WARNING: You must return this section with your answer book otherwise marks will be lost.

Write your examination number here.

AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA

LEAVING CERTIFICATE EXAMINATION, 2001

PHYSICS — ORDINARY LEVEL

MONDAY, 18 JUNE — MORNING 9.30 to 12.30

Answer **all** questions in Section A.

Answer **two** questions from Section B and **three** questions from Section C.

Write your examination number at the top.

Be sure to return this section of the examination paper, enclosing it in the answer book you use in answering Sections B and C.

SECTION A (120 marks)

Answer each question in this section.
Each question carries the same number of marks.
Write your answers in the spaces provided.

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1. Answer *five* of the following items, (i), (ii), (iii), etc. In the case of each item write the letter corresponding to the correct answer in the box provided.

(i) The unit of force is the

A. joule
B. newton
C. kilogramme
D. watt
E. second.

Answer ☐ (6)

(ii) The momentum of a body is equal to

A. mg
B. mgh
C. ma
D. mv
E. $^1/_2mv^2$.

Answer ☐ (6)

(iii) The pitch of a musical note depends on its

A. amplitude
B. quality
C. frequency
D. resonance
E. harmonics.

Answer ☐ (6)

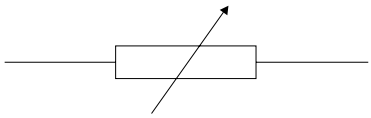
(iv) A transformer is a device used to

A. store energy
B. charge a battery
C. convert a.c. voltages to d.c. voltages
D. change a.c. voltages
E. convert d.c. voltages to a.c. voltages.

Answer ☐ (6)

(v) The symbol in the diagram represents a

A. diode
B. rheostat
C. thermistor
D. battery
E. transistor.



Answer ☐ (6)

(vi) Thermionic emission is the

A. heating effect of light rays
B. release of electromagnetic radiation
C. release of alpha particles
D. heating effect due to nuclear reactions
E. release of electrons from the surface of a hot metal.

Answer ☐ (6)

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PHYSICS – ORDINARY LEVEL

Section A is on a separate sheet which provides spaces for your answers. The completed sheet should be enclosed in your answer book.
Write your answers to Sections B and C in your answer book.

SECTION B (82 marks)

Answer **two** of the questions from this section.
Each question carries the same number of marks.

5. In an experiment to verify Newton's second law, a force was applied to a body. The acceleration of the body was measured. This was repeated for different values of the force.

Draw a labelled diagram of the apparatus used. (9)

How was the force measured? (6)

The table shows the measurements taken in the experiment.

Force/N	1.0	2.0	3.0	4.0	5.0	6.0	7.0
Acceleration/cm s^{-2}	5.2	10.2	15.8	21.0	26.0	31.0	36.4

Plot a graph on graph paper of force against acceleration. (15)

What conclusion can be drawn from the graph? (6)

Give one precaution that should be taken to get an accurate result. (5)

6. In a report of an experiment to measure the specific latent heat of fusion of ice, a student wrote the following.

"Ice at 0 °C was added to the water in the calorimeter.
When all the ice had melted measurements were taken.
The specific latent heat of fusion of ice was then calculated."

Draw a labelled diagram of the apparatus used. (12)

What measurements were taken before the ice was added to the water? (9)

How did the student make sure that the ice was at 0 °C? (6)

How did the student find the mass of the ice? (9)

Give one precaution that should be taken to get an accurate result. (5)

7. In an experiment to investigate the variation of the resistance of a metallic conductor with temperature, the resistance of a coil of wire was measured at a number of different temperatures. The recorded data were then plotted on a graph.

List the apparatus used. (12)

Draw a diagram to show how the apparatus was arranged. (6)

How was the resistance of the wire measured? (6)

How was the temperature of the wire measured? (6)

Sketch the graph obtained in this experiment. (11)

SECTION C (198 marks)

Answer **three** questions from this section.
Each question carries the same number of marks.

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8. Define (i) velocity, (ii) acceleration. (12)

Describe an experiment to measure the acceleration due to gravity, g. (21)

A stone is thrown straight up from the ground with an initial speed of 25 m s^{-1}. Calculate the height reached after 2 s. Use the equation $s = ut + {}^1/_2at^2$. (12)

Describe how the speed of the stone changes as it rises to its highest point. (6)

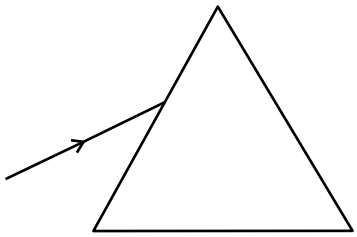
Calculate the time it takes the stone to reach its highest point. Use the equation $v = u + at$. (9)

How long will it take the stone to return to the ground? (6)

(Acceleration due to gravity, g = 9.8 m s^{-2}.)

