MAJLIS PEPERIKSAAN MALAYSIA
Malaysian Examinations Council

PELANGI

Laporan Peperiksaan
STPM 2023

Physics (960)

Physics 960/1

OVERALL PERFORMANCE

For Semester 1, 1 282 candidates sat for the examination of this subject and 65.83% of them obtained a full pass.

The achievement of the candidates for this subject according to grades is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	10.14	8.58	8.58	8.42	10.37	8.74	11.00	2.73	5.81	3.16	22.46

RESPONSES OF CANDIDATES

SECTION A: *Multiple-Choice Questions*

Answer keys

Question number	Key	Question number	Key	Question number	Key
1	**B**	6	**C**	11	**D**
2	**A**	7	**A**	12	**B**
3	**A**	8	**C**	13	**B**
4	**A**	9	**B**	14	**D**
5	**D**	10	**D**	15	**C**

General comments

All the questions were in the medium range with 30% to 70% of the candidates obtaining the correct answers.

SECTIONS B AND C: *Structured and Essay Questions*

General comments

In general, the performance of the candidates was good in quantitative questions. Most candidates were able to use the correct formula and present the final answer with the correct significant figures and units. The steps for calculations were well organised and presented systematically. The performance of the candidates was satisfactory in qualitative questions. Candidates showed less ability in understanding physics concepts and explaining it in their own words.

Comments on individual questions

Question 16

In part (*a*), based on the graph of variation of tensile force with extension, most candidates were able to state that the glass fibre was brittle with the reason that there no plastic deformation before the fibre breaks at *P*.

In part (*b*), most candidates were able to determine the maximum tensile stress using the formula, $\sigma = \frac{F}{A}$. However, there were a few candidates who gave the final answer without a unit.

In part (*c*), most candidates were also able to determine the Young Modulus for the glass fibre using the formula, $Y = \frac{\sigma}{\frac{e}{L}}$. However, many candidates were lose the final mark due to misunderstanding the value of *Y* which had no unit.

In part (*d*), most candidates were able to calculate the energy released once the glass fibre breaks using the formula, $E = \frac{1}{2}Fe$.

Answers: (*b*) 7.81×10^{7} N m^{-2}, (*c*) 6.25×10^{10} N m^{-2}, (*d*) 8.8×10^{-3} J

Question 17

In part (*a*), most candidates were able to determine the pressure of the ozone layer using the formula $PV = nRT$, where $n = \frac{m}{M}$ dan $m = \rho V$. Some candidates lose the final mark due to careless in converting molar mass unit of ozone 48 g mol^{-1} to 0.048 kg mol^{-1}.

In part (*b*), most candidates were able to state the ways to reduce the global warming. Candidates were expected to state their answers based on reducing the production of CO_2 gas to the atmosphere such as avoiding open burning, using public transport, plantating of more trees and many others.

Answers: (*a*) 7.51×10^{3} Pa

Question 18

In part (*a*), most candidates were not able to explain the effect of air resistance on the motion of the object in the air correctly. Some candidates were only able to provide a brief answer, which also lead to the terminal velocity. The correct answer should start with all forces involved in the motion where the resultant force was $F = mg - R$ and $F = ma$. Then, the object experienced an increase in the velocity and at the same time the effect of air resistance towards the object increases as well. This results in decreasing the acceleration of the object until $R = mg$ where the acceleration was zero. This causes the object to move at a constant velocity, which was known as terminal velocity. The majority of candidates had misconception by stating the existence of air resistance caused the velocity of the object to decrease. They were also related to the existence of air resistance to the increase of time taken by the object to reach the ground.

In part (*b*)(i), most candidates were able to determine the time taken for the camera to reach the ground using the equation $s_y = u_y t + \frac{1}{2}gt^2$. A few candidates were not able to get the correct answer because of using $u_y = 30\ \text{m s}^{-1}$ instead of $u_y = 0$.

In part (*b*)(ii), most candidates were able to calculate the horizontal distance of the camera using formula, $s_x = u_x t$. Some candidates chose improper formula to be used such as $v^2 = u^2 + 2as$. They might not realise that the acceleration in horizontal direction was zero.

