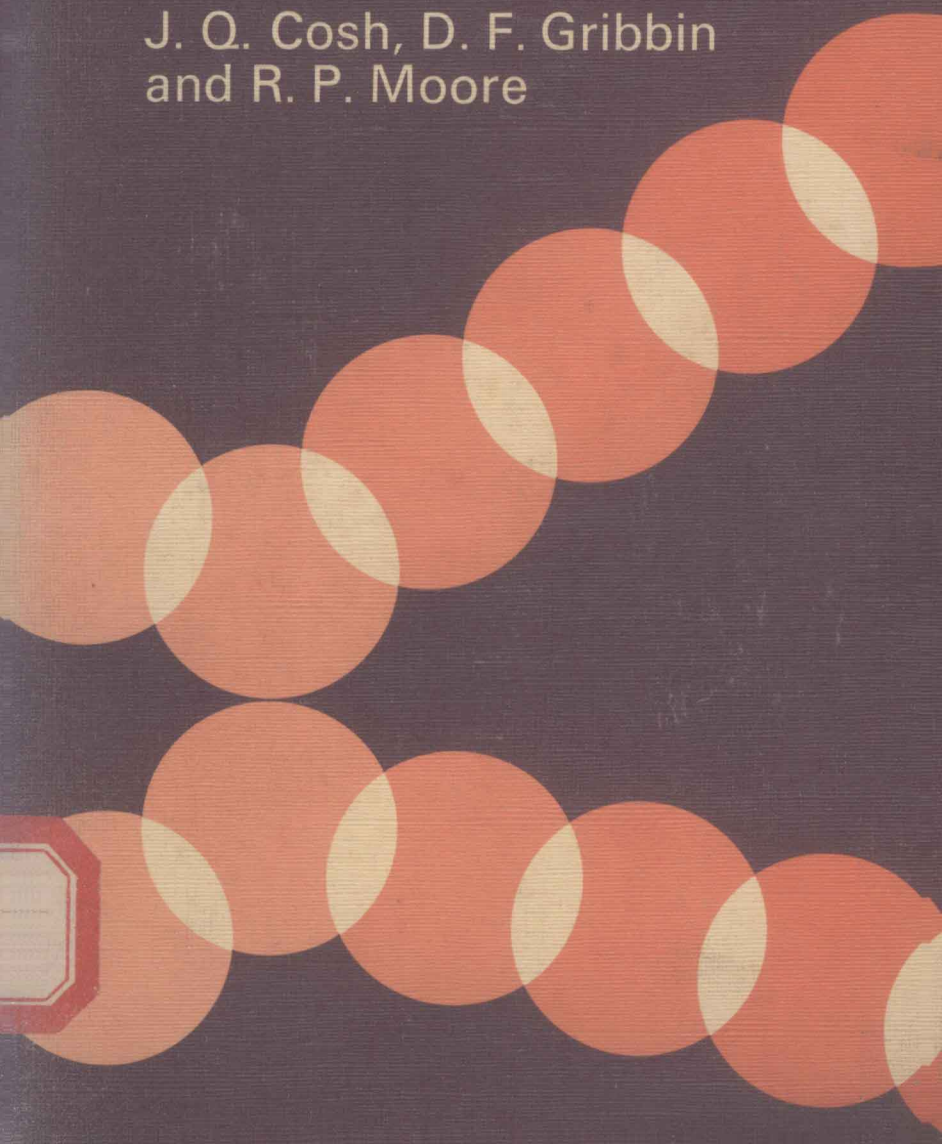


# Objective Tests in Physics

for Nuffield Courses at  
'O' level and CSE

J. Q. Cosh, D. F. Gribbin  
and R. P. Moore



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Edward Arnold

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First Published 1978

by Edward Arnold (Publishers) Ltd.

41 Bedford Square, London WC1B 3DP

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**British Library Cataloguing in Publication Data**

Cosh, J. Q.

Objective tests in physics for Nuffield courses  
at 'O' Level and CSE.

