#### GENERAL CERTIFICATE OF EDUCATION (GCE) BOARD

Section Lethoury
Angele 455, questions

### General Certificate of Education Examination

the mercury thread is 22 cm. It is from plac-

Physics 2 0580

3 marks)

#### **JUNE 2021**

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Subject Title	PHYSICS	ર કેલ પ્રાથમિક સામારામાં મહારામાં (1)
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Subject Code	0580	it had the take the ULX the stateward

## Two and a half hours

Answer ALL questions.

Section 1 is designed to be answered in 1 hour and Section 2 in 11/2 hours.

You are advised to divide your time accordingly.

In section II answer EITHER the a, b and c OR the d, e, and f of each question

For your guidance the approximate mark for each part of a question is indicated in brackets.

You are reminded of the necessity for good English and orderly presentation in your answers.

In calculations you are advised to show all the steps in your working, giving your answer at each stage.

Where necessary, assume:

- the acceleration of free fall,  $g = 10 \text{ m s}^{-2}$
- the speed of light in air,  $c = 3 \times 10^8 \text{ m s}^{-1}$
- the charge on an electron,  $e = 1.6 \times 10^{-19} C$

Calculators are allowed.

(I mark)		
(2 marks)		
(3 marks)	agh air.	Carmonic (a)

# Section 1 (1hour) Answer ALL questions

(a) Define temperature and name an instrument used in a school laboratory for its measurement. (2 marks) 1. (b) An un-calibrated liquid-in-glass thermometer is placed in steam from boiling water under atmospheric pressure. The length of the mercury thread is 23 cm. It is then placed in pure melting ice and the length of the thread changes to 3 cm. Calculate: (2 marks) the fundamental interval. (ii) the temperature for which the length of the mercury thread will be 13 cm. (2 marks) (2 marks) State two factors that affect the pressure exerted by liquids. 2. (i) (a) (ii) Determine the total pressure at a point 10 m below the surface of a lake. Assume that atmospheric pressure is  $1.0 \times 10^5 \ Pa$  and the density of the lake water is  $1025 \ kg \ m^{-3}$ . (3 marks) (3 marks) (b) State Hooke's law and name a material that obeys the law. Two isotopes of carbon are designated as: <sup>12</sup><sub>6</sub>C and <sup>14</sup><sub>6</sub>C. (1 mark) (i) What are isotopes? (ii) Determine the neutron-proton (N/Z) ratio for each of the isotopes and hence deduce which of them is

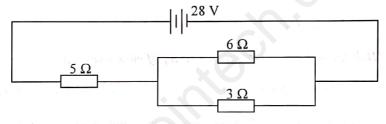
(3 marks)

(2 marks)

(1 mark)

4. Figure 1 shows a network of three resistors connected to a battery of e.m.f., 28 V.

(ii) Name the part of an atom where it's mass is mostly concentrated.



Explain why an atom is said to be neutral, even though it contains charged particles.

Figure 1

	(a)	the total resistance of the circuit. the total current in the circuit.	(2 marks) (2 marks)			
5.	(a)	<ul><li>(i) Distinguish between intrinsic and extrinsic semiconductors.</li><li>(ii) State one example of each type.</li></ul>	(2 marks) (2 marks)			
	(b)		(1 mark)			
		(ii) State the majority charge carriers in an n-type semiconductor and those in a p-type semicon	ductor.			
			(2 marks)			
6.	(a)	Define the 'moment of a force'.	(1 mark)			
	(b)	Explain why a longer spanner is preferred to a shorter one, in undoing a nut.	(2 marks)			
	(c)	State two differences between mass and weight.	(2 marks)			
(d) Draw a free body diagram showing all the forces acting on a body falling freely through air.						

