

EUNOIA JUNIOR COLLEGE JC2 Mid Year Examination 2022 General Certificate of Education Advanced Level Higher 1

CANDIDATE NAME					
CIVICS GROUP	2	1	-	REGISTRATION NUMBER	

PHYSICS

Paper 1 Multiple Choice Questions

8867/01 July 2022

1 hour

Candidates answer on the Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, civics group and registration number on

all the work you hand in.

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

Answer **all** questions.

The use of an approved scientific calculator is expected where appropriate.

Multiple Choice

Write in soft pencil.

There are **thirty** 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.

Data

speed of light in free space	$c = 3.00 \times 10^8 \text{ m s}^{-1}$
elementary charge	$e = 1.60 \times 10^{-19}$ C
unified atomic mass constant	$u = 1.66 \times 10^{-27} \text{ kg}$
rest mass of electron	$m_{\rm e} = 9.11 \times 10^{-31} \rm kg$
rest mass of proton	$m_{\rm p} = 1.67 \times 10^{-27} {\rm kg}$
the Avogadro constant	$N_{\rm A} = 6.02 \times 10^{23} {\rm mol}^{-1}$
gravitational constant	$G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
acceleration of free fall	<i>g</i> = 9.81 m s ^{−2}

Formulae

uniformly accelerated motion	$s = ut + \frac{1}{2}at^2$
	$v^2 = u^2 + 2as$
resistors in series	$R = R_1 + R_2 + \dots$
resistors in parallel	$1/R = 1/R_1 + 1/R_2 + \dots$

mass $m = 51.6 \pm 0.1$ g length $l = 100.0 \pm 0.1$ cm width $w = 10.0 \pm 0.1$ cm thickness $t = 0.20 \pm 0.01$ mm

He uses the equation $\rho = \frac{m}{wlt}$ to calculate the density.

What is the calculated value of density with its uncertainty?

- **A** 0.26 \pm 0.01 g cm⁻³
- **B** $0.26 \pm 0.02 \text{ g cm}^{-3}$
- **C** 2.6 \pm 0.1 g cm⁻³
- **D** 2.6 \pm 0.2 g cm⁻³
- 2 The speed v of a liquid leaving a tube depends on the change in pressure ΔP and the density ρ of the liquid. The speed is given by the equation

$$v = k \left(\frac{\Delta P}{\rho}\right)^n$$

where *k* is a constant that has no units.

What is the value of n?

- **A** $\frac{1}{2}$ **B** 1 **C** $\frac{3}{2}$ **D** 2
- **3** A steel rule can be read to the nearest millimeter. It is used to measure the length of a bar whose true length is 895 mm. Repeated measurements give the following readings:

Length/mm	892 891 892 891 891 892	
Longai		

Are the readings accurate and precise to within 1 mm?

	Results are accurate to within 1 mm	Results are precise to within 1 mm
Α	No	No
В	Yes	No
С	No	Yes
D	Yes	Yes

- 4 A baseball catcher throws a ball vertically upward and catches it in the same spot when it returns to his mitt. At what point in the ball's path does it experience zero velocity and non-zero acceleration at the same time?
 - A Midway on the way up
 - **B** At the top of the trajectory
 - **C** The instant it leaves the catcher's hand
 - **D** The instant before it arrives in the catcher's mitt
- 5 A ball is projected horizontally off a table an initial velocity u. It eventually hits the floor in a direction 30° below the horizontal with a velocity v. What is the relationship between u and v?

A
$$v = \frac{u}{\cos 30^{\circ}}$$
 B $v = u \cos 30^{\circ}$ **C** $v = \frac{u}{\sin 30^{\circ}}$ **D** $v = u \sin 30^{\circ}$

6 A driver decelerates uniformly to a stop as he approaches a junction, turns around suddenly, and accelerates at the same rate that he decelerated earlier. Which of the following velocity-time and acceleration-time graphs best represents this motion?