1. Physics — Examinations, questions, etc.

I. Title II. Moore, R. P. III. Gribbin, D. F.

530'.076

QC32

ISBN 0-7131-0192-X

Set in 9/10 Univers by Parkway Group London and Abingdon  
Printed in Great Britain by Unwin Brothers Ltd. London and Old Woking

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## Preface

Objective questions now form part of many 'O' level and C.S.E. examinations and are widely used in Nuffield and other recently developed courses. This book has been written to cater primarily for the needs of students studying the Nuffield 'O' level physics course or C.S.E. courses based on this, but it is hoped that those studying Nuffield Combined Science, Nuffield Secondary Science or the Schools Council Integrated Science Project will also find the questions valuable. The book is intended to be used both during the course, and at the end for revision.

The sections in the book have been deliberately chosen to follow closely those of the Nuffield 'O' level physics course, with questions more relevant to the other courses inserted at the appropriate points. The first two sections revise the work covered in years one and two of the Nuffield physics course. The final two sections consist of revision questions which aim to test the knowledge and understanding acquired by the end of the examination course.

The authors have endeavoured to cater for as wide a range of attainment as possible by grading the questions so that they vary in difficulty throughout a section, and by including questions demanding the hierarchy of abilities: knowledge, comprehension, application, analysis.

All the accepted types of objective question (with the exception of the assertion/reason) are included, together with some novel ones.

# Introduction

Two types of question are used throughout the book, namely

- (i) multiple choice
- (ii) multiple completion.

The coding system used is such that the answer to *every* question is simply **A, B, C, D** or **E**.

## Answer Code

### *(i) Multiple choice*

This is the more straightforward type. Simply decide which *one* response is correct.

#### *Example*

When one end of a glass rod is heated in the flame of a Bunsen burner

- A** cold and hot molecules change places
- B** heat energy passes from one molecule to another
- C** hot molecules of glass move along the rod away from the source of heat
- D** cold molecules of glass move along the rod towards the source of heat
- E** since glass is an insulator no heat is conducted

### *(ii) Multiple Completion*

In this type three responses are given numbered (i) to (iii). In contrast to the previous type one or more *may* be correct. The letters A, B, C, D and E are now used in the style of a formal code to indicate which selection of responses has been made, as follows

- A** if (i), (ii) and (iii) are correct
- B** if (i) and (ii) are correct
- C** if (ii) and (iii) are correct
- D** if (i) only is correct
- E** if (iii) only is correct

This code is to be used for *all* multiple completion questions.

#### *Example*

A drop of oil spreads out over the surface of some water. What remains the same for the oil as it spreads out?

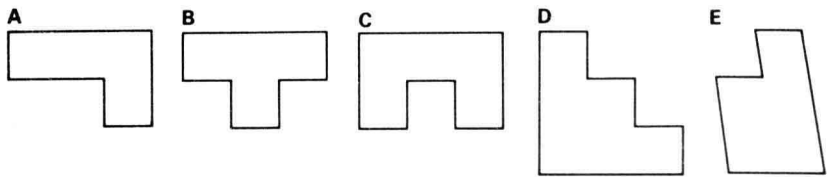
- (i) The mass
- (ii) The volume
- (iii) The surface area

(i) and (ii) are correct and (iii) is incorrect. Hence the correct answer code is **B**.

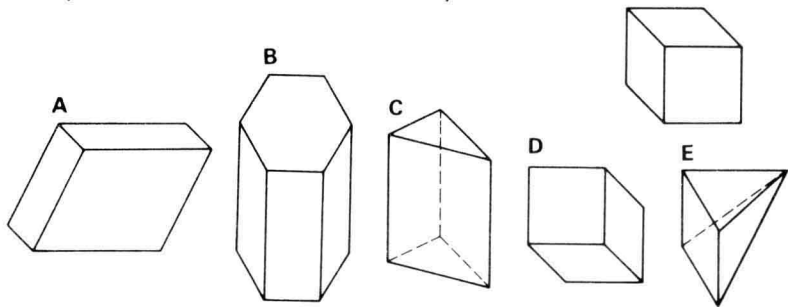
# Section A:

## Basic Introductory Revision

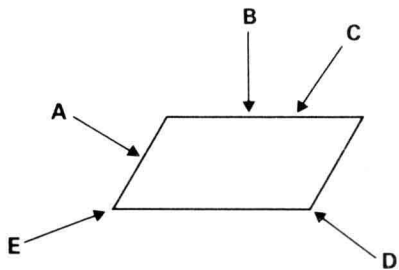
**A1** Sugar forms cubic crystals. Which one of the shapes below could NOT be seen when sugar is placed under a microscope?



