



**CHIJ SECONDARY (TOA PAYOH)
PRELIMINARY EXAMINATION 2022
SECONDARY 4(EXPRESS)**

PHYSICS

6091/01

Paper 1

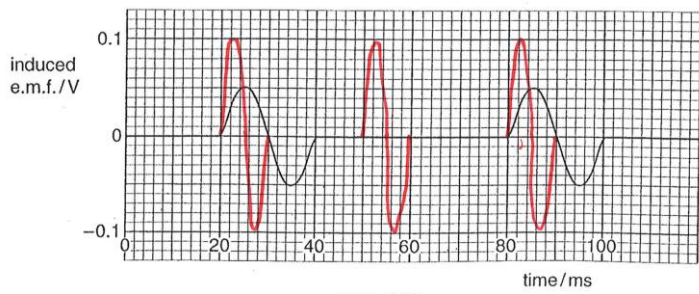
1	D	11	B	21	B	31	B
2	A	12	B	22	D	32	D
3	B	13	C	23	A	33	C
4	C	14	B	24	A	34	C
5	B	15	D	25	A	35	D
6	B	16	D	26	C	36	C
7	C	17	C	27	D	37	A
8	B	18	D	28	B	38	C
9	B	19	A	29	C	39	A
10	C	20	A	30	B	40	D

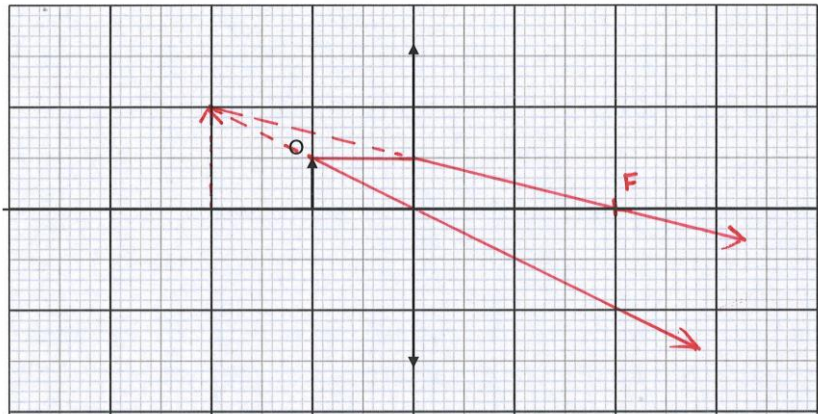
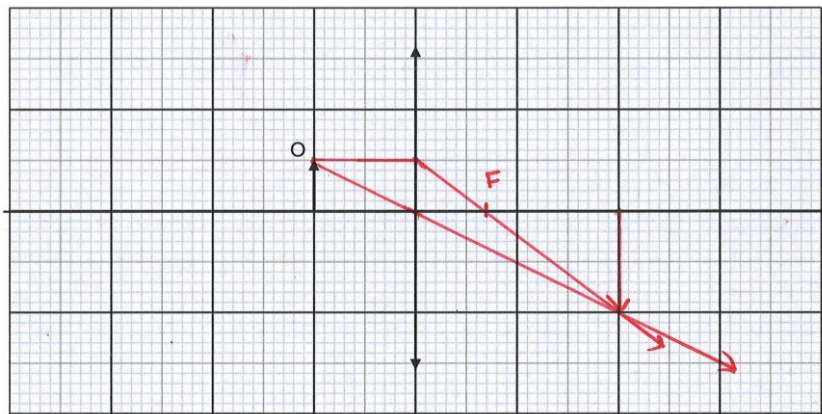
Paper 2

6091/02

Qn	Answers	Mark	
1(a)	The distance travelled per unit time is increasing.	1	
1(b)	average speed = total distance / total time = 80 cm / 2 s = 40 cm/s or 0.4 m/s	1 1	
1(c)	Air resistance is increasing. Weight is constant/ remain unchanged.	1 1	
2(a)	- Gradient on a distance-time graph represents speed - Gradient of P is greater than gradient of Q	1 1	
2(b)	120 km	1	
2(c)	Speed = distance / time = 120 km / 1.5 hours = 80 km/h	1 1	
2(d)		1	
3(a)	- Appropriate scale - Correct resultant force indicated with double arrow - Correct addition of forces drawn - Range: 135kN to 165 kN	1 1 1	

