



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**CO-ORDINATED SCIENCES**

**0654/12**

Paper 1 Multiple Choice

**October/November 2012**

**45 minutes**

Additional Materials: Multiple Choice Answer Sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)

\* 9 7 9 1 0 7 3 3 8 3 \*

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.  
Do not use staples, paper clips, highlighters, glue or correction fluid.  
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.  
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

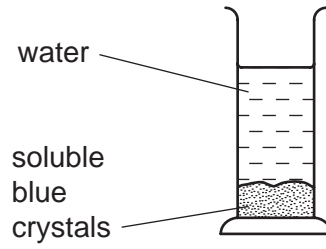
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.  
Any rough working should be done in this booklet.  
A copy of the Periodic Table is printed on page 20.

This document consists of **17** printed pages and **3** blank pages.



2

1 Apparatus is set up as shown.



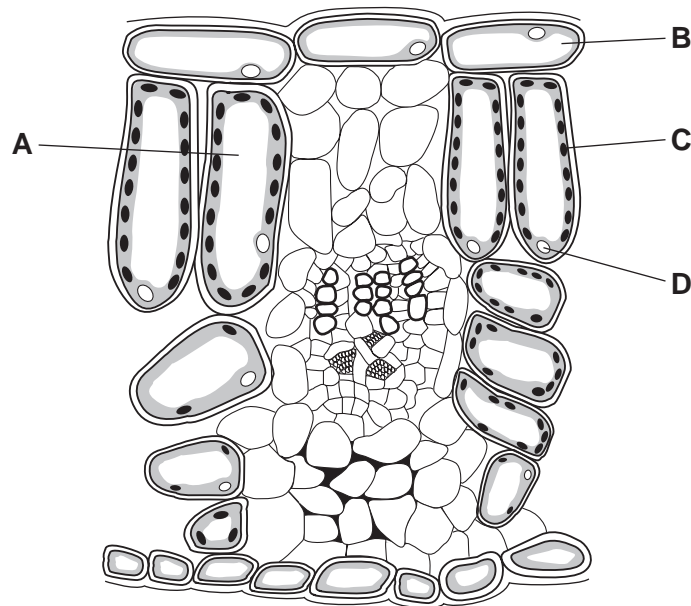
After several hours, all the water has turned blue.

Which process causes this colour change to take place?

- A assimilation
- B diffusion
- C digestion
- D evaporation

2 The diagram shows a section through a green leaf.

Where are carbohydrates made?



3 Which part of a cell has the greatest mass?

- A cytoplasm
- B membrane
- C nucleus
- D vacuole

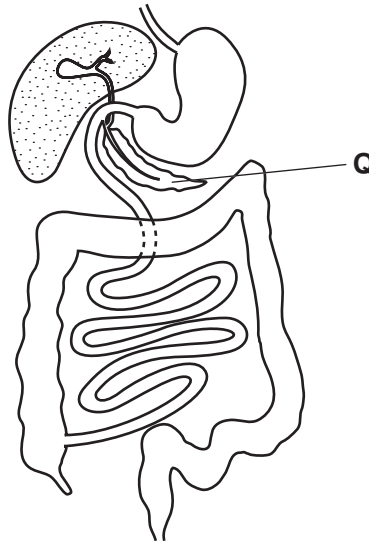
4 Which vessels carry blood towards the heart?

	aorta	pulmonary artery	pulmonary vein	vena cava
<b>A</b>	✓	✓	x	x
<b>B</b>	✓	x	✓	x
<b>C</b>	x	✓	x	✓
<b>D</b>	x	x	✓	✓

5 How should the diet of a weight-lifter differ from the diet of an office worker?

- A** She should eat less fat.
- B** She should eat more protein.
- C** She should eat less carbohydrate.
- D** She should eat more fibre.

