

Cambridge International Examinations

Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
PHYSICAL SCI	ENCE		0652/32
Paper 3 (Extended)		Oct	tober/November 2016 1 hour 15 minutes

No Additional Materials are required.

Candidates answer on the Question 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 an HB pencil for any diagrams, graphs, tables or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

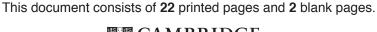
A copy of the Periodic Table is printed on page 24.

Electronic calculators may be used.

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.







1 Ticker tape is attached to a model car which moves across a bench from left to right.

This is shown in Fig. 1.1.

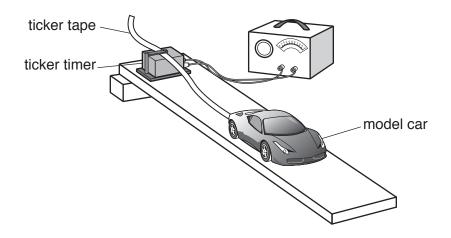


Fig. 1.1

The ticker tape passes through a ticker timer, which prints a dot on the tape every 0.01 s.

Fig. 1.2 shows part of the ticker tape next to a metre ruler.

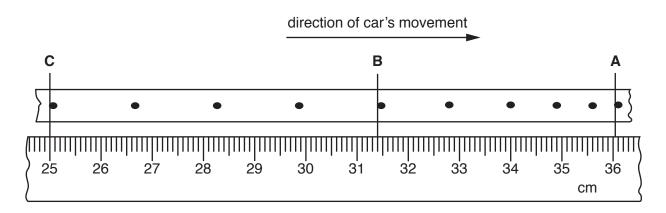


Fig. 1.2

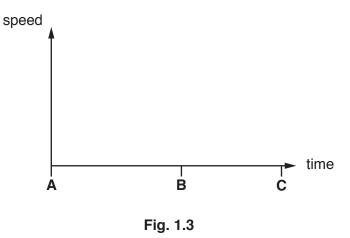
(a) (i) The speed of the car can be calculated from the spacing of the dots.

Calculate the speed of the car during the time that the section **BC** of the tape was made.

(ii) Describe the motion of the car during the time that section **AB** was made.

.....[1]

(b) On Fig. 1.3, sketch a speed/time graph for the motion of the car from time A to time C.



(c) Describe how the acceleration of an object can be found from a speed/time graph.

[2]

2 Fig. 2.1 shows the apparatus used to measure the temperature change that occurs during an exothermic reaction.

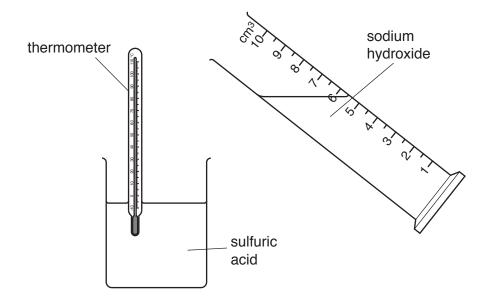


Fig. 2.1

(a)	Predict what will happen to the temperature of the mixture during this reaction.
	[1]
(b)	
	You should refer to bond breaking and bond forming in your answer.
	[2]
(c)	A student wants to increase the rate of reaction between sulfuric acid and sodium hydroxide.
	Suggest one way the rate of this reaction could be increased.

a)	Cor	npiete tn	ie symbol e	quation	for the reacti	on betwe	en sulfuric acid a	na soaiui	m nyarox	iae.
			H ₂ SO ₄	+	NaOH	\rightarrow	Na ₂ SO ₄	+	H ₂ O	[1]
e)	Plai	nts produ	uce glucose	and ox	xygen in an e	ndothermi	ic reaction called	photosyr	nthesis.	
	The	equatio	n for the rea	action fo	or photosynth	esis is sh	own below.			
				6H ₂ O	$+6CO_2 \rightarrow 0$	C ₆ H ₁₂ O ₆ +	+ 6O ₂			
	(i)	carbon	ite the ma dioxide. 12; H, 1; (glucose, C ₆ F	1 ₁₂ O ₆ , ma	ade when 1.0g	of wate	r reacts	with
		Show y	our working	g in the	box.					
						f al				_
					ı	nass or gr	lucose =			y [3]
	(ii)	Outline	how green	plants	obtain the en	ergy need	led for photosynt	hesis to d	occur.	[-]
										[2]

3 Fig. 3.1 shows a crane lifting a load of bricks of weight 5000 N from the ground to a height of 8.5 m.

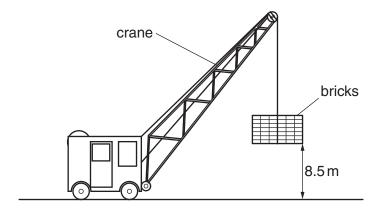


Fig. 3.1

(a)	(1)	Calculate the work done against gravity in litting the bricks.
		Show your working.

	work done = J [2]
(ii)	The energy transferred from the fuel to the crane's motor is considerably greater than the work done to lift the bricks in part (i).
	Use this information to explain what is meant by the term <i>efficiency</i> .
	[1]

(b) The crane takes 12s to raise the bricks to the height of 8.5 m.

