Write your Examination Number here

**AN ROINN OIDEACHAIS**

**LEAVING CERTIFICATE EXAMINATION, 1986**

PHYSICS — ORDINARY LEVEL

WEDNESDAY, 25 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.



**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.
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.

**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) Which of the following is **not** a vector?

A. Displacement
B. Mass
C. Velocity
D. Momentum
E. Acceleration.

Answer ☐ (6)

(ii) Fig. 1 shows a rigid bar which is in equilibrium and is supported at its centre of gravity. The mass X is

A. 2·0 kg
B. 4·5 kg
C. 0·02 kg
D. 1·5 kg
E. 0·5 kg

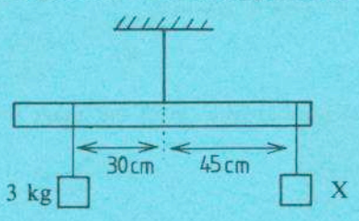


Fig. 1

Answer ☐ (6)

(iii) The solar constant is

A. the speed of the light from the sun
B. the energy per second from the sun falling normally on a square metre of the earth's atmosphere
C. the time it takes the earth to move round the sun
D. the distance from the earth to the sun
E. the power emitted by the sun.

Answer ☐ (6)

(iv) When a moving car is brought to rest by applying the brakes, the kinetic energy of the car

A. does not change
B. is changed to potential energy
C. is changed mostly to heat energy in the brakes
D. is all transferred to the passengers
E. is all absorbed by the road.

Answer ☐ (6)

(v) When an a.c. voltage of 200 V was applied to the primary coil of a transformer the voltage across the secondary coil was 20 V. If the primary coil contained 1,000 turns the secondary coil contained

A. 100 turns
B. 4,000 turns
C. 250 turns
D. 10,000 turns
E. 10 turns.

Answer ☐ (6)

(vi) When the three kinds of nuclear radiation are arranged in *increasing* order of their ionising effect the order is

A. alpha, beta, gamma
B. beta, gamma, alpha
C. beta, alpha, gamma
D. gamma, alpha, beta
E. gamma, beta, alpha.

Answer ☐ (6)

**2.** Answer *five* of the following.

(i) The cabin of an aircraft flying at high altitude is "pressurised". Give a reason for this. .....

.....

..... (6)

(ii) State Newton's Universal Law of Gravitation. .....

.....

..... (6)

(iii) Specific latent heat is defined as .....

..... (6)

(iv) For an astronomical telescope in normal adjustment the image formed by the objective lens is at .....

..... (6)

(v) For what achievement is the eminent scientist Thomas Young best remembered? .....

..... (6)

(vi) What is an electrolyte? .....

.....

Give an application of electrolysis. ..... (6)

**AN ROINN OIDEACHAIS**

LEAVING CERTIFICATE EXAMINATION, 1986

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 (80 marks)**

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

**5.** In an experiment to measure the focal length of a concave mirror a student found the position of the real image for various positions of an object. The object distance, $u$, and the corresponding image distance, $v$, were measured and the following table was drawn up.

| $u$/cm | $v$/cm | $\frac{1}{u}$/cm$^{-1}$ | $\frac{1}{v}$/cm$^{-1}$ |
|---|---|---|---|
| 29 | 64 | 0·034 | 0·016 |
| 37 | 43 | 0·027 | 0·023 |
| 40 | 41 | 0·025 | 0·024 |
| 50 | 35 | 0·020 | 0·029 |

(i) Draw a simple sketch to show how the apparatus might have been arranged in this experiment. (9)

(ii) How might the position of the image have been determined? (9)

(iii) Calculate a value for the focal length $(f)$ of the mirror using the above data and the equation

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$ (21)

**6.** The apparatus shown in the photograph (Fig. 3) was used in a circuit to verify Joule's law in a school laboratory.