**A2** The diagram on the right shows a crystal of salt. If the crystals of DIFFERENT substances shown below are placed in a strong salt solution, around which one would salt crystals form?



**A3** The crystal below is split in two with a knife by giving the knife a sharp tap with a hammer. In which direction should the blow be delivered in order to split the crystal most easily?



**A4** Which of the materials **A, B, C, D** or **E** has the largest density?

Material	Mass/kg	Volume/m <sup>3</sup>
<b>A</b>	10	1
<b>B</b>	2	40
<b>C</b>	8	80
<b>D</b>	80	4
<b>E</b>	40	1

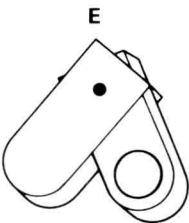
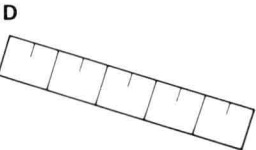
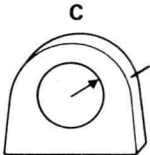
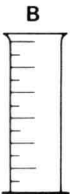
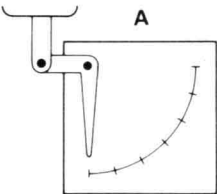
**A5** In the following account of an experiment to measure the density of air, which one of the italicised phrases is **INCORRECT**?

A large plastic container was weighed. Air was then forced into it *using a pump A*. The plastic container was reweighed and the *decrease in mass B* was found. The volume of air was found by allowing it to force water out of a *rectangular perspex box C*. The box was *emptied many times D*, because a large volume of air had been pumped into the plastic container. The experiment showed that air has a *low density E*.

**A6** Four blocks identical in size, but made of different substances are weighed. If the materials are hard wood, lead, rubber and copper, when arranged in order with the heaviest first, lightest last, the correct order is

- A** copper, lead, hard wood, rubber
- B** copper, lead, rubber, hard wood
- C** lead, hard wood, copper, rubber
- D** lead, copper, hard wood, rubber
- E** lead, copper, rubber, hard wood

**Questions A7–10**



The questions refer to the diagrams above of simple pieces of apparatus which can be found in the laboratory.

- A7** Which piece of apparatus would you use to measure the mass of a wooden block?
- A8** Which piece of apparatus would be most suitable for measuring the volume of a rectangular block of brass?
- A9** Which piece of apparatus would be most suitable for measuring the volume of a stopper from a bottle?
- A10** Which piece of apparatus would help you to examine the appearance of a small crystal?

### Questions A11 and 12

Several children decide to measure the distance from a back door to the bottom of the garden.

These are the results that they write down:

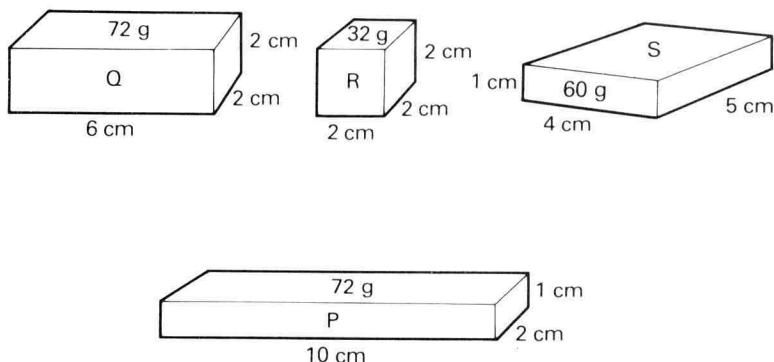
John	20 m	Peter	20 m 3 cm 9 mm	Jill	19.9 m
Ann	23.2 m	James	20 m 6 cm		

**A11** Whose result is likely to be most inaccurate?

**A** John **B** Peter **C** Jill **D** Ann **E** James

**A12** Who has tried far too carefully with their measurement and probably wasted time?

**A13**

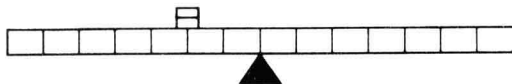


Which of the above rectangular blocks could be made from the same material?

