

Centre Number	Candidate Number	Name
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CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

ADDITIONAL COMBINED SCIENCE

5130/02

Paper 2

October/November 2003

2 hours 15 minutes

Additional Materials: Answer paper

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B

Answer **one** part of each of the three questions.
Write your answers on the separate answer paper provided.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [] at the end of each question or part question.
A copy of the Periodic Table is printed on page 20.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

For Examiner's Use	
Section A	
11	
12	
13	
TOTAL	

This document consists of **19** printed pages and **1** blank page.



Section A

Answer **all** the questions.

Write your answers in the spaces provided on the question paper.

- 1 Some of these statements are true and others are not true.

Put a tick against the statements that are true.

Brass is a chemical compound.

Ammonia is produced in the Haber process.

The rate of a reaction increases with increase in temperature.

Sodium chloride has covalent bonding.

Nitrogen is a noble gas.

A sodium atom has 11 electrons.

[3]

- 2 A potted plant was left in a sunny place for ten hours. The plant was **not** watered during this time.

The diagram, Fig. 2.1, shows how the shape of stomata on the leaves of this plant changed with time.

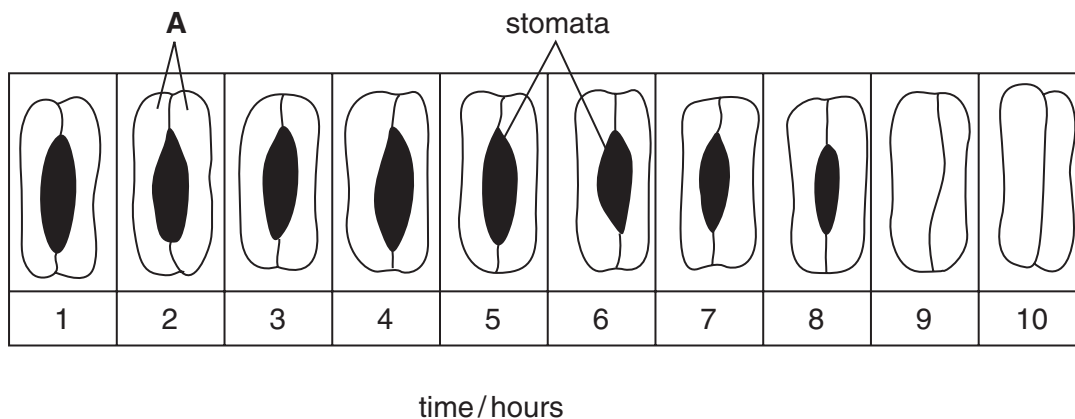


Fig. 2.1

- (a) (i) Describe the function of stomata.

.....

.....

.....

[2]

(ii) After a few hours the stomata gradually decreased in size.

How did this help the plant?

.....
.....
.....[2]

(b) Suggest how the appearance of the whole plant changed during this investigation.

.....[1]

(c) The stomata decreased in size because the cells marked **A** lost water to the surrounding cells of the leaf by the process of osmosis.

(i) Name the cells marked **A**.

.....[1]

(ii) What happens during osmosis?

.....
.....
.....[2]

- 3 The diagram, Fig. 3.1, shows a blast furnace used for the production of iron.