In part (*b*)(iii), most candidates were able to calculate the magnitude of the velocity of the camera just before the camera landed on the ground. The candidates were expected to initially determine the final velocities of the camera for both horizontal and vertical components, v_x and v_y respectively, before performing a vector sum to get the magnitude of the final velocity of the camera, $v = \sqrt{v_x^2 + v_y^2}$. Some candidates tried to solve it by applying the principle of conservation of energy.

Answers: (*b*)(i) 4.95 s; (*b*)(ii) 148.5 m; (*b*)(iii) 57.1 m s^{-1}

Question 19

In part (*a*), many candidates did not have a problem to define Newton's law of universal gravitation. Those candidates who lose mark was due to incomplete definition such as did not write attraction/gravitational force instead of just a force. The candidates who defined it using the formula, $F = G\frac{Mm}{r^2}$, also lose mark because they were not able to define all the symbols used, such as the attractive force, *F*.

In part (*b*), a few candidates were able to explain the changes in the gravitational acceleration of a meteoroid at a distance 3*R* from the surface of the Earth which falls towards the surface of the Earth correctly. Most of them were able to write the expression, $g = \frac{GM}{r^2}$, but were not able to get $r = 4R$ and consequently failed to get the correct Δg. However, many candidates get mark on the gravitational increases as the meteoroid approaching the Earth surface.

In part (*c*)(i), most candidates were able to determine the escape speed correctly using the formula, $v = \sqrt{\frac{2GM}{R}}$. However, some candidates made a mistake that they carelessly used the mass and radius of the Jupiter instead of the mass and radius of the Earth.

In part (c)(ii), many candidates were able to determine the distance travelled by the satellite to reach Jupiter using the formula, $s = vt$. However, some candidates erroneously used Kepler's third law such as $T^2 \propto r^3$ and $T^2 = \frac{4\pi^2 r^3}{GM}$ to get the answer.

In part (*c*)(iii), most candidates were able to determine the gravitational potential, $V = -\frac{GM}{r}$. However, most common mistake was that the candidates either left out the negative sign in the formula or failing to write the correct unit for gravitational potential.

In part (*c*)(iv), most candidates were able to determine the gravitational field strength using the expression, $g = \frac{GM}{r^2}$.

Answers: (*c*)(i) 1.12×10^4 m s^{-1}; (*c*)(ii) 1.77×10^{12} m; (*c*)(iii) 1.80×10^9 J kg^{-1}; (*c*)(iv) 25.2 m s^{-2}

Question 20

In part (a)(i), a few candidates answered correctly where the energy of a molecule was equally shared among all degrees of freedom and each degree of freedom has the average energy of $\frac{1}{2}kT$.

In part (a)(ii), the candidates were expected to use the law of equipartition of energy to derive the internal energy of n moles of ideal gas with the degree of freedom, f, and temperature, T. However, only a handful of candidates were able to start the derivation by introducing the kinetic energy of a molecule with f degrees of freedom and then subsequently expanding the derivation for internal energy of N molecules and n moles of molecules.

In part (b)(i), most candidates were able to determine the ratio of the number of molecules in the left compartment to that in the right compartment. The candidates used the equation, $PV = nRT$ to get the ratio of 6:1. However, a few of them gave the answer incorrectly as 1:6.

In part (b)(ii), most candidates had no problem to get the pressure after the partition breaks since there were several ways to get the correct answer such as using $P_1V_1 = P_2V_2$ or using $PV = nRT$.

In part (b)(iii), most candidates were not able to determine the internal energy of the gas after the partition was broken. Some candidates knew the equation of internal energy of the gas as $U = \frac{n}{2}fRT$ or $U = \frac{f}{2}PV$, but were not able to substitute the correct value of n or P respectively. The candidates only manage to write the correct value of $f = 5$.

In part (b)(iv), most candidates were also not able to discuss whether the internal energy will be greater or smaller if the gas behaved as a real gas. Most candidates did understand that the internal energy of the gas was sum of the kinetic energy and potential energy of the gas molecules. The candidates also knew that the potential energy of the gas molecules arised from the intermolecular forces between the gas molecules. Some candidates mentioned that the intermolecular force between ideal gas molecules is negligible. But most candidates did not know that the potential energy has a negative value, therefore the internal energy of real gas would be smaller.