7 A cannon ball is fired at a speed of 450 m s⁻¹ at sea level at an angle of θ = 31.6° with respect to horizontal. The cannon ball hits the top of a watchtower located 900 m away as shown in figure.



How high is the top of the watchtower above sea level? Neglect air resistance.

Α	527 m	В	542 m	С	580 m	D	1390 m

8 The graph shows the variation with time *t* of a force *F* acting on a 2.0 kg mass.



- **10** An elastic ball is dropped from a height. It comes to a momentary stop when it hits the ground and its compression is at a maximum. Which of the following statements best explains its resultant force at this instant?
 - A Its resultant force is zero because it is momentarily at rest.
 - **B** Its resultant force is zero because at maximum compression, the force from the ground is exactly equal to its weight.
 - **C** Its resultant force is upwards because it is experiencing an upward acceleration.
 - **D** Its resultant force is downwards because the rubber ball is pushing the ground with a force greater than its weight due to its compressed state.

11 Two balls **X** and **Y** approach each other along the same straight line and collide elastically. Their speeds are u_x and u_y respectively. After the collision they move apart with speeds v_x and v_y respectively. Their directions are shown on the diagram.



Which of the following equation is correct?

- $\mathbf{A} \quad u_x u_y = v_y v_x$
- $\mathbf{B} \quad u_x + u_y = v_x v_y$
- $\mathbf{C} \qquad u_x + u_y = v_x + v_y$
- $\mathbf{D} \quad u_x u_y = v_x v_y$
- **12** A cyclist who needs to accelerate quickly would get off the seat and pedal while standing. In this situation, the resultant force accelerating the bicycle is
 - A the weight of the cyclist
 - **B** the force the cyclist exerts on the pedal
 - C the frictional force on the wheels by the ground
 - D the contact force the wheels exert on the ground
- **13** A hard sphere is rolling with constant speed along a straight line on a hard horizontal surface as shown.



Neglecting air drag, which diagram best represents the force exerted by the surface on the sphere?













D

14 A non-uniform rod of mass 4.0 kg is suspended by a string attached at B and is hinged at A so that it is horizontal. The centre of gravity of the rod is 60 cm from A and 40 cm from B. The string makes an angle 30° with the vertical as shown.



15 A uniform rod XY is freely hinged to the wall at X. It is held horizontal by a force *F* acting on **Y** at an angle θ to the vertical as shown in the diagram. Which arrow shows the direction of the reaction force exerted by the wall on the rod?



16 A pump lifts 200 kg of water per minute through a vertical height of 15 m. What is the input power rating of the pump if it is 65% efficient?

A 1	19 kW	В	45 kW	С	320 W	D	750 W
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- **17** A lorry of mass 2000 kg has an engine which can deliver a maximum power of 50 kW. What is the minimum time in which the lorry can be accelerated from rest to a speed of 100 km h⁻¹ on level ground?
 - **A** 11.3 s **B** 15.4 s **C** 30.9 s **D** 200 s

18 An 8 W Light Emitting Diode (LED) and 15 W compact fluorescent (CFL) each generates approximately the same light output. The LED generates heat of 3.4 Btu per hour (1 Btu = 1055 J) and the CFL generates 30 Btu per hour.

What is the difference in efficiency of the two lighting device?

A 41 % B 46 % C 54 % D 88 %	\ 41 %	46 % C 54	% D 88 %
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19 A car of mass m moving at a constant speed v passes over a humpback bridge of radius of curvature r. Given that the car remains in contact with the road, what is the contact force R experienced by the car when it is at the top of the bridge?



- $R = mg + \text{Error! Bookmark not defined.} \frac{mv^2}{r}$ Α
- R = mg Error! Bookmark not defined. $\frac{mv^2}{r}$ В m. 2

C
$$R$$
 = Error! Bookmark not defined. $\frac{mr}{r}$ - mg

D
$$R = \frac{mv^2}{r}$$

20 A pendulum bob is swung in such a way that it performs uniform circular motion in a vacuum as shown in the diagram below.