9. State the laws of refraction of light. (12)

The diagram shows a ray of monochromatic light travelling from air into a 60° glass prism. Copy the diagram into your answer book and show clearly the ray of light passing though the prism and back into air. (9)



60° glass prism

List the apparatus you need in an experiment to measure the refractive index of a substance. (6)

Draw a diagram to show how the apparatus is arranged in this experiment. (9)

What readings do you take? (6)

How do you use these readings to find the refractive index? (6)

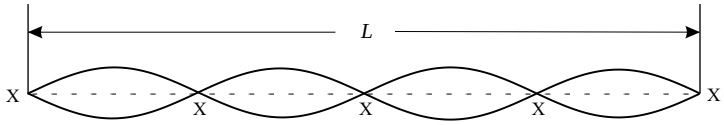
Draw a ray diagram to show the formation of the final image in an astronomical telescope. (18)

10. "Sound is a longitudinal wave motion. Sound waves may undergo constructive interference and destructive interference."

Explain the underlined terms. (18)

How would you demonstrate interference of waves in the laboratory? (9)

The diagram shows a stationary wave on a stretched string.



What is the name given to the points marked X? (6)

How many wavelengths are contained in the distance marked *L*? (6)

Name one factor that affects the natural frequency of a stretched string. (6)

Describe an experiment to investigate how the natural frequency of a string varies with this factor. (21)

11. Explain what is meant by the resistivity of a material. (6)

Outline an experiment to measure the resistivity of a sample of nichrome wire. (18)

The diagram shows the wiring arrangement in a domestic electric iron.

The heating element is made from nichrome wire. The resistivity of nichrome is 1.0×10^{-6} Ω m.

The heating element has an overall length of 0.8 m and a cross sectional area of 1.8×10^{-6} m^2.

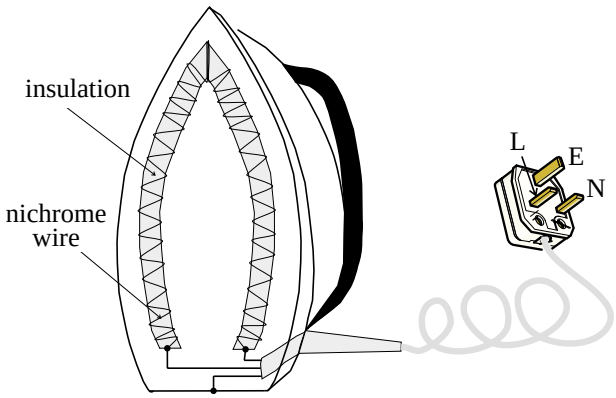
Calculate the resistance of the heating element. Use the formula $\rho = \frac{RA}{l}$. (12)

Explain the purpose of the wire connected to the terminal E on the plug in the diagram. (6)

Give the standard colour of the insulation on the wires connected to each of the terminals L, N, E on the plug. (9)

The power rating of the electric iron is 1.2 kW. What current flows through the heating element of the iron when it is connected to the ESB mains supply of 230 V? Use the formula $P = VI$. (9)

Explain why a fuse should be used when operating any electric appliance connected to the mains supply. (6)



12. Describe an experiment to demonstrate that a current-carrying conductor in a magnetic field experiences a force. (18)

The force on a current-carrying conductor in a magnetic field is given by $F = IlB$. The letter *I* stands for the current. What do the letters *l* and *B* stand for? (9)

The diagram shows a motor.