Answers: (b)(i) 6:1; (b)(ii) $1.75P$; (b)(iii) 887 J

Physics 960/2

OVERALL PERFORMANCE

For Semester 2, 1 221 candidates sat for the examination of this subject and 62.41% of them obtained a full pass.

The achievement of the candidates for this subject according to grades is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	9.83	3.85	9.75	6.31	10.89	10.48	11.30	6.63	6.80	4.26	19.90

RESPONSES OF CANDIDATES

SECTION A: *Multiple-Choice Questions*

Answer keys

Question number	Key	Question number	Key	Question number	Key
1	**B**	6	**B**	11	**A**
2	**D**	7	**C**	12	**C**
3	**A**	8	**A**	13	**B**
4	**B**	9	**A**	14	**C**
5	**D**	10	**D**	15	**C**

General comments

More than 70% of the candidates answered questions 1 and 6 correctly and less than 30% of the candidates answered question 15 correctly. The rest of the questions were in the medium range with 30% to 70% of the candidates obtaining the correct answers.

SECTIONS B AND C: *Structured and Essay Questions*

General comments

The candidates performed well in quantitative questions. They were able to use the correct formulae to start the calculation. However, some candidates were rather weak in solving questions that consists of many working steps to get the final answers.

Comments on individual questions

Question 16

In part (*a*), most candidates were able to determine the amount of charge on the sphere correctly using the formula, $E = \frac{Q}{4\pi\varepsilon r^2}$.

In part (*b*), most candidates were able to sketch the graph of electric field strength against the distance from the centre of the sphere. However, some candidates were not able to get full marks because they did not start at $r = 0$, to show from the centre of the sphere. Some candidates also did not labelled the radius as 20 cm.

In part (*c*), not many candidates were able to calculate the speed of proton from the centre of a sphere. The candidates were not able to relate gaining in kinetic energy and loss in potential energy, $\frac{1}{2}mv^2 = \frac{Qe}{4\pi\varepsilon_o r} - \frac{Qe}{4\pi\varepsilon_o r'}$.

Answers: (*a*) 1.33×10^{-5} C, (*c*) 7.583×10^{6} m s^{-1}

Question 17

In part (*a*), most candidates were able to state the Kirchhoff's first law and Kirchhoff's second law. However, some candidates missed the keywords *algebraic sum* or the *total amount* in their answer.

In part (*b*), most candidates were able to state the fundamental principle of Kirchhoff's law as the principle of conservation of charge and principle of conservation of energy.

In part (*c*), not many candidates were able to determine the current that go through the batteries. Most candidates failed to solve simultaneous equations, which caused the candidates unable to get the final answer correctly.

Answers: (*c*) 0.339 A, 0.0714 A

Question 18

In part (*a*)(i), most candidates were able to determine the acceleration of proton when entering the magnetic field using the relation, $ma = qvB$.

In part (*a*)(ii), most candidates were able to determine the radius of the proton using the relation, $\frac{mv^2}{r} = qvB$.

In part (*a*)(iii), most candidates were not able to describe the path of the proton as the proton enters perpendicularly to the magnetic field. The candidates could only describe the proton move in a circular path. They failed to describe properly the path of the proton especially about the directions of the proton changing which produced centripetal acceleration.

In part (*b*), most candidates were able to describe the path of electron as the proton enters in parallel to the magnetic field. The candidates knew that the force of the proton was zero, and the proton moved with constant velocity and remained in the original path. However, there were some candidates who were confused with part (*a*)(iii), as the proton enters perpendicularly to the magnetic field.

Answers: (*a*)(i) 2.299×10^{13} m s^{-2} ; (*a*)(ii) 3.914×10^{-3} m

Question 19

In part (*a*), most candidates got full mark on stating the Faraday's law. However, some lose mark due to missing the word the rate of change of magnetic flux in the answer.

In part (*b*), a few candidates were able to explain the phenomenon of self-induction. Most candidates knew that self-induction was due to the changes in magnetic flux, but forget that the change in magnetic flux was due to changes in magnetic field and finally caused the induced current.

In part (*c*), most candidates were not able to state the ways to change the magnetic flux of a coil in a uniform magnetic field. Candidates should properly in state the ways to change the magnetic flux such as shrinking or expanding a coil in the magnetic field, rotating the coil in the magnetic field and pulling the coil into and out of the magnetic field.