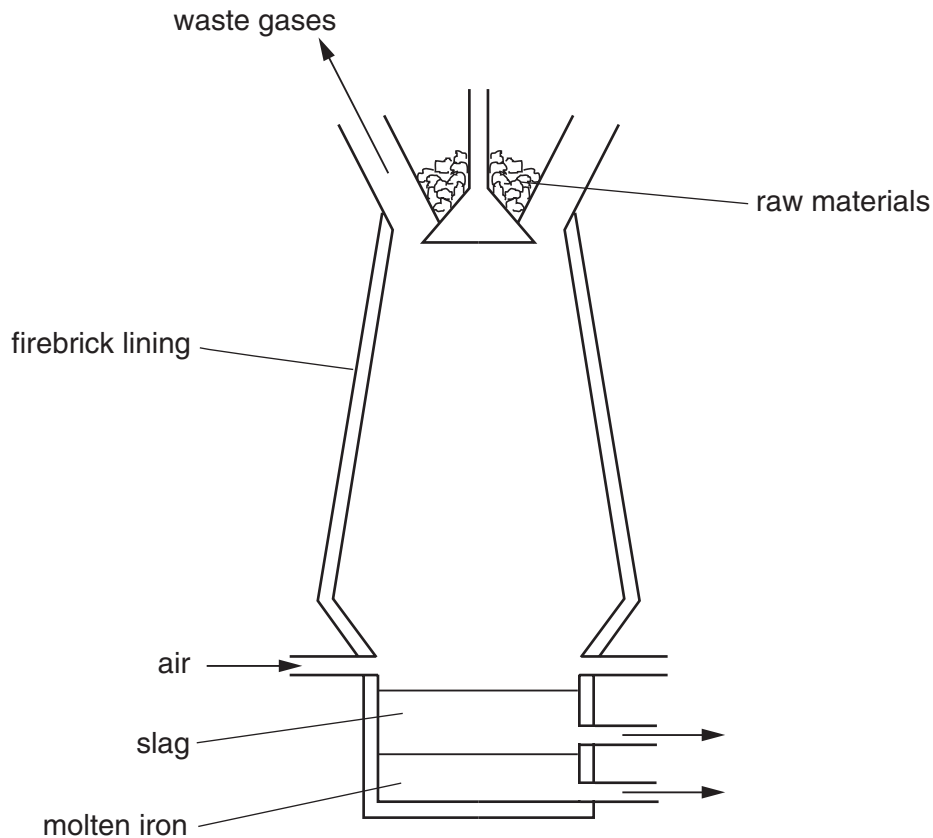


Fig. 3.1

- (a) Iron ore, haematite, enters at the top of the blast furnace.

Name the two other raw materials entering at the top of the blast furnace.

1

2[2]

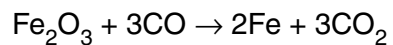
- (b) (i) In the blast furnace name the materials that react to form slag.

.....[1]

- (ii) Why is the formation of slag important in the extraction of iron from haematite?

.....[1]

- (c) This equation shows how iron is formed from haematite.



- (i) Explain how the carbon monoxide in this reaction is formed.

.....
.....
.....[2]

- (ii) Calculate the mass of iron, in kg, extracted from each tonne of iron oxide.

(1 tonne = 1000 kg)

mass = kg [3]

4 A man connects a fused 13A plug to an air conditioning unit.

The diagram, Fig. 4.1, shows the wiring in this plug.

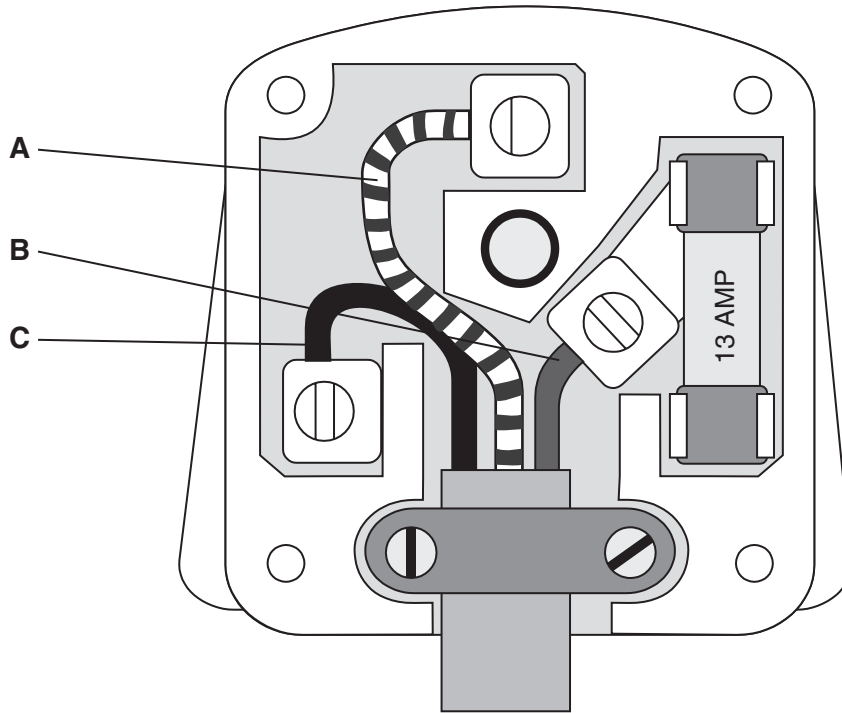


Fig. 4.1

(a) State the name and colour of each of the three wires labelled **A**, **B** and **C**.

wire	name	colour
A		
B		
C		

[3]

(b) Why is the fuse connected to wire **B**?