**A** R and S **B** R and P **C** P and Q **D** Q and S **E** P and S



**A14**



The diagram above show a small wooden plank which is balanced on a triangular block. Two metal squares are placed two spaces from the centre on the left of the plank. Where must one similar metal square be placed in order to balance the plank?

- A** 2 spaces from the centre on the left
- B** 1 space from the centre on the right
- C** 4 spaces from the centre on the left
- D** 2 spaces from the centre on the right
- E** 4 spaces from the centre on the right

**A15** A slug of mass 20 g is sitting on a see-saw. He is balanced by a snail of mass 40 g. The snail starts to move away from the pivot at 1 cm per second. In order to keep the see-saw balanced the slug must move:

- A** away from the pivot at  $\frac{1}{2}$  cm per second
- B** away from the pivot at 2 cm per second
- C** away from the pivot at 4 cm per second
- D** towards the pivot at 2 cm per second
- E** towards the pivot at  $\frac{1}{2}$  cm per second

**A16** John and his younger brother Peter are sitting on a see-saw. John's mass is 80 kg and he is sitting 90 cm from the centre of the see-saw. If Peter's mass is 60 kg, how far from the centre must he sit in order to balance the see-saw?

- A** 20 cm   **B** 60 cm   **C** 72 cm   **D** 120 cm   **E** 150 cm

### Questions A17 and 18

**A17** When 80 g is hung on the end of a thin spring, it stretches by 40 mm. What will be its stretch when 20 g is hung on the end?

- A** 10 mm   **B** 20 mm   **C** 60 mm   **D** 80 mm   **E** 160 mm

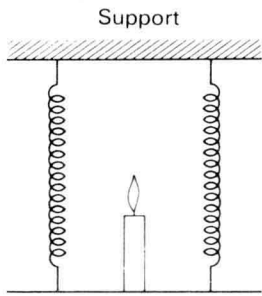
**A18** What will be the stretch when 8 kg are hung on it?

- A** Impossible to tell   **B** 100 mm   **C** 1000 mm   **D** 3200 mm  
**E** 4000 mm

**A19** A girl makes a spring by winding some copper wire round a pencil. She then hangs masses on the end of the spring and measures the amount by which the spring stretches with each mass. Her results are shown below, but one of the results has been incorrectly recorded. Which one?

	Mass in grams	Stretch in millimetres
<b>A</b>	10	4
<b>B</b>	20	8
<b>C</b>	30	10
<b>D</b>	40	16
<b>E</b>	50	20

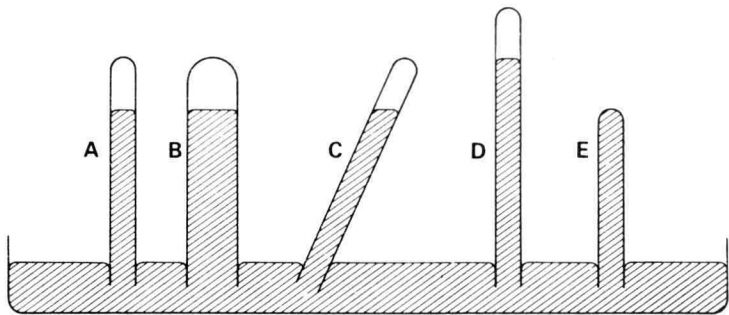
A20



A slow burning candle is put on a pan held by two springs hanging from the support. The flame is lit. As the wax is burned at a steady rate the pan will

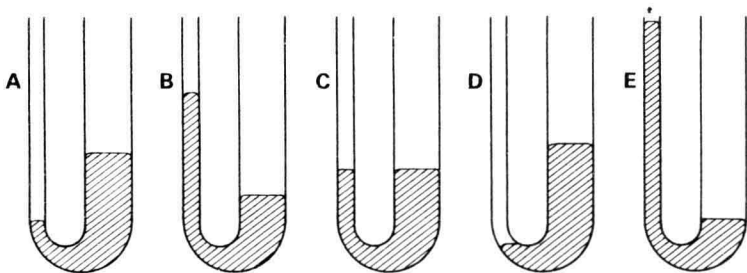
- A remain stationary
- B move up at a steady rate
- C move down at a steady rate
- D remain still, then suddenly move down
- E remain still, then suddenly move up

