

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

Write Your
Examination
Number here

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LEAVING CERTIFICATE EXAMINATION, 2000

PHYSICS — ORDINARY LEVEL

MONDAY, 19 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.

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. kilogram
- D. metre per second
- E. pascal.

Answer ☐ (6)

(ii) The three states of water are ice, water and water vapour. The temperature at which all three can be in contact with each other is called the

- A. melting point
- B. critical point
- C. U-value
- D. absolute value
- E. triple point.

Answer ☐ (6)

(iii) A sound wave has a frequency of 400 Hz and a wavelength of 0.8 m. The speed of the wave is

- A. 320 m s^{-1}
- B. 50 m s^{-1}
- C. 500 m s^{-1}
- D. 3200 m s^{-1}
- E. 256 m s^{-1} .

Answer ☐ (6)

(iv) The frequency of the note from an ambulance siren appears to change as the ambulance goes past. This is called

- A. refraction
- B. interference
- C. diffraction
- D. the Doppler effect
- E. reflection.

Answer ☐ (6)

(v) When a current is flowing in a conductor the voltage divided by the current is called the

- A. pressure
- B. power
- C. resistance
- D. density
- E. resistivity.

Answer ☐ (6)

(vi) Einstein's equation which relates mass to energy is

- A. $E = mgh$
- B. $E = meV$
- C. $E = mc^2$
- D. $E = mv^2$
- E. $E = \frac{1}{2} mv^2$.

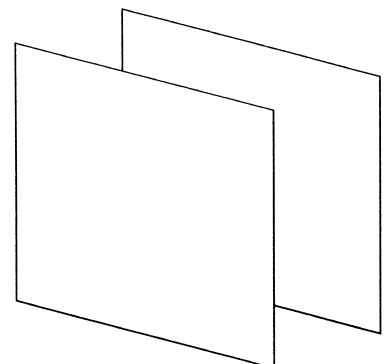
Answer ☐ (6)

2. Answer *five* of the following.

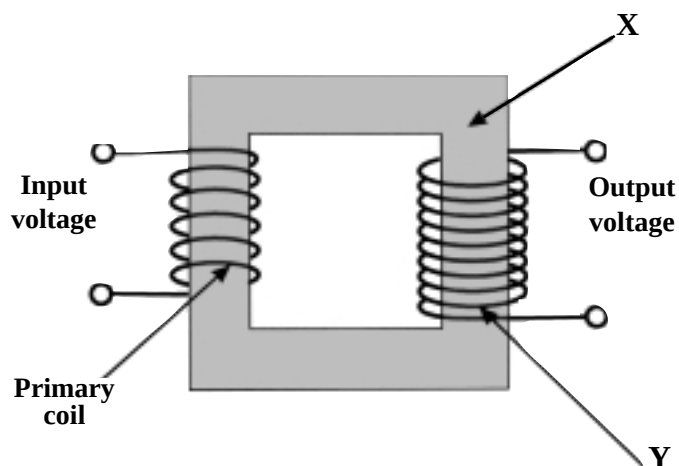
- (i) The force which acts on a body which is sliding over a fixed surface is called (6)
- (ii) The specific heat capacity of a substance is the amount of required to raise the temperature of of the substance by 1 K. (6)
- (iii) The loudness of a note increases when the of the wave increases. (6)
- (iv) Name two particles emitted by radioactive substances.
1..... 2..... (6)
- (v) Cathode rays consist of a beam of electrons and so they have a electric charge. (6)
- (vi) Name the Irishman who invented the induction coil (6)

3. Answer *five* of the following.

- (i) The average speed of a body is equal to the..... travelled divided by the time taken. (6)
- (ii) When a beaker is full of liquid the pressure at a point in the liquid depends on the below the surface and on the of the liquid. (6)
- (iii) The moment of a force is equal to the product of the force and the perpendicular from the (6)
- (iv) The natural frequency of a string depends on its tension and its (6)
- (v) The force between two electric charges is proportional to the product of the charges and inversely proportional to (6)
- (vi) The diagram shows a simple parallel plate capacitor. The capacitance of the capacitor depends on the common of the plates and on thebetween them. (6)



4. The diagram shows a transformer. Answer *five* of the following.



- (i) What is a transformer used for?(6)
- (ii) Name the part labelled X(6)
- (iii) What metal is part X usually made from? (6)
- (iv) What is the name given to the coil labelled Y? (6)
- (v) The transformer is based on the principle that is induced in a coil in a changing magnetic field. (6)
- (vi) If the coil Y has ten times more turns than the primary coil, then the output voltage will be times the input voltage. (6)

LEAVING CERTIFICATE EXAMINATION, 2000

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 a report of an experiment to verify Boyle's law, a student wrote the following.

"A sample of air was trapped in a tube and its temperature was not allowed to change.
The pressure and the volume of the trapped air were measured.
The pressure was changed and a new set of measurements were taken.
This procedure was repeated a few times."

Draw a labelled diagram of the apparatus used.

(8)

How was the pressure changed?