.....

[3]

(c) The air conditioning unit has a power rating of 500 W.

The cost of electricity is 8 cents per kilowatt hour.

Calculate the cost of running this air conditioning unit for 24 hours.

cost = cents [3]

- 5 In an investigation, the size of the pupil in a person's eye is measured in different conditions of light intensity.

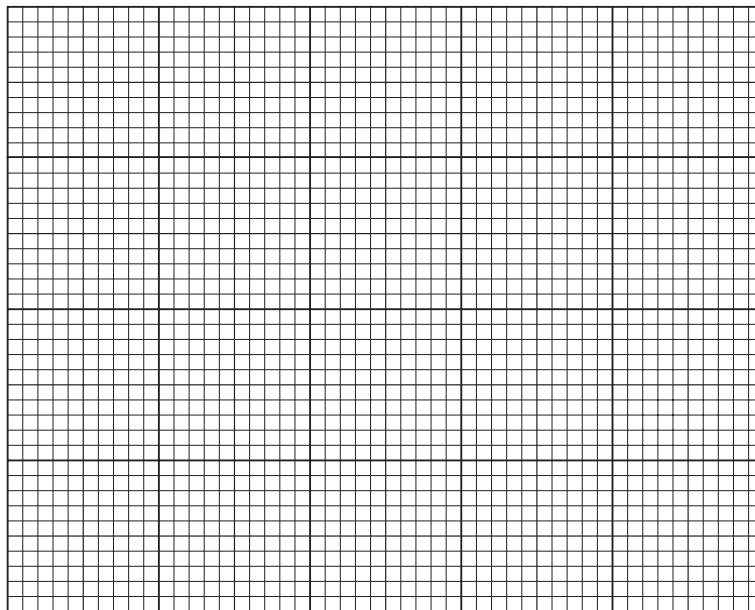
The results of this investigation are shown in the table in Fig. 5.1.

light intensity (arbitrary units)	size of pupil in mm
10	4.0
20	2.8
30	2.1
40	1.6
50	1.3

Fig. 5.1

- (a) Plot a graph of light intensity (horizontal axis) against pupil size.

Draw a curve through the points.



[4]

- (b) (i) Use your graph to find the size of the person's pupil when the light intensity is 25 units.

.....[1]

- (ii) From the graph describe how the size of the pupil is related to light intensity.

.....

.....

.....[2]

(iii) Explain how a relay neurone is involved in this response of the eye.

.....
.....
.....[2]

(c) Name the parts of the eye that perform the following functions.

(i) detecting light

.....[1]

(ii) focusing light

.....[1]

