UNIVERSITI MALAYSIA TERENGGANU

FINAL EXAMINATION
PEPERIKSAAN AKHIR

SEMESTER II 2022/2023 SESSION (STEM FOUNDATION PROGRAMME)
SEMESTER II SESI 2022/2023 (ASASI STEM)

COURSE ***NAMA KURSUS***	**:**	**PHYSICS II** ***FIZIK II***
COURSE CODE ***KOD KURSUS***	**:**	**ASP1324**
DATE ***TARIKH***	**:**	**3 MAY 2023 (WEDNESDAY)** ***3 MEI 2023 (RABU)***
VENUE ***TEMPAT***	**:**	**DEWAN SULTAN MIZAN**
TIME ***MASA***	**:**	**12.00 PM – 2.00 PM (2 HOURS)** ***12.00 – 2.00 PETANG (2 JAM)***

MATRIC NO. ***NO. MATRIK***	**:**	
PROGRAMME **NAMA PROGRAM**	**:**	
SEAT NO. ***NO. MEJA***	**:**	

INSTRUCTIONS TO CANDIDATES
ARAHAN KEPADA CALON

i. Answer all questions.
   Sila jawab semua soalan.

ii. All answers must be written in answer booklet provided.
   Semua jawapan hendaklah ditulis dalam buku jawapan yang disediakan.

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

THIS QUESTION PAPER CONSISTS OF (13) PRINTED PAGES
KERTAS SOALAN INI MENGANDUNGI (13) MUKASURAT 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	$\varepsilon_0 = 8.85 \times 10^{-12} \, \text{F m}^{-1}$
	$(\dfrac{1}{4\pi\varepsilon_0} = 8.99 \times 10^9 \, \text{m F}^{-1})$
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 / *Formula*

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,	$\phi = -\dfrac{Gm}{r}$
hydrostatic pressure,	$p = \rho gh$
pressure of an ideal gas,	$p = \frac{1}{3}\dfrac{Nm}{V}<c^2>$
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,	$V = \dfrac{Q}{4\pi\varepsilon_0 r}$
capacitors in series,	$1/C = 1/C_1 + 1/C_2 + \ldots$
capacitors in parallel,	$C = C_1 + C_2 + \ldots$
energy of charged capacitor,	$W = \frac{1}{2}QV$
resistors in series,	$R = R_1 + R_2 + \ldots$
resistors in parallel,	$1/R = 1/R_1 + 1/R_2 + \ldots$
alternating current/voltage,	$x = x_0 \sin \omega t$
radioactive decay,	$x = x_0 \exp(-\lambda t)$
decay constant,	$\lambda = \dfrac{0.693}{t_{\frac{1}{2}}}$

PART A / *BAHAGIAN A* **(40 Marks/** *40 Markah***)**

Please choose the most appropriate answer for each question in this part.
Sila pilih jawapan yang paling tepat bagi setiap soalan dalam bahagian ini.

1. In a uniform circular motion, the direction of linear velocity is along the
    Dalam gerakan bulat seragam, arah halaju linear adalah sepanjang

    A. tangent to the curve path
        tangen kepada laluan lengkung

    C. perpendicular to the plane of the circular
        serenjang dengan satah bulatan

    B. radius vector towards the centre
        vektor jejari ke arah pusat

    D. radius vector
        vektor jejari

2. Which of the following devices **NOT** acts on the principle of circular motion?
    *Antara peranti berikut, yang manakah **TIDAK** bertindak mengikut prinsip gerakan membulat?*

    A. Merry-go-round
        'Merry-go-round'

    C. Ruler
        Pembaris

    B. Centrifuge
        Empar

    D. Rotation of fan blades
        Putaran bilah kipas

3. A belt passes over a wheel of radius 25 cm. If a point on the belt has a speed of 5 m/s, the belt is moving with an angular velocity of
    Sebuah tali pinggang melepasi sebuah roda berjejari 25 cm. Jika satu titik pada tali pinggang mempunyai kelajuan 5 m/s, tali pinggang itu bergerak dengan halaju sudut

    A. 3.2 rad/s

    C. 20 rad/s

    B. 0.32 rad/s

    D. 0.032 rad/s

4. Work done on an object to bring it to a certain point in a gravitational field is called
    Kerja yang dilakukan pada suatu objek untuk membawanya ke suatu titik tertentu dalam medan graviti dipanggil

    A. potential energy
        tenaga keupayaan

    C. kinetic energy
        tenaga kinetik

    B. mechanical energy
        tenaga mekanikal

    D. gravitational potential energy
        tenaga keupayaan graviti

5. The force attraction between two objetcs of masses M and m which separated by distance d from each other is directly proportional to the

   Daya tarikan antara dua objek berjisim M dan m yang dipisahkan dengan jarak d antara satu sama lain adalah berkadar terus dengan