Which one of the following statements about the motion is correct?

- **A** The kinetic energy of the bob is constant because no work is done on it.
- **B** The bob is in equilibrium because the tension in the string balances its weight.
- **C** The momentum of the bob is constant.
- **D** The acceleration is constant because the tension is constant.
- **21** Two satellites orbit around the Earth in 24 hours. Which of the following statement(s) **need not be true**?
 - i The satellites have the same mass.
 - ii The satellites are at the same radial distance from the centre of the Earth.
 - iii The satellites are geostationary.
 - A i B ii C i, ii D i, iii
- 22 Four resistors are connected in a square as shown.



The resistance may be measured between any two junctions.

Between which two junctions is the measured resistance greatest?

A P and Q B Q and S C R and S D S and P

23 A 20 V d.c. supply is connected to a circuit consisting of five resistors L, M, N, P and Q.



There is a potential drop of 7 V across L and a further 4 V potential drop across N.

What are the potential drops across M, P and Q?

	potential drop across M/V	potential drop across P/V	potential drop across Q/V
Α	9	7	13
в	13	7	13
С	13	11	9
D	17	3	17

24 Two wires **P** and **Q**, each of the same length and the same material, are connected in parallel to a battery. The diameter of **P** is half of that of **Q**.

What fraction of the total current passes through P?

A 0.20

- **B** 0.25
- **C** 0.33
- **D** 0.50

25 The diagram below shows a circuit consisting of five 2.0 Ω resistors. A multimeter is used to measure the resistance across different terminals.



Which of the following statements is false?

- **A** The resistance measured between B and C is 1.0Ω .
- **B** The resistance measured between B and C will be smaller if an additional 2.0 Ω resistor is connected in parallel across BC.
- **C** The resistance measured between A and D is 2.0 Ω .
- **D** The resistance measured between A and D will be smaller if a zero resistance wire is connected across BC.

26 The figure below shows the track of a charged particle in a magnetic field. The direction of the magnetic field is into the paper.



Which of the following shows the particle's charge and point of entry?

	Charge	Point of Entry
(i)	Positive	Р
(ii)	Positive	Q
(iii)	Negative	Р
(iv)	Negative	Q

- A (i) and (ii)
- **B** (ii) and (iii)
- **C** (iii) and (iv)
- **D** (i) and (iv)

27 A beam of electrons is directed into a magnetic field and is deflected by it.

Diagram 1 represents a magnetic field in the plane of the paper. Diagram 2 represents a magnetic field directed perpendicular into the plane of the paper. The lines **A**, **B**, **C** and **D** represent possible paths of the electron beam. All paths are in the plane of the paper.

Which line best represents the path of electrons inside the field?



28 A uniform metallic rod PQ of density ρ , area of cross-section *A* and length *L*, is suspended horizontally by two identical strings as shown below.



A uniform magnetic field of flux density B acts throughout this region. When a current I is passed along the rod, the tensions of the supporting strings reduce to zero. Which of the following gives the direction of the magnetic field, magnitude and direction of current in PQ.

	Direction of Magnetic field	Magnitude of current	Direction of current
Α	х	В	Q to P
		ho Ag	
В	У	<u></u>	P to Q
		ho Ag	
С	-Z	ρAg	Q to P
		В	
D	Z	ρAg	Q to P
		В	

- **29** Which conclusion can be drawn from the results of the experiment showing the scattering of α -particles by gold foil?
 - A Electrons orbit the atomic nucleus in well-defined paths.
 - **B** Nuclei of different isotopes contain different numbers of neutrons.
 - **C** The atomic nucleus contains protons and neutrons.
 - **D** The nucleus is very small compared to the size of the atom.
- **30** In an experiment on α -particle scattering, α -particles are directed onto a thin gold foil, and detectors are placed at positions P, Q and R as shown in the diagram below. What is the distribution of α -particles as recorded at P, Q and R respectively?



Α	none	none	all
В	most	some	none
С	most	some	few
D	few	some	most

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