6 The diagram, Fig. 6.1, shows the separation of crude oil.

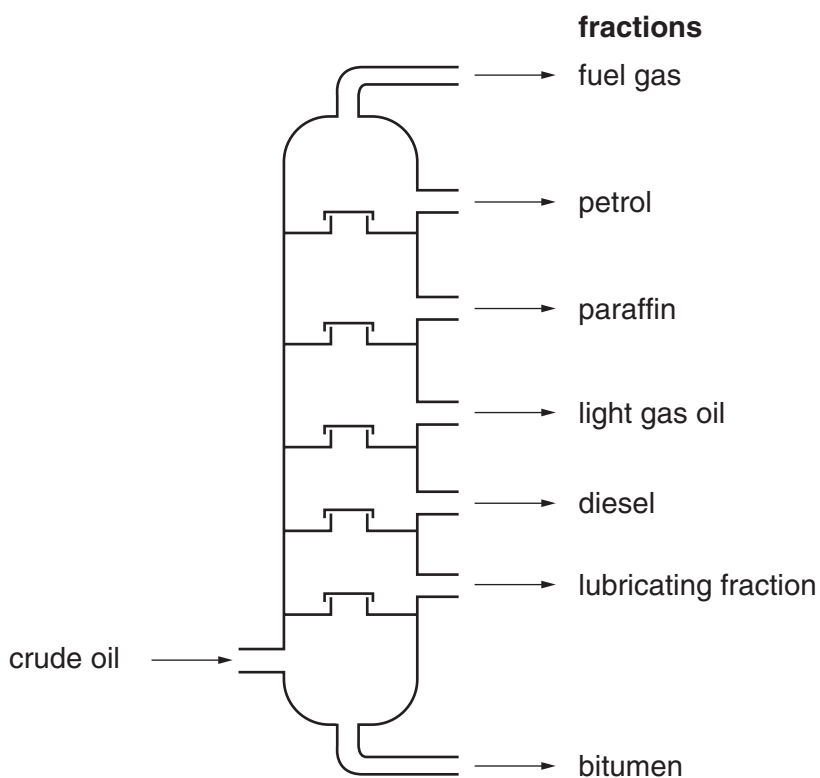


Fig. 6.1

(a) What is the name of this process?

.....[2]

(b) Choose **three** of the fractions shown in Fig. 6.1.

Describe a different use for each.

fraction

use

fraction

use

fraction

use[3]

- 7 The diagram, Fig. 7.1, shows an electrical circuit.

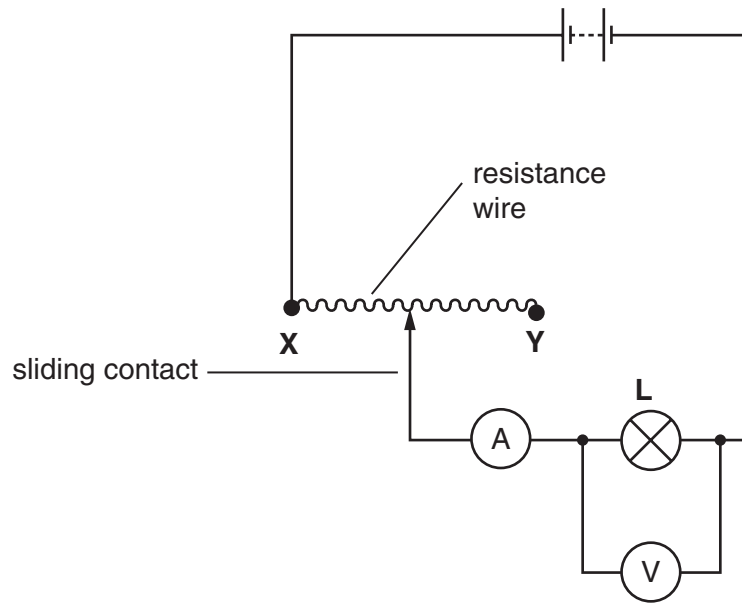


Fig. 7.1

- (a) The ammeter reading is 1.8 A and the voltmeter reading is 3.0 V.

Calculate the resistance of the lamp L.

[3]

- (b) The sliding contact is moved towards Y along the resistance wire.

What change would this cause to the

- (i) ammeter reading,

.....[1]

- (ii) voltmeter reading,

.....[1]

- (iii) resistance of the lamp?

.....[1]

(c) Explain your answers to (b)(i) and (b)(ii).

.....

.....

.....

.....[3]