3(b)	- The resultant force of the two tugboats is equal and opposite to the friction between ship and water. - Resultant force on ship is 0 N.	1 1	
4(a)	Volume = $3.6 \times 0.35 \times 0.025 = 0.0315 \text{ m}^3$ Density = mass / volume = $23 / 0.0315 = 730 \text{ kg/m}^3$	1 1	
4(b)(i)	$W = mg$ $= 23 \times 10 = 230 \text{ N}$	1 1	
4(b)(ii)	Moment = force x perpendicular distance $= 230 \times 1.3 = 299 \text{ Nm}$	1 1	
4(c)	- When painter moves further to the right, his weight will create a clockwise moment about the right-hand support. - This clockwise moment is greater than the anti-clockwise moment due to the weight of the plank about the same pivot.	1 1	
5(a)	- Chemical potential energy $\longrightarrow$ Kinetic energy + Gravitational potential energy - Chemical potential energy is decreasing, kinetic energy is constant, gravitational potential energy is increasing. OR Chemical potential energy $\longrightarrow$ Gravitational potential energy + thermal energy + sound	1 1	
5(b)	All the chemical potential energy input by the cyclist is converted to thermal energy when the cyclist stops.	1	
5(c)	$GPE = mgh$ $5700 = 60 \times 10 \times h$ $h = 9.5 \text{ m}$	1 1	
6(a)	less same less greater same	1 1 1 1 1	
7(a)	Three errors: 1. Ultra-sound should be ultraviolet instead 2. The positions of microwaves and infra-red waves should be interchange. 3. Visible light is missing. It should be between ultraviolet and infra-red waves.	1 1 1	
7(b)	X-rays is used to check for internal cracks in metal structures.	1	
8(a)	- Bring positively charged rod near but not touching sphere. - Connect the earth connection to the sphere. - Remove the earth connection. - Remove the positively charged rod.	1 1 1	
8(b)	- When positively charged rod is brought near the sphere, electrons on sphere will be attracted to the left side of sphere. - When earth connection is connected to sphere, electrons will be attracted from the earth into the sphere.	1 1	
8(c)	$Q = It$ $I = Q/t = 2.5 \times 10^{-9} / 4.0 \times 10^{-3} = 625 \text{ nA}$	1 1	
9(a)	- Soft-iron is magnetised into a strong electromagnet - Iron lever is attracted by the strong electromagnet and starts <u>to turn clockwise about the pivot</u> - Spring will contract and pull the springy metal towards the reset button - Contact will open	1 1 1 1	
9(b)	Increase the number of turns per unit length in the coil	1	
END OF SECTION A			

10(a)	- As the turbine rotates, the coil will experience a rate of change of magnetic flux around it. - By <u>Faraday's law of electromagnetic Induction</u>, an <u>induced</u> e.m.f. is formed on the coil.	1 2	
10(a)(ii)	 Fig. 10.2 - Amplitude increased to 0.1 V - Period reduced by $\frac{1}{2}$ - time interval between waveform is reduced from 60 ms to 30 ms.	1 1 1	
10(c)	Turns ratio = $N_s / N_p = V_s / V_p$ $= 400k / 25k = 16$	1	
10(d)	$V_s / V_p = I_p / I_s$ $16 = 12 \times 10^3 / I_s$ $I_s = 750 \text{ A}$	1 1	Power input = power output $I_p V_p = I_s V_s$
10(e)	Reduce energy loss through thermal on the transmission cables.	1	Due to lower current transmitted.
11(a)	Input transducers are electronic devices that convert non-electrical energy to electrical energy while output transducers convert electrical energy to non-electrical energy.	1	
(b)(i)	Resistance at $40^\circ\text{C} = 2.5 \text{ k}\Omega$	1	
(b)(ii)	Graph is not a straight line / Resistance of the sensor changes non-linearly	1	
(c)	$I = V / R$ $= 20.0 / [10 \times 10^3] = 2 \text{ mA}$	1 1	
(d)(i)	$V = I R = 2 \times 10^{-3} \times 7500 = 15 \text{ V}$	1	
(d)(ii)	$V_{\text{output}} = R/[R+R_T] \times 20.0 \text{ V}$ $6.0 = 7500/[7500+R_T] \times 20.0 \text{ V}$ $R_T = 17.5 \text{ k}\Omega$ From graph, minimum temperature = 0°C $10.0 = 7500/[7500+R_T] \times 20.0 \text{ V}$ $R_T = 7.5 \text{ k}\Omega$ From the graph, maximum temperature = 15°C	1 1 1	
(d)(iii)	To switch on a heater when the temperature drops below 15°C .	1	
12 Either			
12(a)	Effective resistance between AB $= [1/(1/10+1/10) + 1/(1/10+1/10+1/10+1/10)]$ $= 7.5 \Omega$	1 1	
12(b)(i)	- E.m.f is defined as the amount of work done <u>by an electrical source</u> in driving one unit charge around a complete circuit. - Potential difference is defined as the amount of work done in driving one unit charge <u>across a component</u> in the electrical circuit.	1 1	

12(b)(ii)	Potential difference across AB = $24 - 6 = 18 \text{ V}$	1	
12(c)(i)	$V = IR$ $I = V / R = 18 / 7.5 = 2.4 \text{ A}$	1 1	
12(c)(ii)	$R = V / I = 6.0 / 2.4 = 2.5 \Omega$	1	
12(d)	- In the event of an electrical fault, the earth wire will <u>conduct the large fault current safely</u> to the ground. - This will <u>prevent user from getting an electric shock</u> if user accidentally touches the metal casing	1 1	
12OR			
(a)(i)	 - Correct pair of rays drawn - Correct F labelled	1 1	
(a)(ii)	 - Correct pair of rays drawn - Correct F labelled	1 1	
(b)	Image is upright.	1	
(c)	Overhead Projector It is able to project a big image of a small object onto a screen.	1 1	
(d)	Object should be placed exactly 2 focal length away from lens.	1	
(e)	1. The incident ray, the normal and the refracted ray at the point of incidence all lie on the same plane. 2. For 2 given media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant.	1 1	
	END OF PAPER 2		