In part (*d*)(i), most candidates were not able to calculate the induced e.m.f. in every stage. However, some candidates were able to write correctly the formula, $\varepsilon = \frac{d\phi}{dt}$ and $\phi = BA$.

In part (*d*)(ii), most candidates were able to determine the magnitude of induced current using the formula, $\varepsilon = IR$.

Answers: (*d*)(i).0.20A V, 0.00 V, 0.10A V; (*d*)(ii) 0.040A A

Question 20

In part (*a*)(i), most candidates were able to state the meaning of alternating current correctly as the direction of current change periodically.

In part (*a*)(ii), most candidates were able to explain the ways to increase the current in RC circuit by increasing the voltage and the frequency because the current is directly proportional to the voltage and frequency.

In part (*b*)(i), most candidates were able to determine the peak voltage across the resistor and the capacitor using the formula reactance of capacitor, $X_C = \frac{1}{2\pi fC}$, impedance, $Z = \sqrt{X_C^2 + R^2}$ dan peak voltage, $V_o = \sqrt{2}V_{rms}$. However, there were many alternative solutions to determine the peak voltage correctly.

In part (*b*)(ii), most candidates were able to calculate the value of θ using the equation $\tan\theta = \frac{X_C}{R}$.

In part (*b*)(iii), almost half of the candidates were able to sketch the curve of voltage supply against time, but most of them were not able to sketch the curve of r.m.s. voltage against time, which was a straight line.

Answers: (*b*)(i) 64.4 V; (*b*)(ii) 46.7°

Physics 960/3

OVERALL PERFORMANCE

For Semester 3, 1 212 candidates sat for the examination of this subject and 64.70% of them obtained a full pass.

The achievement of the candidates for this subject according to grades is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	9.49	8.42	5.94	7.84	13.12	10.81	9.08	7.26	1.90	3.80	22.36

RESPONSES OF CANDIDATES

SECTION A: *Multiple-Choice Questions*

Answer keys

Question number	Key	Question number	Key	Question number	Key
1	**D**	6	**C**	11	**A**
2	**A**	7	**A**	12	**D**
3	**C**	8	**C**	13	**D**
4	**D**	9	**D**	14	**A**
5	**A**	10	**B**	15	**B**

General comments

More than 70% of the candidates answered question 5 correctly. The rest of the questions were in the medium range with 30% to 70% of the candidates obtaining the correct answers.

SECTIONS B AND C: *Structured and Essay Questions*

General comments

In general, good and moderate candidates were able to answer questions in the form of knowledge, understanding and application by using the correct formula. While weak candidates were able to answer questions of knowledge and used the formulas to solve straightforward questions.

Comments on individual questions

Question 16

In part (*a*), most candidates were able to calculate the fundamental resonance frequency of the recorder when all the tone holes were covered. Candidates knew that the recorder acted as open ends pipe and hence used the equations, $\frac{\lambda}{2} = L$ and $v = f\lambda$. There were only a few candidates who used incorrect equations such as $f = 2L$ and $f = \frac{\lambda}{v}$, while some other candidates mistakenly took the recorder as a closed pipe and hence used the equation $\frac{\lambda}{4} = L$.

In part (*b*), a few candidates were able to explain the difference between the calculated frequency and the actual frequency produced by the recorder. Candidates were expected to understand the existing of end correction at both ends of the recorder which causes the actual length or wavelength of the sound longer than 30.0 cm, and hence makes the actual frequency produced to be lower than the calculated frequency. Some candidates recognised the existence of end correction for the recorder but failed to relate the physical aspects of length with relation to the end corrections.

In part (*c*), most candidates were able to determine the new frequency if the pipe which was closed at one end by using the equations, $\frac{\lambda}{4} = L$ and $v = f\lambda$.

Answers: (*a*) 550 Hz, (*c*) 275 Hz

Question 17

In part (*a*), most candidates were able to calculate the distance of the image that was formed on the concave mirror using the formula, $f = \frac{r}{2}$ and $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$. However, a few candidates used irrelevant formula such as spherical mirror formula.

In part (*b*), most candidates were able to determine the image magnification using the formula $m = \frac{v}{u}$ and $m = \frac{h_i}{h_o}$.

In part (*c*), most candidates were able to state the characteristic of the image but some candidates stated more than one characteristics and contradicted each other.

