



UNIVERSITI MALAYSIA TERENGGANU

FINAL EXAMINATION
PEPERIKSAAN AKHIR

SEMESTER I SESSION 2025/2026 (STEM FOUNDATION)
SEMESTER I SESI 2025/2026 (ASASI STEM)

COURSE <i>KURSUS</i>	:	PHYSICS I <i>FIZIK I</i>
COURSE CODE <i>KOD KURSUS</i>	:	ASP1214
DURATION <i>TEMPOH</i>	:	3 HOURS <i>3 JAM</i>

MATRIC NO. <i>NO. MATRIK</i>	:	_____
PROGRAMME <i>NAMA PROGRAM</i>	:	_____
SEAT NO. <i>NO. MEJA</i>	:	_____

INSTRUCTIONS TO CANDIDATES
ARAHAN KEPADA CALON

- i. Answer all questions.
Sila jawab semua soalan.
- ii. All answers must be written in answer booklet and OMR form provided.
Semua jawapan hendaklah ditulis dalam buku jawapan dan borang OMR yang disediakan.

DO NOT OPEN THE QUESTION PAPER UNTIL INSTRUCTED
JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

THIS QUESTION PAPER CONSISTS OF TWENTY TWO (22) PRINTED PAGES
KERTAS SOALAN INI MENGANDUNGI DUA PULUH DUA (22) MUKA SURAT BERCETAK

Constant / Pemalar

speed of light in free space

$$c = 3.00 \times 10^8 \text{ m s}^{-1}$$

permeability of free space

$$\mu_0 = 4\pi \times 10^{-7} \text{ H m}^{-1}$$

permittivity of free space

$$\begin{aligned} \epsilon_0 &= 8.85 \times 10^{-12} \text{ F m}^{-1} \\ \left(\frac{1}{4\pi\epsilon_0} \right) &= 8.99 \times 10^9 \text{ m F}^{-1} \end{aligned}$$

elementary charge

$$e = 1.60 \times 10^{-19} \text{ C}$$

the Planck constant

$$h = 6.63 \times 10^{-34} \text{ J s}$$

unified atomic mass unit

$$1 \text{ u} = 1.66 \times 10^{-27} \text{ kg}$$

rest mass of electron

$$m_e = 9.11 \times 10^{-31} \text{ kg}$$

rest mass of proton

$$m_p = 1.67 \times 10^{-27} \text{ kg}$$

molar gas constant

$$R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$$

the Avogadro constant

$$N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$$

the Boltzmann constant

$$k = 1.38 \times 10^{-23} \text{ J K}^{-1}$$

gravitational constant

$$G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$$

acceleration of free fall

$$g = 9.81 \text{ m s}^{-2}$$

Formulae

uniformly accelerated motion,

$$s = ut + \frac{1}{2}at^2$$
$$v^2 = u^2 + 2as$$

work done on/by a gas,

$$W = p\Delta V$$

gravitational potential,

$$\phi = -\frac{Gm}{r}$$

hydrostatic pressure,

$$p = \rho gh$$

pressure of an ideal gas,

$$p = \frac{1}{3} \frac{Nm}{V} \langle c^2 \rangle$$

simple harmonic motion,

$$a = -\omega^2 x$$

velocity of particle in s.h.m.,

$$v = v_0 \cos \omega t$$

$$v = \pm \omega \sqrt{x_0^2 - x^2}$$

electric potential,

$$V = \frac{Q}{4\pi\epsilon_0 r}$$

capacitors in series,

$$1/C = 1/C_1 + 1/C_2 + \dots$$

capacitors in parallel,

$$C = C_1 + C_2 + \dots$$

energy of charged capacitor,

$$W = \frac{1}{2}QV$$

resistors in series,

$$R = R_1 + R_2 + \dots$$

resistors in parallel,

$$1/R = 1/R_1 + 1/R_2 + \dots$$

alternating current/voltage,

$$x = x_0 \sin \omega t$$

radioactive decay,

$$x = x_0 \exp(-\lambda t)$$

decay constant,

$$\lambda = \frac{0.693}{t_{\frac{1}{2}}}$$

PART B/ BAHAGIAN B (60 Marks/ 60 Markah)

Please answer all question.

Sila jawab semua soalan.