(b) (i)

Calculate:

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(1 mark (2 marks	Section 2 (1 ½ hours)  Answer ALL questions, choosing one question from each pair of alternatives
Ar	(f) On a stormy day, a student sees lightning in the (a), (b) 7 (d), (c) and (d), (d) bins (d), (d) and (e) on (d), (e) and (e) on (e) o
dram () beoler	(ii) Given that the speed of sound in air is 340 m s <sup>-1</sup> , determine how far (a), (b) and (c) or oducine the lightning
(2 marks	
7. (a)	(i) Sketch a displacement-distance graph for two cycles of a wave profile. On it, indicate the amplitude and the wavelength of the wave. (3 marks)
	(ii) Describe an experiment to determine the speed of sound in air. Your description should include:  • a labelled diagram  (1) DER (2) (b) 6 HO (2) DER (6) DER (8) 6 TO (12) DER (9) (12) DER (13) DER (14) DER (15) DER
	<ul> <li>the procedure followed in collecting data</li> <li>the processing of the data to determine the speed of sound</li> </ul>
shum I)	• any precaution taken to minimise error. (7 marks)
(2 marks	(ii) State the principle of conservation of linear momentum
sarun(b)	A ship's sonar sends down a sound of frequency 6000 Hz into water in a sea, at a point which is 3000 m
	deep. The echo is heard 4 seconds later.  (i) Which wave phenomenon is responsible for echoes? (1 mark)
5 kg lying	(i) Which wave phenomenon is responsible for echoes? (2 mark) (1 mark) (2 marks) (2 marks) (2 marks)
(2 marks)	(iii) Calculate the wavelength of the sound. The state of the sound is the sound of the sound. The sound of t
(2 marks)	(iv) State a factor which affects the speed of the sound in water. (1 mark)
(c)	A boy stands 100 cm in front of a large plane mirror and observes the image of a girl who is standing 50 cm
(0)	behind him.
	(i) How far is the image of the girl seen in the mirror from the boy? (3 marks)
	(ii) State one property of the image. (1 mark)
(b) Wilt (b) marks) (l mark)	<ul> <li>(i) Draw a ray diagram of a convex lens to show how rays parallel to the principal axis and passing through it are refracted. On the diagram, indicate the principal focus and the focal length. (3 marks)</li> <li>(ii) Describe an experiment to determine the focal length of a convex lens using the plane mirror method. Your description should include: <ul> <li>a labelled diagram</li> <li>the procedure followed in collecting data</li> <li>the processing of the data to determine the focal length</li> <li>any precaution taken to minimise error.</li> </ul> </li> <li>(7 marks)</li> </ul>
2 marks) 2 marks)	
(e)	Figure 2 shows two rays diverging from a stone, O, at the bottom of a 1 m deep pond. The refractive index of
avode.	water is 1.3. a rightly guideline a transfer become on our right of the first and control of the A. (2)
	the granted Heart in 1.5 st tigliculate:  11. The Store done by the grift to rech the sectind floor.
2 marks) I marks)	I take the set were set were set and the set of the set
TEST LEVILL IN	Air
it and the	(1) for an experiment to determine the in
	corres and me efforts noted. The result of the india below.
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(Fram I)	Figure 2 1 Commence of descending the Figure 2 1 Commence of the Commence of t
(silving)	(II) 1'lot a graph of load (y-axis) against the affort (x-axis)