   A. sum of the masses of object $(M + m)$
      jumlah jisim objek (M + m)

   B. product of the masses of object $(M \times m)$
      hasil darab jisim objek (M x m)

   C. difference between masses of object $(M – m)$
      perbezaan antara jisim objek (M – m)

   D. sum of the squares of masses of object $(M^2 + m^2)$
      jumlah kuasa dua jisim objek (M² + m²)

6. The force attraction between two objects of masses M and m which separated by distance d from each other is inversely proportional to the

   Daya tarikan antara dua objek berjisim M dan m yang dipisahkan dengan jarak d antara satu sama lain adalah berkadar songsang dengan

   A. square distance between two objects   C. difference between masses of object
      jarak persegi antara dua objek   *perbezaan antara jisim objek*

   B. distance between two objects   D. sum of the squares of masses of object
      jarak antara dua objek   *jumlah kuasa dua jisim objek*

7. The velocity of a body, executing simple harmonic motion is _____ at its maximum position.

   Halaju jasad yang melakukan gerakan harmonik ringkas ialah _____ pada kedudukan maksimum.

   A. zero   C. maximum
      sifar   *maksimum*

   B. minimum   D. infinity
      minimum   *infiniti*

8. Energy of a system in simple harmonic motion is obey

   Tenaga sistem dalam gerakan harmonik mudah mematuhi

   A. Newton's law   C. the principle of conservation of charge
      hukum Newton   *prinsip keabadian cas*

   B. Hooke's law   D. the principle of conservation of energy
      hukum Hooke   *prinsip keabadian tenaga*

9. If simple harmonic motion is represented by $x = A \cos(\omega t + \varphi)$, then φ is
   Jika gerakan harmonik ringkas diwakili oleh $x = A \cos(\omega t + \varphi)$, maka φ ialah:

   A. displacement
      sesaran

   C. amplitude
      amplitud

   B. phase constant
      pemalar fasa

   D. angular frequency
      frekuensi memusat

10. Temperature is a quantity to measure:
    Suhu adalah suatu kuantiti untuk mengukur:

    A. the degree of hotness of a body.
       darjah kepanasan sesuatu jasad.

    B. the heat energy inside a body.
       tenaga haba yang terkandung dalam sesuatu jasad.

    C. the force carried from a body.
       daya yang dibawa oleh sesuatu jasad.

    D. the preasure that applied to a body
       tekanan yang dialami oleh sesuatu jasad.

11. In ideal gas law, the equation $PV = nRT$ is a combination of:
    Di dalam hukum gas unggul, persamaan $PV = nRT$ adalah kombinasi daripada:

    i.   Boyle's law
         hukum Boyle

    ii. Charles' law
         hukum Charles

    iii. Gay-Lussac's law
         hukum Gay-Lussac

    A. i and ii
       i dan ii

    C. i, ii and iii
       i, ii dan iii

    B. i and iii
       i dan iii

    D. none of the above
       tiada satu pun di atas

12. In the expression $PV = nRT$ that applied in ideal gas system, what do the symbol 'n' represent?
    Dalam ungkapan PV = nRT yang digunakan dalam sistem gas ideal, apakah yang diwakili oleh simbol 'n'?

    A. number of mol
       bilangan mol

    B. number of molecule
       bilangan molekul

    C. number of charge
       bilangan cas

    D. number of atom
       bilangan atom

13. The capacitance of a capacitor is not affected by
    Kapasitans suatu kapasitor tidak dipengaruhi oleh

    A. thickness of plates
       ketebalan plat

    B. distance between plates
       jarak antara plat

    C. area of plates
       luas plat

    D. all the above
       semua yang di atas

14. The capacitance between two plates increases with
    Kapasitans antara dua plat meningkat dengan

    A. smaller plate area and higher applied voltage
       luas plat yang lebih kecil dan voltan yang digunakan lebih tinggi

    B. smaller plate area and shorter distance between them
       luas plat yang lebih kecil dan jarak yang lebih pendek antara mereka

    C. larger plate area and shorter distance between plates
       luas plat lebih besar dan jarak antara plat lebih pendek

    D. larger plate area, longer distance between plates and higher applied voltage
       kawasan plat yang lebih besar, jarak yang lebih jauh antara plat dan voltan yang digunakan lebih tinggi

15. Which of the following is the unit of magnetic flux density?
    Antara berikut, yang manakah unit ketumpatan fluks magnet?