1. a. The pressure, P at a depth, h in an incompressible fluid of density, ρ is given by
Tekanan, P pada kedalaman, h dalam cecair ketumpatan tak boleh mampat, ρ diberikan oleh

$$P = \rho gh$$

where g is the gravitational acceleration. Use base units to check the homogeneity of this equation. (4 marks)

di mana g ialah pecutan graviti. Gunakan unit asas untuk menyemak kehomogenan persamaan ini. (4 markah)

- b. In an experiment, student has measured a mass and volume of a metal block. The result as shown below:

Dalam suatu eksperimen, pelajar telah mengukur jisim dan isipadu bongkah logam. Hasilnya seperti di bawah:

$$\text{mass} = 500 \pm 2 \text{ g}$$

$$\text{jisim} = 500 \pm 2 \text{ g}$$

$$\text{volume} = 200 \pm 5 \text{ cm}^3$$

$$\text{isipadu} = 200 \pm 5 \text{ cm}^3$$

- i. Calculate the density of the metal block. (2 marks)
Kira ketumpatan bongkah logam itu. (2 markah)
- ii. Find the fractional uncertainty in the density of the metal block. (2 marks)
Cari nisbah ketidakpastian dalam ketumpatan bongkah logam. (2 markah)
- iii. Determine the percentage uncertainty in density of the metal block. (2 marks)
Tentukan peratus ketidakpastian ketumpatan bongkah logam itu. (2 markah)

2. a.

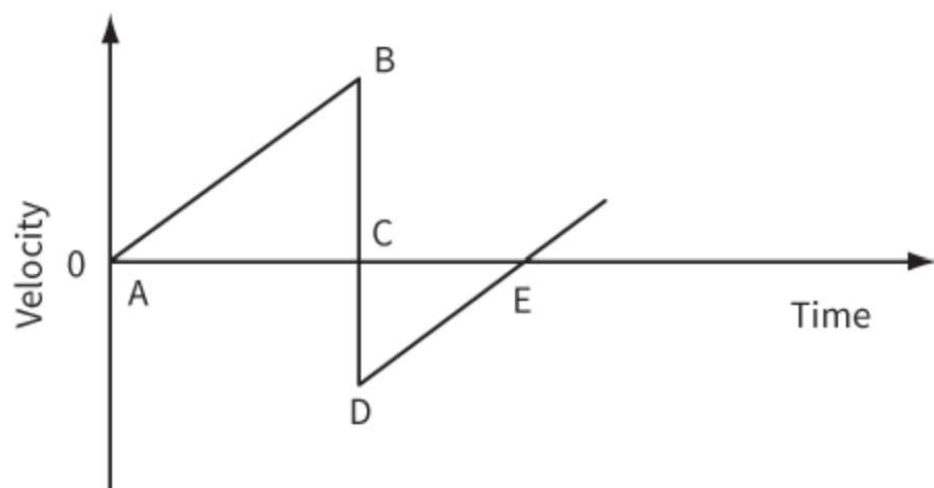


Figure 8
Rajah 8

Figure 8 shows velocity versus time graph for a vertically bouncing ball.

Rajah 8 menunjukkan graf halaju melawan masa untuk bola yang melantun secara menegak.

- i. State what happen to the ball at D. (1 mark)
Nyatakan apa yang berlaku kepada bola di D. (1 markah)
- ii. At which position the ball is at its highest position. (1 mark)
Pada kedudukan mana bola berada pada kedudukan tertinggi. (1 markah)
- b. A ball is thrown vertically upwards from ground level and reaches a maximum height of 11.5 m before falling back to ground level. Assume air resistance is negligible. Calculate:
Sebiji bola dibaling menegak ke atas dari aras tanah dan mencapai ketinggian maksimum 11.5 m sebelum jatuh semula ke aras tanah. Anggap rintangan udara boleh diabaikan. Kira:
 - i. initial vertical velocity a ball being thrown. (2 marks)
halaju menegak awal bola dilontar. (2 markah)
 - ii. total time for which the ball is in the air (2 marks)
jumlah masa bola berada di udara. (2 markah)
- c. A missile is launched from ground level at an angle of 40° above horizontal with a speed of 50 m s^{-1} .
Sebuah peluru berpandu dilancarkan dari aras tanah pada sudut 40° di atas mendatar dengan kelajuan 50 m s^{-1} .
 - i. How long is a missile in the air before it again contacts the ground? (2 marks)
Berapa lamakah peluru berpandu berada di udara sebelum ia kembali menyentuh tanah? (2 markah)
 - ii. What is the horizontal distance travelled by that missile? (2 marks)
Berapakah jarak mendatar yang dilalui oleh peluru berpandu tersebut? (2 markah)