(ednisa t	<ul> <li>(i) Define refractive index.</li> <li>(ii) Calculate the apparent depth of the stone to an observer.</li> <li>(iii) Calculate the apparent depth of the stone to an observer.</li> <li>(iii) Calculate the apparent depth of the stone to an observer.</li> </ul>
(adapte )	(ii) Canada in affirm the factories to an observation and in Canada in an in Canada in Canad
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					4					
	(iii) What wave	•		~						(1 mark
	(iv) Given that t	he speed	of light in	air is 3.0	$\times 10^8  m  s$	<sup>-1</sup> , determ	ine the sp	eed of ligh	t in water	. (2 marks
(f)	On a stormy day  (i) Explain why  (ii) Given that to producing the produ	y he sees the speed he lightni	the lightni of sound i ng.	ng before in air is 340	hearing the $0 m s^{-1}$ , of	e sound. determine l	how far fro	om the stud	dent was t	(1 mark he cloud (2 marks (1 mark
<del>almana Ci</del> Sil	swer either 8 (a) a	girt galvar	io v zin m	hajing lo l	ngogs arit	a. determine	of the war criment lo	avelength ibc in exp	the or ii) Descr	)
An	swer either 8 (a) a	and (b) ar	nd (c) OR	8 (d), (e)						
EIT	THER 8 (a), (b) a	nd (c)				balloo ni b				
		(-)	bado	spood of s		data to deta				
8. (a)	(i) Define linea					alminiot o	ion iaken i	ny precaut	E e	(1 mark)
	(ii) State the pri	nciple of	conservati	on of linea	r moment	um.				(2 marks)
	(iii) Describe a r	eal life sit	tuation in	which this	principle	is applied.	down a si	onar sends etho is he	es quis s	(2 marks)
ruim/k)	A lauret C 1	11	0.01	. Go.avit	بالمارة فأمحوم					
(b)	A hunter fires a bon a smooth surfa	oullet of m	nass 0.05 /	kg with a v	elocity of	$5400 m s^{-}$	into a w	ooden bloc	ck of mass	5 5 kg lying
Z murk	(i) the moment			. oo it bita t	الماماء	of the out	ditur Less	at anti-amin	ote Orini	(2
Page 11	(ii) the combine	d velocity	of the bu	llet and the	block giv	on that the				(2 marks) (2 marks)
				not una the	olock gr	on that the	y stick tog	ctilei oii ii	праст.	(2 marks)
(c)	In an experiment	to determ	nine the ac	celeration	of a movi	ng car, the	magnitude	of its velo	city and t	he
la con f	corresponding tir	nes were	recorded o	ver a perio	od of 300 s	seconds. Th	ne results a	re shown	on the tab	le below:
			1 (1)(1-)	0.0000034	um as ci	flySta Miles	in is velai	100-170	100 H 11 J	_
	Velocity /ms <sup>-1</sup> Time /s	0	4.0	7.0	8.0	10.6	12.6	17.0	21.0	<u> </u>
	Time/S	U	- 00	100	120	150	180	240	300	
	(i) Define veloc	rity						(1) hou (	91.4b) T.	10
	(ii) Plot a graph		ty (v-axis)	against tin	ne (x-axis)					(1 mark)
glandi 2	(iii) Determine th	ne slope o	f vour grai	oh and stat	e its signif	icance.		till for s		(5 marks)
Strine 5	(iv) Use the grap	h to calcu	late the to	tal displace	ement of t	he car.	ah adi ati)	bulbertar	315 ft	(3 marks)
Dyrallis	francista gad	Applem var	91, 25 / 450	A 10 Julius	279 011	deterrina	eriment to			(2 marks)
						:401101	The track	unique de	*tre(	
OR	8 (d), (e) and (f)					(1) (5)	margari	iabeliad d	i a	
3. (d)	(i) Define work		-11	and lend		oollus m h				
3. (d)			ongo mindi	must report	om onder	data to den	All to aut	seasond on	0	(1 mark)
	(ii) State the prin	energy of	onservatio	ni or energ	y.	sunahing d	113/21/10/11	mpoqui An	() a	(2 marks)
e indove	(iii) Describe the	chergy cr	ianges tha	i take piace	wnen a s	tretched ca	tapult proj	ects a stor	ie.	(2 marks)
	A girl of mass 40	kg runs u	n a flight d	of stairs to	the secon	d floor of o	L	2 W1 S W 2	s annas	(2)
. ,	the ground floor	in 75 s C	'alculater	), stans to	ine secon	a moor or a	building v	vnich is lo	cated 12 r	n above