6 The diagram shows the human alimentary canal.

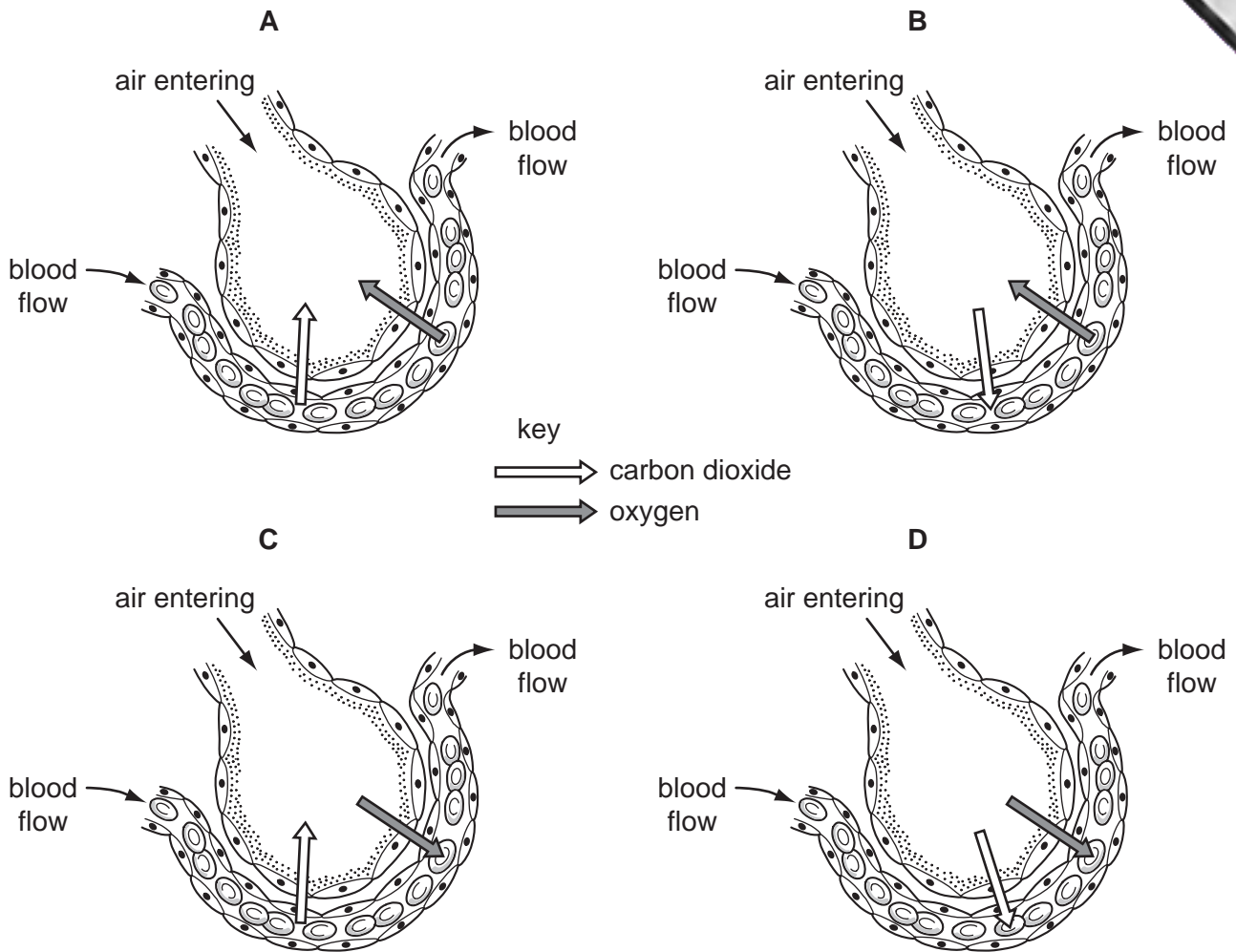


Proteases are produced by structure **Q**.

What is structure **Q** and which nutrient does protease digest?

	structure <b>Q</b>	nutrient digested
<b>A</b>	liver	fat
<b>B</b>	liver	protein
<b>C</b>	pancreas	fat
<b>D</b>	pancreas	protein

- 7 Which diagram shows the diffusion of carbon dioxide and oxygen between an alveolus and a capillary?



- 8 Which process would **not** work well in an adult person whose diet consists solely of milk?

- A absorption of digested food into the blood
- B digestion of fats in the milk
- C maintenance of strong bones
- D movement of food along the intestines

- 9 Which is an example of homeostasis?

- A adding acid to food in the stomach
- B breathing out water vapour from the lungs
- C keeping the body temperature steady
- D producing adrenaline in the adrenal glands

10 Allele T is dominant over allele t.

Which cross will produce offspring with phenotypes in a 1:1 ratio?

- A  $tt \times tt$       B  $Tt \times Tt$       C  $Tt \times tt$       D  $TT \times tt$

11 Which process is taking place as pollen lands on the stigma of a flower?

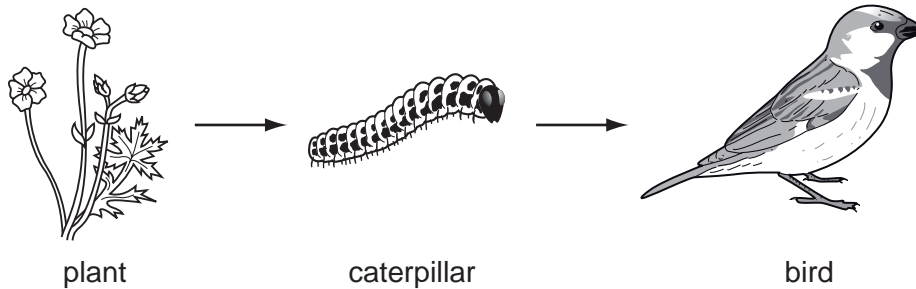
- A asexual reproduction  
 B fertilisation  
 C germination  
 D pollination

12 In the carbon cycle, several different processes may release carbon dioxide from dead organisms.

Which process does **not** do so?