Answers: (*a*) 16.7 cm, (*b*) 3.67 cm

Question 18

In part (*a*), most candidates were not able to state the condition for the formation of standing waves. There were only a few candidates who managed to acquire the full marks. Majority of the candidates stated the characteristics of standing wave instead of the conditions such as the wave profile did not move, no energy transferred and must have nodes and antinodes, which were all wrong.

In part (*b*)(i), most candidates were able to determine the speed of the standing wave using the formula $v = f\lambda$, and then substituted $f = \frac{\omega}{2\pi}$ and $\lambda = \frac{2\pi}{k}$.

In part (b)(ii), most candidates were able to determine the distance between two consecutive nodes as $\frac{\lambda}{2}$.

In part (b)(iii), most candidates were able to state nodes as the position of the string that can be touched without disturbing the standing wave. However, the candidates were not able to state the reason that the particles were at rest or the amplitude was zero.

In part (c)(i), most candidates were able to determine the beat frequency heard by the observer using the formula, $f_{ob} = \frac{f_s}{\left(1 - \frac{v_s}{v}\right)}$ and beat frequency as $f_b = f_{ob} - f_s$. Some candidates rounded off the intermediate answer and affected the final answer.

In part (c)(ii), most candidates were not able to explain the change in beat heard by the observer if the wind blows in the same direction as the train. Many candidates misunderstood that the beat frequency decreases due to the increase in the source speed. Some candidates think wrongly that the wind caused the speed of train to increase, and hence the apparent frequency increases.

Answers: (b)(i) 60 m s^{-1}, (b)(ii) 0.628 m; (c)(i) 7.4 Hz

Question 19

In part (a), most candidates were not able to state the Huygens's principle correctly. Many candidates still misunderstood about how the wavefront was formed. They seem not to know that the new wavefront was tangent to the wavelets. Most of them also did not know that every point of the wave front could be considered as the source of the secondary wavelets.

In part (b), most candidates were able to determine the angular separation between the two lines in the second order of the diffraction using formula, $d\sin\theta = m\lambda$. However, some candidates forgot to substract the value of θ obtained by two different wavelengths. Some candidates were confused on using the value of θ in degree or in radian.

In part (c)(i), most candidates were able to determine the wavelength of the monochromatic light using the formula, $\lambda = \frac{ax}{D}$.

In part (c)(ii), majority candidates were able to calculate the distance between the centre of the interference pattern and the third dark fringe using formula, $x_m = \frac{\left(m - \frac{1}{2}\right)\lambda D}{a}$ where $m = 3$ instead.

In part (c)(iii), most candidates seemed to forget that the refractive index of water was higher than air, thus lead to the wrong explanation. Due to this, some candidates stated the wrong relationship between the refractive index of medium and the wavelength of light, and thus deduced the incorrect change on the interference pattern. There were few cases where the candidates deduced the change on slit separation instead of change in the interference pattern.

Answers: (b) 11.33°, (c)(i) 3.5×10^{-7} m; (c)(ii) 8.75×10^{-3} m

Question 20

In part (*a*)(i), most candidates were not able to define binding energy correctly. Some candidates defined the binding energy as the energy to combine/hold/bind the nucleons instead of to separate them completely. The other candidates failed to get the correct concept of binding energy such as relate the binding energy to fusion reaction.

In part (*a*)(ii), most candidate were able to write the decay of Uranium to Thorium correctly which was ${}^{238}_{92}\text{U} \longrightarrow {}^{234}_{90}\text{Th} + {}^{4}_{2}\text{He} + Q$.

In part (*a*)(iii), the majority of candidates were able to sketch a graph of binding energy per nucleon against nucleon number. However, many of them committed mistakes such as starting the graph from origin. There were also a few candidates who sketched the graph wrongly such as using a straight line and half-parabolic shape.

In part (*a*)(iv), most candidates did not realise that Uranium was an unstable nucleus since it has very low binding energy per nucleon. Candidates were also expected to explain that energy was released in the decay process without the influence of external factors or physical conditions such as pressure and temperature.

In part (*b*)(i), very surprisingly, many candidates still cannot calculate the mass of ${}^{20}_{10}\text{Ne}$ nucleus correctly. However, a few candidates were able to calculate correctly using equation nuclear mass = atomic mass – mass of electrons.