(i) the work done by the girl to reach the second floor.

(2 marks)

(ii) the power of the girl.

(2 marks)

(f) In an experiment to determine the mechanical advantage of a certain machine, loads were applied to it and the corresponding efforts noted. The results are summarized on the table below:

- 1	Load /N	0	40	0.0	100					
ł		0	40	80	120	160	200	240	280	ı
L	Effort /N	0	5.0	<u>11.5</u>	17	22.5	28.5			ı
					11	22.5	20.5	34	39.5	ı

(i) Define mechanical advantage?

(ii) Plot a graph of load (y-axis) against the effort (x-axis).

(1 mark)

(iii) Determine the slope of your graph and state its significance.

(5 marks)

(3 marks)

(iv) If the efficiency of the machine is 80 %, calculate its velocity ratio.

(2 marks)

(c) Figure 4 shows a transformer used to operate a radio set.

(iv) State two sources of ener.

**EITHER 9 (a), (b) and (c)** 

(a) (i) A polythene rod can be charged by rubbing. Identify the type of charge acquired by the rod and explain its origin. (2 marks)

Two charged metallic balls A and B on insulating stands are placed a short distance from each other as shown in figure 3. Ball A is positively charged while ball B is negatively charged and and in information of the charged with the charged and the charged while ball B is negatively charged.

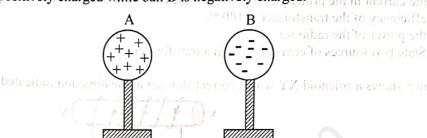


Figure 3

- (ii) Name the type of force that exist between A and B. (1 mark)
- (iii) State two factors that affect the size of the force. (2 marks) (2 marks)
- (iv) State and explain what will happen if A and B are connected using a conducting wire.
- (b) A battery causes charges to move round a circuit for 30 s and it is observed that the current in the circuit is 5 A. Calculate:
  - (i) the quantity of charge that passes through the battery. (2 marks)
  - (ii) the number of electrons that flow round the circuit per unit time given that the charge on one electron is  $1.6 \times 10^{-19} \text{ C}$ (2 marks)
  - (iii) the amount of energy converted into heat and light by a lamp, given that this battery provides a p.d. of 12 V across the lamp. (2 marks)
  - (iv) Differentiate between the potential difference (p.d.) the battery can supply across an external load such as a lamp and the electromotive force (e.m.f.) of the battery. (2 marks)
- (c) (i) Draw a ring circuit used in house wiring. Your diagram should clearly show how a socket carrying a fuse is connected to the ring circuit. (3 marks)
  - (ii) State two advantages of the ring circuit over a linear circuit.

(2 marks)

OR 9 (d), (e) and (f)

(d) (i) Differentiate between soft and hard magnetic materials.

(2 marks)

Two bar magnets are placed side by side as shown in figure 4.

Figure 4

(ii) Name the type of force that exists between the two magnets.

(1 mark)

(iii) Name two factors that affect the size of the force.

(2 marks)

(iv) Copy the diagram and draw the magnetic field pattern between the two magnets.

(2 marks)

Turn Over

(e) Figure 4 shows a transformer used to operate a radio set.

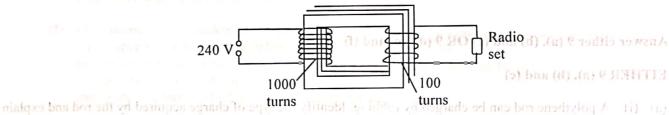


Figure 4

Calculate:

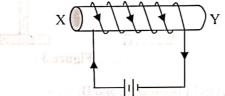
- (i) the output voltage using the figures on the diagram. The most base A stled militare beginning ow (2 marks)
- (ii) the current in the primary coil given that the current in the secondary coil is 2 A, assuming that the (2 marks) efficiency of the transformer is 100 %.

(2 marks) (iii) the power of the radio set.

(iv) State two sources of energy losses in a transformer.

Figure 5

(f) Figure 5 shows a solenoid XY with a current flowing in the direction indicated.



(i) Copy the diagram and indicate the magnetic flux pattern around the solenoid. (ii) State two factors that will affect the strength of the magnetic field.

(3 marks)

(2 marks)

(2 marks)

(2 marks)

(dram'l)

(2 marks)