- A combustion  
 B decomposition  
 C photosynthesis  
 D respiration

13 The diagram shows a food chain.



Which row is correct?

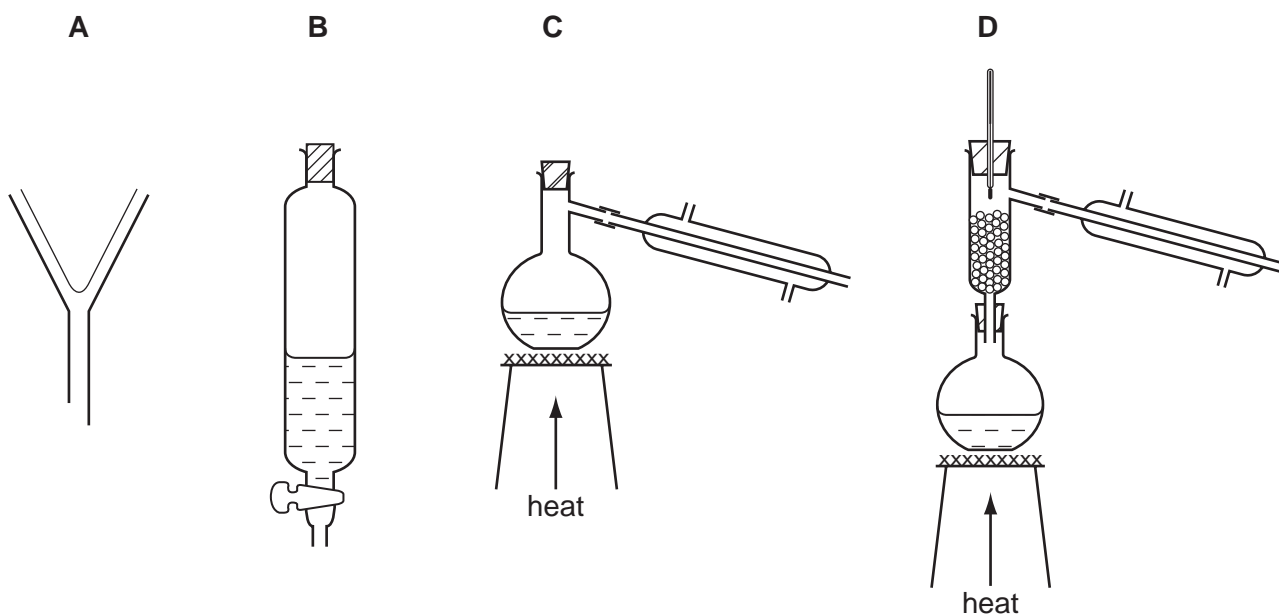
	plant	caterpillar	bird
A	makes energy	eats leaves	uses energy
B	makes starch	is a producer	is a consumer
C	photosynthesises	digests food	eats animals
D	traps light	feeds on plants	is a decomposer

14 What are the charge and mass of an electron?

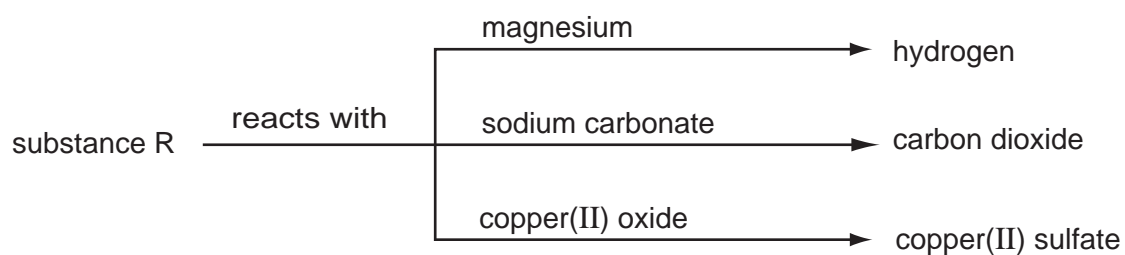
	charge	mass
<b>A</b>	+1	negligible
<b>B</b>	+1	1
<b>C</b>	-1	negligible
<b>D</b>	-1	1

15 Hexane and octane are liquid hydrocarbons that mix together.

Which is the best method of separating a mixture of these two liquids?



16 Some reactions of a substance, R, are shown in the diagram.

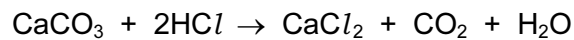


What type of substance is R?

