motion of the molecules of trapped air change when the temperature is increased?

....

(1)

(b) Explain why the volume of the trapped air does not double when the temperature rises from 25 °C to 50 °C.

....

....

....

....

(2)

(c) Why is concentrated sulphuric acid, rather than another liquid, used to trap the air?

....

....

....

....
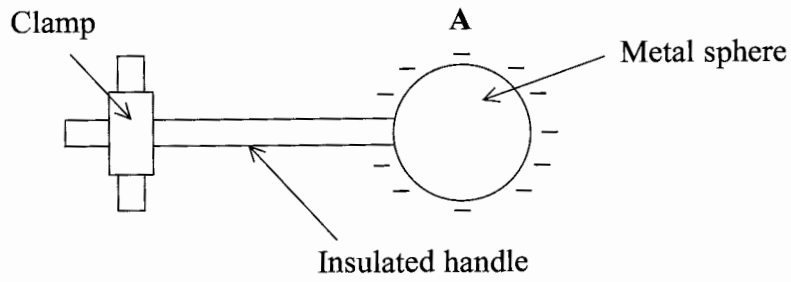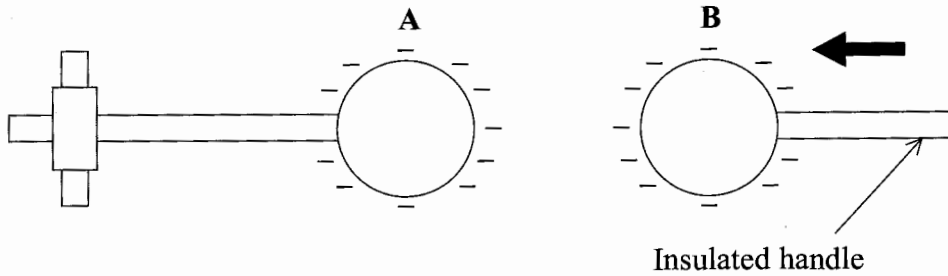
(2) Q5

(Total 5 marks)

6. The diagram shows a negatively-charged metal sphere **A** with a clamped insulated handle.

Clamp   **A**

Metal sphere

Insulated handle

A similar negatively-charged sphere **B** is brought near to **A** using its insulated handle as shown below.

A   **B**

Insulated handle

(a) (i) Explain why a force is required to move **B** towards **A**.

....

....

(2)

(ii) As **B** is brought closer to **A**, state whether the size of the force gets bigger, remains the same or gets smaller.

....

(1)

(b) **A** is now earthed. When **B** is very close to **A**, a spark jumps between the spheres. When the potential difference between the spheres is 5000 V, the energy in the spark is 0.0080 J.

Calculate:

(i) the charge passing between the spheres

....

....

....

(2)

(ii) the time for this charge to pass if the power in the spark is 2.0 W.

....

....

....

(2)

(Total 7 marks)

7. The diagram shows a low voltage power supply and a resistor.
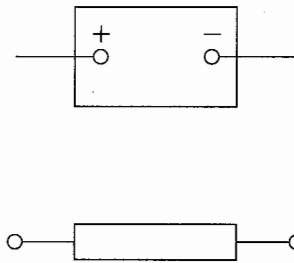
(a) Add to the diagram an ammeter —(A)—
    and a voltmeter —(V)— to show a circuit suitable for measuring the
    resistance of the resistor.

                                                                        (2)

(b) Which of the two meters should have a very high resistance?

    ....
                                                                        (1)

(c) The resistor is replaced by one of the combination of resistors, **A** or **B**, shown
    below.

    Each individual resistor has a resistance of 4 Ω.