In part (*b*)(ii), most candidates were not able to calculate the total mass of individual nucleon in the nucleus. Some of them used the wrong equation such as the total mass of proton + total mass of neutron – atomic mass of ${}^{20}_{10}\text{Ne}$.

In part (*b*)(iii), only a few candidates were able to explain the differences between the values in (*b*)(i) and (*b*)(ii). The candidates were not able to explain that the mass of individual nucleon was higher than the mass of nucleus due to the energy used to bind the nucleus.

In part (*b*)(iv), most candidates were able to determine the binding energy per nucleon of the ${}^{20}_{10}\text{Ne}$ nucleus. Candidates were expected to firstly calculate the mass defect by using the equation $\Delta m = m_{nucleon} - m_{nucleus}$ and then $E = \Delta mc^2$, in order to determine the binding energy.

Answers: (*b*)(i) 19.992439 u; (*b*)(ii) 20.164900 u; (*b*)(iv) 8.032 MeV

PAPER 960/5 (WRITTEN PRACTICAL TEST)

Comments on the individual questions

Question 1

In part (*a*), almost all candidates were not able to name the instrument that was used to measure the diameter of the copper rod correctly.

In part (*b*), most candidates were able to calculate the percentage of error in the measurement of the diameter of the copper rod using $\frac{0.01}{2.50} \times 100$.

In part (*c*), most candidates were not able to state the purpose of stirring the water as to ensure the uniform temperature in the water.

In part (*d*), half of the candidates were able to plot the graph of θ against x with the correct labelled axes and with all the points marked correctly.

In part (*e*)(i), most candidates were able to calculate the gradient of the graph. However, there were some candidates who mistakenly calculated the simple expression.

In part (*e*)(ii), none of the candidates were able to determine the thermal conductivity of the copper rod.

In part (*f*), most candidates were able to state the precautions that should be taken to improve the result of the experiment. The candidates knew that to make sure the power supply was steady, used the good insulation and used enough ice.

In part (*g*), most candidates were not able to explain the effect on the accuracy of the experiment when a copper rod with a bigger diameter was used.

Answers: (*b*) 0.40%, (*e*)(i) -485.7 °C m^{-1}

Question 2

In part (*a*), almost all candidates were not able to calculate the value of A, which was the crosssectional area of a coil.

In part (*b*), only one candidate was able to plot a graph of ε_{rms} against f with all the points marked correctly. The candidates who were not able to plot a graph also were not able to draw a bestfit line through the plotted points.

In part (*c*)(i), most candidates were not able to calculate the gradient of the graph since they were not able to plot a graph correctly. Thus, the candidates also were not able to calculate the value of μ_o in part (*c*)(ii).

In part (*d*), many candidates were able to state the errors that affect the accuracy of the experiment as the plane of the coil may not perfectly at the right angle to the flux and the flux linkage through the coil was not perfect.

In part (*e*), only a few candidates were able to suggest a way to increase the accuracy of the experiment as increased the number of turns in coil or increased the supply current to the solenoid.

In part (*f*), most candidates were not able to state the expected value of the induced emf if an iron core was inserted into the solenoid, *S*.

Answers: (*a*) 1.39×10^{-3} m^2, (*c*)(i) 2.8×10^{-6} Vs; (*c*)(ii) 1.08×10^{-6} H m^{-1}

Question 3

In part (*a*), most candidates mistakenly calculated the value of mass per unit length, μ. They were confused with the formula given in the question.

In part (*b*), most candidates were able to tabulate the value of m, the mean values of L and L^2 correctly.

In part (*c*), most candidates were also able to plot a graph of L^2 against m correctly.

In part (*d*)(i), most candidates clearly demonstrated the points that they used to calculate the gradient. Some candidates misread coordinates or did not use a sensibly sized triangle.

In part (*d*)(ii), many candidates were able to calculate the frequency, f, correctly.

In part (*d*)(iii), the candidates were not able to calculate the percentage error of the frequency.

In part (*e*), not many candidates were able to state one source of error that affected the accuracy of the experiment.

Answers: (*a*) 7.3×10^{-4} kg m^{-1}, (*d*)(i) 1.3 m^2 kg^{-1}; (*d*)(ii) 50.8 Hz; (*d*)(iii) 1.6

Laporan Peperiksaan
STPM 2023

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