8 The diagram, Fig. 8.1, shows part of the human respiratory system.

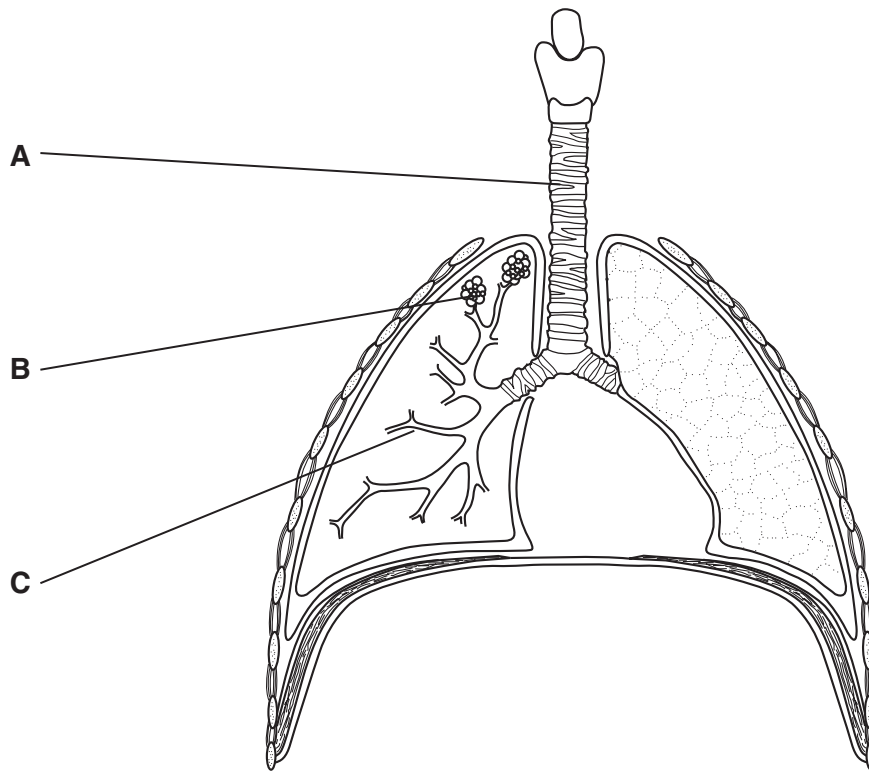


Fig. 8.1

(a) Name the parts labelled **A**, **B** and **C** on the diagram.

A

B

C [3]

(b) Describe the function of part **B**.

.....

.....

..... [2]

- 9 The diagram, Fig. 9.1, shows the structure of diamond.

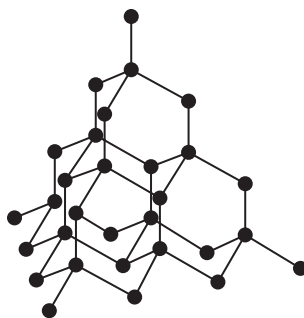


Fig. 9.1

- (a) (i) Name the type of bonding present in diamond.

.....[1]

- (ii) Diamond is a solid with a very high melting point.

Use ideas about the bonding in diamond and its structure to explain this fact.

.....

[2]

- (b) Silicon(IV) oxide and carbon dioxide both have the same type of bonding as diamond. Silicon(IV) oxide is a solid with similar properties to diamond, including a high melting point. Carbon dioxide is a gas at room temperature. Explain this difference.

.....

[3]