- A** an acid
- B** a base
- C** an element
- D** a salt

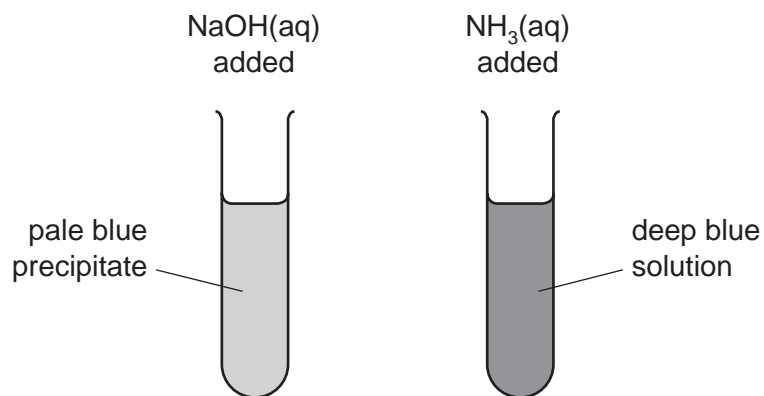
- 17 Hydrochloric acid reacts with calcium carbonate.

The equation for the reaction is shown.



Which change increases the speed of the reaction?

- A Decrease the temperature of the hydrochloric acid.
  - B Increase the concentration of the hydrochloric acid.
  - C Increase the size of the calcium carbonate particles.
  - D Increase the volume of the hydrochloric acid.
- 18 The diagrams show the results of adding an excess of aqueous sodium hydroxide and aqueous ammonia to separate solutions of salt S.

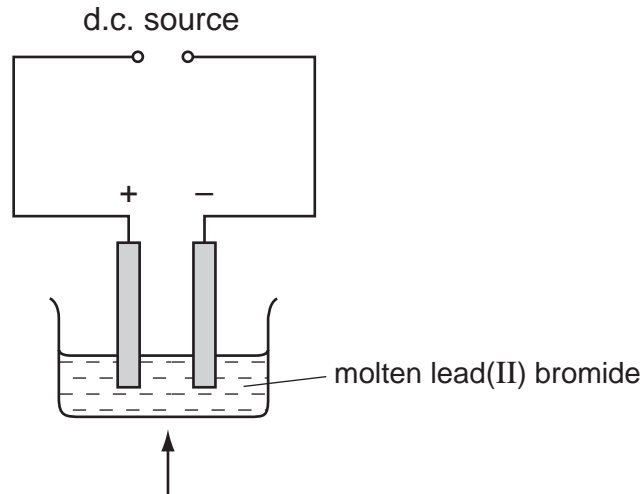


Which metal ion is present in salt S?

- A  $\text{Cu}^{2+}$
- B  $\text{Fe}^{2+}$
- C  $\text{Fe}^{3+}$
- D  $\text{Zn}^{2+}$

19 Molten lead(II) bromide is electrolysed as shown.

An element is produced at the negative electrode.



What is the name of the element and of the electrode?

	element	electrode
<b>A</b>	bromine	anode
<b>B</b>	bromine	cathode
<b>C</b>	lead	anode
<b>D</b>	lead	cathode

20 Burning coal has advantages and disadvantages.

Which row is correct?

	the reaction is exothermic	the reaction can cause 'acid rain'
<b>A</b>	advantage	advantage
<b>B</b>	advantage	disadvantage
<b>C</b>	disadvantage	advantage
<b>D</b>	disadvantage	disadvantage



21 Alloys are metals formed by dissolving one metal in another.

Alloys are .....X..... .

.....Y..... alloys conduct electricity.

Which words correctly complete the statements?

	X	Y
<b>A</b>	compounds	All
<b>B</b>	compounds	Some
<b>C</b>	mixtures	All
<b>D</b>	mixtures	Some

22 The table gives some information about the reactivity of three different metals.

metal	reaction with water or steam	reaction with dilute hydrochloric acid
X	reacts with cold water	reacts with cold acid
Y	no reaction when heated in steam	no reaction when boiled with acid
Z	reacts when heated in steam	reacts when warmed with acid

What is the order of reactivity of the three metals?

	most reactive	—————>	least reactive
<b>A</b>	X	Y	Z
<b>B</b>	X	Z	Y
<b>C</b>	Y	Z	X
<b>D</b>	Z	X	Y

23 An element X has a high melting point and its oxide is coloured.

Which row is correct?

	element	oxide
<b>A</b>	transition metal	acidic
<b>B</b>	transition metal	basic
<b>C</b>	non-metal	acidic
<b>D</b>	non-metal	basic

24 The atoms of two elements can be represented by  ${}^4_2\text{X}$  and  ${}^{20}_{10}\text{Y}$ .

Which properties do both elements have?