3. a. A block is dragged along a flat surface, as shown in Figure 9. The coefficient of friction between the block and the floor is 0.5 when the block is sliding.
Bongkah diseret sepanjang permukaan rata, seperti yang ditunjukkan dalam Rajah 9. Pekali geseran antara bongkah dan lantai ialah 0.5 bila bongkah menggelongsor.

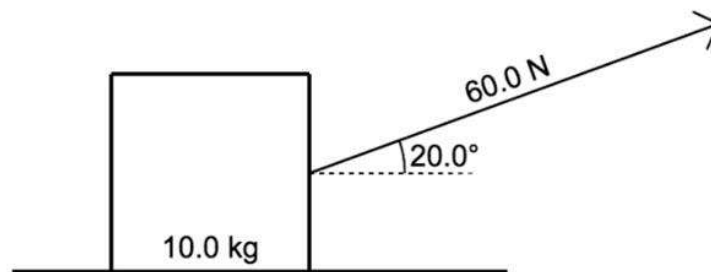


Figure 9
Rajah 9

- i. Draw a free-body diagram of the block. Label each force. (2 marks)
Lukis gambarajah badan bebas bongkah. Labelkan setiap daya. (2 markah)
 - ii. Calculate the acceleration of the block. (4 mark)
Kirakan pecutan bongkah itu. (4 markah)
- b. State **two quantities** that are conserved in an elastic collision. (2 marks)
*Nyatakan **dua kuantiti** yang terabadi dalam perlanggaran kenyal. (2 markah)*
- c. In a football match, a player kicks a stationary football of mass 0.44 kg and gives it a speed of 32 m s^{-1} .
Dalam perlawanan bola sepak, seorang pemain menendang bola sepak pegun berjisim 0.44 kg dan memberikannya kelajuan 32 m s^{-1} .
- i. Calculate the change of momentum of the football. (2 marks)
Kirakan perubahan momentum bola sepak itu. (2 markah)
 - ii. The contact time between the football and the footballer's boot was 9.2 milisecond. Calculate the average force of impact on the football. (2 marks)
Masa sentuhan antara bola sepak dan but pemain bola sepak ialah 9.2 milisaat. Kira purata daya impak ke atas bola sepak. (2 markah)

4. a. i. An object of mass 4 kg is tied to a string and spun in a horizontal circle of radius 2 m at a speed of 6 m s^{-1} . Calculate the centripetal force acting on the object. (3 marks)
Sebuah objek berjisim 4 kg diikat pada tali dan diputarkan dalam bulatan mendatar berjejari 2 m dengan kelajuan 6 m s^{-1} . Hitung daya memusat yang bertindak ke atas objek itu. (3 markah)
- ii. A washing machine drum spins at 1200 revolutions per minute. Calculate the angular velocity in rad/s. (4 marks)
Dram mesin basuh berputar pada 1200 putaran seminit. Kira halaju sudut dalam rad/s. (4 markah)
- b. A 500 kg satellite orbits Earth at $6.6 \times 10^6 \text{ m}$ from its centre. Calculate the gravitational force acting on it. (3 marks)
Sebuah satelit berjisim 500 kg mengorbit Bumi pada jarak $6.6 \times 10^6 \text{ m}$ dari pusatnya. Hitung daya graviti ke atasnya. (3 markah)
- c. A 950 kg sack of cement is lifted to the top of a building 50 m high by an electric motor.
Seguni simen 950 kg diangkat ke atas bangunan setinggi 50 m oleh motor elektrik.
- i. Calculate the increase in the gravitational potential energy of the sack of cement. (2 marks)
Kira pertambahan tenaga keupayaan graviti guni simen itu. (2 markah)
- ii. The output power of the motor is 4.0 kW. Calculate how long it took to raise the sack to the top of the building. (2 marks)
Kuasa keluaran motor ialah 4.0 kW. Kirakan berapa lama masa yang diambil untuk menaikkan guni ke atas bangunan. (2 markah)

5. a. The tank of water in Figure 10 is used to study the behavior of water waves. The water wave is a type of transverse wave.
Tangki air dalam Rajah 10 digunakan untuk mengkaji kelakuan gelombang air. Gelombang air ialah sejenis gelombang melintang.