10 Fig. 10.1 shows a man exercising.

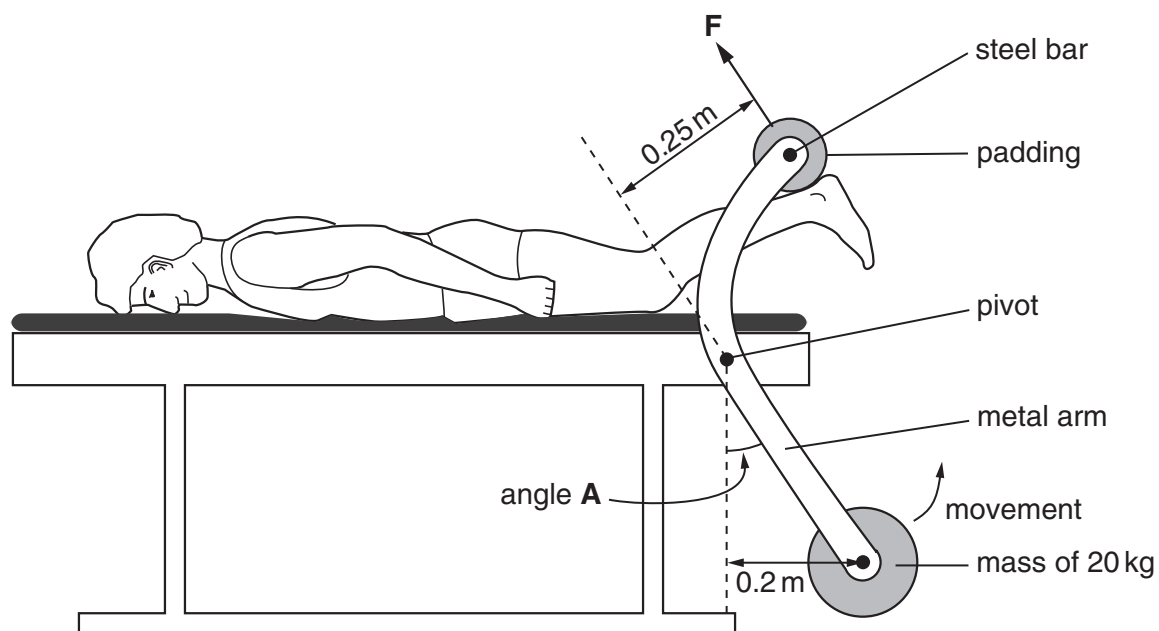


Fig. 10.1

When he applies a force F to the steel bar with his heels the metal arm rotates at the pivot and angle A increases, lifting the mass of 20 kg.

He moves the metal arm until the 20 kg mass is in the position shown.

(a) As angle A increases more force is needed to hold the 20 kg mass in position.

Explain why this is so.

.....

.....

.....[2]

(b) Calculate the force **F** applied by the man's heels to hold the mass in the position shown.

Use ideas about moments and the distances shown in the diagram in your calculation.

Ignore the mass of the metal arm.

(The force exerted by gravity on a 1 kg mass can be taken as 10 N.)

force = N [3]

Section B

Answer **one** part, **(a)** or **(b)**, of each of the three questions.

Write your answers on the separate answer paper provided.

11 Either

- (a) (i) Define the processes of sexual and asexual reproduction.
Describe pollination and fertilisation in a dicotyledonous flower. [8]
- (ii) Plant growers sometimes propagate plants by producing seeds (sexual reproduction) and sometimes by taking cuttings (asexual reproduction).
Suggest **one** advantage for each method. [2]

Or

- (b) (i) Describe the dual circulation of blood in humans in terms of the pressure and the functions of the two circulations. [4]
- (ii) Describe how you would investigate the effect of exercise on pulse rate.
State and explain the results that you would expect. [6]

12 Either

- (a) You are given four white powders and told that they are ammonium chloride, calcium carbonate, calcium chloride and zinc carbonate. You are not told which powder is which compound.
Describe the tests that you would carry out to identify each powder. [10]

Or

- (b) (i) Define the terms *acid* and *alkali*.
Describe how you would demonstrate in the laboratory **two** characteristic chemical properties of an acid and **two** characteristic chemical properties of an alkali. [6]
- (ii) Describe the use of the pH scale in the measurement of acidity and alkalinity. [4]

13 Either

(a) The diagram, Fig. 13.1, shows the main parts of a simple electric motor.