A21



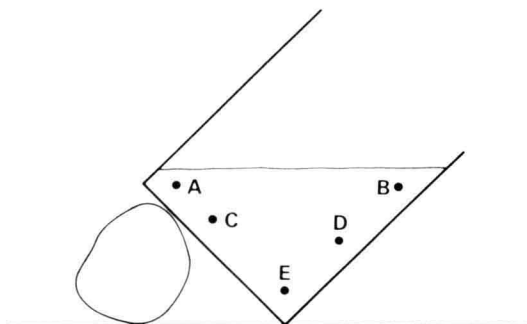
The diagram shows five barometer tubes in a large trough of mercury. In which of the tubes is the level incorrectly marked?

A22 Mercury is poured into glass tubes as shown. The diameter of the left hand arm is about 1 cm and the diameter of the right hand arm is about 3 cm. In which position will the mercury end up?



- A23** The gas supply in a laboratory causes the levels in a *water* manometer to differ by 20 cm. A difference of less than 2 cm is seen with a *mercury* manometer. This is because
- A** mercury absorbs gas
  - B** the gas pressure has dropped
  - C** mercury sticks to the glass
  - D** mercury is much denser than water
  - E** mercury takes a long time to reach its proper level

**A24**



An old tin can leaning against a stone has been filled with rain. From which of the holes does the water squirt quickest?

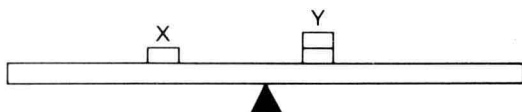
### Questions A25–28

Each of the answer **A, B, C, D, E**, may be used once, more than once, or not at all, to complete the sentences correctly.

- A** half as much
- B** the same
- C** twice as much
- D** four times as much
- E** eight times as much

- A25** The gas supply causes a certain difference in levels when connected to a water manometer. If the manometer tube's diameter is doubled, the difference in levels will be . . . .

**A26**

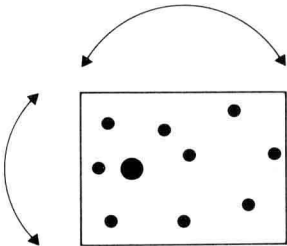


In the diagram above, X is balanced by Y. If the mass of Y is halved and it is moved four times further away from the knife edge, the mass of X which will cause the plank to balance is . . . . .

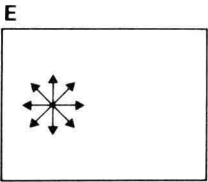
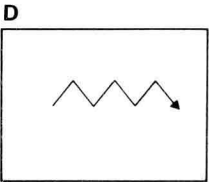
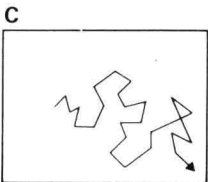
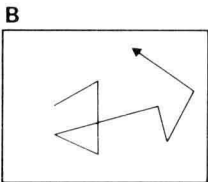
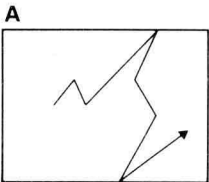
**A27** Two cubes of the same type of wood are made such that the dimensions of one are twice those of the other. The mass of the larger cube is ..... as the mass of the smaller.

**A28** There are two types of square paving slab in a garden. The coloured ones are the same mass as the plain ones, but their length is half that of the plain ones. The pressure that the coloured slabs exert on the ground is ..... as the pressure exerted by the plain ones.