	they are gaseous	they are unreactive
<b>A</b>	✓	✓
<b>B</b>	✓	x
<b>C</b>	x	✓
<b>D</b>	x	x

25 Which of the following is **not** produced by fractional distillation of petroleum?

- A** diesel fuel
- B** ethanol
- C** paraffin
- D** petrol

26 Which three elements do most fertilisers contain?

- A** Na, C, P      **B** Na, P, K      **C** K, C, N      **D** K, P, N

27 Which process produces molecules with long chains?

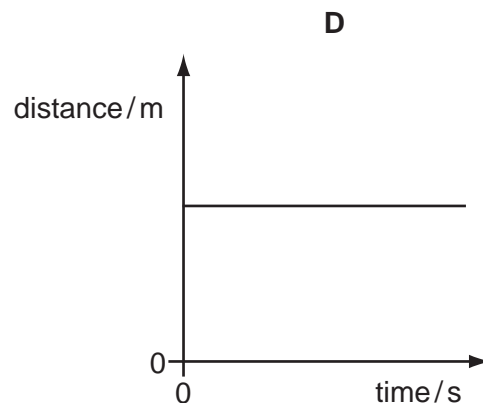
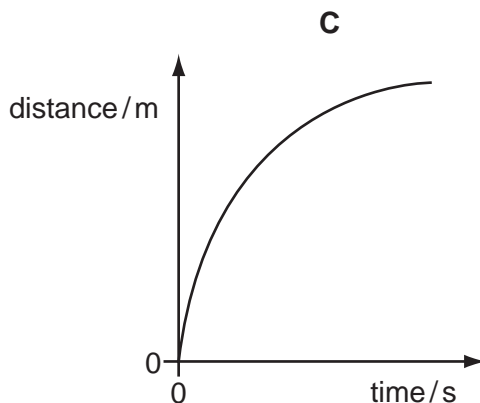
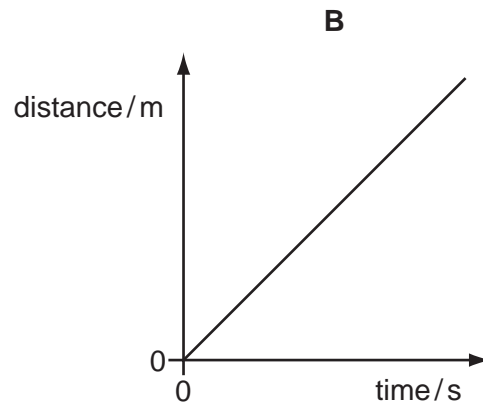
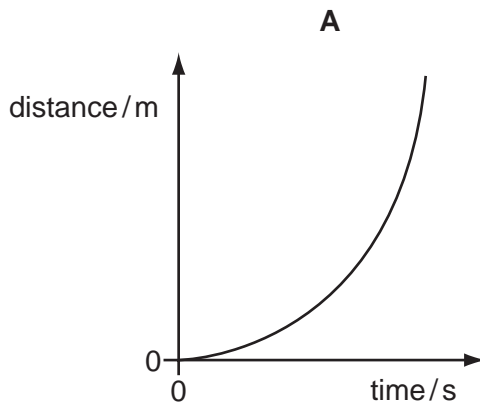
- A** combustion of hydrocarbons
- B** cracking
- C** fractional distillation of petroleum
- D** polymerisation

28 What is the density of an object that has a mass of 20g and a volume of 5 cm<sup>3</sup>?

- A** 4g/cm<sup>3</sup>      **B** 15g/cm<sup>3</sup>      **C** 25g/cm<sup>3</sup>      **D** 100g/cm<sup>3</sup>

29 The following are distance / time graphs.

Which graph shows an object travelling at constant speed?



30 Which statement about a gas in a container of constant volume is correct?

- A** The less often the gas molecules collide with the container walls, the higher the pressure.
- B** The lower the temperature of a gas, the more often its molecules collide with the container walls.
- C** The pressure of a gas increases as its temperature decreases.
- D** The temperature of a gas increases as the speed of the gas molecules increases.

31 Which statement about the transfer of thermal energy is correct?

- A** Heat transfer by radiation involves mainly ultraviolet radiation.
- B** Heat transfer by radiation requires a medium to travel through.
- C** The main method of heat transfer through gases is conduction.
- D** The main method of heat transfer through liquids is convection.

32 Which is a non-renewable energy resource?

- A coal
- B geothermal
- C solar
- D wave

33 Radio waves, infra-red radiation and visible light are different types of electromagnetic waves.

What is true for these electromagnetic waves?

- A Infra-red radiation travels more quickly than visible light.
- B Radio waves travel more quickly than infra-red radiation.
- C Radio waves travel at the same speed as visible light.
- D Visible light travels more slowly than radio waves.