    A. Weber

    B. Lumens

    C. Tesla

    D. None of the above
       Tiada satu pun di atas

16. The uniform magnetic field is
Medan magnet seragam ialah

    A. the field in which all lines of magnetic flux are parallel and equidistant
    medan di mana semua garis fluks magnet adalah selari dan sama jarak

    B. the field of a set of parallel conductors
    medan bagi set konduktor selari

    C. the field of a single conductor
    medan konduktor tunggal

    D. none of the above
    tiada satu pun di atas

17. What is the function of a transformer?
Apakah fungsi transformer?

    A. Transformer converts DC to AC voltages.
    Transformer menukarkan voltan DC kepada AC.

    B. Transformer converts AC to DC voltages.
    Transformer menukarkan voltan AC kepada DC.

    C. Transformer is used to step down or up the DC voltages and currents.
    Transformer digunakan untuk menurunkan atau menaikkan voltan dan arus DC.

    D. Transformer is used to step down or up the AC voltages and currents.
    Transformer digunakan untuk menurunkan atau menaikkan voltan dan arus AC.

18. An induced e.m.f. is produced when a magnet is plunged into a coil. The strength of the induced e.m.f. is independent of
D.g.e. teraruh terhasil apabila magnet digerakkan ke dalam gegelung. Kekuatan d.g.e. teraruh adalah tidak dipengaruhi oleh

    A. the strength of the magnet.
    kekuatan magnet.

    B. number of turns of coil.
    bilangan lilitan gegelung.

    C. the resistivity of the wire of the coil.
    kerintangan wayar gegelung itu.

    D. speed with which the magnet is moved.
    kelajuan magnet itu digerakkan.

19. The equation which links Energy to wavelength is____
    Persamaan yang menghubungkan tenaga dengan panjang gelombang adalah____

    A. $E = hf$ C. $E = hf/\lambda$

    B. $E = hc/\lambda$ D. $c = f\lambda$

20. A researcher plots a straight-line graph of maximum kinetic energy of electron against the frequency of the radiation base on the equation below.
    Seorang penyelidik memplot graf garis lurus tenaga kinetik maksimum elektron terhadap frekuensi sinaran berdasarkan persamaan di bawah.

$$KE + \emptyset = hf$$

Which answer is **CORRECT**?
*Jawapan manakah yang **BETUL**?*

	Gradient of graph *Kecerunan graf*	y-intercept of graph *Pintasan-y graf*
A.	The Plank constant *Pemalar Plank*	Work function of metal *Fungsi kerja logam*
B.	Threshold frequency *Frekuensi ambang*	The Plank constant *Pemalar Plank*
C.	Threshold wavelength *Panjang gelombang ambang*	Threshold frequency *Frekuensi ambang*
D.	Work function of metal *Fungsi kerja logam*	Threshold wavelength *Panjang gelombang ambang*

PART B / *BAHAGIAN B* **(40 Marks/** *40 Markah***)**

Please answer all question.
Sila jawab semua soalan.

1.   a.   A microwave cooker uses electromagnetic waves of frequency 2450 MHz. The microwaves warm the food in the cooker by causing molecule of water vibrate with a large amplitude at the frequency of the microwaves.

Ketuhar gelombang mikro menggunakan gelombang elektromagnet frekuensi 2450 MHz. Ketuhar gelombang mikro memanaskan makanan di dalam periuk dengan menyebabkan molekul air bergetar dengan amplitud yang besar pada frekuensi gelombang mikro.

   i.   The effective microwave power of the cooker is 750 W. The temperature of a mass of 280 g of water rises from 25 °C to 98 °C in a time of 2 minutes. Calculate a value for the specific heat capacity of the water (3 marks)

   Kuasa gelombang mikro yang berkesan bagi periuk ialah 750 W. Suhu jisim 280 g air meningkat daripada 25 °C kepada 98 °C dalam masa 2 minit. Hitung nilai untuk muatan haba tentu air (3 markah)

   ii.   The value of the specific heat capacity determined from the data in **(i)** is greater than the theoretical value (4200 $Jkg^{-1}K^{-1}$). A student gives the reason for this difference: 'heat lost to the surroundings'. Suggest 2 possible situations to explain this reason. (2 marks)

   Nilai muatan haba tentu yang ditentukan daripada data dalam (i) adalah lebih besar daripada nilai teori (4200 $Jkg^{-1}K^{-1}$). Seorang pelajar memberikan sebab perbezaan ini: 'haba hilang ke persekitaran'. Cadangkan 2 situasi yang mungkin untuk menerangkan alasan ini. (2 markah)

   b.   A fixed mass of an ideal gas has volume 210 cm^3 at pressure 3.0 × 10^5 Pa and temperature 270 K. The volume of the gas is reduced at constant pressure to 140 cm^3, as shown in Figure 1. The final temperature of the gas is *T*. Determine:

   Jisim tetap gas ideal mempunyai isipadu 210 cm^3 pada tekanan 3.0 × 10^5 Pa dan suhu 270 K. Isipadu gas dikurangkan pada tekanan malar kepada 140 cm^3, seperti ditunjukkan dalam Rajah 1. Suhu akhir gas ialah T. Tentukan:

