

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1985

PHYSICS—ORDINARY LEVEL

WEDNESDAY, 26 JUNE—MORNING, 9.30 to 12.30

Any six questions to be answered.

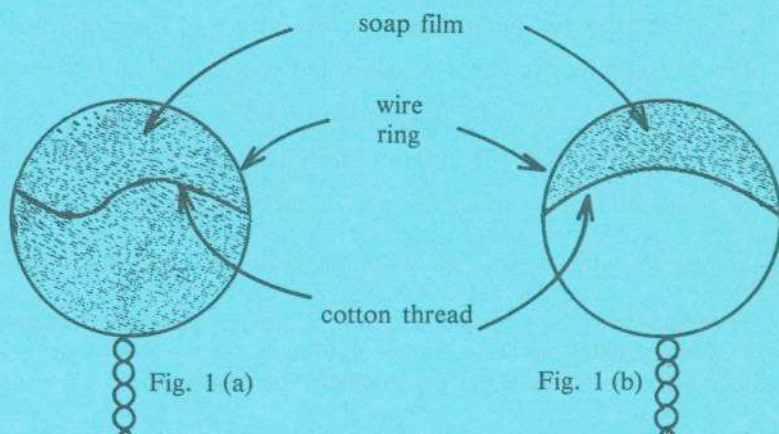
All the questions carry the same marks.

1. Answer *eleven* of the following items (a), (b), (c), etc. All the items carry the same marks. *Keep your answers short.*(a) Calculate the potential energy of a body of mass 2 kg when raised to a height of 2.5 m. (Take $g = 9.8 \text{ m s}^{-2}$.)

(b) Give (i) an example of a scalar quantity, (ii) an example of a vector quantity.

(c) What is meant by the moment of a force about a point?

(d) Fig. 1 (a) shows a cotton thread tied across a wire ring in which there is a soap film. When the soap film in the lower half of the ring is broken the thread as a result is pulled into an arc as shown in Fig. 1 (b). What phenomenon does this illustrate?

(e) How much heat is lost by 2 kg of boiling water when its temperature falls to 90°C ? (Specific heat capacity of water is $4,200 \text{ J kg}^{-1} \text{ K}^{-1}$.)

(f) What are transverse waves?

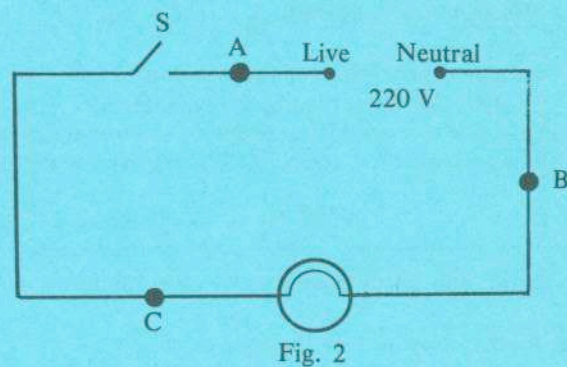
(g) Show by means of a ray-diagram how a convex mirror forms a virtual image of an object.

(h) What is meant by diffraction?

(i) Complete the following statement: "The force between two charges is directly proportional to the of the charges and inversely proportional to the of the distance between them".

(j) Define capacitance.

(k) A bulb is connected to the electricity mains through a switch S as shown in Fig. 2. In which one of the three positions A, B or C should a fuse be inserted to ensure the safe operation of the circuit?



(l) Define the ampere.

(m) Name the charge carriers in (i) a metal, (ii) an electrolyte.

(n) What energy conversion takes place in a photoelectric cell?

(o) State two properties of ultra-violet light *or* infra-red light.

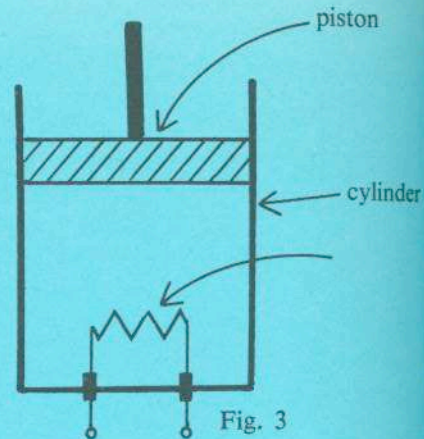
(p) What is meant by nuclear fusion?



2. Define (i) force, (ii) work.

Outline a laboratory experiment to demonstrate the conservation of momentum.