(3)

How was the pressure measured?

(3)

The table shows the measurements taken in the experiment.

Pressure/kPa	100	110	120	130	150	170	200
Volume/cm ³	6.0	5.5	5.0	4.5	4.0	3.5	3.0
$\frac{1}{\text{Volume}} / \text{cm}^{-3}$							

Copy this table and complete the last row of the table by calculating $\frac{1}{\text{volume}}$ for each measurement.

(6)

Plot a graph on graph paper of pressure against $\frac{1}{\text{volume}}$.

(15)

Explain how the graph verifies Boyle's law.

(6)

6. An apparatus used to measure the electrochemical equivalent of copper is shown in the diagram.

Name the electrodes **X** and **Y**.

(6)

Explain how the mass of copper deposited is measured.

(9)

Name the part labelled **W** and give its function.

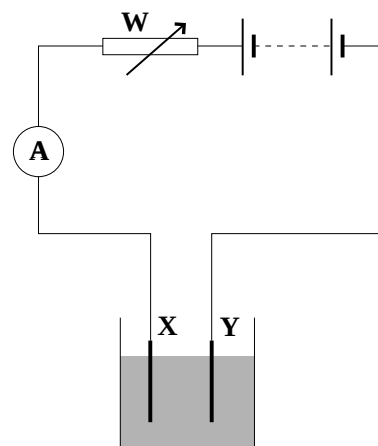
(9)

A current of 2.0 A flowed for 10 minutes and deposited 0.40 g of copper. Use the equation $m = zIt$ to calculate the electrochemical equivalent of copper.

(11)

Give one precaution which should be taken to get an accurate result.

(6)

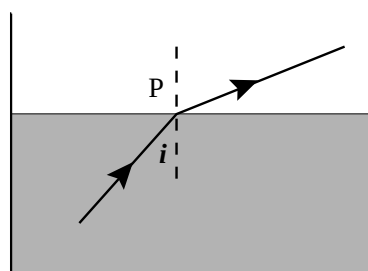


7. A student used a monochromatic light source in an experiment to measure the wavelength of light. (9)
- Explain the term monochromatic light. Give one example. (9)
- Sketch and label the apparatus that the student used. (9)
- State two readings which the student took in the experiment. (9)
- Give the equation used to calculate the wavelength of the light in this experiment. (8)
- Mention one precaution which should be taken in this experiment to get an accurate result. (6)

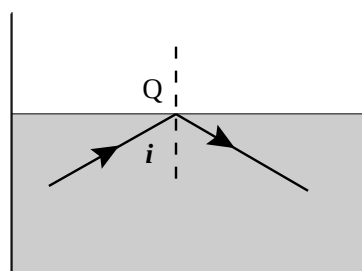
SECTION C (198 marks)

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

8. State the principle of conservation of momentum. (9)
- List the apparatus you need to verify the principle of conservation of momentum. (6)
- Draw a diagram to show how the apparatus is arranged. (6)
- What measurements do you take? (9)
- How do you use these measurements to verify the principle of conservation of momentum? (6)
- Explain how the principle of conservation of momentum is applied in launching a spacecraft. (6)
- Give one other application of the principle of conservation of momentum. (6)
- An ice skater of mass 50 kg is moving with a speed of 8 m s^{-1} . What is her momentum? (9)
- The skater collides with another skater of mass 60 kg who is standing still. After the collision both skaters move together. Calculate the speed of the two skaters after the collision. (9)
9. The diagram shows light travelling through water in tank A and also through water in another tank, B. (6)
- What name is given to what is happening to the light at the point P in tank A? (6)
- What name is given to what is happening to the light at the point Q in tank B? (9)
- In tank B the angle of incidence i must be bigger than a certain angle. What is this angle called? (6)
- Give one everyday application of the effect shown in tank B. (6)



Tank A



Tank B

- Describe an experiment to measure the focal length of a converging lens. (15)
- A converging lens is used as a magnifying glass to examine a postage stamp. The lens is held at a distance of 10 cm from the stamp. The focal length of the lens is 15 cm. (9)
- Draw a ray diagram to show how the image is formed by the lens. (9)
- Find the distance of the image from the lens. (9)
- Show that the image is 3 times the size of the stamp. (6)

10. “When a wave meets an object diffraction occurs. A wave with the correct frequency can also cause resonance in an object.”

