FOR OFFICIAL USE			

K & U	PS

Total Marks

# 3220/401

NATIONAL QUALIFICATIONS 2007 WEDNESDAY, 16 MAY 9.00 AM - 10.30 AM PHYSICS STANDARD GRADE General Level

Fill in these boxes and read what is printed below.	
Full name of centre	Town
Forename(s)	Surname
<ul> <li>Date of birth Day Month Year Scottish candidate number</li> <li>Beference may be made to the Physics Data Booklet.</li> <li>All questions should be answered.</li> <li>The questions may be answered in any order but a legibly in this book.</li> <li>For questions 1–5, write down, in the space pro answer you think is correct. There is only <b>one</b> correct</li> <li>For questions 6–18, write your answer where india provided after the question.</li> </ul>	Number of seat
5 If you change your mind about your answer you space provided at the end of the answer book.	may score it out and replace it in the
6 Before leaving the examination room you must give not, you may lose all the marks for this paper.	e this book to the invigilator. If you do
	X



			DO N WRIT TH MAR	JOT 'E IN IS GIN
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1.	Which part of a radio receiver separates the audio signal from the carrier wave?	Marks		
	A Aerial			
	B Tuner			
	C Decoder			
	D Amplifier			
	E Loudspeaker			
	Answer	1		
2.	Four <b>identical</b> resistors, P, Q, R and S are connected as shown.			
	- +			
	P			
	R S			
	In which of the resistors is the current the same?			
	A P and O only			
	B R and S only			
	C P. R and S only			
	D O. R and S only			
	E P. O. R and S.			
		1		
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Wh	ich row of values wou	11 1.1.1			K&U	-P
Wh	nich row of values wou	11 1. • .1 1 •		Marks		
		ild result in the greatest ki	netic energy?			
	Mass (kilograms)	Speed (metres per second)				
Α	45	8				
В	45	4				
С	50	10				
D	50	8				
E	50	4				
			A			
			Answer	1		
A r	ocket is pushed forwa	rds because its engine gase	es			
A D	are pushed backward	S				
В	spread outwards					
D	surround the rocket					
E	spread inwards.					
2	oproud miturasi		Answer	1		
In o Wh	outer space, the engine ien the engine is switc	e of a space probe is switc hed off, the rocket	hed on for a short time.			
А	changes direction					
В	moves at a steady spe	eed				
С	slows down					
D	speeds up					
E	follows a curved path	1.				
			Answer	1		
			[T	n over		







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7.	(cor	ntinu	ied)	Marks			
	( <i>b</i> )	(i)	Name <b>one</b> appliance from the table which requires an earth wire.				
				1			
		(ii)	Circle <b>one</b> word or phrase in the passage below to make the statement correct.				
			The colouring of the insulation around the earth wire is				
			blue       brown       green and yellow	1			
		(iii)	Each appliance is fitted with either a 3 ampere or 13 ampere fuse. State the correct value of fuse for the following appliances.				
			(A) Lamp:	1			
			(B) Hair dryer:	1			
			[Turn	over			

A n base	nobile phone contains a battery which is charged using a base unit. The e unit contains a transformer and is connected to the a.c. mains supply.	3	
	mobile phone containing battery		
	base unit containing transformer		
	to a.c. mains supply		
( <i>a</i> )	What is the purpose of the mains supply?		
(b)	Name the supply mentioned which is d.c.		
(0)	1		
( <i>c</i> )	a.c. is short for alternating current. Explain what is meant by alternating current.		
( <i>d</i> )	State the purpose of a transformer.		
( <i>e</i> )	State <b>one</b> advantage of using a mobile phone.		



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10.	Dif: Fou	feren 1r of 1	t types of radia these radiation	ation are used to s are	) detect and treat	illnesses and inj	Mark. uries.	K&U	PS
			infrared	laser light	ultraviolet	X-rays			
	( <i>a</i> )	Wha	at type of radia	tion is used to tr	reat skin conditior	ns such as acne?	1		
	(b)				<b>CAUTIO</b> <b>X-RA</b> This Equipment P X-Rays When End	ON YS Produces ergized			
		(i)	State <b>one</b> me	dical use of X-r	ays.		1		
		(ii)	What can be	used to detect X	-rays?				
							1		









DO NOT WRITE IN THIS MARGIN  $\mathbf{PS}$ K&U Marks An electronic system is used to control a lift. When a floor has been selected, 13. two checks are made: there are no obstructions to the doors; the lift is not overloaded. Part of the circuit is shown below. Р floor selector to door mechanism NOT GATE Q door sensor Y Х R overload sensor The logic states are as shown for the floor selector, the sensors and the door mechanism. logic level not pressed 0 floor selector pressed 1 0 no obstruction door sensor obstruction 1 0 overloaded overload sensor

not overloaded

doors open

doors closed

.....