Calculate the power produced in raising the bricks.

Show your working and give the unit.

power = unit [3]

4 (a) A student wants to determine the order of reactivity of four metals, A to D.
She tests each metal with cold water, steam and dilute hydrochloric acid.
Her results are shown in Table 4.1.

Deduce the order of reactivity for the metals ${\bf A}$ to ${\bf D}$.

Table 4.1

metal	reaction with cold water	reaction with steam	reaction with hydrochloric acid
Α	no	yes	yes
В	slowly	yes	yes
С	yes	yes	yes
D	no	no	no

most reactive			
least reactive			[2]

(b) The diagram in Fig. 4.1 shows three uses for metals.

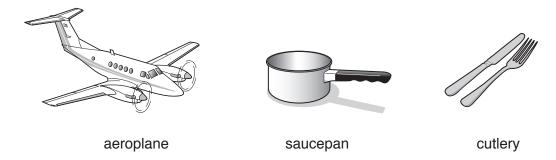


Fig. 4.1

Suggest three different metals that could be used to make each of the items shown above. Use ideas about the properties of the different metals to explain your choice.

(i)	aeroplane
	metal
	reason
	[1]
(ii)	saucepan
	metal
	reason
	[1]
(iii)	cutlery
	metal
	reason
	[1]

(c)	Metals are good conductors of electricity.
	Use ideas about metallic structure and bonding to explain why metals conduct electricity.
	You may draw and label a diagram to help your answer.
	[3]

5 Fig. 5.1 shows a harbour and some anchored boats, viewed from above.

One wavefront of the waves out at sea is labelled.

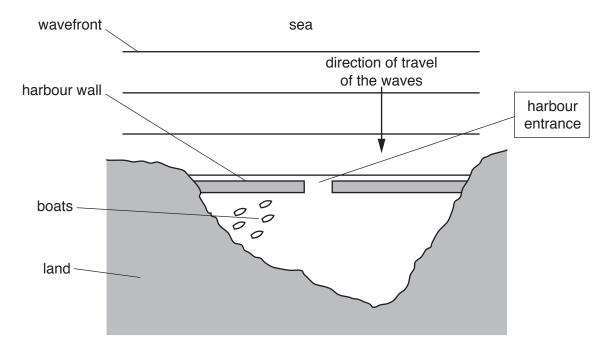


Fig. 5.1

- (a) (i) Draw, on Fig. 5.1, three wavefronts after they pass through the harbour entrance. [3]
 - (ii) Name the property of waves which is demonstrated by the behaviour of the waves after they have passed through the harbour entrance.

	[4]

(iii) The boats in the harbour are sheltered by the harbour wall but still move up and down.

Refer to your diagram to explain why the boats move up and down.



(b)	A gi	rl stands on the harbour wall and counts the waves hitting the harbour wall.	
	In 2 minutes she counts 6 waves hitting the wall.		
	(i)	Calculate the frequency of the waves.	
		frequency = Hz [2]	
	(ii)	She estimates the distance between successive crests of the waves as 25 m.	
		State the wavelength of the waves.	
		wavelength = m [1]	
	(iii)	Calculate the speed at which the waves travel towards the harbour wall.	
		speed = m/s [2]	

6	(a)	Bauxite, haematite and malachite are three metal ores.
		State the metal found in malachite.
		[1]

(b) Fig. 6.1 shows a blast furnace used to extract iron from its ore.

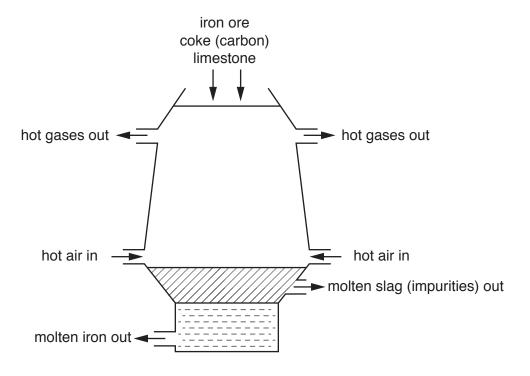


Fig. 6.1

(i)	Explain why it is possible to extract the iron metal from its ore by reacting the ore with carbon.
	[1]
(ii)	Suggest why heated air is forced into the blast furnace.
	You may use an equation to help your answer.
	[2]