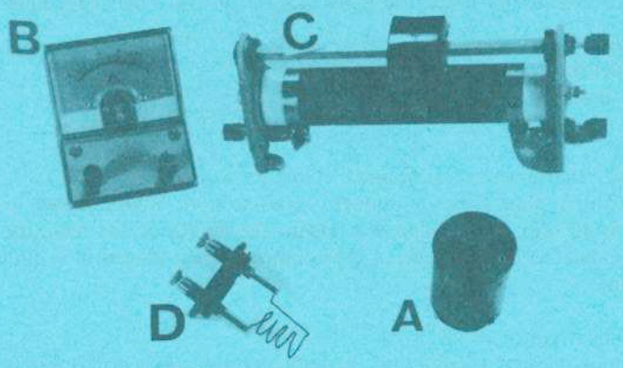


Fig. 3

(i) Name the pieces of apparatus labelled A, B, C, D in the photograph. (12)

(ii) Draw the circuit diagram for this experiment, making use of the usual symbols where appropriate for the apparatus shown in the photograph. (9)

(iii) What measurements should be taken in this experiment? (9)

(iv) How could these measurements be used to verify Joule's law? (9)

7. The graph shown in Fig. 4 was obtained in an experiment to measure the half-life of a short-lived radioactive isotope.

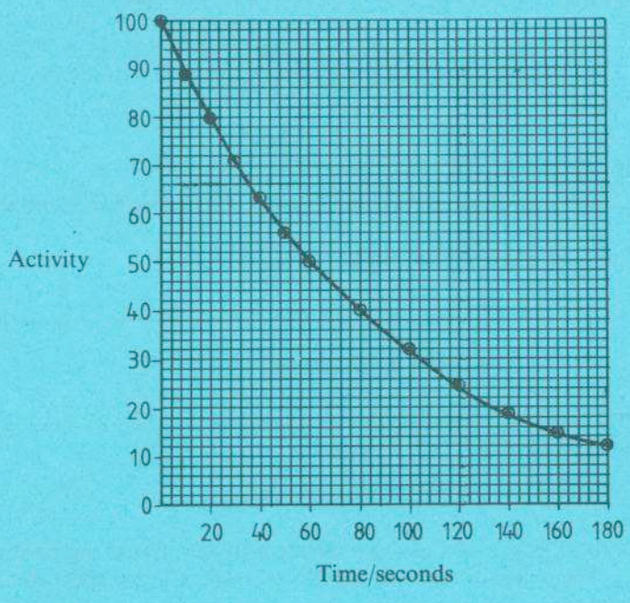


Fig. 4

(i) Name the equipment that may have been used in the experiment. (9)

(ii) Outline the procedure carried out to obtain the information shown in the graph. (12)

(iii) Find the half-life of the radioactive isotope from the information shown in the graph. (12)

(iv) Give *one* use of radioactive isotopes. (6)

---

## SECTION C (200 marks)

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

---

8. State Newton's laws of motion. (24)
A force of 2,400 N causes a car to accelerate from rest to 20 m $s^{-1}$ in 10 seconds. Calculate

(i) the mass of the car, (12)
(ii) the distance travelled by the car in the 10 seconds, (15)
(iii) the work done by the force. (15)

9. *(a)* What is meant by "thermometric property"? Give an example. (12)
Mercury is placed in a glass tube of uniform cross-section. When placed in melting ice the length of the mercury column is 40 mm. When placed in steam the length of the mercury column is 240 mm. Calculate the temperature indicated by this type of thermometer when placed in a liquid if the length of the mercury column is 140 mm. (24)

*(b)* What is meant by heat conduction? (6)
Outline how the rates of heat conduction through various solids could be compared. (18)
How may the U-value of a structure be reduced? (6)

10. Distinguish between transverse and longitudinal waves. (12)
Describe a laboratory experiment to measure the speed of sound in air. (24)
Give *two* of the factors which determine the natural frequency of a string. (6)
Outline an experiment to show how the natural frequency of a string varies with *one* of the factors which you have given. (24)