34 Diagram 1 represents a wave.

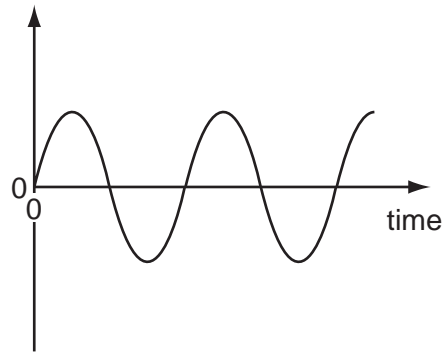
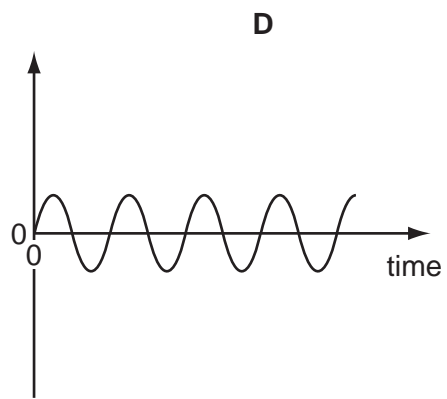
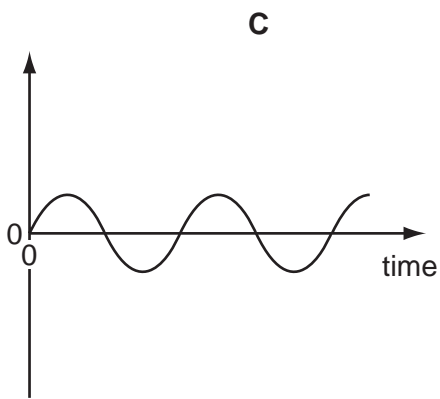
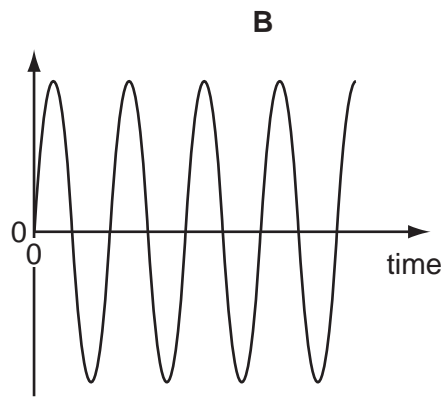
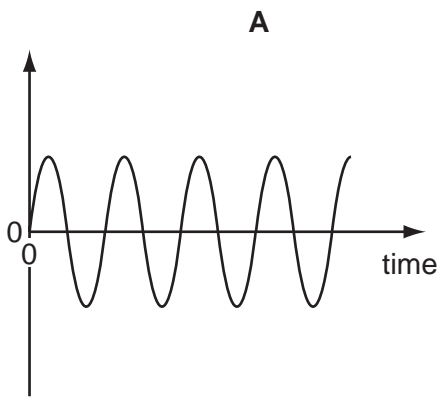


diagram 1

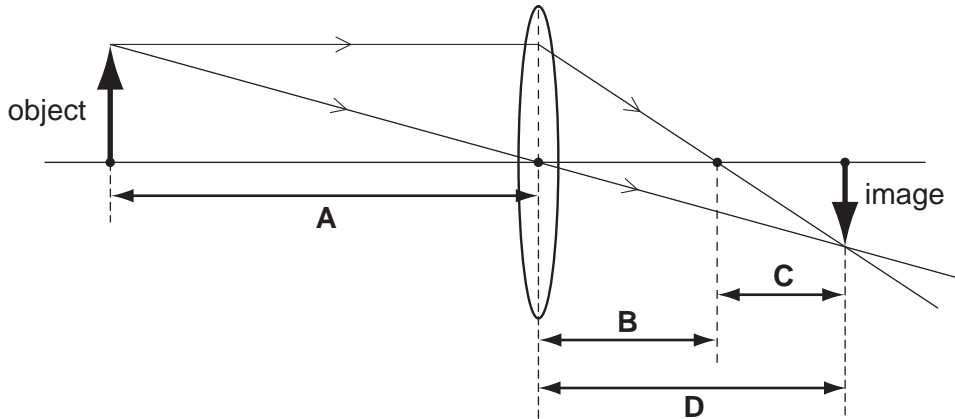
Which diagram represents a wave with double the frequency and half the amplitude of the wave in diagram 1?

The scales are the same in all the diagrams.