A

B
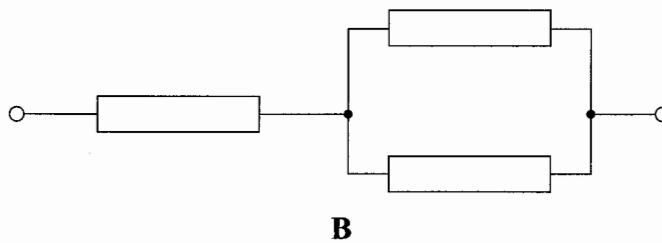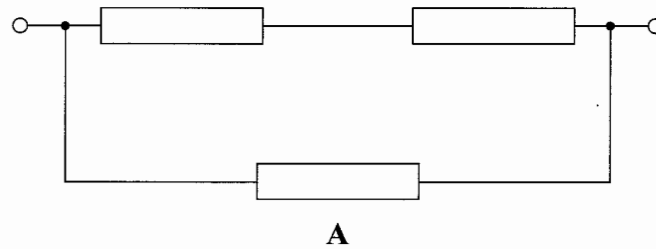
(i)   Calculate the resistance of each combination.

....

....

....

....

....

....

....

Resistance of combination **A** = ...

Resistance of combination **B** = ...

(3)

(ii) Which of the combinations, **A** or **B**, would allow the greater current to pass when connected to the low voltage power supply? Put a cross (☒) in the correct box.
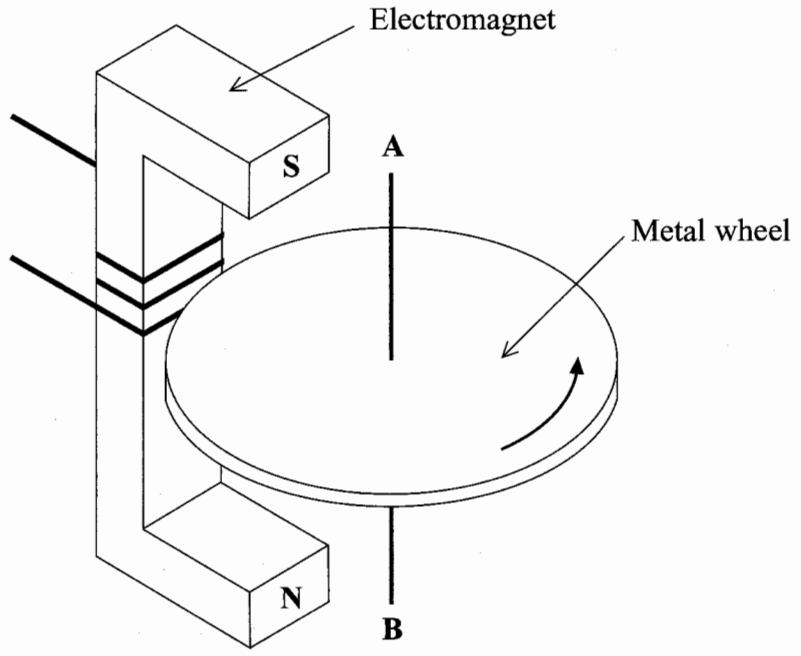
A ☒   **B** ☒

(1)   Q7

(Total 7 marks)

8.

Electromagnet

S   **A**

Metal wheel

N

B

(a) The diagram shows an electromagnet and a rotating metal wheel. The metal wheel is rotating about the axis **AB**.

When the electromagnet is switched on it acts as a brake on the wheel.

(i) On the diagram above, draw, with a direction, one magnetic line of force due to the electromagnet.

(1)

(ii) Explain why there is a current in the rotating metal wheel.

....

....

....

....

....

....

(3)

(b) As the wheel slows down, the braking effect of the electromagnet becomes less.

On the axes below sketch a graph of speed of the wheel against time after the electromagnet is switched on.

Speed

0
 0   Time

(2)

(c) (i) Does the temperature of the rotating wheel increase using this electromagnet as a brake? Put a cross (☒) in the correct box.

Yes ☒   No ☒

(1)

(ii) Explain your answer.

....

....

....

....

(1)

Q8

(Total 8 marks)

9. (a) Complete the table below with values of the relative masses and charges for the nucleons.

	mass	charge
electron	1	−1
proton		
neutron		

(2)

(b) Name an ionising radiation that does not contain any of the three particles shown in (a).

....