Figure 1
Rajah 1

   i.   the amount of gas (2 marks)
        amaun gas (2 markah)

ii.   the final temperature *T* of the gas (3 marks)
       suhu akhir T gas (3 markah)

2.   a.   Explain the meaning of '*the capacitance of a capacitor is 2 F*'. (2 marks)
           Terangkan maksud 'kapasitans suatu kapasitor ialah 2 F'. (2 markah)

     b.   A photoflash capacitor fitted to a camera has a capacitance of 500 µF. It is charged to a voltage of 240 V.
           Kapasitor pemancar foto yang dipasang pada kamera mempunyai kapasitans 500 µF. Ia dicas pada voltan 240 V.

          i.   Determine the energy stored in the capacitor. (2 marks)
                Tentukan tenaga yang disimpan dalam kapasitor. (2 markah)

          ii. The capacitor discharges completely in 3 ms. Calculate the average power output of the flash. (2 marks)
                Kapasitor dinyahcas sepenuhnya dalam 3 ms. Kira purata output kuasa pemancar. (2 markah)

     c.   A student has a 30 µF capacitor, a 47 µF capacitor, and an 82 µF capacitor.
           Seorang pelajar mempunyai kapasitor 30 µF, kapasitor 47 µF, dan kapasitor 82 µF.

          i.   Calculate how the three capacitors can be combined to have an overall capacitance of 60 µF? (2 marks)
                Hitungkan bagaimana ketiga-tiga kapasitor boleh digabungkan untuk mempunyai kapasiti keseluruhan 60 µF? (2 markah)

          ii. Draw a diagram to show how the three capacitors should be connected. (2 marks)
                Lukiskan rajah untuk menunjukkan bagaimana ketiga-tiga kapasitor itu harus disambungkan. (2 markah)

3.   a.   State Faraday's law of electromagnetic induction. Based on this law, explain why a transformer will not operate using a direct current input. (3 marks)
           Nyatakan hukum aruhan elektromagnet Faraday. Berdasarkan hukum ini, terangkan mengapa transformer tidak akan beroperasi menggunakan input arus terus. (3 markah)

     b.   An alternating voltage *V* is represented by the equation:
           Suatu voltan ulang-alik V diwakili oleh persamaan:

$$V = 300 \sin (120\pi t) \text{ Volt}$$

i)   What are the values of peak voltage V_o, angular frequency ω and frequency f for this voltage? (3 marks)

Apakah nilai voltan puncak V_o, frekuensi sudut ω dan frekuensi f untuk voltan ini? (3 markah)

ii) What is the root mean square (r.m.s.) value of the voltage? (2 marks)

Apakah nilai punca min kuasa dua (p.m.k.d.) bagi voltan? (2 markah)

iii) What is the value of voltage V when $t = 0.002$ s? (2 marks)

Berapakah nilai voltan V apabila t = 0.002 s? (2 markah)

4. a. Define photoelectric effect. (2 marks)

Takrifkan kesan fotoelektrik (2 markah)

b. Figure 2 shows the maximum kinetic energy of the emitted photoelectrons as the frequency of the incident radiation on a sodium plate is varied.

Rajah 2 menunjukkan tenaga kinetik maksimum bagi fotoelektron yang dipancarkan kerana kekerapan sinaran kejadian pada plat natrium diubah.
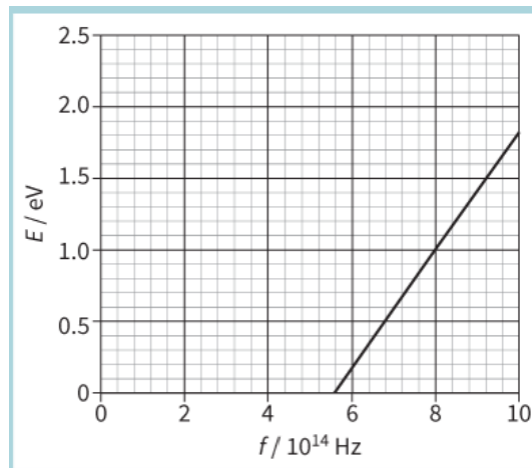

Figure 2
Rajah 2

i.   Explain why there are no photoelectrons emitted when the frequency of the incident light is less than 5.6×10^{14} Hz. (2 marks)

Terangkan mengapa tiada fotoelektron yang dipancarkan apabila frekuensi cahaya kejadian kurang daripada 5.6×10^{14} Hz (2 markah)

ii. From the graph, determine:
Daripada graf, tentukan:

a. the work function of sodium. (3 marks)

fungsi kerja natrium. (3 markah)

b. the value of the Plank constant. (3 marks)
nilai pemalar Plank. (3 markah)

End of Question Paper
Kertas Soalan Tamat