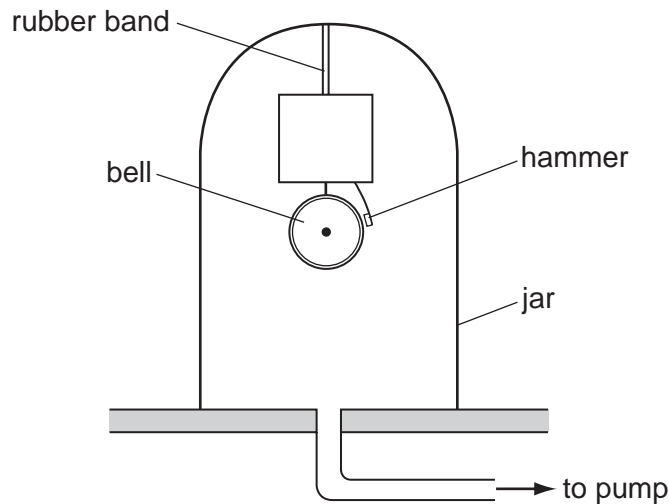


35 The diagram shows how a real image is formed by a converging lens.

Which distance is the focal length of the lens?



36 An electric bell with its own battery is suspended by a rubber band inside a sealed glass jar. The hammer hits the bell and makes it ring. A pump can remove air from the jar.



The pump is switched on and the air is removed from the jar. The hammer still hits the bell but the sound becomes quieter until it cannot be heard.

Why does this happen?

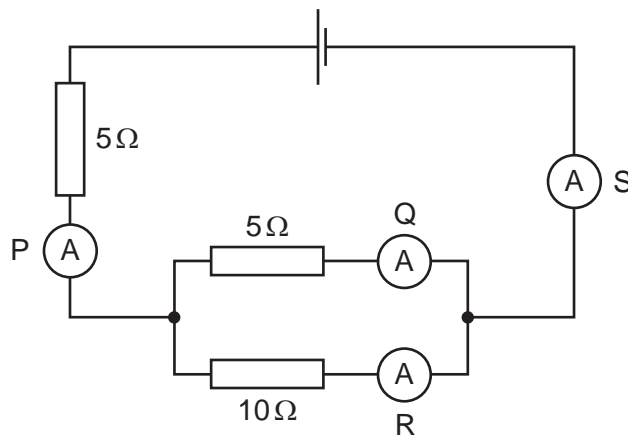
- A An electric current cannot flow in a vacuum.
- B A medium is required to transmit sound waves.
- C The bell cannot be made to vibrate in a vacuum.
- D The pitch of the note is now outside the range of human hearing.

37 A student wishes to measure an e.m.f. and a potential difference.

Which meter(s) does she need?

- A an ammeter only
- B a voltmeter only
- C a voltmeter and an ammeter
- D a voltmeter and a newton meter

38 The circuit contains four ammeters, P, Q, R and S.

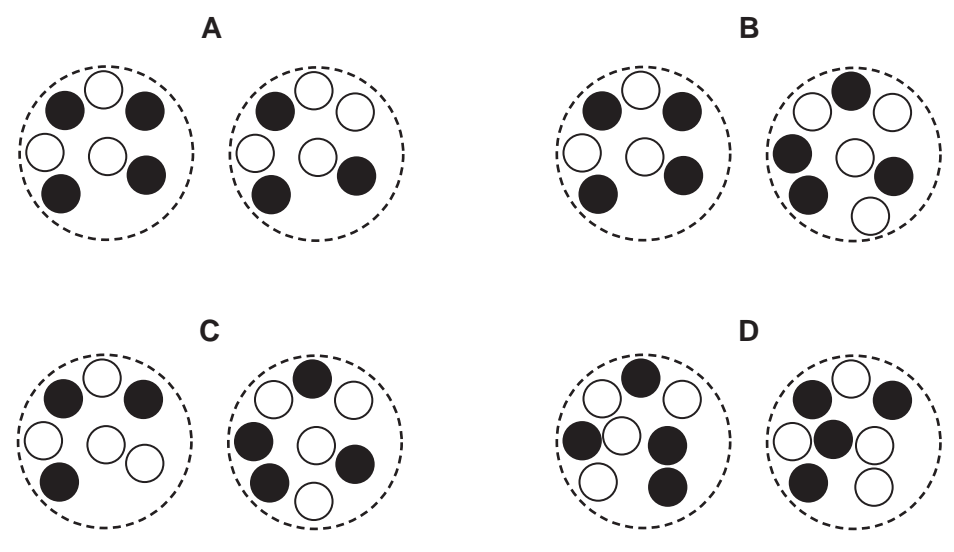


Which statement about the readings on the ammeters is correct?

- A The reading on S is less than the reading on P.
- B The reading on Q is greater than the reading on S.
- C The reading on R is less than the reading on S.
- D The reading on Q is greater than the reading on P.

39 The diagrams represent pairs of nuclei of some atoms.

Which pair shows nuclei of different isotopes of the same element?