A mass of 10 kg travelling at 5 m s^{-1} has its velocity increased to 25 m s^{-1} in 10 seconds by applying a constant force to the body. Calculate (i) the change in momentum, (ii) the magnitude of the force, (iii) the work done.



3. (a) State *four* assumptions of the kinetic theory of gases.

Fig. 3 shows a cylinder in which a quantity of gas is trapped by means of a close-fitting piston. The cylinder also contains a heating coil. What happens to the piston when the heating coil is switched on? Explain your answer by referring to the kinetic theory of gases.

- (b) Give the basic principles involved in establishing a scale of temperature. Draw a labelled diagram of a constant-volume gas thermometer and show how it may be used to measure temperature.
4. State the laws of refraction of light.
Describe an experiment to measure the refractive index of glass.
Distinguish between a real and a virtual image.
An object 1 cm high is placed 6 cm away from a convex lens of focal length 12 cm. Find the position, height and nature of the image formed.
5. Explain the basic physical principles involved in any *four* of the following.
- A person can jump higher on the surface of the moon than on the surface of the earth.
 - An electric fire has a polished and curved surface behind the heating element.
 - Polaroid is normally used in the lenses of sunglasses.
 - Electrical energy is usually transmitted at high voltage over long distances.
 - Large amounts of energy may be obtained from small quantities of nuclear fuel.
6. Outline an experiment to show that a current-carrying conductor experiences a force when placed in a magnetic field.
Describe, with the aid of a diagram, a moving-coil galvanometer and explain how it operates.
A galvanometer has a resistance of 40 ohms and it gives a full scale deflection when a current of 15 mA flows through it. How may the galvanometer be converted into a voltmeter reading up to 1.5 V?
7. Describe how you would perform any *two* of the following experiments in the laboratory:
- to demonstrate the parallelogram of forces,
 - to measure the value of the resistance of a coil of wire using a metre bridge and a resistor of known resistance,
 - to measure the horizontal component of the earth's magnetic flux density,
 - to show the variation of current with potential difference in the thermionic diode.
8. Describe, with the aid of a diagram, how X-rays are produced.
How may (i) the intensity, (ii) the penetrating power, of the X-rays be increased?
Calculate the energy of an X-ray photon with a wavelength of 8.0×10^{-11} m.
(Take Planck's constant, $h = 6.6 \times 10^{-34}$ J s; velocity of light = 3.0×10^8 m s⁻¹)
9. Give *two* properties of the neutron.
Explain the terms: isotope; radioactivity.
Describe a method for detecting radioactivity and indicate the principle on which the method depends.
The isotope of thorium, ${}_{90}^{232}\text{Th}$, undergoes radioactive decay as follows:



Name the particle emitted at *each* of the four stages of the decay shown above.

10. Answer any *two* of the following.

- Explain the terms (i) wavelength, (ii) frequency, (iii) amplitude.
Outline an experiment to demonstrate the interference of sound waves.
- Give one difference between the object lens in a compound microscope and in an astronomical telescope.
Show, using a ray-diagram, how the final image is formed in a compound microscope.
- State Faraday's laws of electrolysis.

In an experiment to measure the electrochemical equivalent of copper the following readings were obtained:

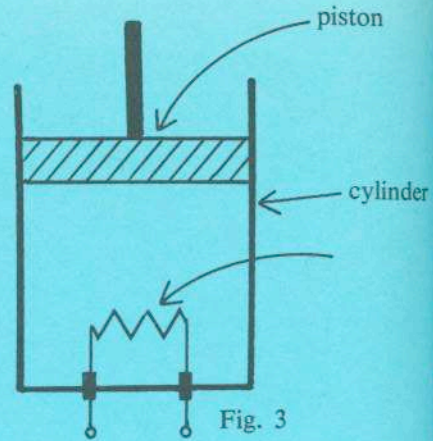
Initial mass of cathode	= 44.25 g
Final mass of cathode	= 44.37 g
Current	= 0.50 A
Time	= 12 mins.

Use these readings to calculate a value for the electrochemical equivalent of copper.
Give *one* application of electrolysis.

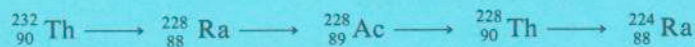
- Write down the laws of electromagnetic induction. Draw a labelled diagram of a simple a.c. generator and explain how its operation is based on the laws of electromagnetic induction.

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