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LEAVING CERTIFICATE EXAMINATION, SAMPLE PAPER

MAY 2001

PHYSICS – ORDINARY LEVEL

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3 HOURS DURATION

Answer **three** questions from section A and **five** questions from section B.

SECTION A (120 marks)

Answer **three** questions from this section.
Each question carries 40 marks.

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1. You have carried out an experiment to verify the principle of conservation of momentum.
Draw a labelled diagram of the apparatus you used.
Describe how you measured the velocity. (12)
As well as measuring velocity, what other measurement is required? (9)
How would you know that the principle of conservation of momentum was verified? (6)
Give one precaution you took to make the experiment accurate. (9)
(4)

2. You are asked to measure the refractive index of a substance using Snell's law.
List the apparatus that you need for this experiment.
Draw a diagram to show how the apparatus is arranged. (6)
Describe how the angle of incidence and the angle of refraction are measured. (6)
(12)

The following table gives the data a student recorded in this experiment.
Why was there a need for more than one set of readings?
Use the data to find the refractive index of the substance. (3)
(13)

angle of incidence/ °	20	40	60
angle of refraction/ °	13	25	35

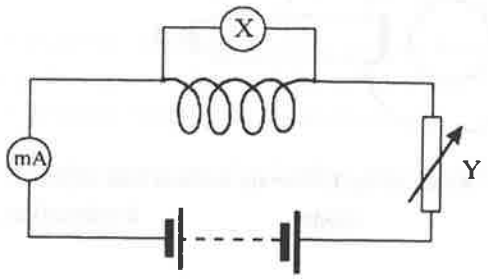
3. A student measured the variation of the resistance R of a coil of wire with temperature θ and the following data was produced.

θ / °C	10	20	30	40	50	60	70	80
R/ Ω	3.8	4.1	4.4	4.8	5.0	5.3	5.7	6.0

List the apparatus used.
Draw a labelled diagram to show how the apparatus was arranged. (9)
How was the temperature changed? (6)
Draw a graph of resistance against temperature. Put temperature on the horizontal axis. (6)
(12)

The coil was left in a warm room and its resistance was found to be 4.2 Ω. From your graph, estimate the temperature of the room.
(7)

The diagram shows the circuit used by a student to investigate the variation of current with potential difference for a metallic conductor.



Name the apparatus X. What does it measure? (6)
Name the apparatus Y. What does it do? (6)

The following table shows the values obtained for the current I and the potential difference V during the experiment.

I/mA	100	200	300	400	500	600	700	800
V/V	0.6	1.1	1.9	2.4	3.0	3.4	4.0	4.9

Draw a graph of current against potential difference. Put current on the horizontal axis. (12)
Explain how your graph verifies that the conductor obeys Ohm's law. (7)
From your graph, calculate the resistance of the conductor. (9)

SECTION B (280 marks)

swer **five** questions from this section.
h question carries 56 marks.

Answer *all* of the following parts.

(i) A car slows down when the driver applies the brakes. Rewrite the sentence below choosing words from the following list:

potential **friction** **gravity** **heat** **newtons** **speed**

"The brakes used the force of ..... to change the kinetic energy of the car to ....." (6)

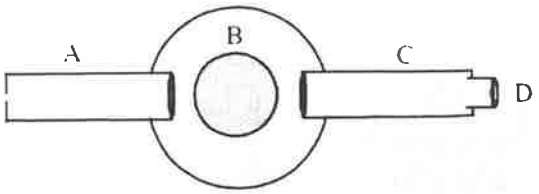
(ii) Explain why it is more likely to be frosty on a clear night than on a cloudy night. (6)

(iii) Convert 27 °C to kelvin. (6)

(iv) Which two of the following devices make use of total internal reflection?

floodlights **car rear-view mirrors** **prisms in binoculars** **endoscopes** (6)

(v) The diagram shows a spectrometer. Name two of the parts labelled A, B, C and D. (6)



(vi) A teenager tuned a radio to 2FM. Which of the following devices was adjusted?
resistor **capacitor** **diode** **loudspeaker** (6)

(vii) What is a semiconductor? (6)

(viii) What happens to a beam of electrons when it enters a magnetic field at right angles? (7)

(ix) Give two properties of X-rays. (7)

6. State Newton's first law of motion. (9)

A car of mass 1200 kg is travelling at a constant speed along a level road.
Draw a diagram showing the forces acting on the car. (9)

The car hits a wall at a speed of 20 m s^{-1} and is stopped in 0.2 s.
Calculate (i) the acceleration of the car during the collision,
(ii) the force acting on the car during the collision. (15)

The driver was not wearing a seatbelt and so hit the steering wheel when the car was suddenly brought to a stop.
Using Newton's laws of motion, explain how wearing a seatbelt could have prevented this from happening. (15)

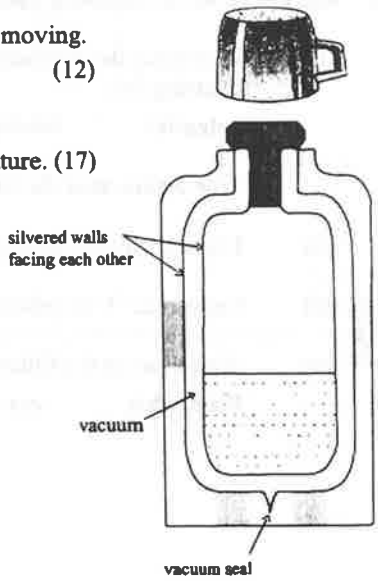
Calculate the energy of the car as it hit the wall. What happens to this energy after the car hits the wall? (8)

($v = u + at$; $F = ma$; $E_k = \frac{1}{2}mv^2$)