40 Which type of radiation has the greatest ionising effect?

- A  $\alpha$ -particles
- B  $\beta$ -particles
- C  $\gamma$ -rays
- D infra red rays









**DATA SHEET**  
**The Periodic Table of the Elements**

		Group																																																																											
		I	II	III	IV	V	VI	VII	0																																																																				
		1 <b>H</b> Hydrogen 1																																																																											
7	9	<b>Li</b> Lithium 3	<b>Be</b> Beryllium 4																																																																										
23	24	<b>Na</b> Sodium 11	<b>Mg</b> Magnesium 12																																																																										
39	40	<b>K</b> Potassium 19	<b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36																																																										
85	88	<b>Rb</b> Rubidium 37	<b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Ru</b> Ruthenium 44	101 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	115 <b>Sn</b> Tin 50	119 <b>Sb</b> Antimony 51	122 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54																																																											
133	137	<b>Cs</b> Caesium 55	<b>Ba</b> Barium 56	139 <b>La</b> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	210 <b>Rn</b> Radon 86																																																											
	226	<b>Fr</b> Francium 87	<b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89																																																																									
		*58-71 Lanthanoid series										†90-103 Actinoid series																																																																	
		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">a</td> <td style="padding: 2px;"><b>X</b></td> </tr> <tr> <td style="padding: 2px;">b</td> <td style="padding: 2px;"></td> </tr> </table>										a	<b>X</b>	b		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">140</td> <td style="padding: 2px;"><b>Ce</b> Cerium 58</td> <td style="padding: 2px;">141</td> <td style="padding: 2px;"><b>Pr</b> Praseodymium 59</td> <td style="padding: 2px;">144</td> <td style="padding: 2px;"><b>Nd</b> Neodymium 60</td> <td style="padding: 2px;">150</td> <td style="padding: 2px;"><b>Sm</b> Samarium 62</td> <td style="padding: 2px;">152</td> <td style="padding: 2px;"><b>Eu</b> Europium 63</td> <td style="padding: 2px;">157</td> <td style="padding: 2px;"><b>Gd</b> Gadolinium 64</td> <td style="padding: 2px;">159</td> <td style="padding: 2px;"><b>Tb</b> Terbium 65</td> <td style="padding: 2px;">162</td> <td style="padding: 2px;"><b>Dy</b> Dysprosium 66</td> <td style="padding: 2px;">165</td> <td style="padding: 2px;"><b>Ho</b> Holmium 67</td> <td style="padding: 2px;">167</td> <td style="padding: 2px;"><b>Er</b> Erbium 68</td> <td style="padding: 2px;">169</td> <td style="padding: 2px;"><b>Tm</b> Thulium 69</td> <td style="padding: 2px;">173</td> <td style="padding: 2px;"><b>Yb</b> Ytterbium 70</td> <td style="padding: 2px;">175</td> <td style="padding: 2px;"><b>Lu</b> Lutetium 71</td> </tr> <tr> <td style="padding: 2px;">232</td> <td style="padding: 2px;"><b>Th</b> Thorium 90</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>U</b> Uranium 92</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>Np</b> Neptunium 93</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>Pu</b> Plutonium 94</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>Am</b> Americium 95</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>Cm</b> Curium 96</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>Bk</b> Berkelium 97</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>Cf</b> Californium 98</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>Es</b> Einsteinium 99</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>Fm</b> Fermium 100</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>Md</b> Mendelevium 101</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>No</b> Nobelium 102</td> <td style="padding: 2px;">238</td> <td style="padding: 2px;"><b>Lr</b> Lawrencium 103</td> </tr> </table>										140	<b>Ce</b> Cerium 58	141	<b>Pr</b> Praseodymium 59	144	<b>Nd</b> Neodymium 60	150	<b>Sm</b> Samarium 62	152	<b>Eu</b> Europium 63	157	<b>Gd</b> Gadolinium 64	159	<b>Tb</b> Terbium 65	162	<b>Dy</b> Dysprosium 66	165	<b>Ho</b> Holmium 67	167	<b>Er</b> Erbium 68	169	<b>Tm</b> Thulium 69	173	<b>Yb</b> Ytterbium 70	175	<b>Lu</b> Lutetium 71	232	<b>Th</b> Thorium 90	238	<b>U</b> Uranium 92	238	<b>Np</b> Neptunium 93	238	<b>Pu</b> Plutonium 94	238	<b>Am</b> Americium 95	238	<b>Cm</b> Curium 96	238	<b>Bk</b> Berkelium 97	238	<b>Cf</b> Californium 98	238	<b>Es</b> Einsteinium 99	238	<b>Fm</b> Fermium 100	238	<b>Md</b> Mendelevium 101	238	<b>No</b> Nobelium 102	238	<b>Lr</b> Lawrencium 103
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		Key																																																																											
		a = relative atomic mass										X = atomic symbol																																																																	
												b = proton (atomic) number																																																																	

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

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