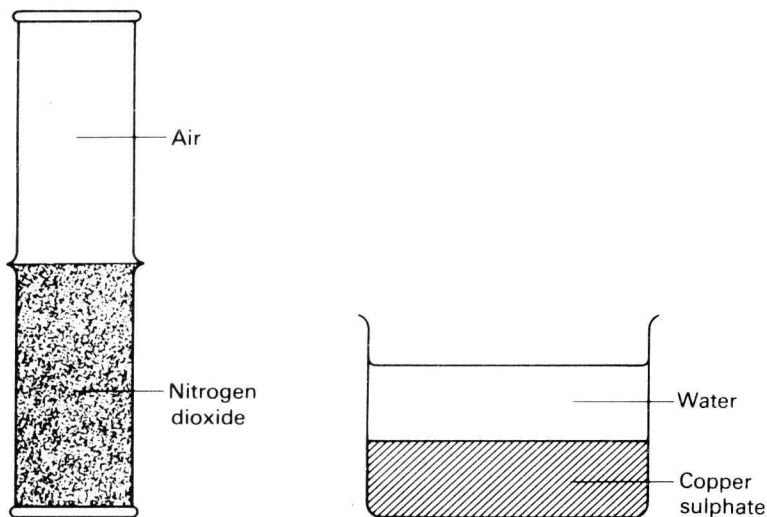
**A29**



The tray of marbles above is shaken by giving it rapid irregular movements in the directions shown. The path of the large marble could be



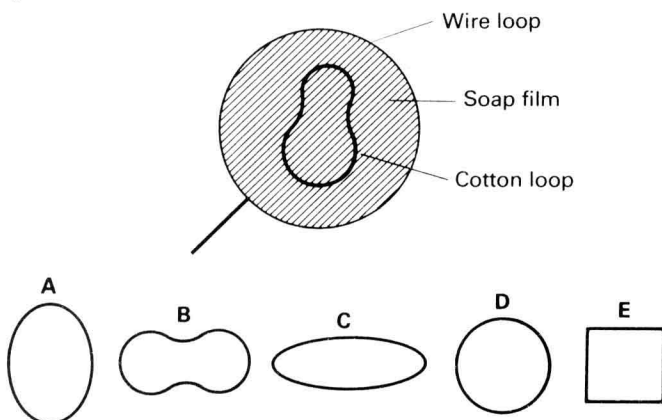
A30



In the diagrams above a gas jar of air has been placed upside-down above a jar containing nitrogen dioxide and a layer of copper sulphate has been carefully poured into a beaker of water. Some time later the gases have mixed but the water is only slightly blue. This shows that

- A only gas molecules move
- B nitrogen dioxide is lighter than air
- C liquid atoms are heavier than gas atoms
- D gas molecules move much faster than liquid molecules
- E liquids cannot mix when exposed to air

**A31** A soap film is formed in a wire loop and a loop of cotton is carefully placed on top of the soap film. When the liquid *inside* the loop of cotton is broken, which of the diagrams below shows the shape taken up by the cotton?

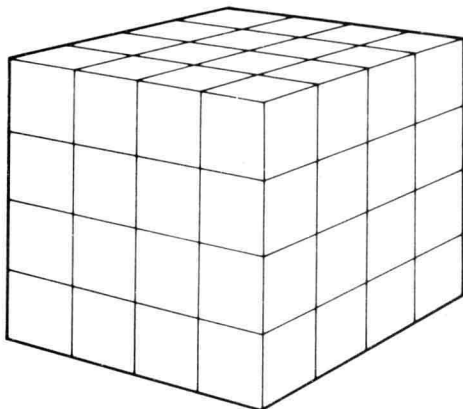


**A32** Which one of the following observations CANNOT be explained by assuming a liquid has an elastic skin?

- A** A small pin will float on water.
- B** Small drops of liquid are spherical.
- C** A solid will float in a liquid which is more dense than itself.
- D** Small lumps of camphor move around when placed in water.
- E** Bubbles can be formed by blowing on a film of soap solution in a wire loop.

**A33** A large cube is made by piling up some smaller polystyrene cubes as shown. The large cube is then dropped into a large trough of water. Each cube floats to the surface, where all the cubes are pushed together to form a square. The number of cubes along a side of the square is

- A** 2   **B** 4   **C** 8   **D** 16   **E** 64



**A34** A small spherical drop of oil falls onto a clean water surface. It spreads to make a circular patch. A second drop is now used, whose diameter is four times greater. How much greater will the diameter of its circular patch be?