7. What is meant by *temperature*? (6)
Describe an experiment to compare the rates of conduction of heat through a number of different solids. (15)
Name two other ways in which heat can be transferred. (6)

The spongy material in a wetsuit keeps the layer of water near the swimmer's skin from moving.
Explain how a wetsuit can keep a swimmer warm. (12)

A vacuum flask (thermos flask) is designed to keep a liquid in it at a fixed temperature.
By referring to the diagram, explain how the flask can keep the liquid at a fixed temperature. (17)



8. Describe how you would demonstrate the formation of a real image by a converging lens. (8)

Explain, with the aid of diagrams, how the human eye can form a sharp image of (i) a near object, (ii) a distant object. (12)

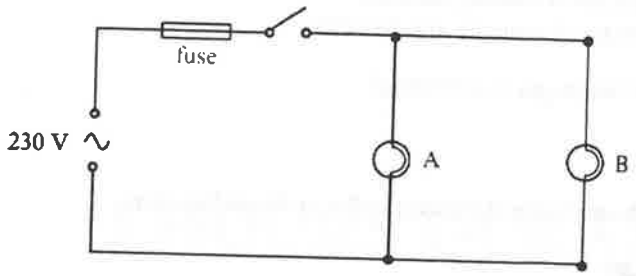
The distance between the centre of the eye-lens system and the retina is 2 cm.
What is the focal length of the eye-lens system when viewing an object that is 50 cm away? (12)
Calculate the power of the eye-lens system when viewing this object. (9)

Name a common defect of vision in the human eye. Explain how wearing spectacles can correct this defect. (15)

$\left(\frac{1}{f}=\frac{1}{u}+\frac{1}{v};\quad P=\frac{1}{f}\right)$

9. Describe an experiment to demonstrate the heating effect of an electric current. (12)

The diagram shows part of the lighting circuit in a room.



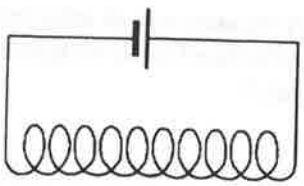
A is a 75 W lamp. The switch is closed. Calculate the current flowing through lamp A. (12)
The current flowing through the fuse is 0.76 A. What is the current flowing through lamp B? (6)
Calculate the resistance of lamp B. (9)
Explain how the fuse acts as a safety device in this circuit. (6)

An electric kettle is rated 3 kW. On average, the kettle is on for 30 minutes each day. How many units of electricity does the kettle use each day? How much does it cost to use the kettle each day, when one unit of electricity costs 8.36p? (11)
($P = VI;\ V = RI$)

10. What is the difference between a permanent magnet and an electromagnet? (6)
Magnets have many uses in the home. Give an application in the home of (i) a permanent magnet, (ii) an electromagnet.

The needle of a magnetic compass is a permanent magnet. (6)
Explain why one end of the compass needle turns towards a piece of iron placed nearby. (6)
Explain why a nearby electric current disturbs a compass needle. (6)

A solenoid is connected to a cell as shown. Copy this diagram into your answer-book and sketch its magnetic field. (9)



Explain the term *electromagnetic induction*. (9)
A magnetic field and a coil of wire can be used to generate electricity. Describe, with the aid of a diagram, how you could demonstrate this. (14)

11. Three types of radiation are α, β, γ.
Match each of the following descriptions with the correct type of radiation.

(i) short wavelength electromagnetic radiation
(ii) a particle consisting of two protons and two neutrons
(iii) a fast moving electron. (9)

Radon-222 is a radioactive gas that can seep into buildings from underground rocks.
It undergoes the following nuclear reaction.

$$^{222}_{86}\text{Rn} \rightarrow {}^{218}_{84}\text{Po} + {}^{4}_{2}\text{He}$$

What type of radiation is emitted by radon-222? (6)

Explain what is meant by the *half-life* of a radioactive material. (6)
The half-life of radon-222 is 4 days. The activity of a sample of radon-222 is measured as 520 Bq.
Estimate the activity of the radon-222 sample after 12 days. (9)

Outline the principle of operation of a detector of ionising radiation. (9)
Describe how you would measure the activity of a sample of radon-222. (9)

Why is it important to control the level of radon gas in a building? (8)

12. The following is an extract from a Health and Safety Authority leaflet on Noise Exposure.

IS YOUR WORK MAKING YOU DEAF?

Forty of every hundred workers who have worked all their lives at high noise levels (90dB(A) decibels) will, at the age of 65 years, find it difficult to hear other people talking. Some of these workers will even be deaf.
This deafness means that you can hear sounds but they are totally distorted or "muffled".

This type of deafness is *incurable*.
This type of deafness *can be prevented*.

How can I be protected?
If you are exposed to continuous loud noise at work the "European Communities (Protection of Workers) (Exposure to Noise) Regulations 1990" set out what your employers must do to protect you from noise exposure. They must assess, measure and control noise and supply hearing protection as appropriate.

Assessing Noise
The level of noise to note is 85 dB(A).
If it is necessary to communicate by shouting at a distance of 2 m, the noise level may well be 85 dB(A). A specially trained person should, therefore, measure the noise level.

(i) What is noise? (6)
(ii) How might a person's hearing be affected by exposure to high noise levels? (6)
(iii) Name a source of high noise level that might be found in the workplace. (6)
(iv) What physical quantity is measured in decibels? (6)
(v) What is the dB(A)? (6)
(vi) How are noise levels measured? (6)
(vii) What must employers do if their workers are exposed to high noise levels? (6)
(viii) Where else, other than at work, might you be exposed to high noise levels? (6)
(ix) Explain the term *frequency response of the ear*. (8)