11. What is meant by (i) potential difference, (ii) capacitance? (18)
Describe an experiment to show that the capacitance of a parallel-plate capacitor depends on the distance between the plates of the capacitor. (30)
What is the capacitance of a capacitor which has a charge of 6 μC and a potential difference of 6 V? (12)
Give *one* common use of a capacitor in an electric circuit. (6)

**12.** Describe the structure and the principle of operation of a simple a.c. generator. (36)
Sketch a graph to show how the voltage generated by the a.c. generator varies with time. (12)
The points X and Y on the circuit shown in Fig. 5 were connected to the terminals of an a.c. generator. What is the function of the diode (A) in this circuit?
Sketch a graph to show how the voltage across the resistor R varies with time. (18)

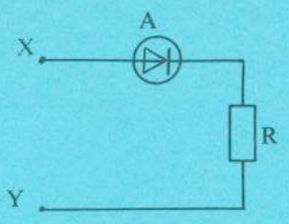


Fig. 5

**13.** Answer any *two* of the following.

*(a)* What is meant by the coefficient of static friction? (12)
A horizontal force of 10 N is required to cause a body of mass 2 kg to begin to move along a rough horizontal surface. Draw a simple diagram to indicate the directions of the forces acting on the body. Calculate the coefficient of static friction between the body and the surface. (Take $g = 9{\cdot}8\ \text{m s}^{-2}$) (21)

*(b)* What is meant by dispersion of light? (6)
Describe how a reasonably pure spectrum of white light could be obtained in the laboratory. (18)
How may infra-red radiation be detected? (9)

*(c)* State Ohm's law (9)
Fig. 6 shows an arrangement of three resistors each of value 12 ohms.

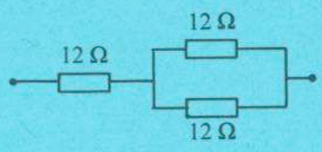


Fig. 6

Calculate the resistance of the single resistor which could be used to replace this arrangement. (15)
On what factors does the resistance of a metallic conductor depend? (9)

*(d)* Give the basic structure of a transistor. (12)
What is (i) a thermistor, (ii) a relay? (12)
Fig. 7 shows a circuit which was used to switch a relay.

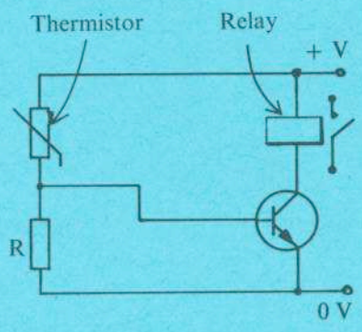


Fig. 7

State why the relay switches when the thermistor is heated beyond a certain temperature. (9)

**3.** Fig. 2 shows the magnetic field pattern of a bar magnet.

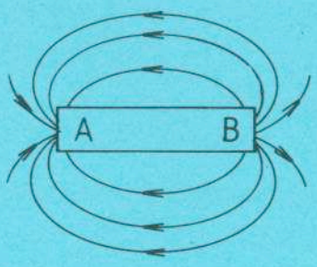


Fig. 2

Answer *five* of the following.

(i) Which pole A or B is the north pole of the magnet? ..... (6)

(ii) How might the magnetic field pattern be demonstrated in the laboratory? .....

..... (6)

(iii) What is meant by magnetic declination? .....

..... (6)

(iv) What is meant by magnetic dip? .....

..... (6)

(v) In what other way might a magnetic field pattern be produced (other than by using a magnet)? .....

..... (6)

(vi) The moving-coil loudspeaker has a permanent magnet. What happens to the cone of the loudspeaker on passing a varying current through the coil? .....

..... (6)

**4.** Answer *five* of the following.

(i) Give two properties of electrons. .....

..... (6)

(ii) What is meant by thermionic emission? .....

..... (6)

(iii) What are X-rays? ..... (6)

(iv) What causes the electrons to be accelerated in an X-ray tube? .....

..... (6)

(v) Why is shielding necessary in an X-ray tube? .....

..... (6)

(vi) Give *one* application of X-rays. ..... (6)