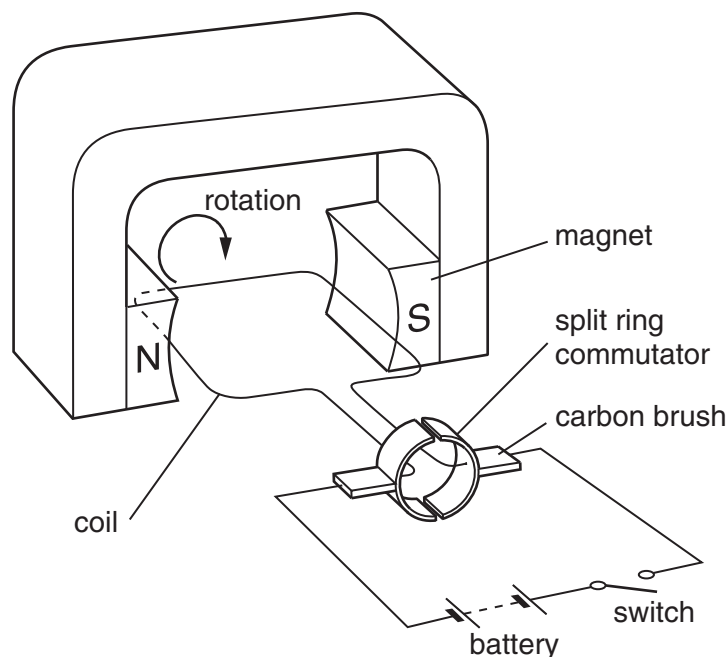


Fig. 13.1

- (i) Explain why the coil moves.
Explain the function of the split-ring commutator. [6]
- (ii) Explain why the speed of the motor is increased by winding the coil onto a soft iron core.
State and explain two other ways of increasing the speed of this electric motor. [4]

Or

- (b) (i) Describe how you would determine the relative penetrating powers of radiation from alpha, beta and gamma sources in the laboratory.
Describe **two** other ways in which these radiations differ. [7]
- (ii) What safety measures should be used in the storage and use of these sources? [3]