Explain the underlined terms. (18)

How would you demonstrate diffraction in the laboratory? (9)

List the apparatus you need in an experiment to measure the speed of sound in air in the laboratory. (6)

Draw a diagram to show how the apparatus is arranged in this experiment. (6)

What readings do you take? (9)

How do you use these readings to find the speed of sound? (6)

If you are standing a few hundred metres from a fireworks display you will often see the flash of light from an exploding firework before you hear the sound of the explosion. What does this tell you about the speed of sound in air? (6)

Name a medium in which sound travels faster than it does in air. (6)

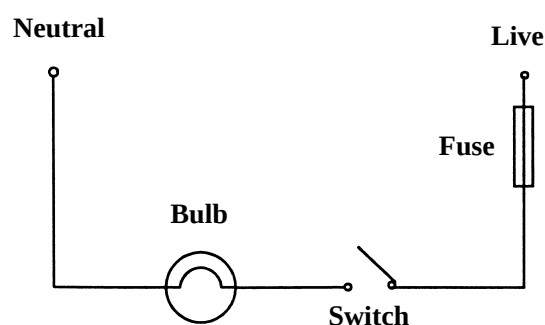
11. Joule’s law relates the heat produced in a wire to the current flowing through the wire. State Joule’s law. (9)

How would you show the heating effect of an electric current in the laboratory? (12)

The diagram shows a household circuit containing a bulb, a switch and a fuse.

What is the purpose of the fuse and how does it work? (12)

Why is the switch on the live side of the bulb rather than the neutral side? (6)



What is the purpose of an earth wire in a circuit? Why is an earth wire not needed in the circuit shown in the diagram? (9)

The unit of electrical energy used by the ESB is the kilowatt-hour. What is meant by a kilowatt-hour? (6)

In a room there is a 100 W television and a 2 kW electric heater. Find the total cost of using both of these for 5 hours if one unit costs 8p. (12)

12. (a) What are X-rays? (6)

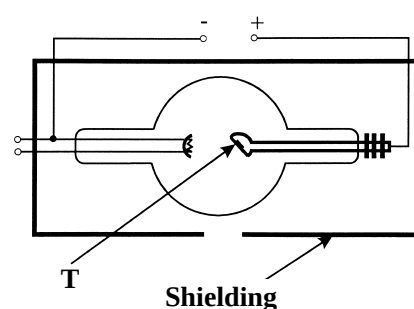
The diagram shows an X-ray tube. In this tube electrons are produced by thermionic emission and are accelerated across the tube to the anode.

Name the part of the tube where the electrons are produced. (6)

The part of the tube labelled **T** is a metal which has a high melting point. What is **T** and why must it have a high melting point? (9)

Why is there shielding around the X-ray tube? (6)

Give one use of X-rays. (6)



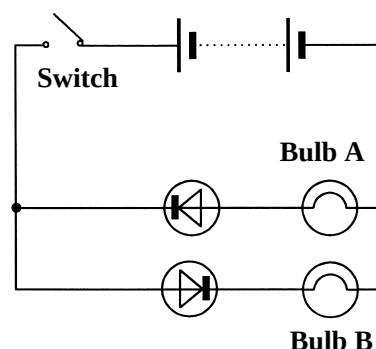
- (b) What is a semiconductor? (6)

Draw a labelled diagram to show the structure of a diode. (9)

The diagram shows two diodes connected to two bulbs, A and B, and a battery.

What happens when the switch is closed? (9)

Explain your answer. (9)



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

- (a) Newton's Universal Law of Gravitation gives an equation for the force between two masses. Write down this equation. (9)

List the apparatus you need to measure the acceleration due to gravity, g . (6)

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

What measurements do you take? (6)

How do you use these measurements to find a value for g ? (6)

- (b) "When calibrating a thermometer you need a thermometric property and two fixed points."

What is a thermometric property? (6)

Name two fixed points. What values are given to these fixed points on the Celsius scale? (9)

Name the thermometric property used in a mercury thermometer and also used in an alcohol thermometer. (6)

Give one other example of a thermometric property. (6)

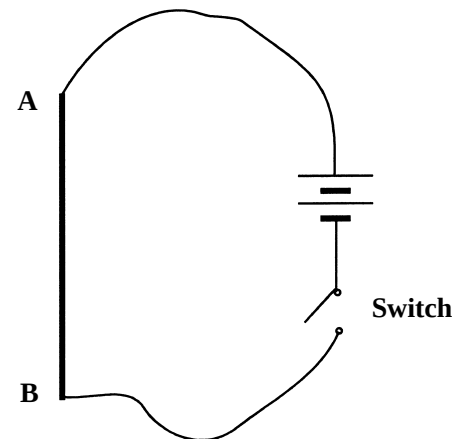
The boiling point of alcohol on the Celsius scale is 79°C . What is the boiling point of alcohol on the Kelvin scale? (6)

- (c) The diagram shows a straight piece of wire, AB, connected to a battery and a switch.

If the wire AB is placed just above a compass and the switch is then closed what happens to the compass needle? (6)

Explain why this happens when the switch is closed. (9)

If you put a magnet close to the wire AB what would you see when the switch was closed? What principle does this demonstrate? (12)



Name one piece of equipment that is based on this principle. (6)

- (d) The nuclear reactors which are now in use around the world are based on nuclear fission.

What is nuclear fission? (6)

Name a fuel used in nuclear reactors. (3)

Mention two parts of a nuclear reactor, other than the fuel rods. (12)

Scientists are working to develop a nuclear reactor based on nuclear fusion.

What is nuclear fusion? (6)

Give one advantage of a reactor based on nuclear fusion compared with a reactor based on nuclear fission. (6)