(*a*) Name logic gate **X**.

door mechanism

1

 $\frac{1}{0}$ 

1

DO NOT WRITE IN THIS MARGIN K&U  $\mathbf{PS}$ Marks 1 1 3 1

#### 13. (continued)

(b) (i) Gate Y is a NOT gate.Draw the symbol for a NOT gate.

Space for symbol

(ii) Complete the truth table for a NOT gate.

Input	Output
0	
1	

(c) (i) State the logic levels needed at P, Q and R to close the lift doors.

Logic level at P.....Logic level at Q.....Logic level at R.....

(ii) What output device could be used for the door opening and closing mechanism?

[Turn over





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5.	A s	kier takes part in a downhill competition.	Marks	K&U	PS
	( <i>a</i> )	State <b>two</b> ways the skier can reduce friction in order to reach high speeds.			
			2		
	( <i>b</i> )	When the skier reaches the maximum speed of 65 metres per second, this speed is maintained over the rest of the course. State how the size of the downhill force compares with the size of the			
		frictional force during this part of the course.	1		
	(c)	At the end of the course, the frictional force brings the skier to rest over a horizontal distance of 500 metres. During this distance, the average frictional force is 346 newtons. Calculate the work done to bring the skier to rest.			
		Space for working and answer			
			2		

2

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16. A ke E	student carries out an exp eeping drinks hot. ach mug is made from a diff	periment to find out v erent material.	Mar which mug is the best at	k&U ks	PS
	plastic	metal	ceramic		
Т	he same volume of hot wate	er is added to each mug.			
(a	) Describe how the studen Your description should	t could carry out the ex include:	periment.		
	what apparatus wou what measurements how you reach a cor	Ild be used; are made; nclusion.			
(b	) How could the heat lost f	rom the mugs be reduc	ed?		
			[Turn over		
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DO NOT WRITE IN THIS MARGIN  $\mathbf{PS}$ K&U Marks A householder installs a wind turbine electricity generator. The table gives information about the wind turbine. 1.5 kilowatts Rated power output Product life 20 years Installation cost £1600 (a) In the year 2006, the wind turbine generated electricity for 2000 hours. Calculate the energy generated in kilowatt-hours during 2006. Space for working and answer 2

17.

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7.	(co	ntinued)	Marks		
	(b)	An electricity supplier charges 8 pence per kilowatt-hour. Calculate the cost of buying the same amount of electricity as generated by the wind turbine in 2006.			
		Space for working and answer			
	( <i>c</i> )	The wind turbine costs $\pounds 1600$ to install. It is used to generate energy for 20 years. Each year it generates the same amount of energy as it did in 2006. Calculate how much money the householder will save if the turbine is used to generate electricity over this time	2		
		Space for working and answer			
			2		
		[Turn	over		



DO NOT WRITE IN THIS MARGIN K&U PS Marks

1

1

1

1

#### 18. (continued)

(b) The table gives information about some of the planets in our Solar System.

Planet	<i>Diameter</i> (kilometres)	Distance from Sun (million kilometres)	Weight of one kilogram at surface (newtons)	Time to go around the Sun once (years)	Time for one complete spin (in Earth days or hours)
Mercury	4800	58	4	0.25	59 days
Venus	12 000	110	9	0.6	243 days
Earth	12750	150	10	1	24 hours
Mars	7000	228	4	1.9	25 hours
Jupiter	140 000	780	26	12	10 hours
Saturn	120 000	1430	11	30	10 hours
Neptune	50 000	4500	12	165	16 hours

- (i) Which planet has the longest day?
- (ii) Which planet has the longest orbit?

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(iii) On which planet would a 4 kilogram mass have the greatest weight?

.....

.....

(c) A meteorite is the name given to an object which enters the Earth's atmosphere from space. When they enter the atmosphere, meteorites heat up.

State the energy change when the meteorite enters the atmosphere.

- (d) Stars and planets belong to galaxies.What is a galaxy?

# [END OF QUESTION PAPER]

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