DATA SHEET
The Periodic Table of the Elements

		Group																																																																																																																	
I	II	III	IV	V	VI	VII	0																																																																																																												
7 Li Lithium 3	9 Be Beryllium 4	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>1 H Hydrogen 1</td> <td colspan="10"></td> </tr> <tr> <td>11 Na Sodium 11</td> <td>12 Mg Magnesium 12</td> <td>13 Al Aluminium 13</td> <td>14 Si Silicon 14</td> <td>15 P Phosphorus 15</td> <td>16 S Sulphur 16</td> <td>17 Cl Chlorine 17</td> <td>18 Ar Argon 18</td> <td>19 F Fluorine 9</td> <td>20 Ne Neon 10</td> <td>21 Sc Scandium 21</td> <td>22 Ti Titanium 22</td> <td>23 V Vanadium 23</td> <td>24 Cr Chromium 24</td> <td>25 Mn Manganese 25</td> <td>26 Fe Iron 26</td> <td>27 Co Cobalt 27</td> <td>28 Ni Nickel 28</td> <td>29 Cu Copper 29</td> <td>30 Zn Zinc 30</td> <td>31 Ga Gallium 31</td> <td>32 Ge Germanium 32</td> <td>33 As Arsenic 33</td> <td>34 Se Selenium 34</td> <td>35 Br Bromine 35</td> <td>36 Kr Krypton 36</td> <td>37 Rb Rubidium 37</td> <td>38 Sr Strontium 38</td> <td>39 Y Yttrium 39</td> <td>40 Zr Zirconium 40</td> <td>41 Nb Niobium 41</td> <td>42 Mo Molybdenum 42</td> <td>43 Tc Technetium 43</td> <td>44 Ru Ruthenium 44</td> <td>45 Rh Rhodium 45</td> <td>46 Pd Palladium 46</td> <td>47 Ag Silver 47</td> <td>48 Cd Cadmium 48</td> <td>49 In Indium 49</td> <td>50 Sn Tin 50</td> <td>51 Sb Antimony 51</td> <td>52 Te Tellurium 52</td> <td>53 I Iodine 53</td> <td>54 Xe Xenon 54</td> <td>55 Cs Caesium 55</td> <td>56 Ba Barium 56</td> <td>57 La Lanthanum 57</td> <td>58 Ce Cerium 58</td> <td>59 Pr Praseodymium 59</td> <td>60 Nd Neodymium 60</td> <td>61 Pm Promethium 61</td> <td>62 Sm Samarium 62</td> <td>63 Eu Europium 63</td> <td>64 Gd Gadolinium 64</td> <td>65 Tb Terbium 65</td> <td>66 Dy Dysprosium 66</td> <td>67 Ho Holmium 67</td> <td>68 Er Erbium 68</td> <td>69 Tm Thulium 69</td> <td>70 Yb Ytterbium 70</td> <td>71 Lu Lutetium 71</td> <td>72 Hf Hafnium 72</td> <td>73 Ta Tantalum 73</td> <td>74 W Tungsten 74</td> <td>75 Re Rhenium 75</td> <td>76 Os Osmium 76</td> <td>77 Ir Iridium 77</td> <td>78 Pt Platinum 78</td> <td>79 Au Gold 79</td> <td>80 Hg Mercury 80</td> <td>81 Tl Thallium 81</td> <td>82 Pb Lead 82</td> <td>83 Bi Bismuth 83</td> <td>84 Po Polonium 84</td> <td>85 At Astatine 85</td> <td>86 Rn Radon 86</td> <td>87 Fr Francium 87</td> <td>88 Ra Radium 88</td> <td>89 Ac Actinium 89</td> <td>90 Th Thorium 90</td> <td>91 Pa Protactinium 91</td> <td>92 U Uranium 92</td> <td>93 Np Neptunium 93</td> <td>94 Pu Plutonium 94</td> <td>95 Am Americium 95</td> <td>96 Cm Curium 96</td> <td>97 Bk Berkelium 97</td> <td>98 Cf Californium 98</td> <td>99 Es Einsteinium 99</td> <td>100 Fm Fermium 100</td> <td>101 Md Mendelevium 101</td> <td>102 No Nobelium 102</td> <td>103 Lr Lawrencium 103</td> </tr> </table>										1 H Hydrogen 1											11 Na Sodium 11	12 Mg Magnesium 12	13 Al Aluminium 13	14 Si Silicon 14	15 P Phosphorus 15	16 S Sulphur 16	17 Cl Chlorine 17	18 Ar Argon 18	19 F Fluorine 9	20 Ne Neon 10	21 Sc Scandium 21	22 Ti Titanium 22	23 V Vanadium 23	24 Cr Chromium 24	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36	37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Zr Zirconium 40	41 Nb Niobium 41	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54	55 Cs Caesium 55	56 Ba Barium 56	57 La Lanthanum 57	58 Ce Cerium 58	59 Pr Praseodymium 59	60 Nd Neodymium 60	61 Pm Promethium 61	62 Sm Samarium 62	63 Eu Europium 63	64 Gd Gadolinium 64	65 Tb Terbium 65	66 Dy Dysprosium 66	67 Ho Holmium 67	68 Er Erbium 68	69 Tm Thulium 69	70 Yb Ytterbium 70	71 Lu Lutetium 71	72 Hf Hafnium 72	73 Ta Tantalum 73	74 W Tungsten 74	75 Re Rhenium 75	76 Os Osmium 76	77 Ir Iridium 77	78 Pt Platinum 78	79 Au Gold 79	80 Hg Mercury 80	81 Tl Thallium 81	82 Pb Lead 82	83 Bi Bismuth 83	84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86	87 Fr Francium 87	88 Ra Radium 88	89 Ac Actinium 89	90 Th Thorium 90	91 Pa Protactinium 91	92 U Uranium 92	93 Np Neptunium 93	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103
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| 133 **Cs** Caesium 55 | 137 **Ba** Barium 56 | 139 **La** Lanthanum 57 | 178 **Hf** Hafnium 72 | 181 **Ta** Tantalum 73 | 186 **Re** Rhenium 75 | 190 **Os** Osmium 76 | 192 **Ir** Iridium 77 | 195 **Pt** Platinum 78 | 197 **Au** Gold 79 | 201 **Hg** Mercury 80 | 204 **Tl** Thallium 81 | 207 **Pb** Lead 82 | 209 **Bi** Bismuth 83 | 210 **Po** Polonium 84 | 210 **At** Astatine 85 | 210 **Rn** Radon 86 | 226 **Ra** Radium 88 | 227 **Ac** Actinium 89 | 232 **Th** Thorium 90 | 232 **Pa** Protactinium 91 | 238 **U** Uranium 92 | 238 **Np** Neptunium 93 | 238 **Pu** Plutonium 94 | 238 **Am** Americium 95 | 238 **Cm** Curium 96 | 238 **Bk** Berkelium 97 | 238 **Cf** Californium 98 | 238 **Es** Einsteinium 99 | 238 **Fm** Fermium 100 | 238 **Md** Mendelevium 101 | 238 **No** Nobelium 102 | 238 **Lr** Lawrencium 103 |

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a	X
= relative atomic mass	
= atomic symbol	
= proton (atomic) number	

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).