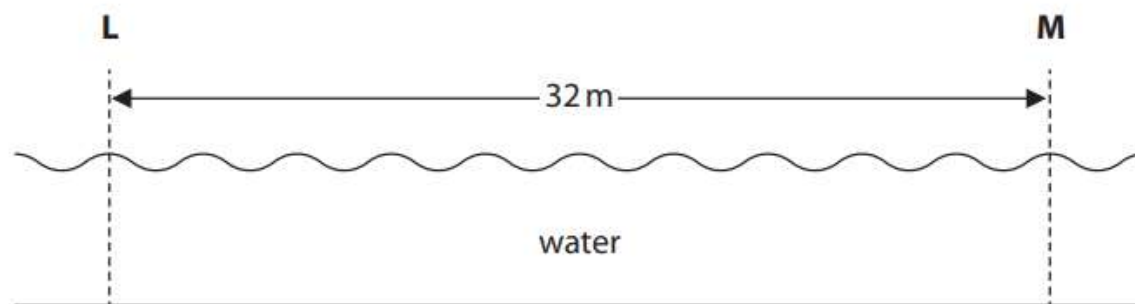


Figure 10
Rajah 10

- i. Figure 10 shows a side view of the tank. A water wave in the tank is moving from L to M. Calculate the wavelength of the wave. (3 marks)
Rajah 10 menunjukkan pandangan sisi tangki. Gelombang air dalam tangki sedang bergerak dari L ke M. Hitung panjang gelombang gelombang itu. (3 markah)
- ii. A technician stands at the side of the tank. He counts the peaks of the waves as they pass him. 12 peaks pass the technician in a time of 15 s. Calculate the frequency of the water wave. (2 marks)
Seorang juruteknik berdiri di sisi tangki. Dia mengira puncak ombak semasa ia melewatinya. 12 puncak melepasi juruteknik dalam masa 15 s. Kira frekuensi gelombang air. (2 markah)
- b. A mass on a spring is displaced 0.036 m vertically downwards from its equilibrium position and then released. The stopwatch starts when the mass reaches its highest point, and the oscillations are counted. The mass takes 7.60 s to perform 20 oscillations.
Assuming the motion is SHM, it can be described by the equations $x = A \cos(2\pi ft)$, where x is the displacement in upward direction and t is the time since the clock has started.
Satu jisim pada spring disesarkan 0.036 m menegak ke bawah dari kedudukan keseimbangannya kemudian dilepaskan. Semasa jam randik dimulakan apabila jisim mencapai titik tertinggi, dan ayunan dikira. Jisim mengambil masa 7.60 s untuk melakukan 20 ayunan.
Dengan mengandaikan gerakan itu ialah GHM, ia boleh dihuraikan dengan persamaan $x = A \cos(2\pi ft)$, di mana x ialah sesaran ke arah atas dan t ialah masa sejak jam bermula.
- i. What are the values of its amplitude, A and frequency, f for this motion?(2 marks)
Apakah nilai amplitud, A dan frekuensi, f untuk gerakan ini? (2 markah)
- ii. Sketch a graph of displacement against time for **two** complete oscillations. (3 marks)
*Lakarkan graf sesaran melawan masa untuk **dua** ayunan lengkap (3 markah)*

- c. A loudspeaker produces sound in a tube open at both ends. The tube length is 1.0 m and 2 full wavelengths fit inside the tube. Given the speed of sound is 340 m s^{-1} . Calculate:
Sebuah pembesar suara menghasilkan bunyi dalam sebuah tiub terbuka pada kedua-dua hujung. Panjang tiub ialah 1.0 m dan 2 panjang gelombang penuh muat dalam tiub tersebut. Diberi laju bunyi adalah 340 m s^{-1} . Hitung:
- i. the wavelength of the wave? (2 marks)
panjang gelombang tersebut? (2 markah)
 - ii. the frequency of the wave? (2 marks)
frekuensi gelombang tersebut? (2 markah)

End of Question Paper
Kertas Soalan Tamat