	(iii)	Complete the symbol equation to show the products of the reaction between iron oxic and carbon monoxide in the blast furnace.	le
		Fe_2O_3 + 3CO \longrightarrow +	2]
(c)	Stat	te the role of the calcium carbonate (limestone) in the extraction of iron from haematite.	
			1]
(d)	Cald	cium carbonate (limestone) is also used in the manufacture of calcium oxide (lime).	
	(i)	Write a word equation for the reaction of calcium carbonate to form calcium oxide.	
	(ii)	State the name given to this type of reaction.	1]
		[1]

7 Fig. 7.1 is a diagram of a circuit in which there is a battery of e.m.f. 9.0 V, three resistors and three voltmeters **A**, **B** and **C**.

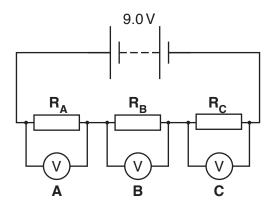


Fig. 7.1

(a) Table 7.1 shows the readings on voltmeters A and B.

Table 7.1

reading on voltmeter A / V	reading on voltmeter B / V	reading on voltmeter C / V
4.2	3.6	

Complete Table 7.1 to show the reading on voltmeter C.

[1]

(b) (i) The current through $\mathbf{R}_{\mathbf{A}}$ is 0.40A.

Calculate the energy dissipated in $\mathbf{R}_{\mathbf{A}}$ in 5.0 minutes. Show your working and state the unit.

(ii) Determine the current through $\mathbf{R}_{\mathbf{B}}$ and $\mathbf{R}_{\mathbf{C}}.$

(c) Fig. 7.2 shows the same 9.0 V battery connected across two resistors in parallel.

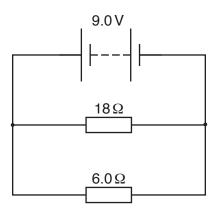


Fig. 7.2

(i) Calculate the combined resistance of the two resistors.

resistance = Ω [2]

(ii) Calculate the current in the battery.

current = A [1]

(iii) Calculate the charge passing through the battery in 30 seconds.

charge = C [2]

8 Table 8.1 shows data for the atomic radii of elements in Group II of the Periodic Table.

Table 8.1

Group II element	atomic radius / nm
beryllium	0.125
magnesium	0.160
calcium	0.174
strontium	
barium	0.198

(a)	Suggest a value for the atomic radius of strontium.
	nm [1]
(b)	State the number of electrons barium has in its outer electron shell.
	[1]
(c)	Magnesium can be reacted with the Group VII element chlorine to form the ionic compound magnesium chloride.
	Describe the formation of ionic bonds between magnesium and chlorine. You should draw and label a diagram to help your answer.

Question 9 begins over the page.

9 Fig. 9.1 shows a simple alternating current (a.c.) generator.

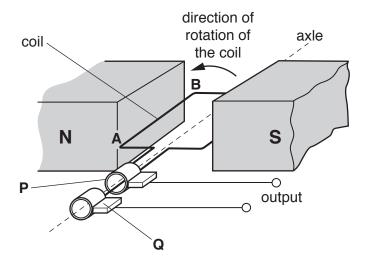


Fig. 9.1

(a)	name the parts labelled P and G in Fig 9.1.	
	P	
	Q	
(b)	Explain why an e.m.f. is induced across the section AB of the coil when the coil rotates.	[2]
		[2]

(c)	(i)	A resistor is connected across the generator. There is an alternating current in the resistor.
		Explain what is meant by the term alternating current.
		[1
	(ii)	Fig. 9.2 shows the screen of a cathode ray oscilloscope (c.r.o.).

The output from the a.c. generator is connected to the c.r.o.

Draw, on Fig. 9.2, two complete cycles of the trace seen on the screen of the oscilloscope.

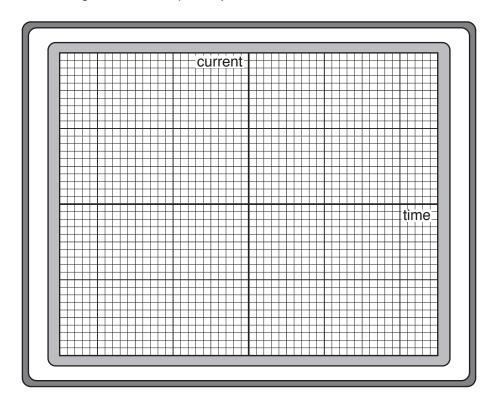


Fig. 9.2

[2]

10 Graphite and diamond are both forms of carbon.

Table 10.1 shows some physical properties of graphite and diamond.