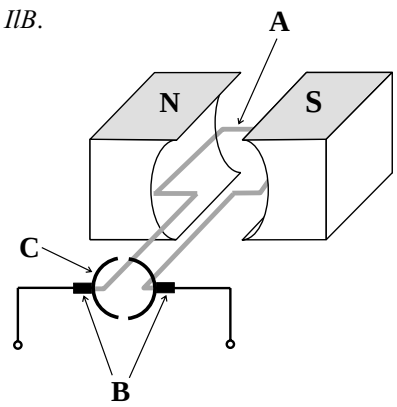
Name the parts labelled A, B and C. (9)

Explain why A turns when a current flows thought it. (12)

Give the function of the parts labelled B. (6)

Give an everyday use of a motor. (6)

Name another device that is based on the same principle as the motor. (6)



13. Answer any *two* of the following parts (*a*), (*b*), (*c*), (*d*).

(*a*) Name three ways of transferring heat. (9)

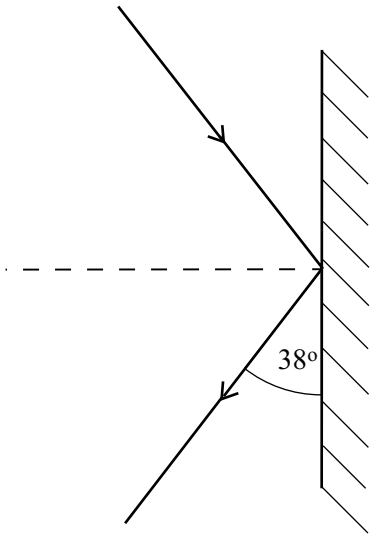
How is energy transferred from the sun to the earth? (6)

Outline how solar heating can be used to heat a house. (12)

Give two ways by which the U-value of a house can be reduced. (6)

(*b*) State the laws of reflection of light. (12)

The diagram shows a ray of light being reflected by a plane mirror. What is the value of the angle of incidence? (6)



Draw a labelled diagram of the apparatus used in an experiment to measure the focal length of a concave mirror. (9)

Give one use of a concave mirror. (6)

(*c*) "The capacitance of a parallel plate capacitor depends on the distance between the plates."

Explain the underlined term. (6)

Describe an experiment to investigate the above statement. (15)

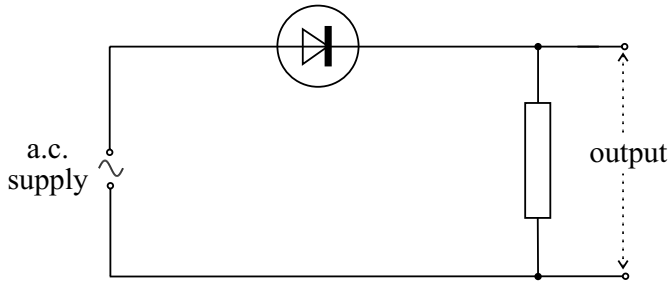
Name another factor that affects the capacitance of a parallel plate capacitor. (6)

A capacitor has a capacitance of 20 μF. A voltage supply of 20 V is connected across it.

What is the charge on the plates of the capacitor? Use the formula $Q = CV$. (6)

(*d*) What is a semiconductor? (6)

What is the difference between a p-type semiconductor and an n-type semiconductor? (9)



The diagram shows a p-n diode being used as a half-wave rectifier.
What is the purpose of a half-wave rectifier? (9)

Sketch a graph to show how the output voltage varies with time. (9)

2. Answer *five* of the following.

(i) The barometer is a device used to measure ..... (6)

(ii) The boiling point of alcohol is 79 ^{o}C. What is the boiling point of alcohol on the Kelvin scale? ..... (6)

(iii) Microwaves have a longer wavelength than .....but have a shorter wavelength than ..... (6)

(iv) The magnetic declination is the angle between ..... and the ..... (6)

(v) Faraday's first law of electrolysis states that the ..... of a substance liberated during electrolysis is proportional to ..... (6)

(vi) The photoelectric effect is the emission of..... from the surface of a metal when .....falls on it. (6)

3. Answer *five* of the following.

(i) Define energy. ..... (6)

(ii) What is the unit of energy? ..... (6)

(iii) Write down Einstein's equation which relates mass and energy. ..... (6)

(iv) State the principle of conservation of energy. .... (6)

(v) An electrical generator converts .....energy to electrical..... (6)

(vi) State one energy conversion that occurs when water goes down a waterfall. .... (6)

4. Answer *five* of the following.

(i) Name two types of radiation emitted from radioactive substances. ..... (6)

(ii) Name an instrument used to detect radiation. ..... (6)

(iii) Give one precaution which should be taken when dealing with radioactive substances. .....

..... (6)

(iv) Give one use for radioactive substances. ..... (6)

(v) Name the scientist who discovered radioactivity. ..... (6)

(vi) A radioactive substance has a half-life of 2 days. A sample of the substance has a mass of 20 g. How much of the sample will be left after 4 days? ..... (6)

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