- A** twice as great   **B** 4 times   **C** 8 times   **D** 16 times  
**E** 64 times

**A35** When a small drop of oil spreads on water it is possible to calculate a size for the molecules in the oil. Which one of the following comments about the experiment and calculation is NOT correct?

- A** It is important to remove oil from the water surface beforehand.
- B** The calculation assumes that the layer of oil is one molecule thick.
- C** The result gives the smallest possible size for the oil molecule.
- D** The precision of the result is likely to be improved by repeating the experiment.
- E** The results obtained agree with those that are gained by different methods.

**A36** Which of the following is a situation where no 'fuel energy' is needed?

- A** compressing air in a bicycle pump
- B** a computer doing sums
- C** a person digging the garden
- D** the walls holding up the roof of a house
- E** winding up your alarm clock

**A37** Which of the following is a situation where 'fuel energy' is required?

- A** water keeping a boat afloat
- B** a piece of wood being held in a vice
- C** a table supporting a book
- D** pillars holding up a church roof
- E** a refrigerator keeping food cool

**A38** Simple levers and pulley systems are regarded as machines – that is they help us do work. They always

- A** reduce the force needed to lift a load
- B** reduce the energy needed to lift a load
- C** increase the force needed to lift a load
- D** increase the energy needed to lift a load
- E** convert heat into energy

## Section B

### More Introductory Revision

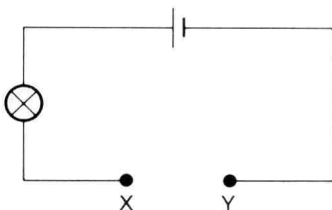
**B1** Here are five statements about magnetic forces. Which one is INCORRECT?

- A** Magnetic forces are strongest near the ends of a bar magnet.
- B** Magnets can attract one another.
- C** Magnets can push one another apart.
- D** Magnets can pick up any metal.
- E** Both ends of a magnet can pick up iron filings.

**B2** The table below shows how different types of force can be 'pushes' or 'pulls'. Which entry in the table is INCORRECT?

	Push	Pull
<b>A</b> Magnetic force	✓	✓
<b>B</b> Electrical force	✓	✓
<b>C</b> Gravitational force	✓	×
<b>D</b> Spring force	✓	✓
<b>E</b> Pressure force	✓	×

**B3** A circuit is set up as shown. Between the terminals X and Y can be attached different types of material. They are all of the same length and all of the same cross-sectional area.

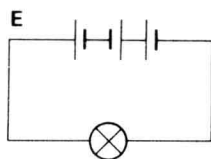
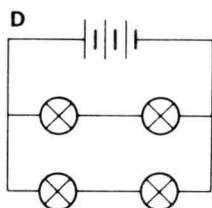
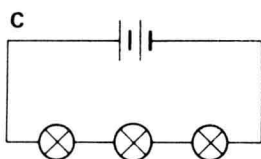
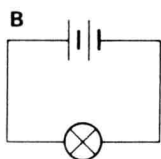
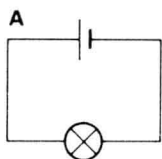


Which one will cause the lamp to light most brightly?

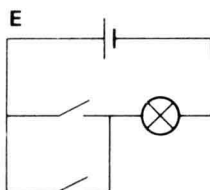
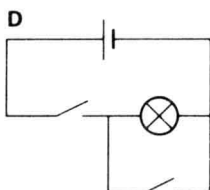
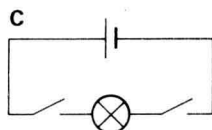
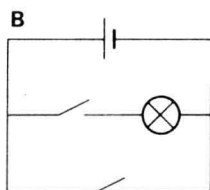
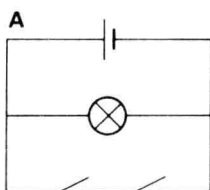
- A** glass
- B** graphite
- C** wood
- D** copper
- E** polythene



- B4** Which circuit will have the brightest lamp or lamps? (All lamps are identical and all cells are identical.)



- B5** In which of the circuits below will the lamp light ONLY when BOTH switches are closed?



- B6** In which of the circuits below can the lamps be switched on and off INDIVIDUALLY?