Table 10.1

	melting point / °C	hardness
graphite	3600	soft
diamond	4000	hard

Fig. 10.1 shows the structure of graphite and diamond.

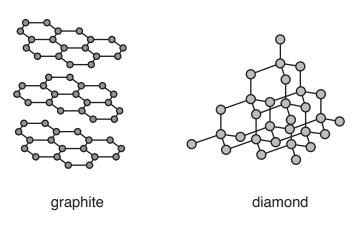


Fig. 10.1

(a)	Use	Table 10.1 and Fig. 10.1 to explain the following properties of graphite and diamond.
	(i)	hardness
		[3]
	(ii)	melting point
		[1]

(b)	Carbon is one of the elements found in ethanol and ethene.
	Name the process used to produce ethanol from ethene.
	[1]
(c)	Draw a diagram to show the electron arrangement in ethene, C ₂ H ₄ .

[2]

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The Periodic Table of Elements

	III/	F 5	helium 4	10	Ne	neon 20	18	Ā	argon 40	36	궃	krypton 84	22	Xe	xenon 131	98	R	radon			
	IIA			6	Щ	fluorine 19	17	Cl	chlorine 35.5	35	B	bromine 80	53	П	iodine 127	85	Αt	astatine			
	IN			80	0	oxygen 16	16	S	sulfur 32	34	Se	selenium 79	52	<u>L</u>	tellurium 128	8	Ро	polonium	116	_	livermorium -
	>			7	z	nitrogen 14	15	۵	phosphorus 31	33	As	arsenic 75	51	Sb	antimony 122	83	<u>.</u>	bismuth 209			
	2			9	ပ	carbon 12	41	S	silicon 28	32	Ge	germanium 73	20	Sn	tin 119	82	Pb	lead 207	114	F1	flerovium -
	≡			2	В	boron 11	13	Αl	aluminium 27	31	Ga	gallium 70	49	In	indium 115	81	l1	thallium 204			
										30	Zu	zinc 65	48	g	cadmium 112	80	Нg	mercury 201	112	ű	copernicium
										29	J	copper 64	47	Ag	silver 108	62	Αu	gold 197	111	Rg	roentgenium -
dn										28	z	nickel 59	46	Pq	palladium 106	78	瓧	platinum 195	110	Ds	darmstadtium -
Group										27	ပိ	cobalt 59	45	돈	rhodium 103	77	'n	iridium 192	109	₩	meitnerium -
		- I	hydrogen 1							26	Fe	iron 56	44	Ru	ruthenium 101	9/	SO	osmium 190	108	Hs	hassium
				,						25	M	manganese 55	43	ည	technetium -	75	Re	rhenium 186	107	В	bohrium –
					loc	ass				24	ပ်	chromium 52	42	Mo	molybdenum 96	74	≥	tungsten 184	106	Sg	seaborgium -
			Key	atomic number	atomic symbo	name relative atomic mass				23	>	vanadium 51	41	Q N	niobium 93	73	Б	tantalum 181	105	Op	dubnium –
					ato	rela				22	ı	titanium 48	40	Zr	zirconium 91	72	Ξ	hafnium 178	104	ጟ	rutherfordium -
										21	Sc	scandium 45	39	>	yttrium 89	57–71	lanthanoids		89–103	actinoids	
	Ш			4	Be	beryllium 9	12	Mg	magnesium 24	20	Ca	calcium 40	38	ഗ്	strontium 88	56	Ba	barium 137	88	Ra	radium
	_			3	=	lithium 7	1	Na	sodium 23	19	×	potassium 39	37	Вb	rubidium 85	55	S	caesium 133	87	ቷ	francium

i	7.1	n	lutetium	6/1	103	۲	lawrencium	ı
í	9	Υp	ytterbium	1/3	102	Š	nobelium	1
ć	69	T	thulium	601	101	Μd	mendelevium	ı
	89	щ	erbium	101	100	Fm	fermium	1
1	79	운	holmium	COL	66	Es	einsteinium	1
0	99	۵	dysprosium	103	86	ŭ	californium	ı
L	69	Д	terbium	661	26	K	berkelium	ı
	64	В	gadolinium	/61	96	Cm	curium	ı
	63	En	europium	761	92	Am	americium	ı
	62	Sm	samarium	neı	94	Pn	plutonium	ı
3	61	Pm	promethium	ı	93	ď	neptunium	1
· ·	09	PZ	neodymium	44	92	⊃	uranium	238
C	26	ቯ	praseodymium	4	91	Ра	protactinium	231
c i	28	Ce	cerium	041	06	느	thorium	232
	2/	Гa	lanthanum	651	88	Ac	actinium	1

lanthanoids

actinoids

The volume of one mole of any gas is 24 dm $^{\rm 3}$ at room temperature and pressure (r.t.p.)

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