(1)

(c) (i) When the three particles in (a) all travel at the same speed at right angles to a magnetic field, which one has the greatest deflection? Put a cross (☒) in the correct box.

electron ☒

proton ☒

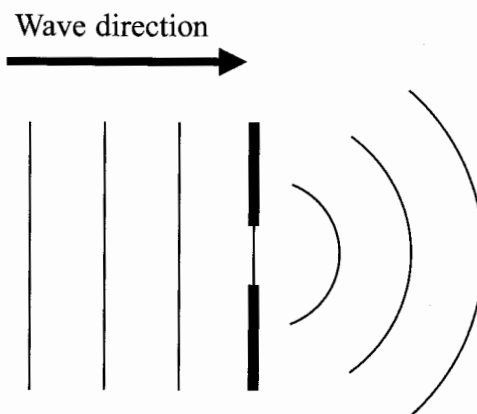neutron ☒

(1)

(ii) Explain your answer.

....

....

....

....

(1) Q9

(Total 5 marks)

10. (a) The diagram shows microwaves passing through a gap.

Wave direction

    (i) State the name of this phenomenon.

....

(1)

    (ii) Account for the shape of the waves emerging from the gap.

....

....

(1)

(b) These microwaves are part of the electromagnetic spectrum and have a wavelength of 0.060 m and a speed of 300 000 000 m/s.

    (i) Calculate the frequency of these waves.

....

....

....

(2)

    (ii) State why light waves would behave differently when passing through the same gap.

....

....
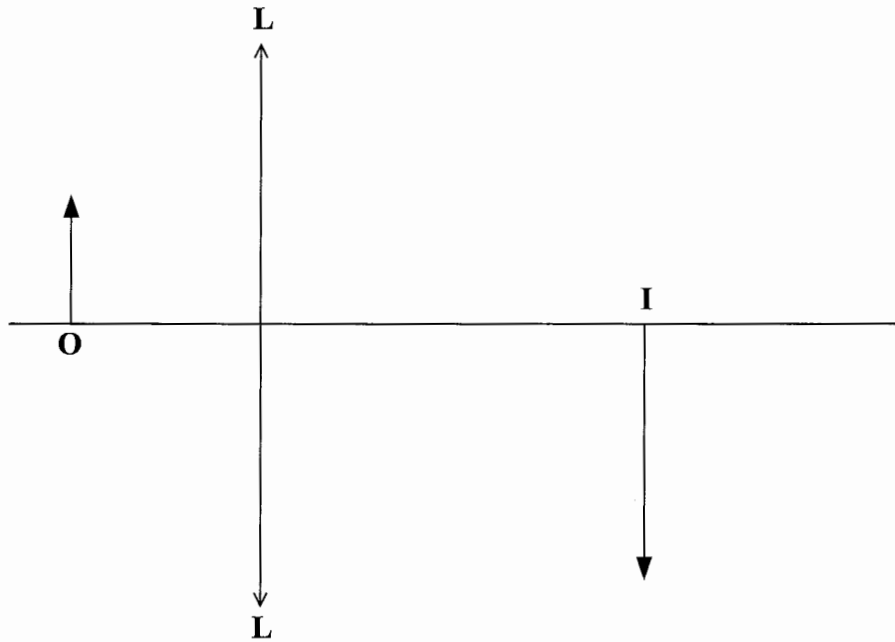
(1)

Q10

(Total 5 marks)

N 2 9 6 5 2 A 0 1 5 1 6

11. (a) The diagram shows an object **O** placed near a converging lens **LL**. The image formed is labelled **I**.

L

I

O

L

(i) Add two suitable rays to the diagram to show how the image is formed.

(2)

(ii) Mark the position of the principal focus of the lens and label it **F**.

(1)

(iii) Is the nature of this image real or virtual? Put a cross (☒) in the correct box.

Real ☒   Virtual ☒

(1)

(b) The object is moved further away from the lens.

(i) Which of the sentences below is true? Put a cross (☒) in the correct box.

The size of the image is less than before ☒

The size of the image is the same as before ☒

The size of the image is greater than before ☒

(1)

(ii) Is the nature of the image real or virtual? Put a cross (☒) in the correct box.

Real ☒   Virtual ☒

(1)

Q11

(Total 6 marks)

TOTAL FOR PAPER: 70 MARKS

END

N 2 9 6 5 2 A 0 1 6 1 6